

DEPARTMENT OF THE INTERIOR**Fish and Wildlife Service****50 CFR Part 17**

[Docket No. FWS-R6-ES-2015-0146];
[4500030113]

Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition To List Greater Sage-Grouse (*Centrocercus urophasianus*) as an Endangered or Threatened Species

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Notice of 12-month petition finding.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), announce a 12-month finding on petitions to list the greater sage-grouse (*Centrocercus urophasianus*), both rangewide and the Columbia Basin population, as an endangered or threatened species under the Endangered Species Act of 1973, as amended (Act). After review of the best available scientific and commercial information, we find that the Columbia Basin population does not qualify as a distinct population segment. In addition, we find that listing the greater sage-grouse is not warranted at this time. However, we ask the public to submit to us any new information that becomes available concerning the threats to the greater sage-grouse or its habitat at any time.

DATES: The finding announced in this document was made on October 2, 2015.

ADDRESSES: This finding is available on the Internet at <http://www.regulations.gov> at Docket Number FWS-R6-ES-2015-0146. Supporting documentation we used in preparing this finding is available for public inspection, by appointment, during normal business hours at the U.S. Fish and Wildlife Service, Mountain-Prairie Regional Office, 134 Union Blvd., Lakewood, CO 80228. Please submit any new information, materials, or questions concerning this finding to the U.S. Fish and Wildlife Service, Mountain-Prairie Regional Office, P.O. Box 25486, DFC, Mailstop 60120, Denver, CO 80225.

FOR FURTHER INFORMATION CONTACT: Michael Thabault, 303-236-9779.

SUPPLEMENTARY INFORMATION:**Executive Summary**

Why we need to publish this document. Under the Endangered Species Act (*hereafter*, Act), a species may warrant protection through listing if it is endangered or threatened throughout all or a significant portion of

its range. We issued a 12-month finding that greater sage-grouse was warranted for listing in 2010 (75 FR 13910, March 23, 2010). However, since that time, new information about the status of the species, potential threats, regulatory mechanisms, and conservation efforts indicates that listing is not warranted.

The basis for our action. Under the 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. Based on new information about these factors and the adequacy of regulatory mechanisms and conservation efforts in managing them, we have determined that the greater sage-grouse is not in danger of extinction now or in the foreseeable future throughout all or a significant portion of its range and that listing the species is no longer warranted.

Based on the best available scientific and commercial information, we have determined that the primary threats to greater sage-grouse have been ameliorated by conservation efforts implemented by Federal, State, and private landowners. In 2010, we identified habitat loss, fragmentation, and inadequacy of existing regulatory mechanisms as factors leading to a warranted determination. Since that time, regulatory mechanisms through Federal and three State plans that incorporate conservation principles identified by the scientific experts have substantially reduced these risks in approximately 90 percent of the breeding habitat through avoidance and minimization measures. Advancements in oil and gas technologies have reduced the anticipated footprint of future development; the future conversion of sagebrush habitats to agriculture is unlikely to impact greater sage-grouse because high densities of breeding sage-grouse do not occur in habitats that are suitable for agriculture; and renewable energy development, although still a potential, is unlikely to occur in areas where greater sage-grouse occur in the highest densities. Fire and invasive species continue to occur in greater sage-grouse habitats, especially in the Great Basin, but existing management and commitments for suppression, restoration, and noxious weed treatments are reducing that impact.

Rangewide, a number of relatively large greater sage-grouse populations continue to be distributed across the landscape and are supported by undisturbed expanses of habitat. Some habitat loss associated with energy development, infrastructure, wildfire, and invasive plants will continue into the future. However, regulatory mechanisms provided by Federal and three State plans reduce threats on approximately 90 percent of the breeding habitat across the species' range.

Acronyms Used in This Document

We use many acronyms throughout this document. To assist the reader, we provide a list of the most frequently used acronyms here for easy reference:

AML Appropriate Management Level
AUM Animal Unit Months
BLM Bureau of Land Management
BSU Biologically Significant Unit
CCA Candidate Conservation Agreement
CCAA Candidate Conservation Agreement with Assurances
CED Conservation Efforts Database
CFR Code of Federal Regulations
CNRMP Cultural and Natural Resource Management Plan
COT Conservation Objectives Team
CRP Conservation Reserve Program
DoD U.S. Department of Defense
DOE Department of Energy
DOI U.S. Department of the Interior
DPS Distinct Population Segment
EIS Environmental Impact Statement
FIAT Fire and Invasives Assessment Tool
FLPMA Federal Land Policy and Management Act of 1976
FR Federal Register
GHMA General Habitat Management Area
GIS Geographic Information System
HMA Herd Management Areas
HMAP Herd Management Area Plan
INRMP Integrated Natural Resources Management Plan
LHS Land Health Standards
MZ Management Zone
NEPA National Environmental Policy Act
NFMA National Forest Management Act
NRCS Natural Resources Conservation Service
NSO No Surface Occupancy
NWR National Wildlife Refuge
PACs Priority Areas for Conservation
PHMA Priority Habitat Management Areas
RDF Required Design Features
ROW Right-of-Way
RFPA Rangeland Fire Protection Associations
SARA Canada's Species at Risk Act
SFA Sagebrush Focal Areas
SGI Sage Grouse Initiative
SGMAs Sage-grouse Management Areas
SGPA Sage-grouse Protection Area
SPR Significant portion of the range
USDA U.S. Department of Agriculture
USFS U.S. Forest Service
USGS U.S. Geological Survey
WAFWA Western Association of Fish and Wildlife Agencies
WNV West Nile virus

YTC Joint Base Lewis-McChord Yakima Training Center

Overview of Sections

The following is an outline of the major sections included in this document:

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Background

Section 4(b)(3)(B) of the Act (16 U.S.C. 1531 *et seq.*), requires that, for any petition to revise the Federal Lists of Endangered and Threatened Wildlife and Plants that contains substantial scientific or commercial information that listing the species may be warranted, we make a finding within 12 months of the date of receipt of the petition. In general we must determine whether a petitioned action is: (1) Not warranted, (2) warranted, or (3) warranted, but the immediate proposal of a regulation implementing the petitioned action is precluded by other pending proposals to determine whether

species are endangered or threatened, and expeditious progress is being made to add or remove qualified species from the Federal Lists of Endangered and Threatened Wildlife and Plants. Section 4(b)(3)(C) of the Act requires that we treat a petition for which the requested action is found to be warranted but precluded as though resubmitted on the date of such finding, that is, requiring a subsequent finding to be made within 12 months. We must publish these 12-month findings in the **Federal Register**. See below for further discussion of the limitations imposed through various means on this determination.

Previous Federal Actions

From 1999 to 2005, we received eight petitions to list the greater sage-grouse throughout its range or within specific populations (Table 1). Among those, two were petitions to list the bi-State Distinct Population Segment (DPS) of the greater sage-grouse (2002 and 2005), which we have addressed separately and, hence, are not included in this status assessment (see Bi-State Distinct Population Segment, below). The responses to the other six petitions and the outcomes of ensuing lawsuits and court settlements are detailed in the 2010 finding (75 FR 13910, March 23, 2010), and are summarized in Table 1.

TABLE 1—SUMMARY OF PREVIOUS FEDERAL ACTIONS FOR GREATER SAGE-GROUSE, INCLUDING THE EASTERN AND WESTERN SUBSPECIES AND COLUMBIA BASIN POPULATION

Petitioner	Date	Request of petition	90-day petition finding	Status review finding	Legal challenges	Determination upheld
Craig Dremann (Institute for Wildlife Protection. American Lands Alliance [lead] + 20 other organizations).	Jul. 2, 2002 Mar. 24, 2003 Dec. 29, 2003	List rangewide .. List rangewide .. List rangewide ..	These three petitions were combined in one substantial finding: Apr. 21, 2004 (69 FR 21484).	Not warranted; Jan. 12, 2005 (70 FR 2244).	Western Watersheds Project challenged in 2006.	Finding remanded in 2007; warranted finding published March 23, 2010 (75 FR 13910).
Institute for Wildlife Protection.	Jan. 24, 2002	List the western subspecies.	Non-substantial; Feb. 7, 2003 (68 FR 6500).	N/A	Institute for Wildlife Protection challenged.	Positive 90-day finding April 29, 2008 (73 FR 23170); part of March 23, 2010, finding, but determined it was not a recognized subspecies (75 FR 13910).
Institute for Wildlife Protection.	Jul. 3, 2002	List the eastern subspecies.	Non-substantial; Jan. 7, 2004 (69 FR 933).	N/A	Institute for Wildlife Protection challenged.	Judge ruled in favor of the Service on Sept. 28, 2004, and dismissed plaintiff case.
NW Ecosystem Alliance and Biodiversity Legal Foundation.	May 28, 1999	List the Columbian Basin population as a DPS.	Substantial; Aug. 24, 2000 (65 FR 51578).	Warranted but precluded; May 7, 2001 (66 FR 22984).	N/A	Committed to resolve the DPS status in the rangewide status review.

In 2010, we found that listing the greater sage-grouse rangewide was

warranted, but precluded by other higher priority actions. That finding was

based on continuing population declines, with some areas of local

extirpations, resulting from habitat fragmentation. At that time, habitat fragmentation was caused by a number of land use activities, but energy development, agricultural conversion, conifer encroachment, wildfire, and invasive species were of particular concern. Significant habitat fragmentation was expected to continue into the foreseeable future, and regulatory mechanisms were ineffective in addressing this threat. As a result of these findings, the greater sage-grouse was made a candidate for listing rangewide with a listing priority number of 8, indicating that threats were of moderate magnitude and imminent (75 FR 13910, March 23, 2010).

On May 10, 2011, we filed a multiyear workplan as part of a proposed settlement agreement with Wild Earth Guardians and others in a consolidated case in the U.S. District Court for the District of Columbia. On September 9, 2011, the Court accepted our agreement with the plaintiffs in *Endangered Species Act Section 4 Deadline Litig.*, Misc. Action No. 10–377 (EGS), MDL Docket No. 2165 (D. D.C.) (known as the “Multi-District Litigation case”), on a schedule to publish proposed rules or not-warranted findings for the 251 species designated as candidates as of 2010 no later than September 30, 2016. The workplan included a deadline to submit a proposed rule or not-warranted finding to the **Federal Register** for greater sage-grouse, including any DPSs (but excluding the bi-State DPS), by September 30, 2015. Further, Congress prohibited the expenditure of funds to publish a proposed rule for the greater sage-grouse or the Columbian Basin population (Pub. L. Number 113–235). The publication of this finding complies with the workplan and is consistent with Congressional direction.

Species Information

Greater sage-grouse are birds in the Phasianidae family, which is a diverse taxonomic group consisting of over 50 genera including turkeys (*Meleagris* spp.), pheasants (*Phasianus* spp.), and partridges (*Perdix* spp.). Adult male greater sage-grouse range in length from 66 to 76 centimeters (cm) (26 to 30 inches (in)) and weigh between 2 and 3 kilograms (kg) (4.4 and 6.6 pounds (lb)). Adult females are smaller, ranging in length from 48 to 58 cm (19 to 23 in) and weigh between 1 and 2 kg (2.2 and 4.4 lb). Males and females have dark grayish brown body plumage with many small gray and white spots, fleshy yellow combs over the eyes, long pointed tails, fully feathered legs and feet, and dark green toes. Males also

have blackish chin and throat feathers, conspicuous phylloplumes (specialized erectile feathers) at the back of the head and neck, and white feathers forming a ruff around the neck and upper belly. During breeding displays, males exhibit olive-green apteria (fleshy bare patches of skin) on their breasts (Schroeder *et al.* 1999, p. 2).

Bi-State Distinct Population Segment

In 2010, we found the bi-State population to be a DPS because it is genetically unique and markedly separate from the rest of the greater sage-grouse range (75 FR 13910, March 23, 2010). This DPS has been addressed in a separate status review and was determined to be not warranted for listing (80 FR 22828, April 23, 2015). Therefore, the bi-State population of greater sage-grouse will not be addressed in this status review.

Columbia Basin Population

In 2001, we concluded in a 12-month finding that the Columbia Basin population of the western sage-grouse, a subspecies of the greater sage-grouse, was a valid DPS that warranted listing under the Act (66 FR 22984, May 7, 2001). The subspecies was previously described as being found in southern British Columbia, central Washington, and parts of Oregon, Nevada, and California. Since that 12-month finding, new information emerged that led us to conclude in 2010 that the best scientific and commercial information does not support the recognition of and the taxonomic validity of the western subspecies (75 FR 13910, March 23, 2010). In that finding, we also reported that we would reevaluate the status of the Columbia Basin population as it relates to the greater sage-grouse in the future. Therefore, in the following section we reevaluate the validity (*i.e.*, discreteness and significance) of the Columbia Basin population as a possible DPS with respect to the correct taxon to which it belongs: The greater sage-grouse (*Centrocercus urophasianus*).

Within our *Policy Regarding the Recognition of Distinct Vertebrate Population Segments Under the Endangered Species Act* (61 FR 4722, February 7, 1996), three elements are considered in the decision concerning the establishment and classification of a possible DPS. These elements include:

- (1) The discreteness of a population in relation to the remainder of the species to which it belongs;
- (2) The significance of the population segment to the species to which it belongs; and
- (3) The population segment's conservation status in relation to the Act's standards for

listing, delisting, or reclassification (is the population segment endangered or threatened).

Discreteness

Under the DPS policy, a population segment of a vertebrate taxon may be considered discrete if it satisfies either one of the following conditions:

(1) It is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, or behavioral factors. Quantitative measures of genetic or morphological discontinuity may provide evidence of this separation.

(2) It is delimited by international governmental boundaries within which differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms exist that are significant in light of section 4(a)(1)(D) of the Act.

In our 2001 12-month finding on the Columbia Basin DPS (66 FR 22984, May 7, 2001), we found that the population, which is located in Washington, was physically discrete from other populations of what we then considered the western subspecies of greater sage-grouse in central and southern Oregon. Below, we reevaluate that finding giving consideration to new information and conducting our analysis with respect to the entire range of greater sage-grouse.

Markedly Separate—Greater sage-grouse in the Columbia Basin occur in four relatively small, disconnected areas. Two of these areas (the Army's Joint Base Lewis-McChord–Yakima Training Center (YTC) and Douglas County) have endemic populations, and two areas (Yakama Indian Nation and Lincoln County) are in the process of being repopulated by translocations of individuals from outside the Columbia Basin (WWHCWG 2010, p. 55; WWHCWG 2012, pp. A.2–3). Translocations began in 2004 with augmentation efforts on the YTC (Schroeder *et al.* 2014, p. 8; Stinson and Schroeder 2014, p. 15). Translocations to reestablish populations on Yakama Nation lands and in Lincoln County were initiated in 2006 and 2008, respectively (Schroeder *et al.* 2014, pp. 8–15).

The pre-European settlement distribution of greater sage-grouse is generally described as being continuous from central Oregon, north to the Columbia Basin (Schroeder *et al.* 2004, p. 368). However, this continuity was lost between the pre- and post-settlement period, mostly due to habitat fragmentation (Schroeder *et al.* 2000, pp. 105, 110; 2004, pp. 369–370). Breeding populations of greater sage-grouse in the Columbia Basin are now separated by approximately 250

kilometers (km) (155 miles (mi)) of fragmented and unsuitable habitat from the next nearest breeding population, the Baker population in Oregon (Johnson *et al.* 2011, p. 409, Knick *et al.* 2013, p. 1544). The second closest breeding population, in central Oregon, is approximately 260 km (162 mi) from the nearest breeding population in the Columbia Basin (Johnson *et al.* 2011, p. 409, Knick *et al.* 2013, p. 1544). The area between these populations consists of relatively small patches of fragmented *Artemisia* spp. (sagebrush) within a matrix of croplands (Knick *et al.* 2003, pp. 615–618). At the narrowest point, sagebrush habitats on either side of this forested mountain range are approximately 25 km (15 mi) apart, and no historical greater sage-grouse records exist for this area (Knick *et al.* 2013, p. 1544).

No documented instances exist of greater sage-grouse moving between the Columbia Basin and any other greater sage-grouse populations without the aid of translocations. Seasonal migration in sage-grouse over 100 km (62 mi) has been observed (Hagen 1999, p. 39; Tack *et al.* 2012, p. 65), but in Washington, seasonal movements tend to be less than 30 km (19 mi) between breeding and wintering areas (Schroeder and Vander Haegen 2006, entire; WWHCWG 2010, pp. 54–55). Despite documentation of extensive seasonal movements in this species (Fedy *et al.* 2012, p. 1066; Tack *et al.* 2012, p. 65; Davis *et al.* 2014, pp. 715–716), the natal dispersal abilities of sage-grouse have been shown to be low (Dunn and Braun 1985, p. 622; Thompson 2012, p. 193). Based on data from radio-marked greater sage-grouse, the maximum distance translocated birds in the Columbia Basin moved from the point of release was 85 km (53 mi). The average maximum distance removed from the release site for all birds with two or more locations was only 14 km (9 mi) (Schroeder *et al.* 2014, p. 17).

The ability of greater sage-grouse to move through the landscape is affected by many factors, including the presence of suitable habitats or topographic features that impede movement (Schulwitz *et al.* 2014, p. 568; Row *et al.* 2015, pp. 1965–1966). An assessment of habitat linkages between greater sage-grouse in Washington and Oregon showed relatively high landscape resistance to greater sage-grouse movements and no modeled linkages between the Columbia Basin and other greater sage-grouse populations (WWHCWG 2010, pp. 57–59). A separate modeling effort evaluating contemporary connectivity among leks (communal breeding centers where

males perform courtship displays) spanning the Great Basin and Columbia Basin also showed little to no movement potential between the Columbia Basin and other greater sage-grouse populations (Knick *et al.* 2013, p. 1548).

Analysis of genetic variation across the range of greater sage-grouse is consistent with relatively short-distance dispersal, with gene flow (the transfer of genetic material from one population to another) decreasing as the distance between populations increases (*i.e.*, isolation by distance) (Oyler-McCance *et al.* 2005, p. 1306). Landscape resistance can also influence patterns of gene flow in greater sage-grouse, with broad-scale distribution of low-quality nesting and wintering habitats identified as the most important factors driving patterns of effective dispersal (Row *et al.* 2015, pp. 1963–1964). Landscape-scale analyses of genetic variation show low levels of gene flow between the Columbia Basin and other populations of greater sage-grouse (Oyler-McCance *et al.* 2005, p. 1306). Analysis of allele frequencies in greater sage-grouse on the YTC prior to augmentation efforts showed that these individuals had low genetic diversity and were distinguishable from individuals translocated from Oregon and Nevada (Blankenship *et al.* 2011, pp. 7, 10); a result that is consistent with little to no contemporary gene flow.

Greater sage-grouse have been translocated to the Columbia Basin from Idaho, Oregon, Nevada, and Wyoming (Livingston *et al.* 2006, pp. 2–3; Schroeder *et al.* 2014, pp. 8, 14–15). Moving greater sage-grouse from other areas into the Columbia Basin population means that, while this population is physically discrete from other populations, it has been connected through human intervention. Genetic data collected post-augmentation on the YTC confirms that breeding between endemic individuals and translocated individuals has occurred (Blankenship *et al.* 2011, p. 10). It is unknown if translocated greater sage-grouse released on the Yakama Nation or in Lincoln County are interbreeding with endemic populations of greater sage-grouse. However, at least one bird translocated to Lincoln County is known to have dispersed to the Douglas County population (Schroeder *et al.* 2014, p. 17). In addition, two males released in Lincoln County moved to the Douglas County population for a few days early in the 2015 breeding season, but returned to Lincoln County and were observed strutting on the Lincoln County lek (McPherron, USFWS, pers. comm. 2015).

International Boundaries—Greater sage-grouse occurrences were documented in British Columbia from 1864 to 1918 (Campbell and Ryder 2010, p. 7), in the Okanogan Valley, an area considered part of the Columbia Basin ecosystem. From 1918 to the 1950s, no occurrence records were reported (Campbell and Ryder 2010, entire). Translocations were conducted to reintroduce greater sage-grouse in the late 1950s, but given the lack of occurrence records since the 1960s, the species is considered extirpated from the province (Campbell and Ryder 2010, pp. 7–10). Therefore, greater sage-grouse in the Columbia Basin are not delimited by international governmental boundaries.

Summary for Discreteness—Greater sage-grouse in the Columbia Basin are physically separated from the nearest populations by approximately 250 to 260 km (155 to 162 mi). Information on movement and dispersal ecology, telemetry data, habitat and connectivity modeling, and genetic analyses, when viewed together, suggest that greater sage-grouse are unlikely to move between the Columbia Basin population and other greater sage-grouse populations. Based on this information alone, we could conclude that the Columbia Basin population is discrete based on marked separation from other populations as a consequence of physical and ecological factors. However, ongoing translocation efforts provide a connection that artificially links the Columbia Basin population to other populations of greater sage-grouse. The connectivity provided by human-intervention complicates any conclusions about the Columbia Basin population's discreteness. Therefore, we will assume that the population could be discrete and move on to assess the significance of the population to the taxon.

Significance

If a population segment is considered discrete under one or more of the conditions described in our DPS policy, its biological and ecological significance will be considered in light of Congressional guidance that the authority to list DPSs be used “sparingly” (see Senate Report 151, 96th Congress, 1st Session) while encouraging the conservation of genetic diversity. In making this determination, we consider available scientific evidence of the DPS's importance to the taxon to which it belongs. Since precise circumstances are likely to vary considerably from case to case, the DPS policy does not describe all the classes of information that might be used in

determining the biological and ecological importance of a discrete population. However, the DPS policy describes four possible classes of information that provide evidence of a population segment's biological and ecological importance to the taxon to which it belongs. As specified in the DPS policy (61 FR 4722, February 7, 1996), this consideration of the population segment's significance may include, but is not limited to, the following:

(1) Persistence of the population segment in an ecological setting unusual or unique to the taxon;

(2) Evidence that loss of the population segment would result in a significant gap in the range of a taxon;

(3) Evidence that the population segment represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historical range; or

(4) Evidence that the population segment differs markedly from other populations of the species in its genetic characteristics.

A population segment needs to satisfy only one of these conditions to be considered significant. Furthermore, other information may be used as appropriate to provide evidence for significance.

In our 2001, 12-month finding on the Columbia Basin DPS, we found that the population was significant to the western subspecies because it occurred in a unique ecological setting to the subspecies and because loss of the Columbia Basin would have resulted in a significant gap in the range of the western subspecies (66 FR 22984, May 7, 2001, p. 22992). Below we reevaluate these findings giving consideration to new information and conducting our analysis on the significance of the population segment to the greater sage-grouse species, rather than to the no-longer-recognized western subspecies.

Unusual or Unique Ecological Setting—In our 12-month finding published in 2001, relative to unusual or unique ecological setting, we found that:

(1) The Columbia Basin is a unique ecosystem, whose characteristics were the result of a unique combination of elevation, soil, influences of historical geologic processes, and climatic conditions; as a result, sagebrush habitats in the Columbia Basin could be differentiated from sagebrush habitats outside of the Columbia Basin by a number of floristic characteristics, including the presence of *Juniperus* spp. (juniper) woodlands, salt-desert shrub habitats, and the type and distribution of sagebrush taxa and forb species;

(2) Sage-grouse occupying the Columbia Basin were, "necessarily," differentially exploiting the resources that are available, as

compared with sage-grouse in central and southern Oregon; and that these differences in exploitation of resources had bearing on their food and cover preferences, distribution, movements, reproductive fitness, and ultimately, their survival; and

(3) The unique elements of the Columbia Basin held different management implications for western sage-grouse within this ecosystem (66 FR 22984, May 7, 2001).

Below, we reevaluate these findings giving consideration to new information and conducting our analysis on the entire greater sage-grouse range, rather than the no-longer-recognized western subspecies range.

As stated in the DPS Policy, occurrence in an unusual ecological setting may indicate that a population segment represents a significant resource warranting conservation under the Act (61 FR 4722, February 7, 1996). In considering whether the population occupies an ecological setting that is unusual or unique for the taxon, we evaluate whether the habitat includes unique features not used by the taxon elsewhere and whether the habitat shares many features common to the habitats of other populations. We further evaluate whether any of these differences could play an important biological role with respect to the remainder of the taxon, such as by contributing to the taxon's prospects for survival, to a degree that the population warrants conservation under the Act.

The Columbia Basin represents a separate floristic province within the range of the greater sage-grouse and is unique in that none of the ecosystems within the range of the greater sage-grouse are exactly the same with respect to elevation, soil, influences of historical geologic processes, and climatic conditions. As we found in 2001, these differences have resulted in some differences to the types of sagebrush and other vegetative components present in the ecosystem (66 FR 22984, May 7, 2001, pp. 22989–22991). However, simply the occurrence of a species within a definable ecosystem does not, by itself, make it significant to the taxon under the DPS Policy. Sagebrush-dominated plant communities vary considerably across the range of greater sage-grouse (West and Young 2000, pp. 259–267), and specific habitat components used by greater sage-grouse can vary due to biotic and abiotic factors (Connelly *et al.* 2011a, p. 70). Yet, common to all greater sage-grouse is the use of sagebrush and their dependence on this habitat for food and cover during all periods of the year (Connelly *et al.* 2004, pp. 4–1–4–19).

The greater sage-grouse appears to be fairly adaptable to a variety of conditions as it: (1) Occurs throughout a wide variety of sagebrush habitats in western North America; (2) occurs and breeds from less than 610 m (2,000 ft) to more than 3,000 m (9,842 ft) above sea level; (3) spans a variety of climatic conditions from relatively wet montane sagebrush communities to dry sagebrush types; and (4) uses a wide range of understory vegetation during the breeding and brood-rearing periods (Aldridge and Brigham 2002, pp. 440–442; Connelly *et al.* 2004, pp. 4–1–4–19; Schroeder *et al.* 2004, pp. 366–368; Guttery 2011, pp. 20, 50–51). Stated more simply, the species is able to occupy a broad range of sagebrush communities throughout western North America. Therefore, the ability of the Columbia Basin population of greater sage-grouse to exist within a particular amalgamation of habitat features does not necessarily contribute to the survival of the greater sage-grouse species, or otherwise serve an important biological role with respect to the taxon.

The degree to which regional differences in habitat components affect greater sage-grouse distribution, reproductive fitness, and survival is complex (Connelly *et al.* 2011a, pp. 71–83). Greater sage-grouse in the Columbia Basin are comparable to other populations of greater sage-grouse in their date of nest initiation, variation in the date of nest initiation, length of incubation, nest success, lek visitation by females, and fidelity of males to leks (Schroeder 1997, pp. 937–939; Schroeder and Robb 2003, pp. 295–296). Differences reported for the Douglas County population include higher reproductive effort than greater sage-grouse in other regions and lower fidelity to nest sites (Schroeder 1997, p. 939; Schroeder and Robb 2003, p. 296). The degree to which these differences are the result of habitat fragmentation in north-central Washington or other factors is unknown (Schroeder and Robb 2003, p. 297). Nevertheless, greater sage-grouse in the Columbia Basin appear to have reproductive output and survival estimates that are within the range of values observed elsewhere across the range of the species (Stinson *et al.* 2004, p. 6, Connelly *et al.* 2011b, pp. 56–58).

Under the DPS Policy, a determination of significance can be made if a population segment persists in a unique or unusual ecological setting that is significant to the taxon to which it belongs. Although the Columbia Basin differs in some ways from other habitats that the greater sage-grouse inhabits, this is not unusual for the greater sage-grouse rangewide given the diversity of

sagebrush habitats the species utilizes across its range. Further, nothing about the Columbia Basin population's life history or habitat use is unique when compared to other populations across the range. Given that Columbia Basin habitat and birds fall within the natural range of variability for greater sage-grouse across its range, we conclude that the best information available indicates that the Columbia Basin population is not significant to the species as a whole because of persistence in an unusual or unique ecological setting.

Significant Gap in the Range of the Taxon—In our 12-month finding published in 2001, relative to gap in the range, we found that:

(1) Columbia Basin greater sage-grouse represent the extreme northwestern extent of greater sage-grouse range and the northernmost extent of the historical distribution of the western sage-grouse;

(2) The Columbia Basin historically encompassed roughly 55 percent of the entire range of western sage-grouse; and

(3) Due to its potential isolation, greater sage-grouse in the Columbia Basin are likely experiencing increased directional selection due to marginal and varied habitats at the taxon's range periphery, exhibiting genetic consequences of reduced gene flow from other population segments, and responding (and will continue to respond) to the different anthropogenic (human caused) influences in the region (66 FR 22984, May 7, 2001).

Below, we reevaluate these findings giving consideration to new information and conducting our analysis on the entire greater sage-grouse range, rather than the previously designated western subspecies' range.

Greater sage-grouse in the Columbia Basin are the northwestern extent of the sage-grouse range, but greater sage-grouse in Alberta and Saskatchewan and northern Montana make up the northernmost extent of the range. To assess the degree to which being the northwestern extent of the range makes the population significant, we must consider the proportion of individuals in this extent of the range and the amount of habitat available there for greater sage-grouse; being a peripheral population, by itself, does not connote significance to the taxon. Relative to the rest of the range of greater sage-grouse (excluding the bi-State DPS), the Columbia Basin is estimated to contain only 0.6 percent of the rangewide population estimate (Doherty *et al.* 2015, entire), 2.7 percent of the rangewide distribution of sagebrush habitats (Knick 2011, p. 25), and 4 percent of the total occupied range (Knick 2011, p. 25).

In addition, given new information since 2001, we must reevaluate our conclusion relative to the likelihood of directional selection due to the isolation of this peripheral population. The best available population and genetic data suggest that greater sage-grouse in the Columbia Basin have undergone a severe reduction in population size, and are now isolated from other populations (Schroeder *et al.* 2000, pp. 106–109; Oyler-McCance *et al.* 2005, p. 1307). This has resulted in the loss of genetic diversity, and the population now has the lowest levels of genetic diversity, as measured in mitochondrial and nuclear markers, reported for any greater sage-grouse population (Oyler-McCance *et al.* 2005, p. 1307). However, the extent to which this isolation is causing “selection” or has resulted in the development of traits in greater sage-grouse that are adapted to the Columbia Basin is not definitive.

Morphological or behavioral differences in greater sage-grouse may be indicators of adaptive traits not revealed through analysis of neutral genetic markers. Comparisons of greater sage-grouse in the Columbia Basin with other greater sage-grouse populations suggest they are heavier than birds in Idaho, Nevada, Oregon, and California, but are similar in mass to greater sage-grouse in northern Colorado to Alberta (Schroeder 2008, pp. 5–9). Although some wing and tail measurements differed between greater sage-grouse from the Columbia Basin and elsewhere, the comparison included only a small number of other populations, measurement bias was unknown, and the conclusion of the author was that the available morphometric data did not illustrate any unique morphological characteristics in the Columbia Basin birds (Schroeder 2008, p. 10). Similarly, an assessment of the available behavioral data did not reveal any substantial differences in greater sage-grouse behavior in the Columbia Basin (Schroeder 2008, pp. 9–10).

In summary, loss of the Columbia Basin population would not result in a significant gap in the range of greater sage-grouse. This area represents less than 1 percent of the rangewide population estimates and less than 3 percent of sagebrush habitat. While loss of this population would reduce the occupied range of the species, it would not remove a habitat type found nowhere else in the range nor would it create a barrier to the movement of birds from other populations. Although the Columbia Basin population is peripheral and isolated, there is no evidence that it has been isolated for long periods of evolutionary time,

resulting in significant adaptive traits that might indicate its loss would be significant to the taxon.

Marked Genetic Differences—In our 12-month finding published in 2001, we found that the results from rangewide genetic studies were “suggestive” and demonstrated a marked difference between the population segment of greater sage-grouse within the Columbia Basin and the population segment in central and southern Oregon. However, we concluded that these results did not necessarily indicate that genetic differentiation of this population segment is significant to the remainder of the taxon, as we were unsure to what extent the forces of isolation, adaptive change, genetic drift, and/or inbreeding may have influenced the regional profiles of greater sage-grouse (66 FR 22984, May 7, 2001). Below, we reevaluate these findings giving consideration to new information and conducting our analysis on the entire greater sage-grouse range, rather than the previously recognized western subspecies range.

Additional rangewide studies of neutral genetic variation since 2001 support the conclusion that greater sage-grouse in the Columbia Basin segregate from the other populations when evaluated using quantitative measures of genetic diversity (Benedict *et al.* 2003, pp. 308–309; Oyler-McCance *et al.* 2005, pp. 1304–1305). The reason that genetic diversity can be significant to a species is that the presence of novel haplotypes (set of genes inherited from one parent) or alleles (a variant form of a gene) could provide the species with adaptive capacity if faced with deteriorating environmental conditions. However, the quantitative differences in genetics between this population and the species as a whole were largely the result of greater sage-grouse in the Columbia Basin having extremely low levels of genetic diversity (Oyler-McCance *et al.* 2005, p. 1307), rather than a being a function of having a large proportion of novel haplotypes or alleles.

Evaluation of mitochondrial DNA (mtDNA) revealed that approximately 90 percent of the sampled greater sage-grouse in the Columbia Basin had a single mitochondrial DNA haplotype, while only one novel haplotype was present (Oyler-McCance *et al.* 2005, pp. 1298–1300). This novel haplotype (Haplotype DS) was in the same grouping as one of the most common haplotypes observed in greater sage-grouse (Haplotype X) with only a single base-pair difference from this common haplotype (Oyler-McCance *et al.* 2005, pp. 1299, 1301). This indicates that only

a single mutational event was necessary to produce this novel haplotype, which could have occurred over a relatively short amount of evolutionary time. Thus, the available genetic evidence from studies of mtDNA does not lead us to conclude that the populations in Washington are markedly genetically different from other populations of greater sage-grouse found throughout the Great Basin.

Nuclear genetic data evaluated using microsatellite markers showed that populations in the Columbia Basin had the lowest genetic diversity of the 46 populations of greater sage-grouse studied (Oyler-McCance *et al.* 2005, p. 1307). Although genetic distance comparisons showed that the Columbia Basin populations were some of the most differentiated of all greater sage-grouse populations, this finding is largely a reflection of the small number of alleles found there (Oyler-McCance *et al.* 2005, p. 1307). Therefore, while statistically different, these differences cannot be attributed to greater sage-grouse being isolated for a long period of evolutionary time, which might have indicated that they had developed some adaptive traits not found elsewhere in the range of greater sage-grouse.

Summary for Significance—We have considered significance of the Columbia Basin population by evaluating the uniqueness of the ecological setting; the potential for a significant gap in the range of greater sage-grouse if the population was lost; and genetic

distinctness from other greater sage-grouse populations. We conclude that the Columbia Basin greater sage-grouse do not occur in a unique ecological setting, and their loss would not result in a significant gap in the range of the greater sage-grouse. While genetic diversity is low, the population is not markedly genetically different from other populations of greater sage-grouse. Based on this information, we find that this population does not meet the definition of significance as defined in our 1996 DPS policy.

Greater Sage-Grouse Listable Entity Summary

In 2010, we determined that the bi-State population qualified as a DPS under the Act. At that time, we deferred any other decisions about potential DPSs, including an assessment of the Columbia Basin population, until this status review. After consideration of the distinctness and significance of the Columbia Basin population, giving consideration to new information, and conducting our analysis on the significance of the population to the greater sage-grouse rangewide instead of to the previously recognized western subspecies, we have determined that it does not meet the criteria for a DPS. Therefore, the Columbia Basin population will be considered together with the other populations in the greater sage-grouse range (hereafter referred to as sage-grouse). Specifically, when we discuss sage-grouse in the Great Basin,

we are including Columbia Basin in those discussions. The remainder of this status review will consider all populations and habitat across the range of the species, with the exception of the bi-State DPS.

Distribution

Prior to European settlement of western North America in the 19th century, sage-grouse occurred in an area that today would cover 13 States and 3 Canadian provinces—Arizona, California, Colorado, Idaho, Montana, Nebraska, Nevada, North Dakota, Oregon, South Dakota, Utah, Washington, Wyoming, British Columbia, Alberta, and Saskatchewan (Schroeder *et al.* 2004, p. 369; Figure 1). Sagebrush habitats that potentially supported sage-grouse occurred over approximately 1.2 million square kilometer (km²) (460,000 square miles (mi²)) before 1800 (Schroeder *et al.* 2004, p. 366). Currently, sage-grouse occur in 11 States (California, Colorado, Idaho, Montana, Nevada, North Dakota, Oregon, South Dakota, Utah, Washington, Wyoming), and 2 Canadian provinces (Alberta and Saskatchewan), occupying approximately 56 percent of their historical range (Schroeder *et al.* 2004, p. 369; Figure 1). Approximately 2 percent of the total range of sage-grouse occurs in Canada, with the remainder in the United States (Knick 2011, p. 24).

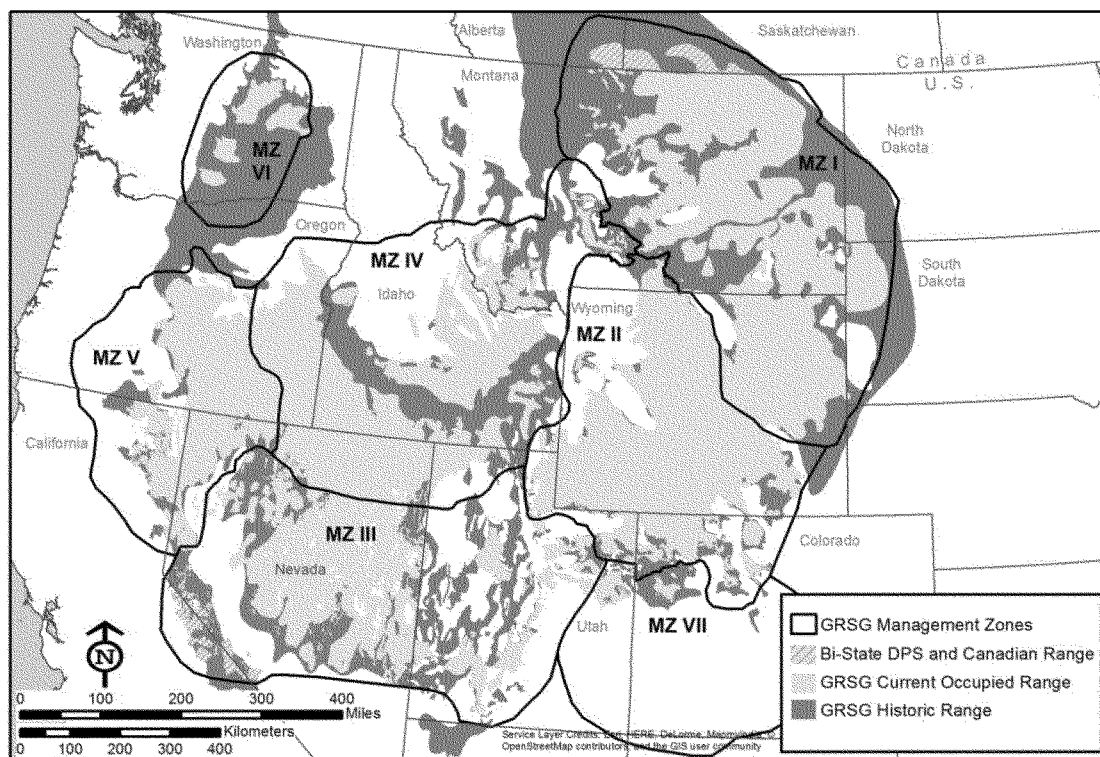


Figure 1. Current occupied and historical range of sage-grouse (derived from Schroeder *et al.* 2004 and updated by the Service) and the WAFWA Sage-Grouse Management Zones (Stiver *et al.* 2006, p. 1–6).

The Western Association of Fish and Wildlife Agencies (WAFWA) Conservation Strategy for Greater Sage-grouse (Stiver *et al.* 2006, p. 1–6) delineated seven sage-grouse Management Zones (MZ; Figure 1) to guide conservation and management. The boundaries of these MZs were delineated based on their ecological and biological attributes (floristic provinces) rather than on political boundaries (Stiver *et al.* 2006, p. 1–6); therefore, vegetation is similar within each MZ, and sage-grouse are likely to respond similarly to environmental factors and management actions. For this reason, we conducted analyses for some potential threats at the MZ-scale. While the Conservation Objectives Team (COT) Report (see *Conservation Objectives Team Report* below for further description) identifies Priority Areas for Conservation (PACs) as the areas needed for the species persistence, not all data used in our potential analyses was available at the PAC scale and the data did not provide a consistent rangewide data set, so PACs were not used as the unit of analysis for the impact analysis.

Sagebrush occurs in two natural vegetation types that are influenced by elevation, temperature, and patterns of precipitation (Miller *et al.* 2011, pp. 147–148). In general, the Great Basin portion of the range, which encompasses MZs III, IV, V, and VI, is lower in elevation and experiences less precipitation. The Rocky Mountain portion of the range, which encompasses MZs I, II, and VII, generally is higher in elevation and has greater precipitation. Due to the variance in the ecological conditions, the regions have differential susceptibility to potential threats (see Summary of Information Pertaining to the Five Factors, below).

Sage-grouse currently occupy a portion of their historical range and are more concentrated in certain Core Areas. Sage-grouse have been extirpated from Nebraska, British Columbia, and Arizona (Schroeder *et al.* 1999, p. 2; Young *et al.* 2000 p. 445; Schroeder *et al.* 2004, p. 369). Changes from the estimated historical distribution are the result of sagebrush alteration and degradation (Schroeder *et al.* 2004, p.

363; Knick and Connelly 2011, p. 6). The current distribution of sage-grouse is estimated at 703,453 km² (271,604 mi²; USFWS 2015a). Approximately half of the sage-grouse occur in the Rocky Mountain portion of the range and half in the Great Basin portion of the range. Management Zones with the highest relative amounts of birds are MZ II (37.5 percent of the rangewide population estimate) and MZ IV (30.7 percent of the rangewide population estimate). As a result, impacts in these MZs may have greater impact to the species rangewide (see Summary of Information Pertaining to the Five Factors, below).

Habitat

Sage-grouse depend on a variety of shrub-steppe habitats throughout their life cycle and are considered a sagebrush obligate (Patterson 1952, p. 48). Sage-grouse use a variety of sagebrush species such as *Artemisia tridentata wyomingensis* (Wyoming big sagebrush), *A. t. vaseyana* (mountain big sagebrush), *A. t. tridentata* (basin big sagebrush), *A. nova* (black sagebrush),

A. frigida (fringed sagebrush), *A. cana* (silver sagebrush), and *A. arbuscula* (little sagebrush) (Miller *et al.* 2011, pp. 145–151). Sage-grouse distribution is strongly correlated with the distribution of sagebrush vegetation (Schroeder *et al.* 2004, p. 364).

Sagebrush is the most widespread vegetation in the intermountain lowlands in the western United States (West and Young 2000, p. 259). Sagebrush occurs in two natural vegetation types that are delineated by temperature and patterns of precipitation (Miller *et al.* 2011, pp. 147–148). The first, sagebrush-steppe, ranges across the northern portion of sage-grouse occupied range, from British Columbia and the Columbia Basin, through the northern Great Basin, Snake River Plain, and Montana, and into the Wyoming Basin and northern Colorado. Sagebrush is a co-dominant plant, along with perennial bunchgrasses, in sagebrush-steppe. The second vegetation type, Great Basin sagebrush, occurs south of sagebrush-steppe, and extends from the Colorado Plateau westward into Nevada, Utah, and California (Miller *et al.* 2011, pp. 147–148). In the Great Basin sagebrush zone, sagebrush is usually the dominant plant layer accompanied by sparse understories. Other sagebrush types within the sage-grouse occupied range include mixed-desert shrubland in the Bighorn Basin of Wyoming, and grasslands in eastern Montana and Wyoming that also support silver

sagebrush and *A. filifolia* (sand sagebrush) (Miller *et al.* 2011 p. 148).

Sagebrush is long-lived, with plants of some species surviving up to 150 years (West 1983, p. 340). Sagebrush is resistant to environmental extremes, with the exception of fire and occasionally defoliating insects (West 1983, p. 341). Natural sagebrush recolonization depends on the presence of adjacent live plants for a seed source or on the seed bank, if present (Miller and Eddleman 2000, p. 17). Although seed viability and germination are high, seed dispersal is limited (West and Young 2000, p. 260). Additionally, sagebrush seeds typically do not remain viable for more than one growing season, and evidence suggests that seeds do not persist in the soil more than 1 year; however, seeds have higher odds of persisting in the seed bank if they are buried (Wijayratne and Pyke 2012, p. 438). Productivity of plants associated with the sagebrush understory varies widely and is influenced by moisture availability, soil characteristics, climate, and topographic position (Miller *et al.* 2011, pp. 151–154). Forb abundance can be highly variable from year to year and is largely affected by the amount and timing of precipitation.

Sage-grouse depend on large areas of contiguous sagebrush to meet all seasonal habitat requirements (Connelly *et al.* 2011a, pp. 82–83; Wisdom *et al.* 2011, p. 465). Sage-grouse exhibit strong site fidelity (loyalty to a particular area, even when the area no longer provides habitat) to seasonal habitats used for

breeding, nesting, brood-rearing, and wintering (Connelly *et al.* 2004, p. 3–1; Connelly *et al.* 2011b, p. 60). Little information is available regarding minimum sagebrush patch sizes required to support populations of sage-grouse. Home range calculations range from 4 to 615 km² (1.5 to 237.5 mi²; Connelly *et al.* 2011b, p. 60), and migratory populations (which are discussed in more detail below) may use areas exceeding 2,700 km² (1,042 mi², 667,185 acres; Leonard *et al.* 2000, p. 269; Davis *et al.* 2014, p. 713). Large seasonal and annual movements emphasize the landscape nature of the species (Knick *et al.* 2003, p. 624; Connelly *et al.* 2011b, p. 60).

Federal lands encompass the majority of the sage-grouse occupied range, with MZs III, IV, and V being more than 60 percent federally owned (Table 2). Primary Federal land managers within the sage-grouse occupied range include Bureau of Land Management (BLM) and the U.S. Forest Service (USFS), which together manage 51 percent of the sage-grouse occupied range. Other Federal owners include the National Park Service, Department of Defense (DoD), the Service, and Department of Energy (DOE). Private lands comprise approximately 39 percent of the species' occupied range, with the largest proportion of private lands occurring in MZs I and VI. Tribal lands cover approximately 3 percent, and State lands cover approximately 5 percent of the current sage-grouse occupied range.

TABLE 2.—PERCENT OF THE CURRENTLY OCCUPIED SAGE-GROUSE RANGE WITHIN MANAGEMENT ZONES, BY SURFACE MANAGING AGENCY

Management zone	BLM	USFS	Other Federal	Tribal	State	Private
I Great Plains	16	2	1	5	8	69
II Wyoming Basin	49	2	2	3	6	38
III Southern Great Basin	69	14	1	1	2	13
IV Snake River Plain	52	8	3	1	5	30
V Northern Great Basin	62	7	6	1	2	23
VI Columbia Basin	5	0	13	11	7	63
VII Colorado Plateau	39	0	0	25	11	25
Rangewide Totals	45	6	2	3	5	39

Life-History Characteristics and Seasonal Habitat Selection

During the breeding season, male sage-grouse gather together to perform courtship displays on areas called leks. These areas are often characterized by having bare soil, shortgrass-steppe, windswept ridges, exposed knolls, or other relatively open sites (Connelly *et al.* 2004, pp. 3–7). Leks are often surrounded by denser shrub-steppe

cover used for shelter and to escape predators. Leks can be formed opportunistically at any appropriate site within or adjacent to nesting habitat (Connelly *et al.* 2000a, p. 970), and, therefore, lek habitat availability is not considered to be a limiting factor for sage-grouse (Schroeder *et al.* 1999, p. 4).

After mating, females travel to nesting areas characterized by sagebrush with an understory of native grasses and forbs that provides cover, an insect prey

base, and herbaceous forage for pre-laying and nesting females (Connelly *et al.* 2000a, p. 971; Connelly *et al.* 2004, pp. 4–18). Females typically move 1.3 to 5.1 km (0.8 to 3.2 mi) from leks to nest (Connelly *et al.* 2011b, p. 62), although the juxtaposition of habitats, disturbance, and the extent of habitat fragmentation may influence nest location distance from leks (Connelly *et al.* 2011b, p. 62 and references therein).

Sage-grouse clutch size ranges from six to nine eggs with an average of seven eggs (Connelly *et al.* 2011b, p. 62). Males do not participate in incubation of eggs or rearing chicks.

The likelihood of a female nesting in a given year averages 82 percent in the eastern portion of the range and 78 percent in the western portion of the range (Connelly *et al.* 2011b, p. 63). Nest success varies widely, and the average nest success for sage-grouse is 51 percent in non-altered habitats and 37 percent in altered habitats (Connelly *et al.* 2011b, p. 58). Re-nesting occurs only if the original nest is lost (Schroeder *et al.* 1999, p. 11) with an average re-nesting rate of 28.9 percent (Connelly *et al.* 2004, pp. 3–11). Approximately 2.25 chicks per female may be necessary to maintain stable to increasing populations (Connelly *et al.* 2000a, p. 970). Due to low chick survival and limited re-nesting, there is little evidence that populations of sage-grouse produce large annual surpluses (Connelly *et al.* 2011b, p. 67).

Females rear their broods near the nest site for the first 2 to 3 weeks following hatching (Connelly *et al.* 2004, p. 4–8). Forbs and insects are essential nutritional components for chicks (Connelly *et al.* 2004, p. 4–9). Therefore, early brood-rearing habitat must provide adequate cover adjacent to areas rich in forbs and insects to ensure chick survival during this period (Connelly *et al.* 2004, p. 4–9).

Approximately 12 weeks after hatching, sage-grouse gradually move from sagebrush uplands to more mesic (wet) areas during the late brood-rearing period (Peterson 1970, p. 149) as herbaceous vegetation dries during the hot summer (Connelly *et al.* 2000a, p. 971). Summer use areas can include sagebrush habitats as well as riparian areas, wet meadows, and *Medicago* spp. (alfalfa) fields (Schroeder *et al.* 1999, p. 4). These areas provide an abundance of forbs and insects for both females and chicks (Schroeder *et al.* 1999, p. 4; Connelly *et al.* 2000a, p. 971). Males and broodless females will also use more mesic areas in close proximity to sagebrush cover during the late summer, often arriving before females with broods (Connelly *et al.* 2004, p. 4–10).

During the winter, sage-grouse depend almost exclusively on sagebrush for both food and cover (Thacker *et al.* 2012, p. 588). Winter areas are characterized by large expanses of big sagebrush and tall shrubs, predominantly located on relatively gentle south- or west-facing slopes that provide more favorable thermal conditions and above snow forage (Doherty *et al.* 2008, p. 192; Hagen *et al.*

2011, p. 536; Dzialak *et al.* 2013, p. 16). The timing of movement to winter ranges varies considerably, but peaks around mid-October through late November (Schroeder *et al.* 1999, p. 10). Sage-grouse exhibit fidelity to winter sites (Berry and Eng 1985, p. 239); however, some birds shift winter habitat use in response to severe conditions (Smith 2010, p. 8).

The availability of winter habitat is important to sage-grouse persistence. Across the range of sage-grouse, winter habitat comprised from 6.8 to 18 percent of the total landscape used by different populations (Dzialak *et al.* 2013, p. 10; Smith *et al.* 2014, p. 12). Winter habitat availability is reduced during severe winters when heavy snowfall and increasing snow depths further decrease or even eliminate access to sagebrush. During harsh winters, birds become even more concentrated in the few remaining areas of exposed sagebrush (Hupp and Braun 1989, p. 828). As a result, the loss of winter habitats used in harsh winter conditions can have impacts disproportionate to their makeup on the landscape (Swenson *et al.* 1987, p. 128). During the average winter, sage-grouse typically experience low over-winter mortality, estimated at 2 to 4 percent, but could be as high as 15 percent (Connelly *et al.* 2000b, p. 229; Wik 2002, p. 40; Sika 2006, p. 90; Bruce *et al.* 2011, p. 421). During notably severe winters, however, higher mortality rates have been documented (Moynahan *et al.* 2006, p. 1,536; Anthony and Willis 2008, p. 544). In some cases, the locations of these wintering habitats are known, but there is not a consistent data set of this information across the range of the species.

The distances sage-grouse move between seasonal habitats are highly variable across the occupied range (Connelly *et al.* 1988, pp. 119–121). Sage-grouse may migrate between two or three distinct seasonal ranges, or not migrate at all. Non-migratory sage-grouse have seasonal movements of less than 10 km (6.2 mi; Connelly *et al.* 2000a, pp. 968–969), while birds in migratory populations (which are discussed in detail below) may travel well over 100 km (62 mi) (Tack *et al.* 2012, p. 65).

Despite the documentation of extensive seasonal movements in this species (Fedy *et al.* 2012, p. 1066; Tack *et al.* 2012, p. 65; Davis *et al.* 2014, p. 716), the dispersal abilities of sage-grouse are assumed to be low. One study estimated median natal dispersal distances of 8.8 km (5.5 mi) for females and 7.4 km (4.6 mi) for males (Dunn and Braun 1985, p. 622); another study

estimated natal dispersal distances of 3.8 km (2.4 mi) for males and 2.7 km (1.7 mi) for females (Thompson 2012, p. 193). Small-scale differences in habitat are not likely to influence sage-grouse dispersal at landscape scales. Rather, the arrangement of habitat quality was more influential on sage-grouse dispersal (Row *et al.* 2015, pp. 1964–1965) than the presence of unsuitable habitats.

Sage-Grouse Connectivity and Landscape Genetics

Habitat-based measures show that maintaining population connectivity is essential for sage-grouse population persistence. Connectivity between sage-grouse populations declined from 1965 to 2007 due to the loss of leks that historically provided connectivity and lower numbers of birds left to disperse (Knick and Hanser 2011, p. 395). As connectivity declined, isolated leks, those leks with low connectivity, were lost first (Knick and Hanser 2011, p. 395), with small decreases in lek connectivity resulting in large increases in probability of lek abandonment (Knick and Hanser 2011, p. 403). This suggests that as connectivity between leks at the edge of the range is lost, the probability these leks will persist is likely to decline (Knick and Hanser 2011, p. 396).

Maintaining sagebrush distribution is the most important factor in maintaining sage-grouse population connectivity (Knick and Hanser 2011, p. 404). Habitat loss decreases the connectivity between seasonal habitats, increasing the potential that a population may be lost (Doherty *et al.* 2008, p. 194). Loss of connectivity can increase population isolation (Knick and Hanser 2011, p. 402 and references therein) and, therefore, lead to a higher probability of loss of genetic diversity and extirpation due to stochastic events. Habitat fragmentation, habitat loss, and altered habitat disturbance regimes (e.g., fire frequency), rather than stochastic events, were identified as the likely primary influences on sage-grouse population trend (Knick and Hanser 2011, p. 403). Large areas of unsuitable habitat, such as mountain ranges, have been found to segregate sage-grouse and restrict genetic mixing (Row *et al.* 2015, p. 1965; Crist *et al.* 2015, p. 16).

Studies of genetic information among populations have revealed patterns of sage-grouse movement and isolation across the landscape. A genetic analysis revealed that the movement of individuals tends to be among neighboring populations and is unlikely to occur over great distances (Oyler-McCance *et al.* 2005, entire; Oyler-

McCance and Quinn 2011, p. 91). Genetic analysis further indicated that sage-grouse in fragmented areas on the periphery of the range in Colorado, Utah, and Washington were not extensively moving between or breeding with other nearby populations (Oyler-McCance and Quinn 2011, p. 92).

A recent analysis shows that core population centers and the habitat between those centers are important for maintaining connectivity (Crist *et al.* 2015, p. 18). This study examined the connectivity of populations across the range of sage-grouse and found that 20 of 188 priority areas contributed the most to range-wide connectivity (Crist *et al.* 2015, p. 11). These results affirm the conclusion by Knick and Hanser (2011) that relatively large populations in southwestern Wyoming, and straddling the borders between Idaho, Nevada, Oregon, and Utah, were the most highly connected areas within the range of sage-grouse (Crist *et al.* 2015, p. 11) and, therefore, essential to species persistence. However, other priority areas likely contribute to maintaining connections by serving as habitat pathways between and within priority areas, or by maintaining local connectivity in an area (Crist *et al.* 2015, p. 11). Active management will be essential to maintain connectivity between priority areas and to ensure long-term species persistence (Crist *et al.* 2015, p. 16).

Population Abundance and Trends

Estimating population sizes and trends of sage-grouse is difficult due to the large, 11-State range of the species, incomplete sampling, and challenges counting females (Garton *et al.* 2011, pp. 295–296). As a result, sage-grouse population sizes are estimated from counts of male sage-grouse on leks during the breeding season (Garton *et al.* 2011, p. 296). While lek surveys do not provide an accurate estimate of total population, the annual counts of males on leks provide the best indicator of sage-grouse trends (Stiver *et al.* 2006, p. 3–2; WAFWA 2015, p. 2). The relationship of lek survey data to actual population size is unknown (WAFWA 2008, p. 3). When counts are done according to a standardized protocol, these counts can be a useful metric of long-term population trends (Connelly *et al.* 2004, p. 6–6; Johnson and Rowland 2007, p. 20; WAFWA 2008, p. 3, Blomberg *et al.* 2013a, p. 1590, Gregory and Beck 2015, p. 7).

Recent work by MacKenzie and Evans (2015) has indicated the current sampling framework across the range of sage grouse which makes interpreting trend and population data difficult.

However, their analysis has indicated that there has been a long-term decline in the number of males per lek which is consistent with other recent trend analyses (Garton *et al.* 2015 and WAFWA 2015). The analysis goes on to indicate that over time and in virtually all management zones the probability of extinction of leks has been relatively stable. Additionally, the probability of recolonization of leks had been decreasing until the mid-1990s but that probability has stabilized to the current point in time. The conclusion of this work indicates that over the last 15 years the rate of extinction of leks and the probability of recolonization of leks has been remarkably stable.

Sage-grouse populations increase and decrease over time, making assessments of population size and short-term trends difficult. The length of these population cycles appears to vary across the range, but most populations have an 8- to 10-year population cycle (Rich 1985, pp. 5–8; Fedy and Doherty 2011, pp. 919–922). The drivers of the cycle are unknown, but may be caused by the amount and timing of precipitation (Rich 1985, p. 14; Fedy and Doherty 2011, p. 921).

In the 2010 finding, we concluded that rangewide, sage-grouse were experiencing a long-term decline in abundance (75 FR 13910, March 23, 2010, pp. 13920–13923). We noted the difficulty in determining the actual rate and magnitude of the declines, but noted that three independent studies had concluded that declines were occurring (Connelly *et al.* 2004, p. 6–71; WAFWA 2008, p. 12; Garton *et al.* 2011, pp. 307–359). In particular, the 2008 WAFWA analysis of lek-count data collected from 1965 to 2007 estimated a long-term decline of 3.1 percent per year during 1965 to 2007 (WAFWA 2008, p. 12). That assessment also found the rate of decline slowed from 1985 to 2007 to an average annual decline of 1.4 percent (Connelly *et al.* 2004, p. 6–71; WAFWA 2008, p. 58). A 2011 study (Garton *et al.* 2011, entire) assessed declining trends similar to the Connelly *et al.* (2004) and WAFWA (2008) analyses. Garton *et al.* (2011, p. 374) also predicted future population declines.

Both Garton *et al.* (2011) and WAFWA (2008) have updated their lek trend analyses to include additional data from 2013 through 2015 (Garton *et al.*, 2015; WAFWA 2015). Garton *et al.* (2015) examined the trend in the years 1965–2013 and reported that the rate of decline has decreased for MZs I, II, and VI when compared to their previous analyses (1965–2007). There was insufficient data from the other MZs to do a similar comparison, but the

updated analyses suggest that MZs I–VI have all experienced a long-term abundance decline (Garton *et al.* 2015). Insufficient data in MZ VII prevented a trend analysis in both Garton *et al.* 2011 and Garton *et al.* 2015. The updated WAFWA analyses reported declines in all MZs since 1965, with the exception of MZ III, where a slight increase was noted. In MZ III, the increasing trend was not uniform across the management zone, as peripheral populations are continuing to decline. The rates of decline have increased in MZs I and V in recent years (WAFWA 2015, pp. 17, 26), while the overall rate of decline across the species' range has slowed in recent years. In five MZs, most of the population estimates are primarily trending down at the periphery of the species' range (WAFWA 2015, p. 1), indicating that the denser, interior population areas are more insulated from declining trends. The number of males counted on leks range-wide in 2015 has increased 63 percent since the most recent population trough in 2013 (WAFWA 2015, p. 1).

Analysis of trend data is sensitive to the start and stop dates of the period analyzed due to the cyclic nature of sage-grouse populations. Garton *et al.* (2015) examined data only through 2013, at which time most populations were experiencing a cyclic decline. Lek counts increased in nearly all locations in 2014 and 2015 (WAFWA 2015, p. 1). However, both updated trend analyses are consistent with previous studies showing a long-term rangewide decline of sage-grouse has occurred since 1965 (75 FR 13910, March 23, 2010, p. 13922). The rate of decline lessened during 1985 to 2007, with an average annual decrease of 1.4 percent (Connelly *et al.* 2004, p. 6–71; WAFWA 2008, p. 58). The updated WAFWA analysis reported that, rangewide, rates of declines were less for the past 10 years (2005–2015) than the long-term decline rates (1965–2015) (WAFWA 2015, pp. 10–11).

Abundance and Distribution Models

We developed two models for use in this status assessment: (1) Population Index Model and (2) Occupied Breeding Habitat Distribution Model. These models were developed to evaluate risk to sage-grouse populations and benefits of conservation actions designed to ameliorate those risks. Our models, built with collaboration from WAFWA, are used as metrics for risk analyses and general Geographic Information System (GIS) queries. Full discussions of how the models were created and used are below.

In the 2010 finding, we assessed impacts to sage-grouse and their habitat based on the portion of occupied range where a disturbance occurred. This approach was based on the best available GIS data at that time, but may have overestimated some impacts, because all lands within the occupied range were assumed to provide habitat. We used this analysis in 2010 because current information available to us about the occupied sage-grouse range was developed at a very broad scale and included large areas of non-habitat. The Occupied Breeding Habitat Distribution Model was developed to more accurately portray the breeding areas that are important to sage-grouse. The

Occupied Breeding Habitat Distribution Model uses sage-grouse lek data as a proxy for landscapes important to breeding sage-grouse, because leks are central to the breeding ecology of sage-grouse. We developed a model that statistically links habitat characteristics around known lek locations to habitat features such as the amount of sagebrush or tree cover within a 6.4-km (4-mi) radius. The output of the model is a prediction of the probability that each 120-m² (393-ft²) area within a sage-grouse management zone provides habitat to support a breeding population of sage-grouse (Figure 2). These spatial predictions of occupied breeding habitat are then able to be linked with spatially

explicit risk models to better understand how potential impacts to sage-grouse overlap with breeding habitat. A consistent data set for other important seasonal habitat is not available, so while the model may not specifically include other seasonal habitats, it is the best available information for predicting impacts to the species consistently across the range. This model was the primary tool used to assess how the location and scope of potential threats may impact the species currently and into the future (see Summary of Information Pertaining to the Five Factors, below).

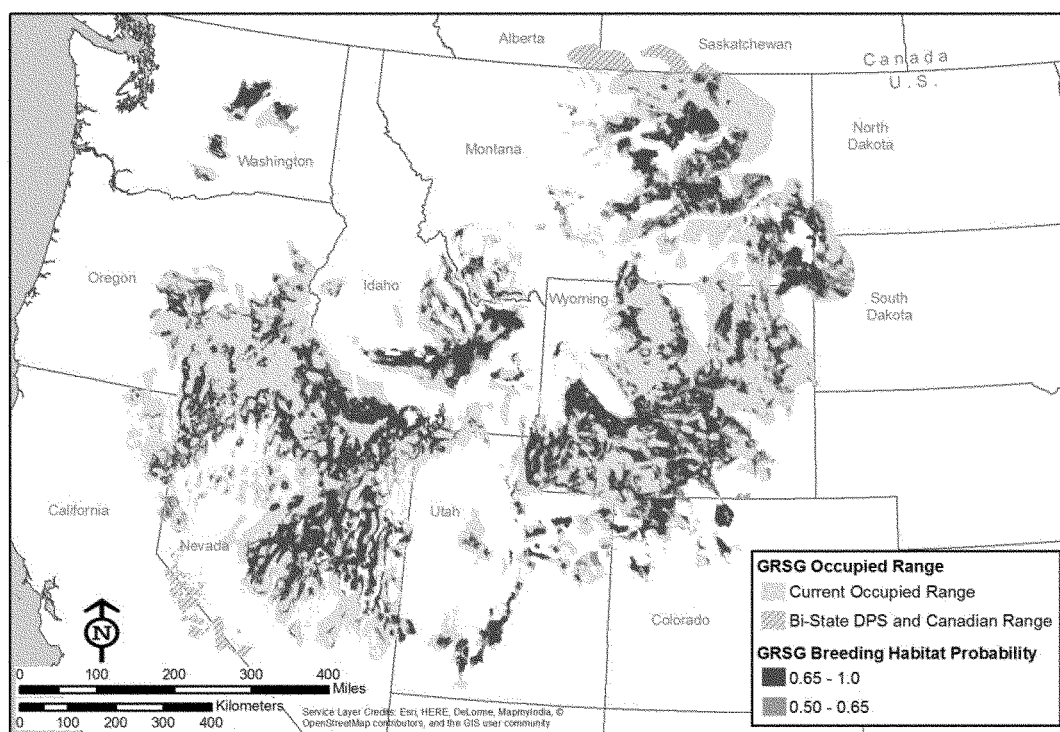


Figure 2. Modeled distribution of occupied sage-grouse breeding habitat.

We developed the Population Index Model to spatially identify Core Areas on the landscape that contain population centers of sage-grouse (Figure 3). We did this because sage-grouse populations are highly clumped, and relatively small areas can contain a disproportionate amount of sage-grouse. To create our Population Index Model, we used lek data to identify hotspots using standard statistical methods. We used the Occupied Breeding Habitat Distribution Model to develop our final

Population Index Model. The model results are grids that represent an index to the relative amount of breeding birds for each 120 m² (393 ft²) within management zones. Similar to our Occupied Breeding Habitat Distribution Model, our Population Index Model can be linked with other spatially explicit risk models or conservation actions to understand spatial overlap with sage-grouse populations. We would expect high levels of future impacts to occur if current sage-grouse population centers

overlap areas with high probabilities of future land use activities. Conversely, we would expect future impacts to be low, if current sage-grouse population centers do not overlap areas with high probabilities of future land use activities. The Population Index Model was used to assess potential impacts from Nonrenewable Energy and Agricultural Conversion (see Summary of Information Pertaining to the Five Factors, below).

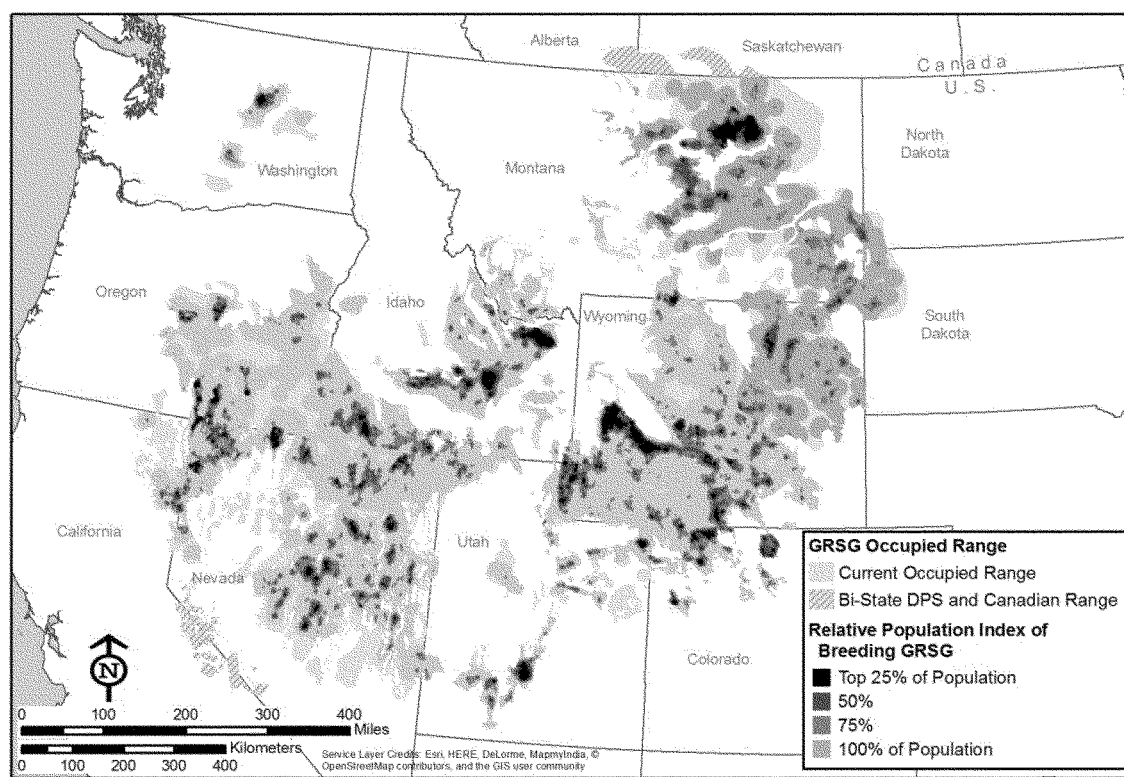


Figure 3. Population Index of breeding sage-grouse. Darker areas illustrate the highest densities of breeding sage-grouse.

Unfortunately we did not receive population or habitat data from the two Canadian provinces within the species range and, therefore, could not include these areas in our modeling efforts. The abundance of sage-grouse is low in both Canadian provinces (Alberta Environment and Sustainable Resource Development 2013, p. 8). Due to the low number of birds remaining in Canada, coupled with the limited amount of existing habitat in Canada, we do not anticipate that the exclusion of these areas affects the outcome of this range-wide model.

Population Abundance and Trends Summary

Estimating sage-grouse abundance is difficult due to changes in seasonal distributions, the cryptic coloration, and behavior of females and their offspring, and the lack of a systematic survey protocol and sampling scheme across the range of the species (WAFWA 2015, pp. 44–46). Lek counts do not provide a precise estimate of population size; however, these counts provide a useful index to the population size that detects population changes over time (Johnson and Rowland 2007, p. 20). Although an imperfect measure, peak counts of males

on leks are the best available information about the number of sage-grouse in an area (Johnson and Rowland 2007, p. 20) and are the accepted method to assess sage-grouse abundance trends (WAFWA 2015, p. 2; Garton *et al.* 2015, entire).

Information reviewed for the 2010 finding indicated a long-term decline of sage-grouse abundance since lek count surveys were initiated in the 1960s. New information since 2010 confirms that long-term declines have occurred from 1965 to 2014 across all MZs where sufficient data exist to make inferences (Garton *et al.* 2011, 2015, entire; WAFWA 2008, 2015, entire). While models agree about downward abundance trends since the 1960s, the actual rates of decline differ among MZs and studies. Our confidence in these rates of decline is limited due to a variety of statistical sampling issues associated with counting peak males on leks (see Johnson and Rowland 2007, pp. 17–20), as well as the cyclic nature of sage-grouse populations. Regardless, the best information available indicates that the rangewide population of sage-grouse is declining.

Changes Since the 2010 Finding

The landscape of the western United States has undergone significant changes since the onset of European settlement, including the dramatic alteration of key sage-grouse habitats. Despite human population growth and accompanying development, sagebrush habitats persist on millions of acres across 11 States in the west. Sage-grouse numbers have declined since pre-European settlement, but sage-grouse distribution (Figure 3) has remained relatively unchanged since our first status review in 2005 (70 FR 2244, January 12, 2005). In other words, despite historical and current population declines, sage-grouse are still distributed throughout their range.

The 2005 status review found that, despite a growing number of serious threats, large numbers of birds continued to be distributed across the range (70 FR 2244, January 12, 2005, p. 2279). At that time, 92 percent of the known active leks occurred in 8 of 41 populations; 5 of those populations were so large and expansive that they were subdivided into 24 subpopulations to facilitate analysis (Connelly *et al.* 2004, p. 13–4). We subsequently

determined that the species did not warrant listing, but emphasized the need for ongoing sage-grouse and sagebrush conservation efforts to moderate the rate and extent of habitat loss for the species in the future (70 FR 2244, January 12, 2005, p. 2279). Following the 2005 finding, the Western Association of Fish and Wildlife Agencies (WAFWA) released a rangewide conservation strategy for sage-grouse, which established an overarching goal of maintaining and enhancing populations and distribution of sage-grouse “by protecting and improving sagebrush habitats and ecosystems that sustain these populations” (Stiver *et al.* 2006, p. i). The WAFWA conservation strategy included actions such as increasing capabilities in habitat restoration, habitat conservation, research, and improving regulatory mechanisms. The WAFWA conservation strategy also identified quantifiable conservation goals (Stiver *et al.* 2006, pp. 1–8).

In 2010, we conducted a second status review for sage-grouse (75 FR 13910, March 23, 2010, entire). Although the species remained widely distributed across the landscape, we found it warranted for listing under the Act due to continued loss and fragmentation of habitat exacerbated by a lack of adequate regulatory mechanisms to address habitat loss. The primary drivers of habitat fragmentation identified were renewable and nonrenewable energy development in prime sage-grouse habitats, continued expansion of supporting infrastructure, the spread of invasive annual grasses and associated changes in wildfire regimes, and the lack of adequate regulatory structures to address these impacts. In addition, trend data showed a continuation of population declines identified in 2005. Without regulatory mechanisms in place to control continued habitat loss and fragmentation, we determined the sage-grouse was at risk of extinction in the foreseeable future and, therefore, warranted protection under the Act. However, due to the workload of managing higher priority species, we designated the sage-grouse a “candidate” species, assigning it a listing priority number of 8 to indicate the moderate magnitude of imminent threats. Species with lower listing priority numbers are addressed before those with higher priority numbers.

We also concluded that the extinction risk was not imminent. As noted in the 2010 finding when determining its listing priority status: “We consider the threats that the sage-grouse faces to be moderate in magnitude because the

threats do not occur everywhere across the range . . . and where they are occurring they are not of uniform intensity or of such magnitude that the species requires listing immediately to ensure its continued existence. While sage-grouse habitat has been lost or altered in many portions of the species’ range, substantial habitat still remains to support the species in many areas of its range. We believe the ability of these population centers to maintain high densities in the presence of several threat factors is an indication that the magnitude of threats is moderate overall” (75 FR 13910, March 23, 2010, pp. 14008–14009). The 2010 finding has galvanized a rangewide conservation effort that includes new management plans developed by Federal and State agencies to establish regulatory mechanisms adequate to address identified threats.

New Scientific Information

Since 2010, the already voluminous scientific literature on sage-grouse has been augmented by extensive, newly published research on sage-grouse biology, sagebrush habitat, and impacts to both. We collected this information for our status review through a direct request to our conservation partners and through general literature reviews. We have used this data to inform our understanding of the current status of sage-grouse and how its status has changed since 2010. All relevant published resources, as well as unpublished data, were considered in our status review. Not all of this new information is cited in this document, as it either did not provide additional information on impacts to the species or response to conservation, or was repetitive of other studies already cited in our assessment. In addition, we considered all new scientific information presented to us in response to our data call for this status review, information received during our previous annual Candidate Notice of Review data calls, data entered into the Conservation Efforts Database (CED), and recently published articles. Several articles providing new information since 2010 are summarized below.

New population trend analyses incorporating up to 7 years of additional data have been completed (Garton *et al.* 2015, WAFWA 2015) and provide greater insight into population cycling and species status. We recognize the difficulty in detecting short-term trends for a species with decadal cycles; longer term trends show a small, but detectable decline since the 1960s. For more information, see Population Abundance and Trends section, above.

An evolving appreciation of mechanisms that affect sage-grouse and sagebrush habitats assisted in the development of new applied science for conservation efforts, including wildfire and invasive management (Chambers *et al.* 2014a, entire), conifer removal (Miller *et al.* 2014, entire), and energy development (Patricelli *et al.* 2013, entire; Drouin 2014). These important, applied conservation tools have been essential in assessing species and habitat persistence and aiding the minimization of impacts to the species and its habitat. Specifically, the resilience and resistance matrix developed by WAFWA and published in 2014 provided a new applied science framework to better understand the likelihood of habitats to ability to resist *Bromus tectorum* (cheatgrass) invasion and recover following wildfire (Chambers *et al.* 2014a, entire). Conservation actions designed to minimize risk have also been furthered by application of new scientific information and tools. For example, the Natural Resources Conservation Service (NRCS) Sage Grouse Initiative (SGI) has incorporated new scientific research on impacts to guide the development of grazing plans, conifer removal, fence marking, and other conservation actions on private lands to benefit sage-grouse and its habitat (NRCS 2015a, entire).

The U.S. Geological Survey (USGS) compiled the findings of published scientific literature evaluating the influence of human activities and infrastructure on sage-grouse (Manier *et al.* 2013, entire). An additional report (Manier *et al.* 2014, entire) provided information on biologically relevant buffer distances around sage-grouse habitats to help reduce habitat avoidance caused by human disturbance and infrastructure. The revised and amended BLM and USFS Federal Plans adopted and incorporated the recommendations in the Manier *et al.* report (2014), as discussed below in the *Sagebrush Landscape Conservation Planning* section. These new analyses and tools, plus all the other information we considered, are addressed throughout this document and our administrative record.

Many partners across the range of the sage-grouse are working to conserve sage-grouse habitat. In 2014, we developed the CED, a spatially explicit, online platform for efficiently collecting data from conservation partners about their sage-grouse conservation efforts. More than 100 partners across the range of the species entered information about 6,200 projects into the CED. Of these projects, 44 percent (2,700 projects) cover more than 1.2 million ha (3

million ac) and were deemed complete and effective at addressing the primary threats identified in the Conservation Objectives Team (COT) Report (See *Sagebrush Landscape Conservation Planning* section below for a description of this report) (USFWS 2013, entire). Examples of these projects include conservation easements, conifer removal, and treatments to remove or reduce invasive weeds and annual grasses. The other 3,500 projects (56 percent), as reported in the CED, were of more limited scope and scale; and some did not contain enough information for us to reliably assess their effectiveness or implementation even on a local scale. Thus, while these efforts will continue to be helpful in conserving sage-grouse and its habitat now and into the future, we took a conservative approach and did not rely on these efforts in this finding.

Sagebrush Landscape Conservation Planning

The expansive range of sagebrush habitat has compelled managers to take a landscape approach to conservation efforts, with sage-grouse assuming the focus of these efforts for the past decade. In 2006, WAFWA developed a comprehensive strategy for conserving habitat for the benefit of this species. The strategy outlined the need to develop partnerships among local, State, Provincial, Tribal, and Federal agencies, non-governmental organizations, and private landowners to design and implement cooperative actions to support robust populations of sage-grouse and the landscapes and habitats upon which they depend (Stiver *et al.* 2006, p. i). This was the first of several

documents to outline the conservation needs of the species and its habitat.

In 2011, the BLM assembled a National Technical Team (NTT) of sage-grouse and sagebrush habitat experts to identify the best available science-based information to guide the development of Federal land management plans for the greater sage-grouse (BLM 2011a, entire). The NTT Report proposed conservation measures based on habitat requirements and other life-history aspects of the species. The NTT Report also described the scientific basis for some of the conservation measures proposed within each of the Federal land planning program areas. These conservation measures included actions such as development of sage-grouse specific habitat objectives relative to domestic livestock management, criteria to inform leasing decisions in sage-grouse habitats, and monitoring of sage-grouse and their habitats (BLM 2011a, entire).

Conservation Objectives Team Report

In 2013, we, together with the States, chartered a team of sage-grouse and habitat experts to identify the conservation goals for the species. The Conservation Objectives Team (COT) Report was a ground-breaking, collaborative approach to develop rangewide conservation objectives for the sage-grouse, both to inform this finding and to inform the collective conservation efforts of the many partners working to conserve the species (USFWS 2013, entire). The highest level objective identified in the COT Report is minimization of habitat threats to the species so as to meet the objective of the 2006 WAFWA Greater Sage-grouse Comprehensive Conservation Strategy: Reversing negative population trends

and achieving a neutral or positive population trend.

The conservation principles of redundancy, representation, and resilience guided the development of the conservation goals, priority areas for conservation, conservation objectives, and measures included in the COT Report (USFWS 2013, p. 12). The COT Report found that satisfying these conservation principles for sage-grouse meant having multiple, geographically distributed populations across the species' range (USFWS 2013, p. 12). The COT Report further stated, "By conserving well distributed sage-grouse populations across geographic and ecological gradients, species adaptive traits can be preserved, and populations can be maintained at levels that make sage-grouse more resilient in the face of catastrophes or environmental change" (USFWS 2013, pp. 12–13).

In particular, the COT Report, using State information, identified the habitats most critical for the conservation of the species, which were described as Priority Areas for Conservation (PAC, Figure 4) (USFWS 2013, entire). Priority Areas for Conservation are "... the most important areas needed for maintaining sage-grouse representation, redundancy and resilience across the landscape" (USFWS 2013, p. 13). Identifying PACs ensured that conservation partners direct their efforts to the highest priority habitats. Since the completion of the COT Report, improved habitat mapping and further discussions with the States has resulted in changes to the PAC map in Nevada, Montana, and Utah. For the purposes of this document, we refer to those areas that were added as Important Priority Areas.

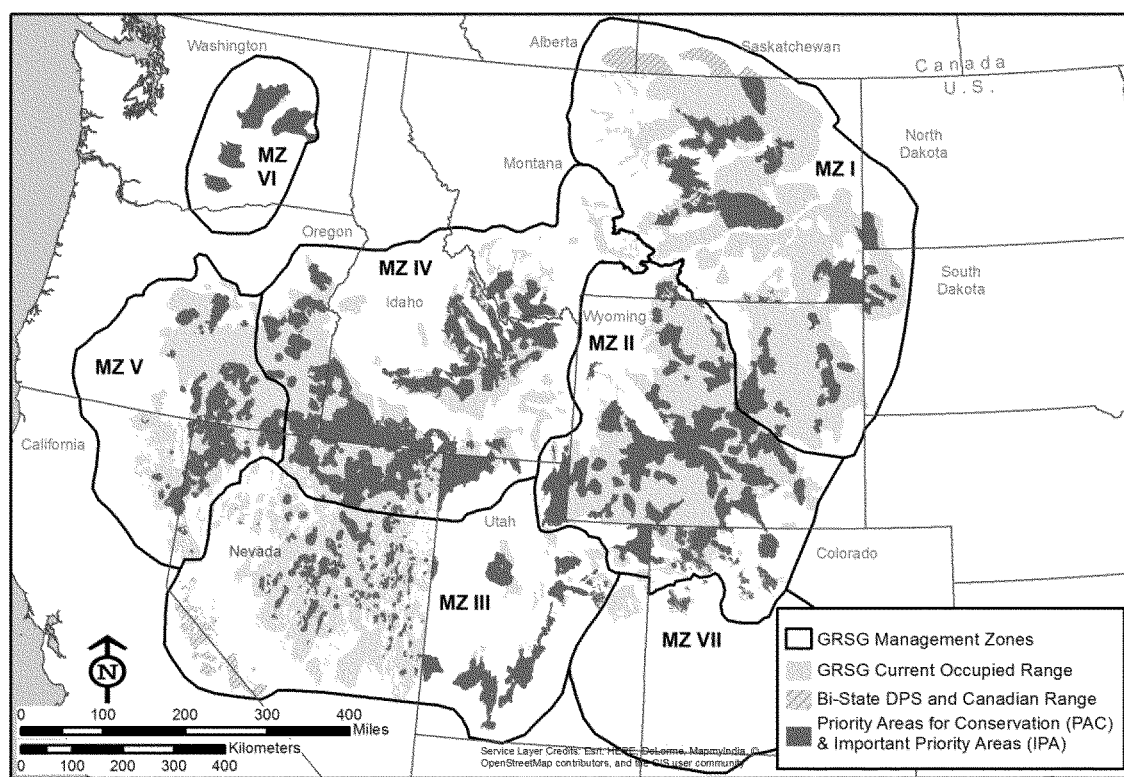


Figure 4 — Sage-grouse Priority Areas for Conservation (PACs) including modifications to incorporate Important Priority Areas.

Federal and State Planning Efforts

As discussed above, in 2010 we concluded that sage-grouse populations were well-distributed across the occupied range, but without the habitat protections provided by adequate regulatory mechanisms, populations were likely to become smaller, fewer, and separated by fragmentation, placing the species at risk of extinction in the future (75 FR 13910, March 23, 2010, p. 13986). Because the 2010 finding indicated that adequate regulatory protections could prevent the need to list sage-grouse, numerous Federal and State agencies undertook planning efforts to improve regulatory mechanisms and conserve sage-grouse into the future. A centerpiece of all of the conservation efforts is the protection of the most important habitats for sage-grouse that are necessary to maintain redundant, representative, and resilient populations (*i.e.*, PACs). These important habitats for conservation were identified in conservation planning efforts (Figure 4) as the places where large, undisturbed expanses of sagebrush habitat were supporting leks and the highest density of breeding birds (USFWS 2013, p. 15). These

important habitats for conservation also correspond with the population centers referred to in the 2010 finding. The maintenance of these areas and the birds that use them would provide a network of resilient and connected populations across the landscape that would provide for long-term species viability.

Using the recommendations provided in the COT Report (USFWS 2013, entire) and the NTT Report (BLM 2011a, entire), the Federal agencies developed conservation strategies to protect the important habitats for conservation. These strategies focus not only on the most important habitats for conservation, but also on conservation objectives to address the greatest threats to the species, as identified in the COT Report (USFWS 2013, pp. 31–52).

While 10 of the 11 States in the range of the sage-grouse updated their State plans to conserve the species by incorporating new information, which is a testimony to their concern and commitment to protect the grouse and its habitats, not all of these plans have been implemented or are regulatory in scope. We will specifically highlight the regulatory conservation actions mandated by the State plans in Wyoming, Montana, and Oregon

because they provide the greatest degree of regulatory certainty in addressing potential threats on State and private lands not under the jurisdiction of Federal plans. We appreciate the work that each State has completed, but not all planning efforts met a level of certainty for implementation and effectiveness. We acknowledge that sage-grouse conservation plans have been developed for Colorado, Idaho, Nevada, North Dakota, South Dakota, and Utah that could provide long-term benefits to sage-grouse. For example, the Idaho Plan includes the following measures: Technical and monetary assistance for fire rehabilitation and restoration efforts in areas where wildfire has impacted both State and Federal lands; assistance with implementation of Federal landscape fuels management projects on lands adjacent to Federal lands (such as the extension of fuel break projects onto State lands); development, coordination, and training for Rangeland Fire Protection Associations (RFPAs); and adoption of a general strategy to reduce Idaho Plan ownership of key habitat within Core Habitat Areas through land exchanges with BLM. We encourage all of the States to fully implement their

sage-grouse plans as they will further contribute to the long-term conservation of the sage-grouse.

In this section, we provide a summary of the various conservation programs and efforts put in place at the Federal, State, and local levels that are most important to our analysis of regulatory mechanisms in addressing potential threats to sage-grouse: The Federal plans, State plans in Wyoming, Montana, and Oregon; and the voluntary conservation efforts on private lands provided by SGI and Candidate Conservation Agreements with Assurances (CCAAs). The Wyoming Plan is analyzed based on its 7-year track record of implementation, and SGI is also analyzed based on its accomplishments to date.

The sections below provide an analysis of the implementation and effectiveness of the Federal plans, Montana program, Oregon efforts, and Secretarial Order 3336 pursuant to our Policy for Evaluation of Conservation Efforts (PECE) (68 FR 15100, March 28, 2003). 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 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 the effectiveness of the conservation efforts to contribute to make listing a species unnecessary. In this finding, we evaluated the certainty that the Federal Plans, and the Montana and Oregon Plans will be implemented into the future and the certainty that they will be effective in addressing threats, based on the best available science and professional recommendations provided in the COT and other scientific literature and reports. We also evaluated the Secretarial Order using PECE, which is discussed below in the *Wildfire and Invasive Plants* section.

The Federal plans and three State Plans provide protective, regulatory mechanisms for the majority of the most important habitat for sage-grouse. The Federal Plans divide habitat into two habitat management area categories—Priority Habitat Management Areas (PHMAs) and General Habitat Management Areas (GHMAs). Priority Habitat Management Areas largely correspond to PACs (USFWS 2013, p. 13) and State-identified Core Areas (BLM and USFS 2015, entire). The PHMAs are the highest priority for conservation because they contain large, undisturbed expanses of breeding

habitat and the highest densities of sage-grouse. The most restrictive conservation measures, such as excluding certain activities and requiring avoidance and minimization measures, apply to 64 percent of the species' breeding habitat designated as PHMAs (USFWS 2015a). The Federal and three State plans protect an additional 26 percent of breeding habitat in GHMAs (USFWS 2015a) that contain fewer leks and sage-grouse than PHMAs, but provide habitat and connectivity between populations. As discussed above in Sage-Grouse Connectivity and Landscape Genetics, connectivity between core population areas has been identified as an important strategy to ensure long-term sage-grouse persistence (Crist *et al.* 2015, p. 17). The required conservation measures in GHMAs are less restrictive than in PHMAs and provide greater land-use flexibility, but still deliver measures that minimize potential impacts. To assess the effectiveness of the Federal Plan, we completed a geospatial analysis of how much the areas designated as PHMAs and GHMAs overlapped with areas modeled as breeding habitat. Collectively, the regulatory mechanisms provided by the Federal plans and three State plans reduce potential impacts to approximately 90 percent of the sage-grouse breeding habitat rangewide (USFWS 2015a). Later in this document, we will discuss how all of these conservation efforts are expected to address adverse effects from potential threats, and lastly, we will assess the adequacy of these efforts as regulatory mechanisms (See *Regulatory Mechanisms*, below).

Federal Plans

The BLM and USFS sage-grouse planning effort was unprecedented in scope and scale, and represents a significant shift from management focused within administrative boundaries to managing at a landscape scale. This effort also represented a concerted effort by the agencies to balance their multiple-use mandates with conservation objectives. The BLM and USFS completed this effort by issuing amendments or revisions to 98 land management plans governing over half of the occupied range. These land management plans are the principal regulatory documents for the activities allowed on BLM and USFS lands, are grounded in the agencies' organic statutes (*e.g.*, Federal Land Management and Policy Act, National Forest Management Act), and are at the core of the agencies' National Sage-Grouse Conservation Strategy outlined in their

plan revisions and amendments. We were a key partner working closely with BLM and USFS throughout the process to develop and complete the Federal Plans. In this section, we will discuss the Federal plans across the 11-State range of sage-grouse, except for the plans in Wyoming. For Wyoming, because the Federal and State plans work together to conserve sage-grouse on all lands, they will be discussed together in a separate section below.

The BLM and USFS have broad authorities to manage the lands and resources within their jurisdiction. 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 and directs development and implementation of Resource Management Plans, which direct management at a local level. Resource Management Plans are the basis for all actions and authorizations involving BLM-administered lands and resources. Management of activities on 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 the USFS must have a Land and Resource Management Plan (16 U.S.C. 1600) to guide and set standards for all natural resource management activities on each National Forest or National Grassland. For the purposes of this document, Resource Management Plans and Land and Resource Management Plans are collectively referred to as Federal Plans.

Under FLPMA, the BLM is required to establish Resource Management Plans for the management and use of public lands in accordance with the principles of multiple-use and sustained-yield. Similarly, pursuant to the NFMA, the USFS is required to establish plans for the management and use of National Forest System lands in accordance with the principles of multiple-use and sustained-yield. The Federal Plans are the basis for on-the-ground actions that the BLM and USFS undertake and authorize. Decisions in Federal Plans guide future land management actions and subsequent site-specific implementation decisions. Land use plan decisions establish goals and objectives for resource management (desired outcomes) and the measures needed to achieve these goals and objectives (land use allocations for the BLM; Standards and Guidelines for the USFS).

These Federal Plans are regulatory mechanisms. The Federal Plans establish goals and objectives and measures to address the potential

threats to sage-grouse and sage-grouse habitat. The Federal Plans establish mandatory constraints and were established after notice and comment and review under the National Environmental Policy Act (NEPA). Therefore, changes to the Federal Plans would require additional notice and comment and further analysis under NEPA. All future management authorizations and actions undertaken within the planning area must conform to the Federal Plans, thereby providing reasonable certainty that the plans will be implemented. The BLM has already made substantial financial commitments to ensure success of actions identified in their Plans, including allocating more than 10 million dollars to support fire management (DOI 2015a, entire). In 2015, BLM directed resources to fund monitoring crews, and funded activities, like data management, to ensure successful implementation of the monitoring commitments; and BLM's fiscal year 2016 budget request included an additional 8 million dollars to directly support monitoring the implementation and effectiveness of the land use plans (Lueders, BLM, 2015, pers. comm.). The Department of the Interior identified additional high-priority actions that the BLM will complete in the next 5 years including prioritizing control of invasive plants and removal of free-roaming equids from high-priority sage-grouse habitat (DOI 2015a, entire). Based upon past Federal land planning efforts, we expect these plans to be implemented for the next 20–30 years. The BLM and USFS have committed to full funding and implementation of these plans, and have included monitoring and adaptive management to ensure their long-term effectiveness.

The Federal Plans represent a paradigm shift in western Federal lands management in their focus on maintaining large expanses of the sagebrush ecosystem for the benefit of sage-grouse and many other species. Federal Plans are structured around a layered management approach that aims to preclude or minimize additional surface disturbance in priority conservation habitats, while providing some management flexibility in sage-grouse habitat areas that are less critical for conservation. In addition to these land use allocations and associated conservation actions, the Federal Plans include direction for wildfire and invasive species management, minimization measures, mitigation strategies, monitoring, and adaptive management that provide further conservation benefits for sage-grouse, as

discussed below. There are differences across 98 plans as necessary to address differing ecological conditions; however, the general regulatory framework is consistent amongst all the plans. Because of the commitments from the Federal Government to implement these plans and because of the Plans' consistency with the COT Report recommendation for measures to reduce threats, these Federal Plans provide substantial conservation benefits to sage-grouse, now and in the future.

Land Management—The Federal Plans adopt a tiered land use allocation regime that provides the greatest level of protection for the most important habitats. We, together with State agencies, helped the BLM and USFS designate priority habitat areas using the best available scientific data to identify the location of the highest quality habitat with the greatest number of breeding sage-grouse. These areas largely coincide with the PACs identified in the COT Report (USFWS 2013, p. 14) and were designated by BLM and USFS in the Federal Plans as Priority Habitat Management Areas (PHMAs) (BLM and USFS 2015, entire). Based on our recommendation to further protect sage-grouse population centers that have been identified in the scientific literature as critically important for the species and areas identified through our analysis as important for conservation, BLM and USFS designated areas as Sagebrush Focal Areas (SFA) and added protections that would further limit new, human-caused surface disturbance in SFAs. Lastly, BLM and USFS designated General Habitat Management Areas (GHMAs) that represent areas with fewer leks and lower densities of breeding birds where disturbance is limited, while providing greater flexibility for land use activities.

Federal Plans mapped approximately 27 million ha (67 million ac) of sage-grouse habitat, of which 14 million ha (35 million ac) were designated as PHMAs, 4.5 million ha (11 million ac) were designated as SFAs (and overlap generally with PHMAs), and 13 million ha (32 million ac) were designated as GHMAs (no habitat was mapped in Washington, as minimal habitat occurs on BLM and USFS land in that State). The Federal Plans authorize and establish allowable resource uses for each of these Management Area designations. The Federal Plans also establish stipulations for certain authorizations to protect resources. Land use allocations of specific activities are generally categorized as:

- **Exclusion/Closed:** Areas that are not available for development or use of particular resources; or
- **Avoidance:** Areas to be avoided but may be available for development or use of particular resources with special stipulations; or
- **Open:** Areas open to development or use of particular resources, although use may be restricted by stipulations.

Using this targeted and tiered approach to habitat conservation, the Federal Plans have a number of components for conserving sage-grouse and their habitats. The primary components of the Federal Plans are a combination of: (1) Land use allocations; (2) human-caused disturbance caps and density limitations; (3) lek buffers; (4) monitoring; (5) adaptive management; (6) mitigation; and (7) a landscape-scale strategy for addressing the threat of fire and invasive grasses.

The BLM, USFS, and other partners recognize the variability in habitat value across sage-grouse habitat, both in terms of habitat characteristics and habitat quality. Priority sage-grouse habitats are areas that have the highest conservation value to maintaining or increasing sage-grouse populations. These areas include breeding, late brood-rearing, winter concentration areas, and where known, migration or connectivity corridors (BLM 2011a, p. 7). The BLM developed a rangewide Breeding Bird Density Map to highlight locations where the highest densities of breeding males were found on leks (Doherty *et al.* 2010a). Using this information and additional State agency expertise, BLM highlighted seasonal habitats needed for the sage-grouse (BLM 2011a, p. 7). In those instances where the BLM State offices did not complete this delineation, BLM relied upon the Breeding Bird Density maps (Doherty *et al.* 2010a, entire; BLM 2011b, entire). An Instructional Memorandum (IM; IM 2012–043) established two habitat categories. Preliminary Priority Habitat forms the basis for PHMA in the final plans and represents the habitat designated to maintain distribution and sustainable sage-grouse populations (BLM 2011b, entire). The second category was Preliminary General Habitat, the precursor to GHMA, which represents areas with fewer leks and lower densities of breeding birds where disturbance is limited, while providing greater flexibility for land use activities. Many of these areas were already impacted by human activities or wildfire. General sage-grouse habitat is described as occupied (seasonal or year-round) habitat outside of priority habitat (BLM 2011a, p. 9).

The Federal Plans focus on land use management within these two management areas (Figure 5). The

discussion below analyzes PHMA and GHMA separately to distinguish the different management considerations in

the most important habitats (PHMA) and the measures provided in other occupied habitats (GHMA).

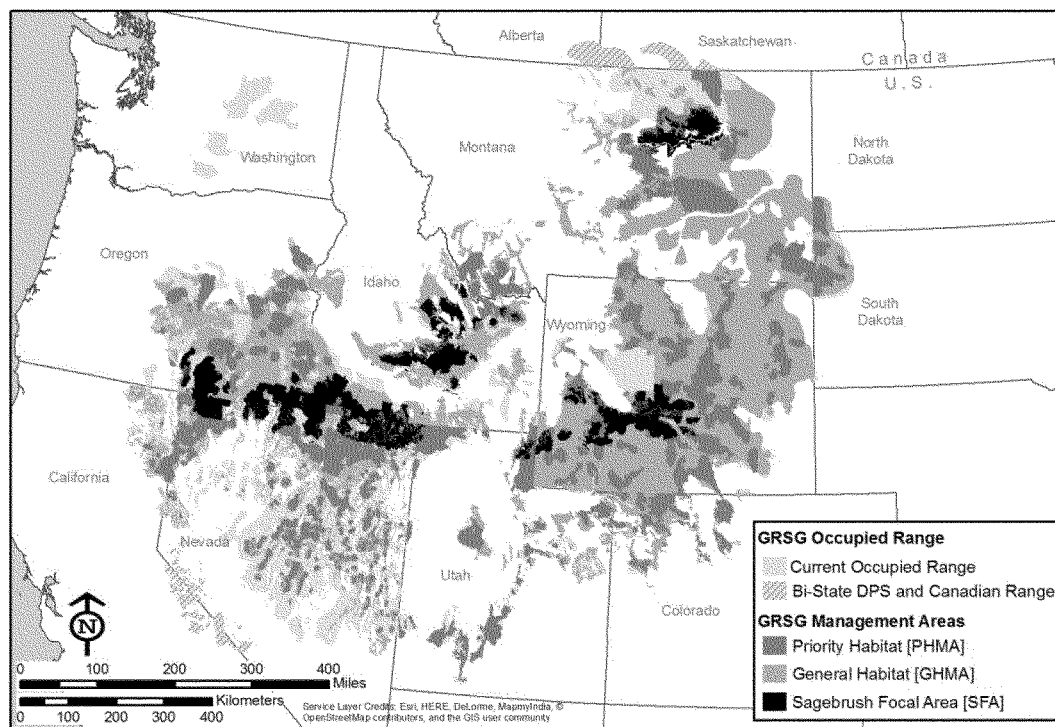


Figure 5. Federal Plan management areas and focal areas.

Priority Habitat Management Areas— The BLM and USFS evaluated the occupied habitat within their jurisdiction and designated the areas with the best habitat and the majority of the leks as PHMAs. Approximately 14 million ha (35 million ac) were designated as PHMA (Figure 5), corresponding with approximately 64 percent of breeding habitat. The PHMA consists of the most important habitat on Federal lands occupied by the species. Because this is the most important habitat on Federal lands within the range of the species, the land use allocations and other measures are more restrictive in these habitats. Below we analyze the land use allocations and other measures in the revised and amended Federal Plans to conserve and maintain these important habitat areas on Federal lands. The Federal Plans in Wyoming are discussed separately below with the Wyoming State strategy as they collectively address all lands in Wyoming in a coordinated effort.

Fluid Minerals (Including Oil, Gas, and Geothermal): Under the revised or amended Federal Plans, PHMAs are closed to new leasing or subject to leasing with No Surface Occupancy

(NSO). No surface occupancy areas are open to leasing, but human-caused surface-disturbing activities, such as development of well pads, cannot be conducted on the surface of the land. Access to oil and gas deposits would require directional drilling from outside the boundaries of the NSO areas. There will be no waivers, exceptions, or modifications, unless the following condition is met: “A lease exception may be considered where a portion of the proposed lease is determined to be in non-habitat, the area is not used by sage-grouse, nor would it have direct, indirect or cumulative effects to sage-grouse or its habitat. The determination would be made by a team of agency sage-grouse experts, including an expert from the state wildlife agency, the Service, and BLM/USFS. All exceptions must be approved by the State Director.” Further, priority will be given to leasing and development of fluid mineral resources, including geothermal, outside of sage-grouse habitat. The implementation of these priorities will be subject to valid existing rights and any applicable law or regulation, including, but not limited to,

30 U.S.C. 226(p) and 43 CFR 3162.3–1(h).”

On existing leases, the BLM will work with the lessees, operators, or other project proponents to avoid, reduce and mitigate adverse impacts to the extent compatible with lessees’ rights to drill and produce fluid mineral resources. The BLM will work with the lessee, operator, or project proponent in developing for the lease an application for a permit to drill to avoid and minimize impacts to sage-grouse or its habitat and will ensure that the best information about the sage-grouse and its habitat informs and helps to guide development of such Federal leases. See the *Nonrenewable Energy* section below for a further discussion of valid existing rights.

Fluid minerals land use allocation decisions are more complex than the typical open, avoidance, and closed/exclusion decisions. Allocative decisions within the Federal Plans for fluid minerals can be one of the following:

- **Open:** These areas are open to leasing with minor to no constraints, subject to existing laws and regulations, and formal orders, as well as any standard terms and conditions.

- Open with moderate constraints: These are areas where it has been determined that moderately restrictive lease stipulations may be required to mitigate impacts. These stipulations include timing limitations and controlled surface uses.

- Open with major constraints: These are areas where it has been determined that highly restrictive lease stipulations are required to mitigate impacts.

- No Surface Occupancy (NSO): These areas are open to leasing, but surface-disturbing activities are precluded. Access to oil and gas deposits would require directional drilling from outside the boundaries of the NSO areas. The NSO areas are also avoidance areas for Rights-of-Way (ROWs); no ROWs would be granted in NSO areas unless there are no feasible alternatives.

- Closed: These are areas where it has been determined that other land uses or resource values cannot be adequately protected with even the most restrictive lease stipulations and appropriate protection can be ensured only by closing the lands to leasing.

In 2010, there were few habitat restrictions specific for sage-grouse for fluid mineral leasing on Federal lands within the range of the species. The new land use allocations in the Federal Plans designating PHMAs as either closed or open with NSO restrictions represent an unprecedented change in the management of areas important for sage-grouse (PHMAs) with fluid mineral potential. These land use allocations are consistent with the COT Report (USFWS 2013, p. 43) recommendations to reduce and eliminate disturbance in PACs. Closing areas to development and requiring NSO with only very limited exceptions, substantially reduces the potential for future disturbance in PHMAs. Considered together, these measures avoid or minimize impacts to fluid mineral development in priority habitat for conservation; this signifies a substantial improvement in the effectiveness of regulatory mechanisms since the 2010 finding.

Non-Energy Leasable Minerals: Under the Federal Plans, PHMAs are closed to new permits for non-energy leasable minerals (e.g., phosphate, sodium, potassium), but expansion of existing operations could be considered, subject to specific conditions outlined in the plans. This provision reduces the potential impacts from non-energy leasable mineral development. The BLM leases certain solid minerals on public and other Federal lands. When mineral rights owned by the Federal Government underlie privately owned surface lands, the BLM can also lease these minerals. The restrictions in PHMAs reduce the likelihood that future development to non-energy leasable minerals will occur in these areas. Closing areas is an effective measure to reduce disturbance.

Mineral Materials: Since July 23, 1955, common varieties of sand, gravel, stone, pumice, pumicite, and cinders were removed from the General Mining Law and placed under the Materials Act of 1947, as amended. Use of salable minerals requires either a sales contract or a free-use permit (free permit for personal, noncommercial use). Under the Federal Plans, PHMAs are closed to new mineral material sale with limited exceptions for free use permits (described below) and the expansion of existing active pits, subject to compensatory mitigation and disturbance caps. Required design features (RDF) will be applied to all free use permits to minimize any potential impacts. As with other mineral development, disturbance in important habitat areas will be minimized through disturbance caps, lek buffers, and other measures. The closure of PHMAs to the sale of mineral materials effectively eliminates new impacts from this activity in PHMAs providing effective conservation in the most important habitats for the species.

Solar/Wind: The Federal Plans generally exclude new utility scale and commercial solar and wind developments from PHMAs. Limited exceptions must be based on an explicit rationale that biological impacts to sage-grouse will be avoided. Rights-of-way are required for wind testing, associated development structures, or solar energy development projects implemented on public lands. In Nevada, California, Utah, and Colorado, the Solar Energy Development Programmatic EIS (BLM 2012, entire) excludes development of utility-scale solar facilities outside the Solar Energy Zones and variance areas (variance areas are potentially available for utility-scale solar energy development, subject to additional environmental review), protecting a majority of the sage-grouse habitat in these States. Exclusion is an effective tool to reduce disturbance and minimize impacts in the most important habitats for conservation on federally managed lands because the activity will not be allowed in important habitats.

Rights-of-way: Under the Federal Plans, PHMAs are either avoidance or exclusion areas for both major and minor rights of way with limited exceptions, which must be based on an explicit rationale that biological impacts to sage-grouse are being avoided. Existing designated corridors for major transmission lines and pipelines will remain open. Federal Plans designate existing and potential ROW corridors to minimize adverse environmental impacts and the proliferation of separate ROWs (43 CFR part 2806). Any new

disturbance within these corridors would count towards the disturbance cap. All new, modified, or deleted corridors will require a land use plan amendment (including NEPA analysis and notice and comment), thereby limiting new or expanded corridors in priority habitats for conservation in the future.

Livestock Grazing: The Federal Plans have not substantively changed livestock land use allocations; however, the BLM and USFS have committed to implementation of vegetative standards and habitat objectives specifically for sage-grouse based on local ecological conditions and prioritization of monitoring in PHMAs to determine if they are meeting sage-grouse habitat objectives consistent with site-specific guidelines or ecological site descriptions. The Federal Plans call for grazing to benefit or be neutral to sage-grouse, including in times of drought. Specifically, the BLM and USFS have committed to implementing the following measures in the Federal Plans:

- The habitat assessment framework (Stiver *et al.* 2010, entire) will be used to monitor progress at achieving rangeland health objectives at multiple spatial scales.

- The BLM and USFS will prioritize the following first in SFAs followed by PHMAs outside of the SFAs: (1) The review of grazing permits/leases, in particular to determine if modification is necessary prior to renewal, and (2) the processing of grazing permits/leases. In setting workload priorities, precedence will be given to existing permits/leases in these areas not meeting Land Health Standards, with focus on those containing riparian areas, including wet meadows. The BLM may use other criteria for prioritization to respond to urgent natural resource concerns (e.g., fire) and legal obligations.

- The NEPA analysis for renewals and modifications of livestock grazing permits/leases that include lands within PHMAs will include specific management thresholds based on sage-grouse Habitat Objectives Table and Land Health Standards (43 CFR 4180.2) and defined responses that will allow the authorizing officer to make adjustments to livestock grazing without conducting additional NEPA analysis.

- Allotments within SFAs, followed by those within PHMAs, and focusing on those containing riparian areas, including wet meadows, will be prioritized for field checks to help ensure compliance with the terms and conditions of the grazing permits. Field checks could include monitoring for actual use, utilization, and use supervision.

- At the time a permittee or lessee voluntarily relinquishes a permit or lease, the BLM and USFS will consider whether the public lands where that permitted use was authorized should remain available for livestock grazing or be used for other resource management objectives.

- Structural range improvements will be managed to benefit or not adversely affect sage-grouse by restricting locations of ranch

facilities (e.g., fences, windmills, and corrals) around leks, marking or removing fences, and controlling invasive plants.

Prioritizing the onsite monitoring to the most important areas for sage-grouse consistent with the rangewide monitoring plan, the certainty of implementation is improved because monitoring and management changes will occur in the most important areas for sage-grouse first. The vegetative objectives in the Federal Plans were developed using the best available scientific information, taking into consideration ecological differences across the range of the species. The Federal Plans specifically cite to the literature relied upon to develop these objectives. The Federal Plans commit to implementation of any habitat enhancement projects and other activities to meet these objectives. The monitoring framework is designed to add consistency to this effort and will, with adaptive management, provide additional certainty that measures will be implemented to meet habitat objectives. These changes represent a significant change from having virtually no or only general land health standards for sage-grouse to a system that establishes specific standards for sage-grouse, prioritizes the most important habitats, and targets monitoring to ensure compliance. This framework represents an effective suite of measures that reduces the impacts from improper grazing.

Sagebrush Focal Areas—Sagebrush Focal Areas (SFAs) are the areas that the Federal Plans manage as the highest priority lands in PHMAs for sage-grouse conservation (Figure 5). The BLM requested input from us about additional conservation opportunities, and we provided a memo that identified “strongholds” for sage-grouse (USFWS 2014a, entire). These “strongholds” represented areas identified in the scientific literature as essential for the persistence of the species. Some of the important characteristics of these areas include large, contiguous blocks of Federal lands; high population connectivity; and high densities of breeding birds (USFWS 2014a, entire). Our recommendations directly informed the BLM and USFS development of SFAs, important conservation units within which land managers will apply the most conservative strategies to protect sage-grouse and habitat. Sagebrush Focal Areas encompass 4.5 million ha (11 million ac) of federally administered lands in PHMAs (BLM and USFS 2015, entire). All of the measures listed above in PHMAs also apply in SFAs; in addition, the

following more restrictive measures also apply in SFAs.

Locatable Minerals: The General Mining Law of 1872, as amended, opened the public lands of the U.S. to mineral acquisition by the location and maintenance of mining claims. Mineral deposits subject to acquisition in this manner are generally referred to as locatable minerals. Locatable minerals include metallic minerals (e.g., gold, silver, lead, copper, zinc, and nickel), nonmetallic minerals (e.g., fluorspar, mica, gypsum, tantalum, heavy minerals in placer form, and gemstones), and certain uncommon variety minerals. Under the Federal Plans, the BLM and FS have recommended that lands in SFAs be withdrawn from location and entry under the Mining Law, subject to valid existing rights. (BLM and USFS 2015). Under FLPMA, the first step of the withdrawal process implementing that recommendation is for the Secretary (or Deputy or Assistant Secretary) to “propose” a withdrawal. 43 U.S.C. 1714(b). Upon publication of such a proposal in the **Federal Register**, the lands are immediately segregated from location and entry under the Mining Law as specified in the notice for a period of two years. That segregation temporarily has essentially the same effect as a withdrawal; that is, it closes the lands to location and entry under the Mining Law, subject to valid existing rights. Although the Secretary is free to make a final decision prior to or after its expiration, the segregation is intended to allow time for public input and allow time for her to make a final decision as to whether to withdraw the lands. The Assistant Secretary took this first step and proposed withdrawal of the SFAs on September 16, 2015. The BLM will publish notice of the proposal concurrent with the announcement of the BLM Records of Decision, which will segregate the lands. After public involvement and preparation of various reports, including a NEPA analysis, the Secretary will make a final decision as to whether to withdraw the lands. 43 CFR 2310.3–2, 3. A withdrawal aggregating more than 5,000 acres is limited by law to a term of 20 years (subject to renewals) and is subject to Congressional notification. 43 U.S.C. 1714(c).

Fluid Minerals (Including Oil, Gas, and Geothermal): The Federal Plans manage SFAs as NSO, without waiver, exception, or modification, for fluid mineral leasing (with the exception of plans in Wyoming, as discussed below). No Surface Occupancy is where areas are open to leasing but surface-disturbing activities associated with development of the lease cannot be

conducted on the surface of the land. Access to oil and gas deposits would require horizontal/directional drilling from outside the boundaries of the NSO areas. This is the most restrictive designation that allows for development of resources and protects habitat.

Habitat Management: BLM and USFS will prioritize management and conservation actions in SFAs, including, but not limited to, review of livestock grazing permits/leases, free-roaming equid gathers, fire management projects, and sagebrush restoration projects. Ensuring these areas are analyzed first provides certainty that, if degraded habitat conditions occur in the most important areas for the species, management actions will be taken and possible restoration will occur.

The actions identified for implementation in the SFAs are more restrictive versions of the measures described above for PHMAs. As such, the measures implemented within SFAs are more effective at reducing threats within these important areas. These measures have been determined to be effective because they eliminate or reduce the impacts from new development or improper grazing on Federal lands in SFAs.

General Habitat Management Areas—The Federal Plans designate approximately 12.5 million ha (31 million ac) as GHMA (Figure 5), which corresponds with approximately 27 percent of breeding habitat rangewide. The GHMAs represent habitats that contain fewer leks and sage-grouse than PHMAs. The designation as GHMAs provide sage-grouse conservation by protecting habitat and connectivity between populations and potential refugia in the event of catastrophic events such as wildfire. While the amelioration of threats in GHMAs will likely be less than in PHMAs due to less stringent required conservation measures, GHMAs do have restrictions that benefit sage-grouse conservation.

Specifically, the Federal Plans contain the following measures that apply in GHMAs:

Fluid minerals (Including Oil, Gas, and Geothermal): General Habitat Management Areas are open with constraints. Areas with standard constraints may be open to mineral leasing with no specific management decisions defined in the Federal Plans; however, these areas are subject to lease terms and conditions. Terms and conditions may include but not be limited to concentrating development, moving or supporting infrastructure, or reducing project footprints, thereby reducing habitat impacts. Moderate constraints include controlled surface

use, which can reduce habitat impacts and timing limitations which reduce human activities during the times sage-grouse are most sensitive to their presence.

Non-Energy Leasable Minerals:

General Habitat Management Areas are open to non-energy leasable mineral development, subject to stipulations. In GHMA, development, including mineral exploration, is subject to lek buffers to protect breeding birds, timing restrictions to reduce human activities in important seasonal habitats while sage-grouse are present, mitigation requirements, and other protective measures discussed throughout this section, thereby reducing and minimizing the impacts to the species and its habitat.

Rights-of-Way: For major transmission lines and pipelines, GHMAs are either avoidance or exclusion areas, and may be available for installation of pipeline and transmission lines/ROWs within existing infrastructure corridors. Protective stipulations such as limiting road use (to minimize disturbance to birds) or eliminating perching areas (to reduce predation) will be incorporated into the ROW grants to protect sage-grouse and its habitat. For minor ROWs (e.g., roads), GHMAs are open and subject to stipulations that will protect sage-grouse and its habitat, such as lek buffers and seasonal restrictions (BLM and USFS 2015, entire). For solar and wind energy rights of way, GHMAs are either designated avoidance or exclusion areas with limited exceptions and available for location of new utility scale and/or commercial development ROWs only with special stipulations that minimize the impact to sage-grouse.

Mineral Materials: General Habitat Management Areas can be open to new mineral material sales and free use permits subject to mitigation requirements and application of RDFs that will protect sage-grouse and its habitat.

Livestock Grazing: Federal Plans call for grazing to benefit or be neutral to sage-grouse in GHMAs and PHMAs. However, GHMAs will be the lower priority for monitoring as they comprise habitat with fewer leks and sage-grouse.

Measures Applicable in Both PHMA and GHMA—In addition to specific land use allocations described above, the new Federal Plans include other protective measures that will further limit disturbance and impacts to sage-grouse and their habitats. Additionally the plans include monitoring and adaptive management to help ensure that implementation of the allocative decisions and limitations on disturbance are effective at conserving

sage-grouse and their habitats, and mitigation provisions where disturbance cannot be avoided. These measures apply regardless of the habitat designation (PHMA, SFA, or GHMA).

Land Tenure: The land tenure land use allocation refers to whether the BLM or USFS intend to dispose of, or retain, Federal lands. A land use allocation of retain means that the agencies will seek to retain the land in Federal ownership, with limited exceptions. An allocation of dispose means that the agencies may transfer the land out of Federal ownership. Under the Federal Plans, PHMAs and GHMAs will be retained in Federal management, with limited exceptions. Those limited exceptions may occur when: (1) The agency can demonstrate that disposal of lands will provide a net conservation gain to the sage-grouse; or (2) the agency can demonstrate that the disposal of lands will have no direct or indirect adverse impact on conservation of sage-grouse. The land tenure allocation ensures that BLM and USFS lands within PHMAs and GHMAs will be managed for sage-grouse into the future.

Trails and Travel Management: Travel management regulations require BLM and USFS to establish lands as open, limited, or closed to off-road vehicle use. In open areas all types of vehicle use is permitted at all times, anywhere in the area. Limited areas are restricted at certain times, in certain areas, and/or to certain vehicular use. Closed areas are those that are closed to all types of vehicle use and include units of the National Wilderness Preservation System. Areas that have not been designated in one of these categories are undesignated and have no restrictions on motorized access.

In PHMA and GHMA, temporary closures will be considered in accordance with several regulations, including Closures and Restrictions (43 CFR subpart 8364); Designated National Area (43 CFR subpart 8351); Use of Wilderness Areas, Prohibited Acts, and Penalties (43 CFR subpart 6302); and Conditions of Use (43 CFR subpart 8341). These regulations help control access to sensitive areas and have been employed strategically in the past to minimize access and disturbance during critical time periods such as spring breeding. These measures ensure that travel management decisions in PHMA and GHMA are made with consideration of sage-grouse conservation needs. These measures help to address concerns with potential disturbance due to travel on Federal lands and will continue to be used by the agencies as needed.

Disturbance Caps and Density

Limitations—Each Federal Plan includes a disturbance cap that will serve as an upper limit (the maximum disturbance permitted). Anthropogenic disturbance has been identified as a key impact to sage-grouse. To limit new anthropogenic disturbance within sage-grouse habitats, the Federal Plans establish disturbance caps, above which no new development is permitted (subject to applicable laws and regulations; e.g., General Mining Law of 1872, and valid existing rights). This cap acts as a backstop to ensure that any implementation decisions made under the Federal Plans will not permit substantial amounts of new disturbance within the distribution of sage-grouse on BLM and USFS lands.

For all States, except Wyoming and Montana, the BLM and USFS have established a 3 percent disturbance cap at two spatial scales—the Biologically Significant Unit (BSU) and at the project scale within PHMAs (BLM and USFS 2015, entire). The BSU is a geographical/spatial area, defined in conjunction with the States, within sage-grouse habitat that contains habitats supporting several interconnected populations. The disturbance cap calculation includes all anthropogenic disturbances in PHMAs at the project scale regardless of land ownership. If 3 percent disturbance is reached at the project level scale, no further anthropogenic disturbances will be permitted by BLM or USFS within PHMAs in the analysis area until the disturbance has been reduced to less than the cap. For BSUs the disturbance calculations will include anthropogenic disturbances in all habitat designations. Those disturbance calculations will be completed on an annual basis by the BLM's National Operation Center. If 3 percent disturbance is reached, the Federal land management agencies will examine all activities under their authority to determine if adaptive management is necessary (depending on the spatial scale at which the 3 percent cap is hit). In Montana, the same disturbance cap approach is used, but disturbance is limited to 5 percent, due to more detailed mapping and disturbance calculations. Wyoming uses a different approach to limiting disturbance in Core Areas, as discussed in Wyoming State and Federal Plans, below. As previously stated, sage-grouse are sensitive to disturbance, and small amounts of development within sage-grouse habitats can negatively affect sage-grouse population viability (Knick and Connelly 2011, p. 1). Thus, limiting future disturbances in sage-grouse

habitats is an essential component of reducing or eliminating effects related to disturbance, as recommended in the COT Report (USFWS 2013, p. 13).

In addition to the percent disturbance cap at the BSU and project scales, the BLM and USFS will use a density cap related to the density of energy and mining facilities during project-scale authorizations. If the disturbance density is greater than an average of 1/259 ha (1/640 ac) in PHMA, the project will either be deferred or co-located in an existing disturbed area (subject to applicable laws and regulations, such as the General Mining Law of 1872, valid existing rights, etc.).

Lek Buffers—Sage-grouse leks are communal breeding centers that are representative of the breeding and nesting habitats. Conservation of these areas is crucial to maintaining sage-grouse populations. Protective buffers around leks conserve these important habitats (Manier *et al.* 2014, pp. 1–2).

To develop “biologically relevant and socioeconomically practical” lek buffer distances for use in the Federal Plans, the DOI commissioned the USGS to review the scientific information on conservation buffer distances for sage-grouse. The result was the publication of a USGS Open-File Report, entitled *Conservation Buffer Distance Estimates for Greater Sage-Grouse—A Review*, in 2014 (Manier *et al.* 2014, entire). In addition to the land use allocations described in this section, the BLM and USFS will apply the lek buffer distances specified as the lower end of the interpreted range in PHMAs as described in the report unless justifiable departures are determined to be appropriate (see below). The lower end of the interpreted range of the lek buffer distances are presented in Table 3. Note that for many potential activities in PHMAs, the Federal Plans land use allocations result in no or few activities allowed in these important areas (*e.g.*, no surface occupancy restrictions). Thus, for those types of projects, buffers are unnecessary in PHMAs because the activity is already restricted.

TABLE 3—LEK BUFFER DISTANCES IN FEDERAL PLANS

Disturbance	Lek buffer
Linear Features (<i>e.g.</i> , roads).	5 km (3.1 mi).
Infrastructure related to energy development.	5 km (3.1 mi).
Tall structures (communication or transmission towers, transmission lines).	2 km (1.2 mi).

TABLE 3—LEK BUFFER DISTANCES IN FEDERAL PLANS—Continued

Disturbance	Lek buffer
Low structures (<i>e.g.</i> , fences, rangeland structures).	2 km (1.2 mi).
Surface disturbance (human activities that alter or remove natural vegetation).	5 km (3.1 mi).
Noise and related disruptive activities.	0.4 km (0.25 mi).

The BLM and USFS may approve actions in PHMAs that are within the applicable lek buffer distance identified above only if the BLM or USFS determine that a buffer distance other than the distance identified above offers the same or greater level of protection to sage-grouse and its habitat. The BLM or USFS will make this determination based on best available science, landscape features, and other existing protections, with input from the local State fish and wildlife agency. The BLM or USFS will explain its justification for determining that the approved buffer distances meet these conditions in its project decision.

For actions in GHMAs, the BLM and USFS will apply the lek buffer distances in Table 3 as required conservation measures to fully address any impacts to sage-grouse identified during the project-specific NEPA analysis. However, if it is not possible to locate or relocate the project outside of the applicable lek buffer distance(s) identified above, the BLM or USFS may approve the project only if: (1) Based on best available science, landscape features, and other existing protections, (*e.g.*, land use allocations, State regulations), the BLM or USFS determine that a lek buffer distance other than the applicable distance identified above offers the same or a greater level of protection to sage-grouse and its habitat, including conservation of seasonal habitat outside of the analyzed buffer area; or (2) the BLM or USFS determines that impacts to sage-grouse and its habitat are minimized such that the project will cause minor or no new disturbance (*e.g.*, co-location with existing authorizations); and (3) any residual impacts within the lek buffer distances are addressed through compensatory mitigation measures sufficient to ensure a net conservation gain, as outlined in the Mitigation Strategy (see below). By applying lek buffers in addition to other measures, the Federal Plans provide an additional layer of protection to the habitat in closest proximity to leks and the areas

documented in the literature to be the most important for breeding and nest success (Manier *et al.* 2014, entire).

Required Design Features—Required Design Features (RDFs) are best management practices to reduce potential effects to sage-grouse for certain project-level features. The RDFs establish the minimum specifications for certain activities to help mitigate adverse impacts. Because of site-specific circumstances, some RDFs may not apply to some projects (*e.g.*, a resource is not present on a given site) and/or may require slight variations (*e.g.*, a larger or smaller protective area). The need to apply RDFs to a project or to modify RDFs to address any concerns unique to a project is determined during the project-specific planning and environmental assessment. All variations in RDFs would require that at least one of the following be demonstrated in the NEPA analysis associated with the project/activity:

- A specific RDF is documented to be not applicable to the site-specific conditions of the project/activity (*e.g.*, due to site limitations or engineering considerations). Economic considerations, such as increased costs, do not necessarily require that an RDF be varied or rendered inapplicable;
- An alternative RDF is determined to provide equal or better protection for greater sage-grouse or its habitat;
- A specific RDF will provide no additional protection to sage-grouse or its habitat.

While the applicability and overall effectiveness of each RDF cannot be fully assessed until the project level when the project location and design are known, the Federal Plans include the requirement to implement appropriate RDFs and these RDFs are expected to further minimize impact to the species and its habitat. These RDFs were developed based on the COT and NTT conservation objectives and the best professional judgment of BLM and USFS wildlife biologists. For example, any project that includes the development of a pond or similar water feature would require RDFs that direct the design, construction, and maintenance of the pond so that it would not provide habitat for mosquitos that could carry West Nile virus (WNV).

Monitoring—While monitoring does not in and of itself reduce impacts, it is an integral component of any conservation program’s long-term success. We take into consideration monitoring when evaluating the overall adequacy and effectiveness of a conservation strategy. The regulations for the BLM (43 CFR 1610.4–9) and the USFS (36 CFR part 209, published July

1, 2010) require that Federal Plans establish intervals and standards, as appropriate, for monitoring and evaluations based on the sensitivity of the resource to the decisions involved. Pursuant to these regulations, an interagency team developed *The Greater Sage-grouse Monitoring Framework* that describes the methods to be used to collect monitoring data and to evaluate implementation and effectiveness of the sage-grouse planning strategy and the conservation measures contained in the Federal Plans (BLM and USFS 2014, entire).

To ensure that the BLM and the USFS are able to make consistent assessments about sage-grouse habitats across the range of the species, this framework lays out the methodology—at multiple scales (broad, mid, fine, and site scales)—for monitoring of implementation and disturbance and for evaluating the effectiveness of the BLM and USFS actions to conserve the species and its habitat. Monitoring efforts will include data for measurable quantitative indicators of sagebrush availability, anthropogenic disturbance levels, and habitat conditions. Implementation monitoring results will allow the BLM and the USFS to evaluate the extent that decisions from their Federal Plans to conserve sage-grouse and their habitat have been implemented. State fish and wildlife agencies will continue to collect population monitoring information, which will be incorporated into effectiveness monitoring as it is made available.

Managing and monitoring sage-grouse habitats are complicated by the differences in habitat selection across the range and habitat use by individual birds within a given season. Therefore, the monitoring framework evaluates multiple habitat suitability indicators to evaluate plan effectiveness. Descriptions of these habitat suitability indicators for each scale are provided in the “*Sage-Grouse Habitat Assessment Framework: Multiscale Habitat Assessment Tool*” (Stiver *et al.* 2010, entire).

Results from monitoring data will define when habitat objectives are not being achieved, disturbance caps have been breached, and adaptive management triggers have been met (see below). Having a consistent framework for all management units will allow the agencies to track information and trends across management units, which has not been possible in the past. The BLM and USFS have and committed to increased monitoring, and we expect the results to give the agencies valuable data to assist and improve implementation and improve the overall effectiveness of the BLM and USFS plans.

Adaptive Management—Like monitoring, adaptive management is a key element of complex long-term conservation strategies, particularly where there is uncertainty. Adaptive management is a decision process that promotes flexible resource management decision-making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. This flexibility is critical for ensuring long-term conservation of sage-grouse into the future, as it will allow the Federal Plans to adjust to changed conditions or new science that cannot be foreseen at this time. Careful monitoring of these outcomes both advances scientific understanding and helps with adjusting resource management directions as part of an iterative learning process. Adaptive management also recognizes the importance of natural variability in contributing to ecological resilience and productivity. An effective adaptive management program will ultimately improve the overall effectiveness of the conservation program through time.

Adaptive management will help ensure that sage-grouse conservation measures in the Federal Plans are effective, and if they are not effective, that corrective actions will be implemented. Each planning area (with the exception of the Lander and North Dakota Plans) has identified adaptive management soft and hard triggers and responses. Soft triggers represent an intermediate threshold indicating that management changes are needed at the project/implementation level to address habitat and population losses. If a soft trigger is met, the BLM will apply more conservative or restrictive implementation conservation measures to mitigate for the specific causal factor in the decline of populations and/or habitats, with consideration of local knowledge and conditions. These types of adjustments will be made to preclude meeting a hard trigger (which signals more severe habitat loss or population declines). Hard triggers represent a threshold indicating that immediate action is necessary to stop a deviation from sage-grouse conservation objectives as set forth in the Federal Plans. Tripping a hard trigger will result in BLM or USFS switching to a more restrictive alternative from the Final Environmental Impact Statement either in whole or in part to address the causal factors (*e.g.*, immediate cessation of authorizing land use authorizations within the area). After the hard-trigger is tripped, the BLM or USFS will determine the causal factor and develop and implement a corrective strategy.

While adaptive management is not a land use allocation decision, the Federal Plans have developed species and habitat triggers and tied them to appropriate management actions in the Federal Plans, providing an additional certainty that action will be taken if the species or habitat objectives are not being met.

Mitigation—All of the Federal Plans require that impacts to sage-grouse habitats are mitigated and that compensatory mitigation provides a net conservation gain to the species. All mitigation will be achieved by avoiding, minimizing, and compensating for impacts following the regulations from the White House Council on Environmental Quality (CEQ) (40 CFR 1508.20; *e.g.*, avoid, minimize, and compensate), hereafter referred to as the mitigation hierarchy. If impacts from BLM/USFS management actions and authorized third party actions that result in habitat loss and degradation remain after applying avoidance and minimization measures (*i.e.*, residual impacts), then compensatory mitigation projects will be used to provide a net conservation gain to the species. Any compensatory mitigation will be durable, timely, and in addition to that which would have resulted without the compensatory mitigation.

The Federal Plans will establish a Management Zone Greater Sage-Grouse Conservation Team (hereafter, Team) to help guide the conservation of sage-grouse, within 90 days of the issuance of the Record of Decision. This Team will develop a Management Zone Regional Mitigation Strategy using the BLM's Regional Mitigation Manual as a framework. The Team will also compile and report on monitoring data (including data on habitat condition, population trends, and mitigation effectiveness) from States across the MZs and will use these data to either modify the appropriate Regional Mitigation Strategy or recommend adaptive management actions. Requiring mitigation for residual impacts provides additional certainty that, while impacts will continue at reduced levels on Federal lands, those impacts will be offset to a net conservation gain standard.

Fire and Invasives Assessment Tool (FIAT)—The Federal Plans recognize that fire and invasive plants are the primary impact to sage-grouse habitat in the Great Basin. The BLM and USFS convened an interagency team to develop a rangewide assessment and step-down approach to address these impacts (*i.e.*, FIAT). The result was the “*Greater Sage-Grouse Wildfire, Invasive Annual Grasses and Conifer Expansion*

Assessment” report (BLM 2014, entire). The FIAT assessments are incorporated in the Federal Plans. The assessments identify the habitats most resistant and resilient to wildfire and invasive plants to target fire management and ecosystem restoration activities (BLM and USFS 2015, entire). The FIAT Assessments ensure that wildfire and invasive plant management and restoration resources are deployed in the landscapes where they will be most effective in reducing this potential threat.

As part of the assessment process, Instructional Memorandum (IM) 2014–134 was released August 28, 2014. This IM, in part, provided guidance for the BLM field offices to cooperate with interagency partners to complete FIAT assessments at local scales for five priority landscapes in sage-grouse habitat, which roughly corresponded to PACs in the Great Basin as identified in the COT Report (USFWS 2013, p. 14) (*i.e.*, Central Oregon, Northern Great Basin, Snake/Salmon/Beaverhead, Southern Great Basin, Western Great Basin/Warm Springs Valley). For each priority landscape, regional findings were stepped down to describe local conditions by Project Planning Area (PPA) and associated treatment needs and management priorities. Each PPA contained emphasis areas, *i.e.*, portions of a PAC with important habitat characteristics and sage-grouse populations that are impacted by wildfire, invasives, and conifer encroachment. The assessments were included in the Federal Plans. The FIAT Assessments are described in more detail in the *Wildfire and Invasive Plants* section, below.

Federal Plans Summary

The Federal Plans provide major new regulatory mechanisms to protect sage-grouse from land use activities on more than half of the occupied range. In 2010, the Federal land management plans did not contain, for the most part, sage-grouse specific measures, and areas important to the species were open to land uses that could disturb habitat (75 FR 13910, March 23, 2010, p. 13982). Since then, the BLM and USFS have amended or revised 98 plans to address threats to the species (BLM and USFS 2015, entire). The Federal Plans exclude or reduce habitat-disturbing activities in PHMAs that contain the most important habitats for conservation. General Habitat Management Areas are still being managed for the benefit of sage-grouse, but BLM and USFS have flexibility to site development or leasing in GHMAs to keep priority areas intact. While some disturbance can occur in the GHMAs, as they contain fewer sage-

grouse when compared to PHMAs, protective measures for activities in those areas minimize impacts and require mitigation. The combination of restrictive PHMAs and less restrictive GHMAs provide conservation for sage-grouse on approximately 27 million ha (67 million ac) while still enabling the multiple uses that are part of the BLM and USFS missions. While there are impacts associated with on-going activities, the Federal Plans provide adequate mechanisms to reduce and minimize new disturbance in the most important areas for the species. By following COT Report and NTT guidance and restricting impacts in the most important habitat, the Federal Plans ensure that high-quality sage-grouse lands with substantial populations are minimally disturbed and sage-grouse within this habitat remain protected.

Wyoming State and Federal Plans

Approximately 37 percent of estimated sage-grouse abundance occurs in Wyoming (Doherty *et al.* 2010a, p. 21). The Wyoming Basin, the majority of which occurs within the State of Wyoming, has been identified as one of two areas with the highest population connectivity (Knick and Hanser 2011, p. 391). Therefore, conservation of this area is essential to the persistence of sage-grouse into the future. We have also identified this area as a stronghold for the species (USFWS 2014a).

The Wyoming Plan relies on the protection of important sage-grouse habitats in the State using a suite of avoidance and minimization measures. Important habitats (Core Areas) were identified by the highest densities of males attending leks, and added associated habitats through a scientific process engaging State wildlife experts and local working groups. Core Areas encompass approximately 83 percent of the breeding population of sage-grouse in Wyoming on approximately 24 percent of the total land surface of the State (Budd, Wyoming Wildlife and Natural Resource Trust, pers. comm. 2015). Additional connectivity areas were identified for protection to ensure population movements. Protective measures associated with the Wyoming Plan (described below) do not extend to lands located outside the identified Core Areas but that are still within occupied sage-grouse habitat. In non-Core Areas, the minimization measures are implemented to maintain habitat conditions such that there is a 50 percent likelihood that leks will persist over time (Wyoming Game and Fish Department 2009, pp. 30–35). While impacts to sage-grouse are possible in

non-core habitats, the majority of primary habitats necessary for long-term conservation of sage-grouse in Wyoming are included in the identified Core Areas. Core Area maps are reviewed and adjusted every 5 years to allow for the incorporation of new data that ensures the most important areas for sage-grouse receive protections. For example, the State of Wyoming reviewed the Plan in 2015 and added 58,191 ha (143,794 ac) to the Core Areas.

The key component of the Wyoming Plan is the application of State regulatory measures associated with the Wyoming Plan on all lands in Wyoming (6 million ha (15 million ac)) as any project requiring a State permit must meet the conditions of the strategy regardless of land ownership. Specifically, the Wyoming Plan applies to all activities that require permits from Wyoming’s Industrial Siting Council (ISC) (Wyoming E.O. 2015–4, entire). The Federal Plans in the State incorporate the Wyoming strategy, thereby ensuring implementation of the strategy on Federal land surfaces and subsurface regardless of the need for a State permit (see further discussion below). The completion of the Federal plans also facilitates greater coordination between the State and Federal agencies in implementing and monitoring the Wyoming Plan. This addition to the Wyoming Plan further increases the value of this effort in conserving sage-grouse by covering all lands in the State with a single regulatory framework to reduce affects to sage-grouse in the most important habitats in the State. Therefore, the strategy conserves sage-grouse through an effective regulatory mechanism for conservation.

The Wyoming Plan first encourages projects to be re-located outside of Core Areas by reducing restrictions in non-Core Areas for development activities. Where projects cannot be relocated, the Plan requires a combination of restricted development densities, development disturbance caps, seasonal restrictions, and lek buffers to minimize habitat disturbance within Core Areas. Surface disturbance is limited to 5 percent within Core Areas reducing fragmentation and degradation of habitat (Wyoming E.O. 2015–4, Attachment A, p. 6; Wyoming E.O. 2015–4, Attachment B, p. 5). While 5 percent is greater than the 3 percent used in other States, habitat disturbance monitoring in Wyoming is conducted at a much finer scale and is, therefore, more inclusive in the number and extent of disturbances measured. Additionally, Wyoming includes natural disturbances, such as wildfire, in the

disturbance measure, which is not included in any other State. Therefore, the higher disturbance cap permitted in Wyoming is not more permissive as a simple comparison of the numbers suggests. Limiting development to one site per 259 ha (640 ac) on average reduces the disturbance footprint to a level where impacts to sage-grouse are minimal, if nonexistent (Holloran 2005, p. 58; Taylor *et al.* 2012a, p. 31; Holloran *et al.* 2010, p. 71). Development is not permitted if either of these criteria (development density or disturbance caps) is exceeded. Incentives to consolidate disturbance further reduce development impacts by minimizing habitat loss and degradation within large landscapes. Where development cannot be moved away from breeding habitats, an NSO buffer of 1 km (0.6 mi) of a lek is required, as well as a seasonal restriction on project development. Activity within 6.4 km (4 mi) of a lek is also restricted from March 15 through June 30. These restrictions reduce impacts to the sage-grouse by avoiding disturbance during breeding season (Wyoming E.O. 2015–4, Attachment B pp. 2–6; Fedy *et al.* 2012, p. 1063; Doherty *et al.* 2010a, entire).

Disturbance (including all anthropogenic and natural disturbances) is tracked via a geospatial database (measuring disturbance at 1 m (3.3 ft). Including all disturbances with such precision ensures that all potential impacts to sage-grouse, regardless of source, are being considered prior to authorizing new development. Additional conservation is gained through the enforcement of noise restrictions at the perimeter of leks, which minimizes disturbance to birds visiting the leks (Wyoming E.O. 2015–4, Attachment B, p. 8; Patricelli *et al.* 2013, p. 241; Blickley and Patricelli 2012, p. 33; Blickley *et al.* 2012, p. 470).

Outside of core-habitat, there are NSO restrictions within 0.4 km (0.25 mi) of leks to minimize impacts to sage-grouse (E.O. 2015–4, Attachment B, p. 6), and activities within 3.2 km (2 mi) of a lek are restricted during the breeding season. These relaxed stipulations encourage development to move outside of Core Areas, while still providing some protections to birds in non-Core Areas. While impacts to birds and their habitats may occur outside of Core Areas, only about 17 percent of the sage-grouse bird density occurs in those areas (Budd, Wyoming Wildlife and Natural Resources Trust, pers. comm. 2015), minimizing impacts to sage-grouse and allowing for the continuation of the economies that support the State.

In 2010, we analyzed the Wyoming Plan and noted that it included

measures that if fully implemented could ameliorate threats to sage-grouse (75 FR 13910, March 23, 2010, pp. 13974–13975). We now have data that shows how implementation has avoided and minimized impacts in core habitats. Since 2012, the majority of the 600 projects proposed in Core Areas and reviewed by the State complied with the criteria of the Wyoming Plan. Projects that added additional surface disturbance within Core Areas were minimized or co-located with existing disturbance. Less than 8 ha (20 ac) of new disturbance has occurred within Core Areas since 2012 (USFWS 2014b). Other applications were denied that would negatively affect sage-grouse, including a wind lease application on State trust lands (USFWS 2014b). The number of oil and gas wells permitted in Core Areas has also declined as industry seeks to avoid conflict with sage-grouse. Between 2006 and 2012, vertically drilled single well permits declined 65 percent, while directionally and horizontally drilled wells, from outside the Core Areas, increased by 66 and 1,337 percent, respectively (USFWS 2014b). This change in the number and nature of oil and gas well permits further demonstrates the efficacy of the Wyoming Plan. Other industries, such as mining, have initiated restoration efforts to remove existing disturbance and improve habitat for sage-grouse. These data demonstrate the efficacy of the Wyoming Plan in removing and reducing impacts to sage-grouse from development activities.

The Federal Plans in Wyoming have incorporated the Wyoming Plan Core Area strategy. Core habitats designated by the State have been identified as PHMA on BLM and USFS lands, while non-core habitats are designated as GHMA. Both the BLM and USFS have adopted the more precise disturbance measurements developed by the State at 5 percent. With the exception of the fluid and non-energy leasable mineral programs, the Federal Plans in Wyoming are the same as with other States. However, these modifications were made to expand the protections already implemented by the State to Federally managed lands.

The fluid mineral designation in the Federal Plans in Wyoming is different than in the other Federal Plans throughout the range, which was necessary to adopt the Wyoming Plan. For fluid minerals in Wyoming, PHMAs are designated Controlled Surface Use, which means these areas are open to leasing, but would require proposals for surface-disturbing activities only be authorized in accordance with the controls or constraints specified in the

Wyoming Plan. For non-energy leasable minerals, PHMAs are open to non-energy leasable minerals, but are subject to measures intended to minimize impact in important (core) areas pursuant to the Wyoming Plan.

A recent analysis of the Wyoming Plan predicted that 83 percent of the landscape within core area boundaries supports increasing or stable populations of sage-grouse (Burkhalter *et al.* 2015, p. 20) due to the conservation of high-quality intact sagebrush habitats. Seventeen percent of the landscape within Core Areas may have declining populations as those areas occur around the edges of Core Areas and, therefore, are subject to disturbances outside these protected areas (Burkhalter *et al.* 2015, p. 20). The factors identified in this report as essential for conservation, such as maintaining connected landscapes in sagebrush cover, and minimizing oil and gas development, are all key components of the Wyoming Plan. The recent completion of the BLM and USFS Federal Plans should reduce disturbance around the edge of Core Areas, thereby increasing the efficacy of the strategy. The Wyoming Plan was renewed in July 2015 ensuring that the protections will continue until at least 2022 (Wyoming E.O. 2015–4, p. 6).

The Wyoming Plan has been in place for 8 years, and has demonstrated its conservation value by protecting areas identified as important to sage-grouse conservation. As described above, development has been removed or minimized in Core Areas, protecting intact habitats from fragmentation and degradation. Carefully controlled development within Core Areas has had minimal to no impact to the sage-grouse as demonstrated by the increasing populations within Core Areas (Burkhalter *et al.* 2015, p. 20).

Protections outside the Core Areas also provide additional conservation to habitats and birds by maintaining connectivity between Core Areas. The adoption of the Wyoming Plan into Federal land plans provides additional assurances that protections of Core Areas will be achieved on all lands, regardless of land ownership.

Montana and Oregon Conservation Efforts

State and Private lands account for 42 percent of the sage-grouse occupied range. Plans developed by States for sage-grouse vary widely in the nature of the protective measures, with some measures being regulatory and some being voluntary. State Plans in three States—Wyoming, Montana, and Oregon—contain regulatory measures

that effectively address threats on State or private lands. Wyoming is addressed separately above because of its integration with the Federal Plans in that State (See *Wyoming* section above).

Since 2010, all States within the range of the species, except for California, have drafted, finalized, or implemented conservation plans for the sage-grouse. These plans take different approaches, but, in general, they identify important conservation objectives for sage-grouse, and provide mechanisms to incentivize conservation. While 10 of the 11 States in the range of the sage-grouse updated plans to conserve the species by incorporating new information, which is a testimony to their concern and commitment to protect the grouse and its habitats, not all of these plans have been fully implemented or regulatory in scope. As discussed above, we will assess the conservation actions mandated by the State plans in Wyoming, Montana, and Oregon because they provide the greatest degree of regulatory certainty in addressing potential threats on State and private lands not under the jurisdiction of Federal Plans. We appreciate the work that each State has completed, but we could not include all planning efforts in other States in our analysis because they did not meet a level of certainty for implementation and effectiveness. Regardless of the nature of State conservation efforts, we reviewed and considered the conservation efforts developed and implemented by the States consistent with the Act (16 U.S.C. 1533(b)(1)(A)). A description of the other applicable State laws is included below in *Regulatory Mechanisms* and *Other Conservation Plans*.

Montana—The Montana Sage-Grouse Habitat Conservation Program (Montana Plan) is similar to the Wyoming Plan in that it is a regulatory mechanism that applies to Core Areas across the State. In 2014, the Governor signed an Executive Order that provides sage-grouse conservation directives for activities on State and private lands where approximately 70 percent of sage-grouse habitat in Montana occurs (Montana E.O. 10–2014, entire). The Governor of Montana issued a second Executive Order putting into effect the Montana Sage Grouse Habitat Conservation Program and giving it full regulatory authority (Montana E.O. 12–2015, entire). This second Executive Order included a full review of State regulatory authority over activities in sage-grouse habitat in Montana. The Montana Plan is regulatory on State lands and on any private lands where State permits or authorizations are required; it requires that State agencies

adhere to the requirements and stipulations of the Program. The Montana Executive Order created the Montana Sage-Grouse Oversight Team (Montana Oversight Team) composed of State Agency Directors to oversee administration of the Montana Plan. Additional staffing of the Montana Plan includes a Program Manager, GIS Manager and technician, biologists, and support for seasonal work. The Montana Plan and supporting documents clearly identify under what regulatory authority the State and private entities are required to act in accordance with the Executive Order.

In the previous section, we describe in detail how the Wyoming Plan addresses the issues of habitat loss and fragmentation and disturbance to sage-grouse. The Montana Plan closely follows the structure of the Wyoming Plan and, similarly, uses information and guidance from the COT Report to identify and reduce impacts associated with threats to sage-grouse in Montana. The Montana Executive Order also identifies scientifically valid performance standards based upon number of males at leks to ensure that the Montana Plan actions are effective; monitoring protocols are also included. The Montana Plan specifies adaptive management strategies in response to this monitoring information. Implementation of the Montana Plan will occur immediately in response to future and additional actions that occur in sage-grouse habitat; full implementation of the Montana Plan is expected by January 2016.

The Montana Plan includes similar requirements as those identified in the Wyoming Plan including the following: Use of a 5 percent disturbance cap in Core Areas; allowance of only one disturbance (well pad, grouped impacts) per section (259 ha (640 ac)) for oil and gas and mining; prohibition of sagebrush eradication or conversion; and lek buffers and disturbance buffers in both Core Areas and general habitats. For a complete discussion of why these methods are effective in supporting viable sage-grouse populations, please see the previous discussion of the Wyoming State and Federal Plan, above.

The Montana State Legislature recently passed, and the Governor signed, the Montana Sage-Grouse Protection Act during the 2015 legislative session. This Act ensures that critical funding and support are available for necessary sage-grouse conservation efforts in the future. This Act funds staff resources to implement the conservation program, and includes a revolving conservation fund with an initial balance of 10 million dollars.

This funding authorization is directly tied to the implementation of the E.O. and provides certainty of implementation. The Governor also signed the Montana Greater Sage-Grouse Stewardship Act, which establishes the Montana Sage-Grouse Oversight Team and provides grant-based funding for voluntary sage-grouse conservation efforts. Unless specifically excluded, all State actions (including those prescribed for sage-grouse conservation) require review under the Montana Environmental Policy Act, which is analogous to the National Environmental Policy Act at the State level. Given this commitment from the State, there is certainty that the Montana Plan will be implemented and effective.

In addition to the Montana Plan, private landowners in Montana have worked with Montana Fish, Wildlife, and Parks to enroll nearly 80,000 ha (200,000 ac) in 30-year sagebrush leases. Montana Fish, Wildlife, and Parks provided 1.2 million dollars for these leases where landowners agreed not to eliminate sagebrush on the enrolled acres (Wightman, Montana Fish, Wildlife, and Parks, 2015, pers. comm.).

Oregon—The Oregon Sage-Grouse Action Plan (Oregon Plan) ensures regulatory protection and enhancement of sage-grouse and their habitat on State and private lands in Oregon. This Plan is backed by two new rules in the Oregon Legislature and an Executive Order. The Oregon Plan includes explicit habitat and population goals with incremental completion dates and prioritizes avoidance with standards for mitigation of impacts if necessary. The Oregon Plan builds on the core area strategies utilized by Wyoming and Montana to address all sage-grouse habitats. The Oregon Plan applies to more than 6 million ha (approximately 15 million ac) of all landownership types and includes regulatory mechanisms, such as disturbance caps and adaptive management triggers, to reduce impacts to sage-grouse in the State.

The Oregon Plan includes similar provisions to those identified in the Wyoming Plan and Montana Plan. Based upon the nature and extent of threats to sage-grouse in Oregon and information in the 2010 Finding and COT Report, the Oregon Plan includes limitations on disturbance in Core Areas through disturbance caps and an avoidance and minimization strategy. Actions permitted through county actions (such as a new subdivision or county road) as well as actions permitted through State agencies (such as a new large-scale energy or utility project) are both subject to the Plan as

outlined in the two Rules (Oregon OAR 635–140–0025, entire; and Oregon OAR 660–023–0115, entire; OR E.O. 2015). For specific discussions of why these stipulations are effective, please see the Wyoming State and Federal Plan discussion. The Oregon Plan identifies fire management measures, such as funding and logistical support for Rural Fire Protection Areas. Wildfire and the fire/invasives cycle can impact large areas of sage-grouse habitat in very short periods of time, making prevention of wildfire important for minimizing effects. This commitment improves the likelihood that wildfires will be effectively controlled to reduce the potential negative effects to sage-grouse habitat. Further, the Oregon Plan includes a State-administered compensatory mitigation program designed to synchronize with BLM mitigation processes. The Oregon Plan has identified an overall population goal of 30,000 birds with interim performance measures and corresponding monitoring protocol to ensure progress towards the larger goal. The Oregon Plan commits to adaptively manage for sage-grouse in response to this monitoring data.

Many of the Oregon Plan measures are similar or complementary to those included in the Federal Plans. This aligned framework of tools, rules, and protocols across local, State, and Federal processes will ensure that coordinated mitigation and voluntary actions conserve the species across all land ownerships in Oregon. It also creates the transparency and credibility necessary for public support of the State's strategy.

The Oregon Plan identifies several State agencies as well as specific staffing and funding requirements necessary for full implementation of the Oregon Plan. In addition to gaining public support and identifying necessary staffing, financial support has been secured through the Oregon Watershed Enhancement Board, which has committed 10 million dollars over the next 10 years. These funds are used to implement aspects of the Oregon Plan that manage impacts from fire and invasive species. In addition, 3.34 million dollars of new funding for sage-grouse conservation was appropriated by the Oregon Legislature for the 2015 through 2017 funding cycle. These commitments ensure that the Oregon

Plan will be successfully implemented for the conservation of the species.

Sage Grouse Initiative

The Sage Grouse Initiative (SGI) works with landowners and other partners to design and deliver voluntary conservation practices, including grazing systems and conservation easements, on private lands to ameliorate impacts to sage-grouse while improving the sustainability of working ranches. Private lands account for 39 percent of sage-grouse occupied range. Habitat under private ownership may be at greater risk of conversion through development than neighboring Federal land. The Sage Grouse Initiative's past, present, and future contributions are considerable because, while private lands are less than half of the sage-grouse occupied range, the potential biological value of those lands for various phases of the species' life history is high, as is their potential conservation value. The NRCS carries out conservation through a variety of authorities and tools. We have identified specific activities that are directly benefiting sage-grouse under SGI (Table 4).

TABLE 4—CONSERVATION COMPLETED BY SGI FOR 2010 TO 2014

[From NRCS 2015a, p. 38]

MZ	Grazing systems		Easements		Conifer removal		Seeding		Fence modification	
	ha	ac	ha	ac	ha	ac	ha	ac	km	mi
I	554,529	1,370,269	26,661	65,881	73	181	3,074	7,597	182	113
II	216,285	534,450	95,186	235,210	1,437	3,551	1,023	2,527	37	23
III	15,199	37,557	4,529	11,191	7,630	18,855	2,240	5,534	16	10
IV	127,448	314,930	39,727	98,167	83,405	206,099	12,035	29,740	153	95
V	35,736	88,306	11,684	28,871	71,061	175,595	439	1,085	129	80
VI	33,619	83,073	1,768	4,369	0	0	274	677	47	29
VII	3,667	9,061	3,316	8,193	389	962	388	960	2	1
Total	986,482	2,437,646	182,870	451,882	163,996	405,243	19,474	48,120	565	351

Grazing Management—The objective of SGI's Prescribed Grazing protocol is to ensure that rangelands are managed sustainably and support functional sagebrush ecosystems (NRCS 2015a, p. 23). Since 2010, SGI has improved rangeland health through rotational grazing systems, re-vegetating with sagebrush and perennial grasses, and controlling invasive species (NRCS 2015a, p. 23). The techniques employed by SGI to improve and/or maintain habitat suitability for sage-grouse are consistent with the recommendations provided in the COT Report (USFWS 2013, pp. 45–46).

Easements—The SGI has enrolled 182,109 ha (450,000 ac) in conservation easements; 80 percent of these occur

inside occupied sage-grouse habitat, and 94 percent provide permanent protection (NRCS 2015a, p. 1). Under these easements, habitat cannot be subdivided or converted to agriculture, thus protecting sage-grouse habitat from development. By maintaining these lands in sagebrush habitat, these easements support existing sage-grouse populations and decrease likelihood of fragmentation.

Restoration—The SGI ameliorates impacts through restoration of disturbed and degraded habitat. The SGI has reclaimed 163,995 ha (405,241 ac) of otherwise suitable habitat by direct removal of conifers encroaching on sagebrush habitat. Removal of early-stage conifers should improve and

expand sage-grouse habitats by precluding ecological type conversion to an otherwise unsuitable habitat (Johnson and Miller 2006, p. 8; Casazza *et al.* 2011, p. 163; Knick *et al.* 2013, p. 1544). Through monitoring data, SGI is working to assess how birds use areas with recent conifer removal. Anecdotal reports suggest that sage-grouse have responded positively to these efforts. Moreover, SGI and others are developing conifer maps in MZs III, VI, V, and VII (NRCS 2015a, p. 19). The SGI will use this new information to target efforts where removal will have the greatest value for sage-grouse (NRCS 2015a, p. 19 and NRCS 2015b, p. 10).

Fence modification is another aspect of SGI restoration. Marking and

removing fences can reduce direct mortality to sage-grouse by reducing fence strikes. NRCS estimates that SGI fence marking prevents 2,600 collisions annually (NRCS 2015a, p. 22).

The SGI uses direct seeding to restore habitat through the addition of native species. Through grazing systems, revegetating former rangeland with sagebrush and perennial grasses and controlling invasive weeds, SGI has enhanced rangeland health inside PACs (NRCS 2015a, p. 2).

Monitoring and Adaptive Management—The NRCS has continued to improve conservation of sagebrush habitat through new information and new scientific methods (NRCS 2015a, entire; NRCS 2015b, entire). They employ habitat suitability models to target conservation easements and address conifer encroachment in the early stages of development to improve the benefit of their treatments. By monitoring and tracking the effectiveness of their efforts and their willingness to incorporate this information into their management, SGI has ensured the long-term implementation of their program will achieve conservation for sage-grouse on private lands.

Since 2010, the NRCS, through the SGI, has invested approximately 425.5 million dollars, with 76 percent of investments occurring within PACs (Table 4). To date, 1,129 ranches have participated in the SGI, across all 11 States in the species' range (NRCS 2015a, p. 1). Through the 2014 Farm Bill, NRCS will continue and accelerate its efforts, ensuring a durable and increasingly targeted conservation effort on private lands in sage-grouse country (NRCS 2015a, p. 29; NRCS 2015b, p. 6). Starting in 2015, NRCS will add 198 million dollars to continue sage-grouse conservation on private lands in the future (NRCS 2015a, p. 29; NRCS 2015b, p. 6).

Where they have been implemented, these conservation efforts have addressed certain potential threats to sage-grouse, such as urban and exurban development, infrastructure, and improper grazing (defined for the purposes of this analysis as grazing at an intensity or in ways that impair ecosystem functions of the sagebrush ecosystem) [See *Grazing and Rangeland Management*, below]. The nature of those potential threats and the impact of SGI's conservation in ameliorating some potential threats are discussed in further detail below (see Summary of Information Pertaining to the Five Factors). Given the history of success of this program, the level of local and national support, NRCS' application of

adaptive management, demonstrated partnerships, and the recent reauthorization and dedicated resources through the 2014 Farm Bill, we expect that SGI will continue to provide valuable on-the-ground conservation to sage-grouse and its habitat into the future.

Candidate Conservation Agreements

Over the past 2 years, we have prioritized Candidate Conservation Agreements with Assurances (CCAAs) to focus conservation on non-Federal lands for the benefit of sage-grouse. Candidate Conservation Agreements with Assurances provide assurances to both landowners and the Service that conservation will continue into the future without resulting in a regulatory burden on the landowners involved. Through these agreements, landowners agree to avoid certain activities that may be harmful to sage-grouse, or to undertake activities on their property that benefit sage-grouse (e.g., restore degraded habitat, create new habitat, augment existing populations, and restore historical populations). In Oregon, more than 575,000 ha (1.4 million ac) of rangeland have been effectively conserved for sage-grouse through enrollment in a CCAA. In Wyoming, 36 CCAAs have been completed, with more than 180,000 ha (445,000 ac) enrolled. In addition to CCAAs, we also employ Candidate Conservation Agreements; these agreements can exist between the Service and private landowners, local governments, States, and Federal agencies.

Candidate Conservation Agreements operate through tailored conservation strategies that specify required activities that will benefit sage-grouse. Although individual agreements vary, the focus is always on improving sage-grouse habitat or populations. Through CCAAs, landowners may restore existing degraded sagebrush to provide habitat for sage-grouse. They may also create new habitat or simply, as with conservation easements, protect existing habitat for the benefit of the species. As an example, landowners enrolled in the Oregon CCAA have agreed to maintain contiguous habitat by avoiding further fragmentation. The objective for this required conservation measure is for no net loss in: (1) Habitat quantity (as measured in acres) and (2) habitat quality (as determined by the ecological state). Additionally, every enrolled landowner must have at least one conservation measure in place to address each threat identified during the baseline assessment of individual properties.

Candidate Conservation Agreements are voluntary agreements. As such, it is possible for landowners to terminate these agreements. However, based on previous experiences with existing CCAAs for a variety of other species (Anderson and Moore, USFWS, 2015, pers. comm.), we have found that landowners generally do not withdraw from these agreements. Of the 34 CCAAs the Service has finalized nationwide for a variety of species, 32 are still in effect and 2 expired based on the term of the agreement, indicating that landowners continue to implement CCAAs following finalization of the agreements (Anderson and Moore, USFWS, 2015, pers. comm.). Landowners commit to beneficial actions that they are willing to implement to receive the assurances of no further regulatory requirements if the species would become listed. In addition to CCAAs, we work with private landowners through the Partners for Fish and Wildlife Program through Private Landowner Agreements to benefit species and their habitats. A past study on the retention of restored wetlands found that the vast majority of landowners continued to implement the practices from their agreements well after the agreement ended (Fairchild 2004, entire). Further, over the last decade, in an 8-State area roughly equivalent to the Rocky Mountain sage-grouse range, the majority of landowners completed their agreements and continued practices after the agreements were completed (Johnson, USFWS, 2015, pers. comm.). Habitat loss and degradation were identified as threats to the species in 2010; through efforts such as these, sage-grouse habitat remains available to the species. Given the ongoing fidelity these efforts to conserve sage-grouse and its habitat, along with our previous experiences with other species, we conclude that there is sufficient certainty that existing CCAAs will continue to be implemented into the future.

Secretarial Order 3336

On January 5, 2015, the Secretary of the Interior signed Secretarial Order 3336, Rangeland Fire Prevention, Management, and Restoration (Secretarial Order), that provides guidance on wildfire management in the sagebrush ecosystem (Department of the Interior (DOI) 2015b, entire). The Secretarial Order places a priority on "protecting, conserving, and restoring the health of the sagebrush ecosystem and, in particular, sage-grouse habitat, while maintaining safe and efficient operations," and allocates fire resources and assets associated with wildfire to reflect that priority. The Secretarial

Order established a Rangeland Fire Task Force (Task Force) to prepare and oversee an Implementation Plan for accomplishing the objectives of the Secretarial Order. The Task Force completed an "Initial Report" outlining actions that can be undertaken during the 2015 western wildfire season and that plan is being implemented (DOI 2015c, entire). The Task Force also prepared a "Final Report" that identifies long-term activities, beyond the 2015 fire season, that can be implemented to further address the effects of wildfire in the Great Basin (DOI 2015d, entire). A full discussion of the Secretarial Order, the Initial and Final Reports, and how they address the effects from wildfire and invasive species is provided below (see *Wildfire and Invasive Plants*).

Summary of New Information Since 2010

Since 2010, there have been several major changes in the regulatory mechanisms that minimize impacts to sage-grouse and their habitats. Foremost among these are the adoption of new Federal Plans specifically tailored to conserving sage-grouse over more than half of its occupied range. These Federal Plans now include substantial provisions for addressing activities that occur in sage-grouse habitats and affect the species, including those threats identified in 2010 as having inadequate regulatory measures. Aside from addressing specific activities, the Federal Plans include provisions for monitoring, adaptive management, mitigation, and limitations on anthropogenic disturbance to reduce impacts authorized in sage-grouse habitats. The Federal Plans are the foundation of land-use management on BLM and USFS managed lands. We are confident that these Federal Plans will be implemented and that the new changes, which are based on the scientific literature, will effectively reduce and minimize impacts to the species and its habitat.

In addition to the Federal Plans, the BLM and USFS have provided new policy guidance and management direction for the management of wildfire and invasive plant in the sagebrush ecosystems. The Secretarial Order establishes new, overarching policy direction for DOI and its wildfire prevention and suppression efforts by prioritizing "protecting, conserving, and restoring the health of the sagebrush ecosystem and, in particular, sage-grouse habitat, while maintaining safe and efficient operations." The Secretarial Order also requires that DOI allocate its wildfire resources and assets in ways that fulfill the priority of

protecting, conserving, and restoring the health of the sagebrush ecosystem. The Secretarial Order aims to reduce the size, severity, and cost of suppressing wildfire in sage-grouse habitats by reducing the spread of invasive plants and prioritizing resources to ensure that suppression efforts are effective.

Further, 10 of the 11 States within the occupied range of the sage-grouse have revised and adopted sage-grouse conservation plans. State sage-grouse conservation plans in Wyoming, Montana, and Oregon contain regulatory mechanisms that minimize impacts to the species and its habitat. Most notably, the Wyoming Plan has been in place since 2008 and has effectively minimized impacts within core habitats, protecting the highest density areas for the species within the State. The Montana and Oregon State Plans use proven conservation measures including disturbance caps, density restrictions, and lek buffers to minimize disturbance to important habitats. In combination, the Federal and three State plans cover 90 percent of the sage-grouse breeding habitat where they provide regulatory mechanisms that reduce potential adverse effects to sage-grouse. These State and Federal Plans, together with the private lands conservation provided by SGI and CCAAs, represent a substantial increase in sage-grouse conservation since 2010. These Plans and private land efforts provide conservation for sage-grouse now and into the future and ensure that the most important habitats will remain distributed across the landscape to support the populations identified as critical to the long-term conservation of the species.

Summary of Information Pertaining to the Five Factors

Section 4 of the Act (16 U.S.C. 1533) and implementing regulations (50 CFR 424) set forth procedures for adding species to the Federal Lists of Endangered and Threatened Wildlife and Plants. 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 a "threatened" species as one "which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range" (16 U.S.C. 1532(6), (20)). Under section 4(a)(1) of the Act, we may determine a species warrants listing as endangered or threatened 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; or

(E) Other natural or manmade factors affecting its continued existence.

In making this finding, we discuss below information regarding the status and potential threats to the sage-grouse in relation to the five statutory factors provided in section 4(a)(1) of the Act. Our evaluation of potential threats is based on information provided in the relevant petitions, information available in our files, and other sources considered to be the best scientific and commercial information available, including published and unpublished studies and reports. In considering what factors might constitute threats to the species, we must look beyond the mere exposure of the species to the factor to determine whether the species responds to the factor in a way that causes actual impacts to the species. If there is exposure to a factor, but no response, or only a positive response, that factor is not a threat. If there is exposure and the species responds negatively, the factor may be a threat to the species and we then attempt to determine if that factor rises to the level of a threat, meaning that it may drive or contribute to the risk of extinction of the species such that the species warrants listing as an endangered or threatened species as those terms are defined by the Act. This does not necessarily require empirical proof of a threat. The combination of exposure and some corroborating evidence of how the species is likely impacted could suffice. The mere identification of factors that could impact a species negatively is not sufficient to compel a finding that listing is warranted; we require evidence that the threats, either alone or when combined, are significant, in that they act on the species to the point that the species meets the definition of an "endangered species" or "threatened species" under the Act.

Habitat Fragmentation

In the 2010 finding, we determined that the greatest threat to the species was habitat loss and fragmentation (Factor A) due to a variety of causes, including but not limited to, energy development, infrastructure, invasive species, and wildfire (75 FR 13910, March 23, 2010, p. 13986). Sagebrush habitats were becoming increasingly degraded and fragmented due to the impacts of multiple threats, including direct conversion, urbanization, infrastructure such as roads and power

lines built in support of several activities, wildfire and the change in wildfire frequency, incursion of invasive plants, improper grazing, and nonrenewable and renewable energy development. Many of these threats were found to be exacerbated by the effects of climate change, which could influence long-term habitat trends.

As noted in 2010, fundamental characteristics of sagebrush landscapes have changed since Euro-American settlement (Knick and Connelly 2011, p. 7). Very little of the extant sagebrush is undisturbed, with up to 50 to 60 percent having altered understories or having been lost to direct conversion (Knick *et al.* 2003, p. 612). Conversion to cropland and other land uses has reduced the quantity of area that is dominated by sagebrush land cover. The composition of sagebrush communities has changed with the expansion of junipers and *Pinus* spp. (pinyon) woodlands (Miller and Rose 1999, p. 556) and the invasion of nonnative species such as cheatgrass (West and Young 2000, p. 262). Habitat suitability has also been affected by the presence of anthropogenic structures such as communication towers and power lines (Connelly *et al.* 2000a, p. 974; Beck *et al.* 2006, p. 1070). Lastly, the configuration of sagebrush mosaics across the species' range has changed, resulting in the risk of increased population isolation, exposure to predators in areas of edge habitat, and invasive plants (Saunders *et al.* 1991, pp. 22–24; Gelbard and Belnap 2003, p. 424; Knick and Connelly 2011, pp. 7–14).

The biology of sagebrush and the ecology of the sagebrush ecosystem makes restoration of disturbed areas very difficult and processes to restore sagebrush habitat are relatively unproven (Knick *et al.* 2003, p. 620). Active restoration activities are often limited by financial and logistical resources (Knick *et al.* 2003, p. 620; Miller *et al.* 2011, p. 147; Pyke 2011, p. 544) and may require decades or centuries to be effective (Knick *et al.* 2003, p. 620). Meaningful restoration for sage-grouse requires action on a landscape, watershed, or eco-regional scale rather than individual, unconnected efforts (Knick *et al.* 2003, p. 623; Wisdom *et al.* 2011, p. 469). Recently, investigations have focused on ascertaining where and how sagebrush habitat restoration is likely to be more effective (Pyke 2011, pp. 531–548; Miller *et al.* 2014, pp. 468–481; Chambers *et al.* 2014b, pp. 440–454). Because loss and fragmentation of habitats due to invasives and wildfire is one of the biggest impacts to sage-

grouse, particularly in the Great Basin, it is important that these investigations continue and that management actions continue to focus on effective wildfire suppression and habitat restoration.

Because of the challenges with sagebrush restoration, management efforts in sagebrush ecosystems are usually focused on habitat maintenance (Miller *et al.* 2011, p. 183; Wisdom *et al.* 2011, pp. 470, 472). This goal has primarily been achieved through the management of activities that can result in habitat loss and fragmentations such as non-renewable energy development, agricultural conversion, wildfire, and invasive plants, consistent with the recommendations in the COT Report (USFWS 2013, pp. 40–52). Each of the activities that can cause habitat fragmentation will be discussed further below, as well as any conservation efforts that have been implemented to address those impacts.

Nonrenewable Energy Development

In 2010, we evaluated the effect of nonrenewable energy development on sage-grouse and concluded that the development and related infrastructure were substantial contributors to habitat loss and fragmentation in the past, and that it would continue into the future, particularly in the Rocky Mountain portion of the species' range. We also found that regulations addressing nonrenewable energy development were inadequate at that time to address this threat. It was the lack of regulatory mechanisms that led us to conclude this nonrenewable energy development would continue at rates similar to or greater than historical rates of development. The 2010 finding concluded that habitat fragmentation, caused in part by nonrenewable energy development, and inadequate regulatory mechanisms were significant threats to the species, then and into the foreseeable future, such that listing was warranted under the Act (75 FR 13910, March 23, 2010, pp. 13986–13988).

Nonrenewable energy development includes the exploration, construction, and drilling of wells and installation of supporting infrastructure needed to extract and transport oil, natural gas, coal, coal-bed natural gas, coal-bed methane, and other types of gas. Nonrenewable energy development begins with exploratory surveys and the construction of access roads and well pads, followed by drilling, extracting, and transporting the energy reserves along roads and pipelines. Additional infrastructure needed for nonrenewable energy development often includes compressor stations, pumping stations, electrical generators, and power lines

(Connelly *et al.* 2004, p. 7–39; BLM 2007, pp. 2–110).

Nonrenewable energy development has occurred in sage-grouse habitats since the late 1800s (Connelly *et al.* 2004, p. 7–28), with wells historically concentrated in MZs I, II, VII, and the eastern portion of MZ III (IHS Incorporated 2014, entire). Specifically, nonrenewable energy development is concentrated above four geologic basins across the sage-grouse range: The Powder River Basin (MZ I); the Williston Basin (MZ I); the Southwestern Wyoming Basin (MZ II); and the Uinta-Piceance Basin (MZs II, III, and VII). These four basins overlap with the highest density of sage-grouse, and the largest number of leks in the Rocky Mountain portion of the occupied range (Doherty *et al.* 2015, entire). Approximately 10 percent of the species' overall occupied range has been directly or indirectly affected by nonrenewable energy development, with approximately 20 percent affected in MZ I, 20 percent affected in MZ II, and 29 percent affected in MZ VII (Knick *et al.* 2011, p. 240). The existing development and infrastructure has already affected the species distribution (Naugle *et al.* 2011, pp. 489–491). Nonrenewable energy development is expected to continue in the occupied range of the sage-grouse based on the estimates of available energy reserves and projected trends in development rates (Copeland *et al.* 2009, p. 5; Knick and Hanser 2011, p. 394; Wisdom *et al.* 2011, p. 467).

Nonrenewable energy development can remove and fragment sagebrush habitats (Factor A). Well pads vary in size from 0.10 ha (0.25 ac) for coal-bed natural gas wells 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, pp. 2–123). Pads for compressor stations typically occupy 5 to 7 ha (12.4 to 17.3 ac) (Connelly *et al.* 2004, p. 7–39). However, where geology permits the use of new horizontal and directional drilling technologies, multiple wells can be placed on one pad, thereby reducing the amount of surface disturbance associated with wells, roads, power lines, and pipelines (Applegate and Owens 2014, p. 288).

The reduction and fragmentation of sagebrush habitats can decrease sage-grouse abundance and reduce the distribution of sage-grouse across the landscape (Knick *et al.*, 2011, pp. 247–250; Leu and Hanser 2011, p. 270). Male sage-grouse may avoid leks if there are five or more wells within 3.0 km (1.9 mi), and sage-grouse are less likely to occupy habitats with wells spaced at 32 ha (80 ac) (Doherty *et al.* 2008, p. 193).

Well densities on Federal lands have typically ranged from 1 well per 16 ha to 32 ha (40 ac to 80 ac), although densities as high as 1 well per 4 ha (10 ac) do occur (BLM 2006, pp. 2–5; Naugle *et al.* 2011, p. 497). Impacts from nonrenewable energy extend beyond the physical footprints of wells and may include indirect effects such as the physical and behavioral changes, increased mortality, and reduced reproductive success (Lyon and Anderson 2003, p. 459; Walker *et al.* 2007a, p. 2651; Holloran *et al.* 2010, p. 70; Knick *et al.* 2011, p. 240).

Sage-grouse avoid habitats near non-renewable energy developments, including important wintering habitats and leks (Dzialak *et al.* 2013, p. 16; Smith *et al.* 2014, p. 15). Sage-grouse have lower nest initiation and nest success rates near nonrenewable energy development (Aldridge and Boyce 2007, p. 517; Webb *et al.* 2012, p. 9), and reduced survival rates (Holloran *et al.* 2010, p. 70; Kirol 2012, p. 15). Due to the strong habitat fidelity exhibited by adult sage-grouse, declining population trends may take up to 10 years to detect following the onset of nonrenewable energy development. (Doherty *et al.* 2010a, p. 5; Harju *et al.* 2010, pp. 441–445; Taylor *et al.* 2012a, p. 8; Gregory and Beck 2014, p. e97132). This delay poses challenges to detecting population-level impacts resulting from development, and may prevent timely implementation of measures to eliminate, reduce, or mitigate those impacts. As a single conservation tool, mitigation measures (such as habitat restoration and seasonal or timing restrictions) to reduce impacts may not be sufficient to prevent sage-grouse declines due to nonrenewable energy development (Walker *et al.* 2007a, p. 2651; Doherty *et al.* 2008, p. 192; Harju *et al.* 2010, p. 445), as the associated infrastructure persists on the landscape for several generations of sage-grouse. However, as part of a larger tool set that includes avoidance and minimization, mitigation can serve as a helpful conservation measure (USFWS 2014c).

Nonrenewable energy resources are the largest source of energy worldwide, and demand for these resources could increase by up to 1.3 percent annually in the United States and 50 percent worldwide by the year 2030 (National

Petroleum Council 2007, p. 46; Naugle *et al.* 2011, p. 490). Nonrenewable energy resources will likely be in demand and used in the United States through the year 2030, although energy forms and extraction techniques may change in the future (EIA 2009, entire). Market conditions and extraction technologies influence the rates of nonrenewable energy development in North America (Applegate and Owens 2014, p. 287); the Energy Policy and Conservation Act (Pub. L. 109–58) and its amendments mandate that the United States increase its domestic energy development. Therefore, nonrenewable energy development is likely to continue throughout the sage-grouse range into the future, although its form and extent across the landscape may change.

In 2010, we assessed impacts to sage-grouse and their habitat based on the portion of occupied range where a nonrenewable energy project was occurring and where there was increased potential for future development (75 FR March 1310, March 23, 2010, pp. 13942–13948). This approach was based on the best available GIS data at that time but may have overestimated some effects, because we had less precise information regarding areas of high oil and gas development potential and we measured impacts against all lands within the occupied range.

For this status review, we used peer-reviewed and published methodologies (Copeland *et al.* 2009, entire) to model the probability of future oil and gas development impacting sage-grouse. The model focused on assessing the risk of nonrenewable energy in MZs I and II, the two areas with the highest potential for future nonrenewable energy development (Figure 2) (Juliussøn and Doherty 2015). Although nonrenewable energy development potential exists and will continue in the Uinta-Piceance Basin (MZ VII), we did not apply the model to MZ VII because the relative proportion of potential development was low, even under the highest development scenario. The model used geological information about potentially available oil and gas resources to map areas of likely future development (Juliussøn and Doherty 2015). We also used Oil & Gas Resource Assessments

developed by the USGS to incorporate future maximum potential development scenarios into the analysis (Juliussøn and Doherty 2015). The analysis quantified potential effects to sage-grouse by calculating the percent of the Population Index and breeding habitat distribution potentially exposed to future nonrenewable energy development based on the availability of oil and gas resources. The potential effects from nonrenewable energy development were assessed with and without regulatory mechanisms contained in the Federal Plans, the Wyoming Plan, and the Montana Plan (see Conservation Efforts, below). The estimate of potential non-renewable energy effects without conservation planning efforts is roughly equivalent to what was evaluated in 2010.

Our analysis indicates that the Federal Plans, the Wyoming Plan, and the Montana Plan are reducing the exposure of the sage-grouse to nonrenewable energy, as measured by the portions of the Population Index and breeding habitat, in MZs I and II, the two MZs at greatest risk of future nonrenewable energy development (Table 5). Without the regulatory mechanisms in MZ I, 28 percent of the Population Index and 21 percent of the breeding habitat could be affected by nonrenewable energy development. Without regulatory mechanisms in MZ II, 27 percent of the Population Index and 25 percent of the breeding habitat could be affected (Table 5). However, with the regulatory mechanisms provided by the State and Federal plans, the risk of nonrenewable energy development decreases. With regulatory mechanisms, 17 percent of the Population Index and 14 percent of the breeding habitat could be exposed to nonrenewable energy development in MZ I, and 8 percent of the Population Index and 9 percent of the breeding habitat could be exposed to nonrenewable energy development in MZ II. Our analysis shows that the State and Federal regulatory mechanisms reduce the risk of nonrenewable energy exposure to the Population Index and breeding habitat by more than 35 percent in MZ I and more than 60 percent in MZ II.

TABLE 5—POTENTIAL EXPOSURE TO SAGE-GROUSE POPULATIONS AND BREEDING HABITAT FROM NONRENEWABLE ENERGY DEVELOPMENT IN MZS I AND II, WITH AND WITHOUT THE REGULATORY MECHANISMS, AT THE HIGHEST DEVELOPMENT SCENARIO

Management zone	Without regulatory mechanisms		With regulatory mechanisms	
	% of the population index exposed	% of the breeding habitat exposed	% of the population index exposed	% of the breeding habitat exposed
I	28	21	17	14
II	27	25	8	9

To summarize, our analysis quantifies that without regulation a high proportion of the Population Index and breeding habitat in MZs I and II could be exposed to and potentially negatively affected by nonrenewable energy development. However, with the regulatory mechanisms enacted since 2010, the potential risk from nonrenewable energy development is substantially reduced in MZs I and II (Table 5). Future impacts to sage-grouse from new development could vary based on other factors, such as economic markets, technologies, densities, proximity to existing development, and the location of new development; however, our results show that the Federal and State regulatory mechanisms in MZs I and II reduce habitat loss and fragmentation due to nonrenewable energy development. The next section will discuss these conservation efforts, including those regulatory mechanisms designed to address the effects of nonrenewable energy development and how they ameliorate this potential threat.

Conservation Efforts

Since 2010, State and Federal agencies have worked collaboratively to develop regulatory mechanisms, that is, legally binding and enforceable sage-grouse conservation measures, as well as other nonregulatory conservation efforts, to reduce or eliminate the potential threat of new nonrenewable energy development to sage-grouse and its habitat. Those efforts are discussed in detail below.

State Plans—Three States where nonrenewable energy development has historically been concentrated have implemented regulatory mechanisms to address this potential threat. As described below, Wyoming and Montana Plans provide regulatory mechanisms to address habitat loss, habitat fragmentation, and disturbance associated with nonrenewable-energy development on applicable lands in their States. In addition, the Utah Executive Order contains a regulatory mechanism for potential nonrenewable

energy development that is discussed below.

The Wyoming Plan provides regulatory mechanisms to reduce impacts associated with energy development on all lands within Core Areas. The Wyoming Plan features development stipulations to guide and regulate development within the Core Population Areas to avoid as much as possible, but, if avoidance is not possible, to minimize and mitigate, impacts to sage-grouse and its habitat (See *Regulatory Mechanisms* section below; Wyoming E.O. 2015–4, entire). Specific measures include controlled surface use, density of development restrictions, seasonal and noise restrictions, and lek buffers. Since implementation of the plan began in 2008, the number of new nonrenewable energy wells in sage-grouse habitats declined by 80 percent and permits for potential new development of single wells has declined by 65 percent (USFWS 2014b). At the same time, applications for directional and horizontal drilling permits, which congregate disturbance from multiple wells into one area, increased by 66 and 65 percent respectively, representing a decrease in sage-grouse habitat lost to nonrenewable energy development (USFWS 2014b). The BLM analyzed existing lease information and found that only 14 percent of PHMA in Wyoming is already leased (Carmen, BLM, 2015, pers. com.). The Wyoming Plan recognizes valid existing rights. “Activities existing or permitted in Core Populations Areas prior to August 1, 2008, will not be required to be managed under Core Population Area Stipulations” (Wyoming E.O. 2015–4, p. 4). Our risk analysis described above confirms that the Wyoming Plan, together with the Federal Plans, reduces the potential exposure of nonrenewable energy development to the Population Index by more than 35 percent in MZ I and 60 percent in MZ II (Table 5) where nonrenewable energy development has historically been concentrated. Results were similar for breeding habitat. Risk of exposure, however, is a measure of areas where regulatory mechanisms

would allow development and does not equate to a forecast of where actual impacts will occur; actual energy development and potential impacts are likely to be much lower than the risk analysis. While some development will occur in the future, the Wyoming Plan directs projects to areas that will avoid impacts, includes stipulations to minimize indirect effects, and if necessary, requires mitigation to benefit the species.

The Montana Plan also provides regulatory mechanisms very similar to those described above for Wyoming that reduce impacts from nonrenewable-energy development. Montana’s State plan includes controlled surface use, restrictions on density of development, seasonal and noise restrictions, and lek buffers. Similar to the Wyoming Plan, it is designed to reduce impacts associated with energy development in Core Areas on State lands and private lands where a State authorization is required (Montana E.O. 10–2014, entire; see *Conservation Efforts* section above). The Montana Plan includes a controlled surface use, density of development restrictions, seasonal and noise restrictions, and lek buffers.

The Utah Executive Order requires that the Utah Division of Oil Gas and Mining coordinate with the Utah Division of Wildlife Resources prior to issuing energy development permits. Further, the Plan directs the Utah Division of Oil, Gas, and Mining to implement recommendations provided during that coordination that require avoidance and minimization measures on State and private lands consistent with the conservation plan. These measures are subject to the statutory requirements to protect rights on private property and avoid waste of the mineral resource.

To summarize, since the 2010 finding, States have undertaken considerable effort to reduce the impact of nonrenewable energy development on sage-grouse and efforts are consistent with the recommendations in the COT Report (USFWS 2013, pp. 43–44). State Plans in Wyoming and Montana provide regulatory mechanisms that direct

development out of Core Areas and minimize indirect effects, effectively reducing the risk of habitat loss and fragmentation in MZs I and II. In addition, the Utah Executive Order contains a regulatory mechanism that requires consultation with the State Division of Wildlife Resources and implementation of its recommendations to avoid and minimize sage-grouse impacts. The State Plans work together with the Federal Plans, as discussed below, to reduce nonrenewable energy effects to sage-grouse habitat across the range, and particularly in MZs I and II, where the potential for development is the greatest.

Federal Plans—Since 2010, BLM and USFS have completed plan amendments or revisions conserving sage-grouse on more than half its occupied range. Approximately 80 percent of the BLM and USFS lands with high to medium potential for nonrenewable energy development are located outside federally managed PHMAs (Quamen, BLM, 2015, pers. comm.). The Federal Plans in Wyoming adopt the Wyoming Plan, which, as described in the *Regulatory Mechanisms* section above, reduces impacts to sage-grouse from nonrenewable energy development. The Federal Plans include NSO restrictions in 14 million ha (35 million ac) of PHMA, with either no or very limited waivers or modifications. Exceptions to this restriction could occur only if it is determined that the project would not affect sage-grouse or would be beneficial compared to other options. The Federal Plans prioritize the future leasing and development of nonrenewable-energy resources outside of sage-grouse habitats. The plans require disturbance caps, surface occupancy restrictions, seasonal restrictions, and lek buffers to effectively reduce habitat loss, habitat fragmentation, and disturbance to sage-grouse from nonrenewable energy development. Calculation of the percentage of disturbed surface under the disturbance caps incorporates both existing and new authorized disturbances to limit habitat loss and fragmentation from new nonrenewable energy development (See *Sagebrush Landscape Conservation Planning* above).

The Federal Plans recognize valid existing subsurface rights to nonrenewable energy resources, but still reduce impacts to sage-grouse by requiring the agencies to work with lessees, operators, and project proponents to follow an avoidance, minimization, and mitigation approach subject to applicable laws (30 U.S.C. 226(p) and 43 CFR 3162.3). The BLM estimates that approximately 10 percent

of all habitat is currently leased rangewide (Carmen, BLM, 2015, pers. comm.). According to BLM's analysis, varying proportions of PHMA are leased across the range of the species: 20 percent in North Dakota; 17 percent in Colorado; 14 percent in Wyoming; 4 percent in Utah; and 2 percent in Montana (Carmen, BLM, 2015, pers. comm.). The Federal Plans provide coordinated monitoring strategies of disturbance caps. In response to monitoring, development allowed under the Federal Plans may be adjusted based on adaptive management criteria to provide an immediate, corrective response to any identified triggers for population or habitat declines. While the development of some valid existing rights may continue, these provisions provide a backstop for other disturbance if adaptive management triggers are exceeded.

In summary, the Federal and three State Plans include closure or NSO restrictions for all PHMAs (except in Wyoming), and limit exceptions to instances where the activity will have no direct, indirect, or cumulative effect on sage-grouse or sage-grouse habitats, or is an alternative action for activities on a nearby parcel and would provide a clear conservation gain to sage-grouse. In GHMAs, Federal Plans dictate that project proponents avoid, minimize, and mitigate impacts from nonrenewable energy development (see *Sagebrush Landscape Conservation Planning* above). The Federal Plans are also consistent with the recommendations in the COT Report (USFWS 2013, pp. 43–44). Together, these measures reduce effects from nonrenewable energy development on approximately 90 percent of the breeding habitat across the range.

Nonrenewable Energy Summary

In the 2010 Finding, we determined that nonrenewable development was a threat to sage-grouse due to the habitat loss and fragmentation it caused. Current information indicates that the global demand for nonrenewable energy resources will continue and will likely increase in sage-grouse habitats through the year 2030. Nonrenewable energy development can negatively affect sage-grouse individuals and populations by reducing and fragmenting sagebrush habitats and by disturbing individual sage-grouse through increased noise and behavioral avoidance of infrastructure and human activity. Nonrenewable energy development could also act cumulatively with other potential threats to increase habitat loss and fragmentation caused by invasive plants, and may increase predation or

disease. Our analysis indicates that regulatory mechanisms reduce the risk of nonrenewable energy exposure to the Population Index and breeding habitat by more than 35 percent in MZ I and more than 60 percent in MZ II, the areas with the greatest potential for nonrenewable energy development. State and Federal Plans emphasize protection of the most important habitats from habitat loss, habitat fragmentation, and disturbance, ensuring that large, contiguous expanses of habitat will remain to support sage-grouse populations. Rangewide, the Federal Plans, Wyoming Plan, and Montana Plan reduce impacts from nonrenewable energy development on approximately 90 percent of the modeled breeding habitat (see *Sagebrush Landscape Conservation Planning* for a detailed discussion of conservation measure implementation and effectiveness).

Infrastructure

In 2010, we evaluated the effect of infrastructure (including roads, railroads, power lines, communication towers, and fences) on sage-grouse and concluded that it was a substantial contributor to habitat fragmentation throughout the species' range and that fragmentation from this source would increase in the future. We also found that infrastructure causes direct mortality from collisions and provides perches for predators. We further found that the regulations governing the location and installation of infrastructure were inadequate to address these threats. The 2010 finding concluded that habitat fragmentation, caused in part by infrastructure, and inadequate regulatory mechanisms to address the negative effects of infrastructure were significant threats to the species and likely to continue or increase into the future such that listing was warranted under the Act (75 FR 13910, March 23, 2010, pp. 13986–13988).

The increasing expansion of human settlement into the western United States has led to an increase in demand for natural resources and the necessary infrastructure to support human development. Development of roads, railroads, power lines, communication towers, and fences can result in habitat loss and fragmentation, and can cause sage-grouse habitat avoidance. These types of infrastructure can also provide sources for the introduction and propagation of invasive plants, increase fire risk, and increase concentrations of predators.

The physical footprint of existing infrastructure has directly impacted

approximately 218,535 ha (540,013 ac) of breeding habitat rangewide (Factor A) (Table 6). In addition, infrastructure can influence a larger ecological footprint by negatively affecting sage-grouse use of otherwise suitable habitats through indirect effects from noise disturbance, increased perches for predators, and pathways for invasive species (Manier *et*

al. 2013, p. 31; Blickley and Patricelli 2012, p. 26). For infrastructure that has been in place for a number of years, these impacts have likely already been realized. The greatest impact from existing infrastructure has occurred in the Columbia Basin (MZ VI) where approximately 2.9 percent of sage-grouse breeding habitat has been

affected. Current infrastructure associated with power lines accounts for the greatest direct disturbance (117,004 ha; 289,125 ac) across the range. Fences occur across the landscape; however, the amount of fencing is unknown (75 FR 13910, March 23, 2010, p. 13929).

TABLE 6—SAGE-GROUSE BREEDING HABITAT DIRECTLY IMPACTED BY EXISTING INFRASTRUCTURE

		Management zone							Total
		I	II	III	IV	V	VI	VII	
Roads ¹	ha	18,344	28,798	17,604	21,210	7,289	4,871	601	98,717
	ac	45,329	71,162	43,501	52,411	18,011	12,036	1,485	243,935
	%	(0.4%)	(0.6%)	(0.5%)	(0.4%)	(0.5%)	(1.1%)	(0.9%)	(0.5%)
Railroads	ha	131	278	115	149		8		681
	ac	324	686	284	369		20		1,683
	%	(<0.1%)	(<0.1%)	(<0.1%)	(<0.1%)	(<0.1%)	(<0.1%)	(<0.1%)	(<0.1%)
Power lines ²	ha	17,171	37,656	18,455	28,104	7,670	7,950		117,005
	ac	42,431	93,049	45,603	69,447	18,952	19,644		289,125
	%	(0.41%)	(0.78%)	(0.54%)	(0.60%)	(0.55%)	(1.78%)	(<0.1%)	(0.6%)
Vertical Towers ³	ha	429	756	404	442	26	68	8	2,133
	ac	1,061	1,867	998	1,091	64	168	21	5,270
	%	(<0.1%)	(<0.1%)	(<0.1%)	(<0.1%)	(<0.1%)	(<0.1%)	(<0.1%)	(<0.1%)
Rangewide Totals ...	ha	36,075	67,487	36,578	49,905	14,984	12,897	610	218,536
	ac	89,144	166,764	90,386	123,318	37,026	31,868	1,507	540,013
	%	(0.9%)	(1.4%)	(1.1%)	(1.1%)	(1.1%)	(2.9%)	(0.9%)	(1.2%)

¹ Includes interstates, State and Federal highways, and secondary roads.

² Includes existing, large (>115 kV) transmission lines. Does not include distribution lines.

³ Includes meteorological towers, communication towers, and wind turbines.

The primary impact of infrastructure is habitat loss and fragmentation (Factor A). Other impacts associated with infrastructure are direct mortality from strikes (Beck *et al.* 2006, p. 1075), spread of invasives (Connelly *et al.* 2004, p. 7–25), wildfire ignition (Havlina *et al.* 2015, p. 2), and increased predator occurrence (Manier *et al.* 2013, p. 31; Howe *et al.* 2014, p. 43). Additionally, sage-grouse may avoid infrastructure because of noise or visual disturbance (Blickley and Patricelli 2012, p. 26). However, fences may be beneficial if used to protect areas used by sage-grouse (USFWS 2013, p. 52), such as fencing livestock and free-roaming equids out of mesic areas used as late brood-rearing habitat. The best available information does not forecast where or how much additional infrastructure could be installed across the species' range. However, as discussed in the next section, regulatory mechanisms provided by the Federal and State Plans will exclude or minimize new infrastructure in approximately 90 percent of sage-grouse breeding habitats.

Conservation Efforts

Since 2010, a number of landscape-scale efforts have been undertaken to reduce impacts from existing and future infrastructure to sage-grouse across the

range that are consistent with the recommendations in the COT Report (USFWS 2013, pp. 51–52). Those efforts include Federal Plan amendments, State Plans, SGI projects, and CCAs.

Federal Plans—The Federal Plans limit new infrastructure primarily through land use allocations, lek buffers, and disturbance caps (BLM and USFS 2015, entire). In PHMA, these measures are designed to avoid or minimize infrastructure development, with limited exceptions for new ROWs. Any exceptions must include the explicit rationale that biological impacts to sage-grouse are being avoided. Existing designated corridors for future major transmission lines and pipelines remain open. Any impacts from new infrastructure require mitigation and are counted toward the 3 percent disturbance cap, except in Wyoming and Montana where a 5 percent cap exists. The Federal Plans also include seasonal timing restrictions, noise restrictions, buffer distances from leks, and required design features to minimize infrastructure impacts on sage-grouse. Further, in response to monitoring, development allowable under the Federal Plans may be adjusted based on adaptive management criteria to provide an immediate, corrective response to any triggers for population or habitat declines. These provisions

provide a backstop to prevent additional disturbance. As a result of these measures, approximately 14 million ha (35 million ac) of PHMA are protected from ROWs. Based on past planning processes, we expect the measures to be implemented for at least the next 20 to 30 years. For additional details about the implementation and effectiveness of Federal Plans, see *Federal Plans* section, above.

State Plans—State Plans in Wyoming, Montana, and Oregon contain regulatory measures to minimize impacts from infrastructure on State lands and, in some instances, on private lands. The Wyoming Plan imposes the following restrictions on all lands in Wyoming: Structure-density limits, timing stipulations, buffers, habitat-disturbance caps, and project-specific reviews for any project subject to State permitting requirements permitted after August 1, 2008, on all lands in Wyoming (Wyoming E.O. 2015–4, entire). Oregon's Plan regulations require avoidance, minimization, and compensatory mitigation actions for development actions in sage-grouse habitat on State and private land and, in conjunction with BLM's Federal Plan, cap the amount of disturbance on sage-grouse core habitat to 3 percent (Oregon OAR 635–140–0025, entire; and Oregon OAR 660–023–0115, entire), while the

Wyoming and Montana Plans cap the amount of disturbance on sage-grouse core habitat to 5 percent (Wyoming E.O. 2015–4, p. 6; Montana E.O. 10–2014, p. 14). For additional details about the implementation and effectiveness of State plans, see the *Wyoming State and Federal Plans* and *Montana and Oregon Conservation Efforts* sections, above.

Sage Grouse Initiative—Marking fences with permanent flagging improves their visibility and reduces fence collisions and was recommended by the COT Report (USFWS 2013, p. 52). The Sage Grouse Initiative has worked with ranchers to implement voluntary conservation projects in sage-grouse habitat, including the marking of fences. To date, NRCS has marked or removed 563 km (350 mi) of high-risk fence to reduce collisions (NRCS 2015a, p. 6). Conservative estimates indicate that fence-marking prevents 2,600 collisions annually (NRCS 2015a, p. 22). Another study found that marking fences reduced collisions by 83 percent over unmarked fences in Idaho during the breeding season (Stevens *et al.* 2012, p. 1). Fence-marking is effective at reducing collisions, but it is unlikely to eradicate collisions completely (Stevens *et al.* 2012, p. 1), and further information is needed to make population-level inferences regarding the impact of reduced collisions (Stevens *et al.* 2013, p. 413).

Candidate Conservation

Agreements—Non-Federal lands currently enrolled in CCAAs have restrictions on building infrastructure within sage-grouse habitat, require consolidation of existing infrastructure when feasible, and require relocating or marking existing fences. Rangeland, approximately 745,000 ha (1.8 million ac) of private lands have landowner commitments in the programmatic CCAAs in Oregon and Wyoming. Enrollment of these areas in the CCAAs ensures that no infrastructure will be constructed on those properties in a way that would adversely impact sage-grouse and encourages the modification or management of existing infrastructure to reduce potential adverse effects.

Infrastructure Summary

The potential threat of new infrastructure has changed substantially since the last status review. In 2010, we found habitat fragmentation, due in part to infrastructure, to be a threat to the species, and regulatory mechanisms were not sufficient to address that threat into the future. Since then, regulatory mechanisms provided by Federal Plans reduce potential future infrastructure on more than half the species' range by eliminating or capping new

development in important sagebrush habitat and by implementing project design features to minimize impacts (e.g., buffers, noise restrictions, etc.). State Plans in Wyoming, Montana, and Oregon provide similar protections on State and private lands. These protections are most important in Wyoming, where historically infrastructure impacts have been the highest. Further, considerable effort has been undertaken by SGI and private landowners to further reduce impacts from infrastructure, and in particular, existing structures such as fencing. Where existing infrastructure occurs, some localized impacts are likely to continue; however, the Federal and State Plans include measures to avoid placing new infrastructure in the most important habitats for the species, thereby reducing the future risk of infrastructure development in those areas. Together, the Federal Plans and Wyoming, Montana, and Oregon State Plans reduce infrastructure impacts to the areas identified as PHMAs and GHMAs, which encompass approximately 90 percent of the modeled breeding habitat across the species' range (see *Sagebrush Landscape Conservation Planning* for a detailed discussion of conservation measure implementation and effectiveness).

Agricultural Conversion

In the 2010 finding, we concluded that agricultural conversion of sage-grouse habitat was one of the primary causes of habitat loss and fragmentation (75 FR 13910, March 23, pp. 13924–13926). Agricultural conversion describes the removal of sagebrush rangelands to create tilled agricultural crops or re-seeded exotic grass pastures (Schroeder and Vander Haegen 2011, p. 519; Wisdom *et al.* 2011, p. 462; USFWS 2013, p. 48). By converting sagebrush habitats to cultivated croplands and pastures, agricultural conversion can reduce and fragment sage-grouse habitats (Factor A) (Connelly *et al.* 2004, p. 7–203; Davies *et al.* 2011, p. 2575; Wisdom *et al.* 2011, p. 462; Knick *et al.* 2013, p. 1547). Since 2010, new information about potential future risk of agricultural conversion has changed our conclusion about this impact, as discussed below.

In the past, approximately 11 percent of the sage-grouse's historical range was converted to agriculture, with 32 percent of the entire Columbia Basin (MZ VI) and 19 percent of the entire Great Plains (MZ I) converted to agriculture (Knick *et al.* 2011, pp. 208–209). Sagebrush habitats with deep, fertile soils and abundant precipitation

were more likely to be converted to agriculture (Connelly *et al.* 2004, p. 1–1; Davies *et al.* 2011, p. 2575). The loss of these productive sagebrush habitats to agriculture displaced some sage-grouse into less productive sagebrush habitats (Manier *et al.* 2013, p. 1). In the rest of the historical range, varied topography, soil types, and drier climates limited the conversion of sage-grouse habitats to agriculture (Knick *et al.* 2011, p. 208). As a result, only 10 percent of the Snake River Plain (MZ IV) and less than 5 percent of the total area of each remaining MZ were converted to agriculture (Connelly *et al.* 2004, p. 5–55; Knick *et al.* 2011, p. 209). Our previous 2010 Finding summarized specific historical losses of sage-grouse habitats from agricultural conversion (75 FR 13910, March 23, pp. 13924–13925).

By reducing and fragmenting sage-grouse habitats, agricultural conversion may reduce sage-grouse populations (Smith *et al.* 2005, p. 314; Walker *et al.* 2007a, p. 2650; Tack 2009, p. iii; Johnson *et al.* 2011, p. 407; Knick *et al.* 2011, p. 208). Although sage-grouse will forage on some crops, such as alfalfa (Schroeder *et al.* 1999, p. 4), they typically will not nest or rear broods in cultivated croplands (Holloran *et al.* 2005, p. 648; Aldridge and Boyce 2007, pp. 508, 523). Agricultural conversion can also reduce the connectivity of habitats and limit the movement of sage-grouse between populations and seasonal habitats (Schroeder and Vander Haegen 2006, pp. 7–8; Knick *et al.* 2011, p. 211). Agricultural conversion may also expose sage-grouse to indirect effects, such as increased predation, exposure to pesticides, and the drying and loss of riparian habitats when water is diverted for irrigation (Knick *et al.* 2011, pp. 208–209). Based on the foraging distances of human-associated predators hunting near croplands and urban areas, agricultural conversion could indirectly influence approximately 49 percent of sagebrush habitats rangelandwide (Connelly *et al.* 2004, pp. 1–1 and 7–23; Manier *et al.* 2013, p. 30).

Although agricultural croplands and pasturelands do not provide suitable habitat, sage-grouse may feed on irrigated croplands, particularly during the late brood-rearing period when other native plant foods have matured and dried (Connelly *et al.* 2004, pp. 4–1 and 4–10; Knick *et al.* 2011, p. 211). The type of crop and proximity to adjacent sagebrush habitats influences whether sage-grouse will feed on the irrigated croplands (Swensen *et al.* 1987, p. 128; Blus *et al.* 1989, p. 1141; Connelly *et al.* 2004, p. 4–18). Sage-grouse generally do

not feed on dry, unirrigated fields that have fewer forbs and insects than irrigated fields. Additionally, increased predation, exposure to pesticides, WNV, and collisions with fences may outweigh any benefits to sage-grouse provided by cultivated cropland and pastures (Blus *et al.* 1989, pp. 1141–1142; Braun 2006, p. 11; Walker 2008, p. 184, Holloran *et al.* 2005, p. 648, Aldridge and Boyce 2007, p. 508; Coates *et al.*, in press).

Rates of agricultural conversion likely slowed and will continue to slow because the most productive sagebrush habitats have already been converted to croplands or pasturelands (Baker *et al.* 1976, p. 167). Since 1982, acres of new cropland within occupied sage-grouse range have decreased in every State except South Dakota (NRCS 2013, pp. 63–79), likely due to the decreasing suitability of the remaining habitats for agriculture. However, economic incentives for biofuels and technological advances in irrigation and cultivation could potentially increase conversion rates in the future (Knick *et al.* 2011, p. 208). In 2010, we determined that agricultural conversion would continue to affect sage-grouse in the future based on historical loss and fragmentation of sage-grouse habitat from agricultural conversion.

To more precisely evaluate the potential risk to sage-grouse from future agricultural conversion, we compared a new cropland suitability model (Lipsey *et al.* 2015, entire) with the Population Index (Doherty *et al.* 2015, entire). The cropland suitability model uses soil and climate data to predict the probability that an area could be converted to cropland (Lipsey *et al.* 2015, entire). The Population Index model identifies important sage-grouse population centers (Doherty *et al.* 2015, entire). By comparing these two models, we quantified the percent of the sage-grouse Population Index that overlaps with sagebrush habitats in the MZ I that have a high potential to be converted to agriculture in the future. Because the cropland suitability model was only finalized for MZ I for reasons explained below, the results of this exercise specifically apply only to MZ I, but can be used to assess potential probabilities of conversion to agriculture rangewide.

The cropland suitability model was developed only for the Great Plains (MZ I), and not for the Columbia Basin (MZ VI) or the Snake River Plain (MZ IV), where agricultural conversion also occurred, due to the limited availability of land cover data, the small size of the Columbia Basin (MZ VI), and differences in the way sage-grouse use agricultural fields between these three

MZs. Additionally, more of the Columbia Basin (MZ VI) has already been converted to cropland (Knick *et al.* 2011, pp. 208–209) and the Great Plains (MZ I) has the highest percentage (69 percent) of private lands (TABLE 2, above), so the potential risk of agricultural conversion is greatest in the Great Plains (MZ I). As a result, the cropland suitability model focused only on the MZ with the greatest potential to be converted in the future, so our overlay analysis with the sage-grouse breeding distribution model could only be calculated in the Great Plains (MZ I). However, by limiting the analysis to the MZ I, the MZ with the greater potential to be converted, the result represents a worst-case scenario that is informative for the rest of the range where future conversion is less likely to occur. Additionally, it would be speculative to analyze future technological agricultural advancements or economic incentives that could potentially increase agricultural conversion on lower quality soils.

Our comparison of the cropland risk model and the Population Index model showed that the majority of the sage-grouse Population Index overlaps with sagebrush habitats in MZ I that have a low probability of being converted to agriculture (Lipsey *et al.* 2015, entire; USFWS 2015a). Specifically, 87 percent of the sage-grouse Population Index in the MZ I occur in sagebrush habitats unlikely to be converted into agriculture due to their soils, climate, and other factors that were incorporated into the cropland suitability model. This analysis confirms that the sage-grouse habitats in MZ I have already been converted to agriculture and the remaining habitats important to sage-grouse are less suitable for agriculture and less likely to be converted in the future.

Although some sage-grouse in MZ I could be exposed to agricultural conversion in the future, 87 percent of the Population Index are not likely at risk from agricultural conversion. Although this result contradicts other sources of information that postulated a greater risk to sage-grouse from future agricultural conversion (RISCT 2012, p. 7; USFWS 2013, pp. 16–29), this analysis quantitatively determined that the risk of exposure to future agricultural conversion is low in MZ I. Because the risk of conversion is greatest in MZ I, a portion of MZ IV in the Snake River Plain in Idaho and the Columbia Basin in Washington (MZ VI) would likely have lower percent overlap between sage-grouse breeding populations and areas likely to be converted to agriculture. With improved

land cover datasets, the cropland suitability model could be expanded to the other MZs to test this assumption. However, the overlay analysis indicates that the potential for agricultural conversion is low in the Great Plains (MZ I), and there is no information to indicate that the risk to sage-grouse would be greater in any other MZ.

Conservation Efforts

Since 2010, a number of conservation efforts have been implemented to reduce the risk of new habitat loss due to agricultural conversion or to address effects from historical agricultural conversion. These include the NRCS efforts with private land owners and other State and Federal Plans or programs. As discussed below, these conservation efforts are relevant to the potential threat of agricultural conversion.

Sage Grouse Initiative—In 2010, NRCS launched the SGI to reduce potential threats facing sage-grouse on private lands (see Sage Grouse Initiative, above, for a detailed discussion of this program). Conservation measures used by the NRCS to reduce impacts to sage-grouse from agricultural conversion include conservation easements, the Farm Bill's Sodsaver provision, and the Conservation Reserve Program (CRP).

Conservation easements are voluntary agreements between landowners and land trusts, the NRCS, or other organizations and agencies that maintain the easement in private ownership to benefit natural resources, often in perpetuity. The conservation easements carry binding and enforceable restrictions on development and other activities, and landowners may be reimbursed. Conservation easements may permanently protect sagebrush habitat from ex-urban development or agricultural conversion. The NRCS estimates that, since 2010, approximately 183,013 ha (451,884 ac) have been protected by conservation easements across the overall range of the sage-grouse (NRCS 2015a, p. 6). Conservation easements effectively block the loss and fragmentation of sage-grouse habitats by prohibiting ex-urban development and agricultural conversion on the easement lands and were recommended in the COT Report (USFWS 2013, pp. 48, 50). Approximately 79 percent of the conservation easements are located inside PACs, and 94 percent of the easements provide permanent protection against future agricultural conversion and ex-urban development (NRCS 2015a, p. 8). Although SGI easements address a variety of potential impacts to sage-grouse, including

agricultural conversion, many of the easements that are already in place are not currently located in sagebrush habitats that are at risk of agricultural conversion, according to the new cropland suitability and breeding distribution models (Lipse *et al.* 2015, entire; USFWS 2015a). However, Montana's recently finalized Greater Sage-Grouse Stewardship Act funds additional sage-grouse conservation that could be used to secure new conservation easements in Montana (NRCS 2015a, p. 3), and with the new models, new easements could be better targeted to conserve sage-grouse habitats that may be vulnerable to future agricultural conversion in Montana. Expanding the cropland suitability model into the Snake River Plain (MZ IV) and the Columbia Basin (MZ VI) would also help target conservation easements to prevent future agricultural conversion in those MZs.

The 2014 Farm Bill's Sodsaver provision also reduces habitat loss and fragmentation from agricultural conversion in Montana, North Dakota, and South Dakota (MZ I) (NRCS 2015a, p. 3). The Sodsaver provision discourages agricultural producers from converting native vegetation to annually tilled crops by reducing their insurance subsidies and disaster assistance if they convert native habitats into croplands (NRCS 2015a, p. 4). The NRCS reports that the Sodsaver policy, in conjunction with proposed policies on State lands and continued investments in conservation easements, reduces sage-grouse population declines that would have occurred without these conservation measures (NRCS 2015a, p. 1).

The voluntary Conservation Reserve Program (CRP) allows private landowners to receive annual payments from USDA's Farm Service Administration in exchange for establishing permanent vegetation on idle or erodible lands that were previously used for growing crops. Enrolled lands are set aside for 10 to 15 years and cannot be grazed or used for other agricultural uses except under emergency drought conditions. The enrollment of CRP lands can be detrimental to sage-grouse when sagebrush rangelands are converted to marginal croplands, and then converted into grasslands, not sagebrush habitats (USFWS 2013, p. 48). However, some CRP lands can provide nesting, brood-rearing, and wintering habitat for sage-grouse (Schroeder and Vander Haegen 2006, p. 32; Schroeder and Vander Haegen 2011, pp. 524–528). When agricultural fields are returned to sage-grouse habitats, enrollment in the CRP

generally benefits sage-grouse, especially in the Columbia Basin (MZ VI) and Great Plains (MZ I) where agricultural conversion historically occurred (Knick *et al.* 2011, p. 208). However, enrollment in CRP fluctuates with Federal funding and crop prices, and the long-term effectiveness of the CRP to improve sage-grouse habitats is uncertain. However, in Washington, lands have frequently remained enrolled long enough for sagebrush to reestablish and sage-grouse to return to nest (Schroeder and Vander Haegen 2011, p. 524).

Candidate Conservation Agreements—The CCAAs for sage-grouse in Oregon and Wyoming include appropriate restrictions on agricultural conversion, habitat fragmentation, and removing sagebrush that benefit sage-grouse rangewide. Approximately 745,000 ha (1.8 million ac) of private lands have landowner commitments in the programmatic CCAAs in Oregon and Wyoming. Enrollment in these CCAAs ensures that these lands are managed consistent with sage-grouse habitat objectives.

State Plans—The Wyoming and Montana Plans have regulatory mechanisms that reduce agricultural conversion in these States on applicable lands. The Wyoming Plan covers all land ownership types and contains a 5 percent disturbance cap in Core Areas that includes disturbance from agricultural conversion (Wyoming E.O. 2015–4, Attachment A, p. 6). The Montana Plan allows the State to prohibit agricultural conversion and the eradication of sagebrush on State Trust Lands in core habitat, general habitat, and connectivity areas (Montana 10–2014, pp. 7–14). By regulating where and how much agricultural conversion can occur within sage-grouse habitats, whether by regulating the amount of disturbance or prohibiting habitat loss on State Trust Lands, both the Wyoming Plan and Montana Plan provide effective regulatory mechanisms to limit future agricultural conversion in their State (see *Regulatory Mechanisms*, below).

Federal Plans—The Federal Plans were not designed to address agricultural conversion, because Federal lands are not used or converted for agricultural production (BLM and USFS 2015, entire). However, transfer of Federal lands to private ownership is possible and, once privately owned, could be converted to agriculture. The Federal Plans require that any PHMA and GHMA be retained in Federal ownership, thus preventing agricultural conversion (BLM and USFS 2015, entire). Exceptions to this requirement

could occur if the land transaction would benefit sage-grouse or not cause any adverse effects. By prohibiting their transfer to private ownership, the Federal Plans reduce the risk of agricultural conversion on more than half the occupied range of the species.

Agricultural Conversion Summary

In 2010, we identified agricultural conversion as one of three factors contributing to the loss and fragmentation of sage-grouse habitats, based on past rates of agricultural conversion that would likely continue. Historically, agricultural conversion reduced and fragmented sage-grouse habitats, resulting in population declines and the loss of connectivity in some areas (Knick *et al.* 2011, p. 208). Agricultural conversion may also expose sage-grouse to pesticides, increased predation, and invasive plants. However, the sage-grouse habitats most conducive to agriculture have already been converted to crop and pasturelands, and the remaining habitats are generally not suitable for agriculture and will likely not be converted. The new cropland suitability model compared with the breeding distribution model confirms that the sage-grouse habitats in the Great Plains (MZ I) most likely to be converted to agriculture have already been converted and that the remaining habitats have a low probability of conversion because of soil types and climatic limitations. Approximately 87 percent of the important sage-grouse populations in MZ I occur in habitats that have low probabilities of conversion to agriculture. The potential for agricultural conversion is also low in the Columbia Basin (MZ VI) and the Snake River Plain (MZ IV), where more sagebrush habitats have already been converted. Additionally, acres of new cropland decreased in every State except South Dakota over the last 30 years. Further, NRCS SGI conservation easements, the 2014 Farm Bill's Sodsaver provision, USDA's CRP, the Wyoming and Montana Plans, and BLM and USGS land-transfer prohibitions implemented since 2010 help reduce habitat loss and fragmentation from agricultural conversion, consistent with recommendations in the COT Report (USFWS 2013, p. 48–49).

Wildfire and Invasive Plants

In 2010, we evaluated the effect of wildfire on sage-grouse and concluded that wildfire was a substantial contributor to habitat loss and fragmentation, particularly in the Great Basin portion of the range (MZs III, IV, V, and VI). The number and size of fires

has increased compared to historical fire regimes (Miller *et al.* 2011, pp. 169, 176). A spatial analysis of areas burned reveals that approximately 18 percent of sagebrush habitat across the occupied range of sage-grouse burned between 1980 and 2007, including 27 percent of the habitat in the Great Basin portion of the range. Further, increased fire frequency is being driven by the expansion of nonnative invasive annual grasses, primarily cheatgrass. In 2010, we analyzed invasive annual grasses separately and concluded that it was a serious rangewide threat (75 FR 13910, March 23, 2010, pp. 13937). The 2010 finding concluded that habitat fragmentation, caused in part by fire, was a threat to the species such that listing was warranted under the Act (75 FR 13910, March 23, 2010, pp. 13986–13988).

Since 2010, the rangeland fire management community has made strides in addressing wildfire and its effects on habitat fragmentation in sage-grouse range, as well as the interactions between wildfire and invasive plants. Specifically, a suite of efforts such as the revised/amended Federal Plans and the associated FIAT assessments; Secretarial Order 3336; and other, related efforts represent a marked shift by the fire management community toward a more holistic approach to identifying, prioritizing, and managing impacts from wildfire in sage-grouse habitat (with fire fighter and human health and safety remaining as the highest priority in wildfire management). This marked shift is particularly important given the degree to which invasives and wildfire have the potential to reduce available habitat. Given the increased management emphasis, we still expect to lose some habitat to fire, but we now expect those losses to be less than would have otherwise occurred.

This new approach includes numerous updates to wildfire management strategies and planning tools. For example, the FIAT and Secretarial Order established local guidance and set forth enhanced policies and strategies for preventing and suppressing wildfire and for restoring sagebrush landscapes impacted by fire across the Great Basin region. Fuel treatments in sage-grouse habitats are now prioritized over treatments in other areas (Murphy *et al.* 2013, p. 4). Additionally, managers have developed protocols to ensure that plans are current and include guidance for fire management in relation to sage-grouse and sage-grouse habitats. These changes have affected what areas are prioritized for firefighting resources during periods of fire activity (Murphy *et al.* 2013, p. 4). While we do not currently know the extent to which these regulatory and non-regulatory mechanisms will alleviate the wildfire impact to sage-grouse, we are confident that that this strategic and coordinated effort by wildfire managers to protect sage-grouse habitat will reduce the impacts from wildfire. Targeting the protection of important sage-grouse habitats during fire suppression and fuels management activities could help reduce loss of key habitat due to fire if directed through a long-term, regulatory mechanism.

Altered Fire Cycle

Historically, wildfire was the principal natural disturbance in the sagebrush ecosystem (Factor A). Sagebrush likely consisted of extensive sagebrush habitat dotted by small areas of grassland. This ecosystem was maintained by long interludes of primarily numerous small fires, punctuated by large fire events that consumed larger expanses (Baker 2011, pp. 196–197; Bukowski and Baker 2013, pp. 559–561). Historical mean fire-

return intervals (the average number of years between two successive fires) have been estimated to be 100 to 350 years in low-lying, xeric, Wyoming big sagebrush communities, and 50 to more than 200 years in more mesic areas and mountain big sagebrush communities (Baker 2006, p. 181; Mensing *et al.* 2006, p. 75; Baker 2011, pp. 194–195; Miller *et al.* 2011, p. 166; Bukowski and Baker 2013, entire). Fire by itself, managed within a historical range of variation, may not necessarily be a threat to sage-grouse. However, altered fire intensity, size, and frequency, due in part to the presence of invasive annual grasses, has resulted in fire posing an increasing threat to sage-grouse, especially in the Great Basin.

Since the mid- to late 1800s, human activities have changed the vegetation composition and structure of the sagebrush ecosystem that has subsequently altered the fire regime (Chambers *et al.* 2014a, p. 3). Changes in wildfire frequency have adversely affected larger parts of sage-grouse range, particularly in the Great Basin (Figure 6). From 1980 to 2007, the number of fires and the total area burned increased in most MZs (Miller *et al.* 2011, pp. 169, 176). We conducted a geospatial analysis of burned areas that shows that between 2000 and 2008, within the Great Basin, more than 2.7 million ha (6.7 million ac) burned within the occupied range of sage-grouse, with more than 2 million ha (5 million ac) occurring in MZ IV alone (Table 7). Between 2009 and 2014, an additional 1.8 million ha (4.6 million ac) burned within the occupied range of sage-grouse, with most of the impact occurring in MZs IV and V in the Great Basin (Table 7). Between 2000 and 2014, the Great Basin experienced an average burn rate of approximately 0.85 percent per year (Table 7).

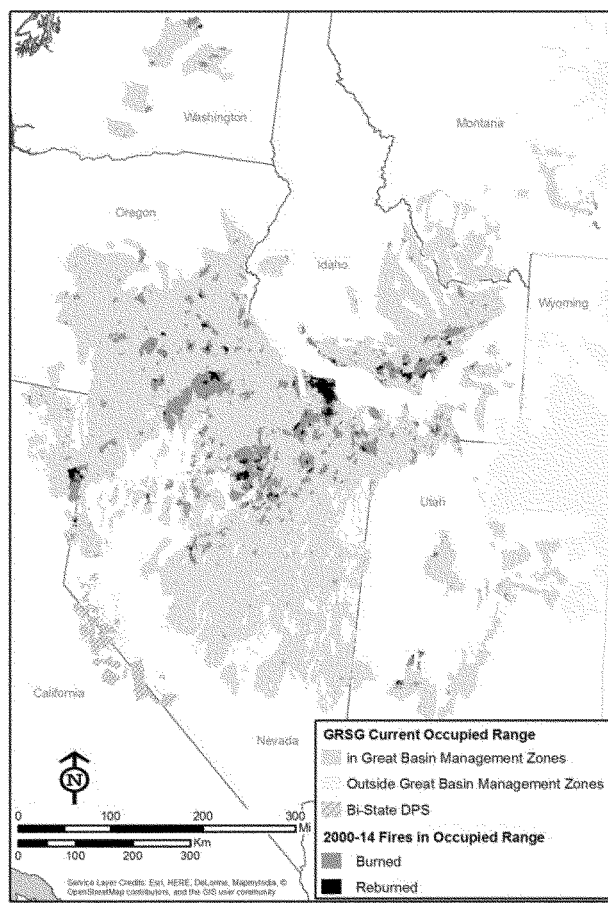


Figure 6. Fires from 2000 to 2014 in the Great Basin (including the Columbia Basin) in sage-grouse occupied range. Overlap captures fires from 2009 to 2014 that reburned any fires from 2000 to 2008.

TABLE 7—AREA OF SAGE-GROUSE OCCUPIED RANGE BURNED FROM 2000 TO 2014 IN THE GREAT BASIN
[Including the Columbia Basin]

Management zone		2000–2008 area burned	2009–2014 area burned	2000–2014 area burned	Annual burn rate ¹ (percent)
III	ha	410,730	148,993	559,723	0.32
	ac	1,014,937	368,171	1,383,108	
IV	ha	2,029,750	1,073,048	3,102,789	1.32
	ac	5,015,622	2,651,560	7,667,182	
V	ha	262,033	580,745	842,788	0.72
	ac	647,499	1,435,053	2,082,552	
VI	ha	27,649	61,963	89,612	0.54
	ac	68,434	153,116	221,550	
Totals	ha	2,730,162	1,864,749	4,594,912	0.85
	ac	6,746,492	4,607,900	11,354,392	

¹ Annual burn rates were calculated using average number of acres burned per year (2000–2014) divided by total occupied range for each area assessed.

We anticipate that these average burn rates will continue in the future and could increase due to cheatgrass expansion, climate change, and drought (see Wildfire and Invasive Plant Impacts, below). These burn rates are based on wildfire-impacted acres each year and do not account for areas

previously burned that re-burn each year; as a result, this rate likely overestimates the amount of habitat that could be impacted each year, as re-burn areas may no longer provide habitat. This burn rate is similar to the current and future burn rates analyzed in the 2010 finding.

Fire occurring within the range of sage-grouse can cause direct loss of habitat, resulting in negative impacts to breeding, feeding, and sheltering opportunities for the species (Call and Maser 1985, p. 17). In addition to the direct habitat loss, fire can also create a functional barrier to sage-grouse

movements and dispersal that compounds the influence wildfire can have on populations and population dynamics (Fischer *et al.* 1997, p. 89). In some cases, fire can isolate sage-grouse populations, thereby increasing their risk of extirpation (Knick and Hanser 2011, p. 395; Wisdom *et al.* 2011, p. 469).

Wildfire is associated with sage-grouse declines across the West (Beck *et al.* 2009, p. 400; Johnson *et al.* 2011, p. 424; Knick and Hanser 2011, p. 395). The extent and abundance of sagebrush habitats, the proximity to burned habitat, and the degree of connectivity among sage-grouse populations affects persistence (Johnson *et al.* 2011, p. 424; Knick and Hanser 2011, pp. 403–404; Wisdom *et al.* 2011, p. 461). Fire has been found to cause negative population trends and lek extirpation (Knick and Hanser 2011, p. 395; Johnson *et al.* 2011, p. 422).

Invasive Plants and the Wildfire Cycle

In 2010, we analyzed the effects of wildfire and invasive plants separately (75 FR 13910, March 23, 2010, pp. 13931–13937). Since that time, we have come to better understand the positive feedback loop between cheatgrass and wildfire, and believe that fire and invasive plants must be assessed, and managed, together to fully address potential impacts on sage-grouse and its habitat. Evidence of a significant relationship exists between an increase in wildfire occurrence caused by cheatgrass invasion in the Snake River Plain (MZ IV) and Northern Great Basin (MZ V) since the 1960s (Miller *et al.* 2011, p. 167) and in northern Nevada and eastern Oregon since 1980 (MZs IV and V). The extensive distribution and highly invasive nature of these invasive annual grasses poses increased wildfire risk and permanent loss of sagebrush habitat, because areas disturbed by fire are highly susceptible to further invasion and ultimately habitat conversion to an altered community state (Miller *et al.* 2011, p. 182). Progressive losses of resilience and resistance can result in the crossing of abiotic and biotic thresholds (Beisner *et al.* 2003, pp. 376–382) and may lead to a catastrophic shift in community structure (Scheffer *et al.* 2009, pp. 53–59; Reisner *et al.* 2013, p. 1047).

Functional habitat loss is occurring because of long-term loss of sagebrush cover and conversion to nonnative annual grasses (primarily cheatgrass), mainly due to an increase in wildfire occurrence, intensity, and severity (Miller *et al.* 2011, p. 183). The positive feedback process between cheatgrass and wildfires facilitates future fires, sagebrush loss, and cheatgrass dominance, resulting in entire landscapes being converted to nonnative annual grasslands (Miller *et al.* 2011, p. 183). Invasive plants reduce and, in cases where monocultures occur, eliminate vegetation that sage-grouse use for food and cover and fragment existing sage-grouse habitat (Miller *et al.* 2011, pp. 160–164). Invasives do not provide quality sage-grouse habitat and, where invasive plants are present, sage-grouse are potentially impacted both seasonally (*e.g.*, loss of forbs and associated insects) and long term (*e.g.*, functional habitat loss) (Manier *et al.* 2013, p. 88).

Interactions among disturbances and stressors may have cumulative effects (Chambers *et al.* 2014c, pp. 365–368). Invasive annual grasses and noxious perennials continue to expand their range, facilitated by ground disturbances, caused by more frequent and more severe wildfires, improper grazing of native perennial plants by domestic livestock and free-roaming equids, infrastructure, and other anthropogenic activity (Rice and Mack 1991, p. 84; Gelbard and Belnap 2003, p. 420; Zouhar *et al.* 2008, p. 23), but disturbance is not required for invasives to spread (Young and Allen 1997, p. 531; Roundy *et al.* 2007, p. 614). Invasions also may occur sequentially, where initial invaders (*e.g.*, cheatgrass) are replaced by new invasive plants (Crawford *et al.* 2004, p. 9; Miller *et al.* 2011, p. 160). Long-term changes in climate that facilitate invasion and establishment by invasive annual grasses further exacerbate the fire regime and accelerate the loss of sagebrush habitats (D'Antonio and Vitousek 1992, pp. 63–87). The effects of disturbance will likely be amplified by greater susceptibility of habitats to burn as well as decreased likelihood for recovery of sagebrush ecosystems (Miller *et al.* 2011, p. 183).

The arrival of European settlers in the mid-1800s initiated a series of changes in vegetation composition that impacted sagebrush ecosystems (Chambers *et al.* 2014a, p. 3). For example, improper grazing practices decreased native perennial grasses and forbs (Chambers *et al.* 2014a, p. 3; Miller and Eddleman 2001, p. 17; Miller *et al.* 2011, p. 181), which facilitated the invasion of nonnative annual grasses, particularly cheatgrass and *Taeniatherum caput-medusae* (medusahead). This increase in fuel load and the lower fuel moisture content of the invasive annual grasses has resulted in more frequent, higher intensity fires (Brooks *et al.* 2004, pp. 679–680). Moreover, invasive annual grasses expand rapidly after fire disturbances becoming a readily burnable fuel source, and ultimately lead to a recurrent fire cycle that prevents sagebrush reestablishment (Zouhar *et al.* 2008, p. 41; Eiswerth *et al.* 2009, p. 1324; Miller *et al.* 2011, pp. 163–170).

Currently, invasive annual grasses are known to occur across the sage-grouse occupied range, with the greatest infestations occurring in the Great Basin (Figure 7). In the Great Basin, cheatgrass dominates over 6.9 million ha (17 million ac) and occupies an additional 25 million ha (62 million ac) as a component of the plant community (Diamond *et al.* 2012, p. 259). Approximately 58 percent of sagebrush habitat in the Great Basin is believed to be at moderate to high risk of cheatgrass invasion during the next 30 years (Suring *et al.* 2005, p. 138). Although nonnative annual grasses are more pervasive in the Great Basin than the Rocky Mountain States (Figure 7) (Connelly *et al.* 2004, p. 5–9; Miller *et al.* 2011, p. 160), in recent years, cheatgrass (and other nonnative annual grasses) has increased its spread across the eastern portion of the species' range (Mealor *et al.* 2012, p. 427). Without effective management, the invasion of cheatgrass into the eastern portion of the species' range is likely to continue (Mealor *et al.* 2012, p. 427), and even now, with more effective management being employed, we expect that sage-grouse habitat will continue to be lost to some degree in the future.

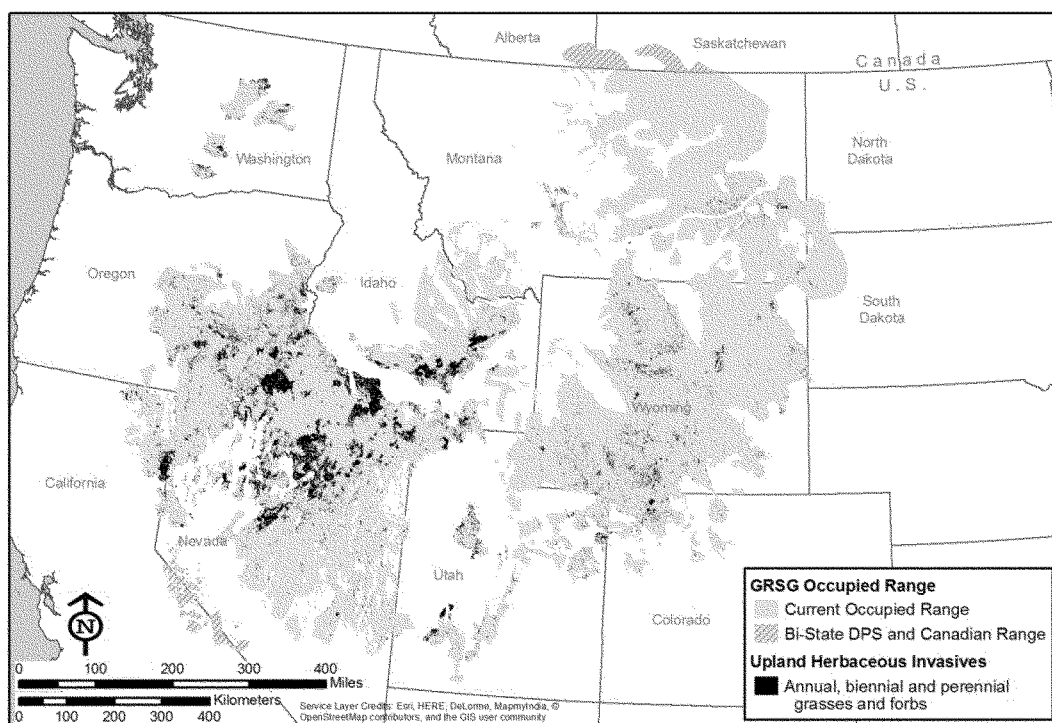


Figure 7. Approximate distribution of upland, herbaceous invasive plants

across the occupied range of sage-grouse.

Nonnative annual grasses, such as cheatgrass and medusahead, have substantially altered regional fire regimes (Balch *et al.* 2013, p. 179). Cheatgrass-dominated rangelands affect sagebrush ecosystems by shortening fire-return intervals and perpetuating their own persistence and intensifying the role of wildfire (Whisenant 1990, p. 4). Sites dominated by cheatgrass may be four times more likely to burn than native sagebrush (Balch *et al.* 2013, p. 178). Invasive annual grasses increase the amount of fine fuels, resulting in wildfires that burn hotter and more evenly than historical times (Miller *et al.* 2011, p. 167). Hotter and more expansive wildfires frequently burn larger contiguous areas of sagebrush and leave fewer pockets of unburnt sagebrush that would be available to recolonize the burned areas. The positive feedback process between cheatgrass and wildfire converts high-diversity native communities into low-diversity communities dominated by invasive plants that are unsuitable for sage-grouse and at increased risk of wildfire reoccurrence (Chambers *et al.* 2014a, pp. 3–8).

Wildfire and Invasive Plant Impacts

While it is known that sage-grouse respond negatively to wildfire (Johnson

et al. 2011, pp. 424–425; Knick and Hanser 2011, pp. 395–403), it is challenging to predict the location and extent of future wildfires. However, a recent study provides insight to the wildfire and invasive plant cycle and serves as a useful tool in predicting future impacts (Chambers *et al.* 2014a, entire). This study used soil temperature and moisture regimes as an indicator of landscapes' resilience to disturbance and resistance to invasive annual grasses. This work classified different ecological soil and moisture regimes (Chambers *et al.* 2014a, p. 16) into three categories of resiliency and resistance to wildfire and invasive species disturbance (which is known as the R&R matrix). For example, areas with low R&R values tend to be prone to invasion by cheatgrass (and, therefore, are at higher risk of large catastrophic wildfires) because these ecosystems have relatively lower resilience to disturbance and higher climate suitability for invasive annual grasses; therefore, low R&R areas are less likely to provide ecological benefits within the sagebrush ecosystem in the future. We assessed the risk of future wildfire and invasive plant invasion by examining the amount of breeding habitat occurring within the three R&R matrix

classes. Habitat identified as low resistance was considered most likely to be adversely affected by wildfire and invasives. Because nonnative annual grasses are more prevalent in the Great Basin than the Rocky Mountain States (Connelly *et al.* 2004, p. 5–9; Miller *et al.* 2011, p. 160), we limited our analysis to the Great Basin MZs III, IV, and V.

In our analysis, sage-grouse in MZ III appear to be at greatest risk from wildfire and nonnative annual grass invasion, with 54 percent of sage-grouse breeding habitat occurring in areas classified as having low resistance. The majority of sage-grouse breeding habitat in MZs IV and V occur in areas having either high or moderate resistance and resiliency to fire and invasives (Table 8).

TABLE 8—PERCENT OF SAGE-GROUSE BREEDING HABITAT WITHIN EACH GREAT BASIN MANAGEMENT ZONE THAT OCCURS WITHIN THE THREE CLASSES OF RESILIENCY AND RESISTANCE TO INVASIVE PLANTS AND WILDFIRE

	MZ III (%)	MZ IV (%)	MZ V (%)
Wetland/Riparian	2	2	1

TABLE 8—PERCENT OF SAGE-GROUSE BREEDING HABITAT WITHIN EACH GREAT BASIN MANAGEMENT ZONE THAT OCCURS WITHIN THE THREE CLASSES OF RESILIENCY AND RESISTANCE TO INVASIVE PLANTS AND WILDFIRE—Continued

	MZ III (%)	MZ IV (%)	MZ V (%)
High Resistance	16	35	8
Moderate Resistance	28	36	59
Low Resistance	54	27	33

While useful for estimating future wildfire and invasive plant risk, sagebrush resistance and resilience does not necessarily equate to sage-grouse resilience and resistance. Depending on the location and extent of wildfires, the amount of undisturbed habitat may be diminished such that it cannot sustain local populations. In addition, depending upon where wildfires occur, impacts to sage-grouse could be greater due to lost connectivity between populations. However, without the ability to predict the location, size, and severity of a wildfire, it is difficult to predict with certainty the location and degree of habitat fragmentation that may occur in the future or the associated population impacts.

A recent study examined the potential impact of wildfire and invasive plants on future sage-grouse population trends in the Great Basin (Coates *et al.* 2015, entire). This study examined 30 years of wildfire and population trend data to estimate Great Basin population trends over the next 30 years, with and without additional management to reduce wildfire impacts (Coates *et al.* 2015, pp. 6–18). Without additional management, wildfire and invasive plants are forecast

to cause sage-grouse abundance in the Great Basin to decline by 43 percent by 2044 (Coates *et al.* 2015, pp. 18–31). Improved management of wildfire suppression and invasive plant infestation could reduce the rate of decline depending upon the success rate of the management approach (Coates *et al.* 2015, p. 34). This study did not consider the impact of post-wildfire restoration projects, which could further reduce the rate of population decline (Coates *et al.* 2015, p. 34). The projected future impact of fire on abundance trends likely also depends upon climatic conditions (Coates *et al.* 2015, p. 34), which, as discussed in *Climate Change and Drought* (see below), is difficult to forecast with certainty 30 years into the future.

Without changes in wildfire and invasive plant management, we anticipate that wildfire would continue to affect the Great Basin at the current rate of about 0.85 percent per year (see Altered Fire Cycle, above). This rate could potentially increase due to the intensifying synergistic interactions among fire, human activity, invasive plants, and climate change (Neilson *et al.* 2005, p. 157; Miller *et al.* 2011, pp. 179–184). Increased human presence and associated infrastructure, such as roads and power lines, could increase the risk of human-caused wildfires. Any future decreases in wildfire and invasive plant risk is dependent upon the successful implementation of wildfire and invasive conservation efforts, as discussed below.

Conservation Efforts

As mentioned above, since 2010, wildfire managers have taken significant steps to better understand and address the impacts of wildfire on sage-grouse habitat. As part of that effort, local,

State, and Federal land managers have undertaken considerable efforts to address the impacts of wildfire and invasive plants. Federal, State, and local partners have implemented a number of projects and programs to prevent and suppress the spread of wildfire and invasive plants, and where impacts have already occurred, to restore, consistent with recommendations in the COT Report (USFWS 2013, pp. 40–43). As discussed further below, the Federal Plans, FIAT assessments, and Secretarial Order provide guidance, coordination, and commitments for Federal and State agencies and private landowners to address the wildfire and invasive plants cycle and reduce impacts to sage-grouse.

The BLM has a long history of implementing vegetation management treatments and has made considerable investments in fuels and restoration treatments within the sagebrush ecosystem since 2010. Analyses of more than 4,000 completed BLM projects suggest these treatments provide direct and indirect benefits to sage-grouse populations and have been effective at ameliorating the impacts of wildfire and invasives to sage-grouse (Table 9). The strong emphasis on sage-grouse since 2010 is reflected through focusing additional and existing resources to protect, conserve, and restore sage-grouse habitat. This emphasis has shifted priorities in many of the BLM's programs that treat vegetation, including fuels management and post-fire recovery. The BLM has incorporated emerging science, monitoring results, and adaptive management to influence and modify vegetation management work to achieve the most ecosystem and landscape benefit.

TABLE 9—BUREAU OF LAND MANAGEMENT PROJECTS IMPLEMENTED SINCE 2009 TO AMELIORATE THE IMPACTS OF WILDFIRE AND INVASIVES TO SAGE-GROUSE

[Adapted from DOI 2015e, pp. 3–5]

Treatment	Completed			In-progress			Planned		
	Number of projects	ha	ac	Number of projects	ha	ac	Number of projects	ha	ac
Habitat Restoration	1,395	322,167	796,091	102	33,060	81,692	40	5,805	14,345
Conifer Removal	693	179,756	444,186	119	48,099	118,854	134	154,661	382,175
Wildfire Pre-suppression	608	34,062	84,169	45	13,357	33,005	55	8,415	20,793
Habitat Restoration Following Wildfire	554	620,955	1,534,412	25	40,635	100,410	7	16,442	40,628
Totals	3,250	1,156,940	2,858,858	291	135,149	333,961	236	185,322	457,941

The Federal Plans require that livestock grazing and feral horses be managed at levels necessary to achieve

Land Health Standards (LHS) (see *Grazing and Rangeland Management* and *Free-roaming Equids*, below). These

standards include minimizing the presence of cheatgrass and other invasive annual grasses within sage-

grouse habitat. These Federal Plan requirements will reduce the infestation of cheatgrass over the long term, reducing wildfire intensity, size, and frequency, and restoring a more natural role of wildfire in the sagebrush ecosystem.

Within the Great Basin, the efforts by BLM, USFS, and DOI to address the impacts of wildfire and invasive plants on a landscape scale are particularly noteworthy. The BLM and USFS are implementing FIAT as part of their Federal Plans to prioritize actions directed at reducing the impacts of invasive annual grasses, wildfires, and conifer encroachment (BLM 2014, entire). Additionally, DOI has committed to the implementation of Secretarial Order 3336, Rangeland Fire Prevention, Management, and Restoration (Secretarial Order), which will result in a multiagency wildfire management paradigm shift that highlights the protection of sagebrush habitat. The BLM and USFS continue to implement measures to reduce the potential threat of wildfire to sage-grouse habitat through greater emphasis on preventing and suppressing wildfire, and restoring sagebrush landscapes threatened by wildfire and invasive species by means of improved Federal-State-local collaboration and coordination. Those efforts, as well as work by local and State wildfire managers, are discussed in further detail below.

Fire and Invasives Assessment Tool—The FIAT is a collaborative multiagency effort by Federal, State, and local wildlife, forestry, and firefighting organizations that identified potential project areas and management strategies in highly valued sage-grouse habitats. As committed to in the Federal Plans,

implementation of the FIAT assessments will reduce the potential impacts to sage-grouse resulting from invasive annual grasses, wildfires, and conifer expansion by prioritizing and focusing wildfire and invasive plant management efforts on the most important sage-grouse habitat while still prioritizing fire fighter and human safety. Focal habitats were identified within PACs based on patterns of ecological resistance and resilience, landscape sagebrush cover, burn probability, and conifer expansion, resulting in the following priority landscapes: Central Oregon, Northern Great Basin, Snake/Salmon/Beaverhead, Southern Great Basin, and Western Great Basin/Warm Springs Valley. For each priority landscape, regional findings were stepped down to describe local conditions by Project Planning Area and associated treatment needs and management priorities (BLM 2014, p. 9). Assessment of treatment needs and priorities were based on recent scientific research on resistance and resilience of Great Basin ecosystems (Chambers *et al.* 2014a, entire, which was described above) and NRCS soil surveys that include geospatial information on soil temperature and moisture regimes (BLM 2014, p. 3; and Campbell 2014, entire).

Potential management actions to resolve resource issues were divided into proactive approaches (e.g., fuels management and habitat recovery/restoration) and reactive approaches (e.g., fire operations and post-fire rehabilitation) (BLM 2014, p. 3). Proactive management strategies are intended to favorably modify wildfire behavior and restore or improve desirable habitat to provide greater

resistance to invasive annual grasses and/or resilience after disturbances such as wildfires. Reactive management strategies are intended to reduce the loss of sage-grouse habitat from wildfires or stabilize soils and reduce impacts of invasive annual grasses in sage-grouse habitat after wildfires. Proactive management strategies, if implemented and effective, will result in long-term sage-grouse habitat improvement and stability, while effective reactive management strategies are essential to reduce current impacts of wildfires on sage-grouse habitat, thus maintaining habitat stability, and allowing for long-term improvements (BLM 2014, pp. 2–3).

Cumulatively, the FIAT assessments of the five priority areas identify more than 16,000 km (10,000 mi) of potential linear fuel treatments, approximately 2.99 million ha (7.4 million ac) of potential conifer treatments, more than 2 million ha (5 million ac) of potential invasive plant treatments, and more than 7.7 million ha (19 million ac) of post-fire rehabilitation (*i.e.*, should a fire occur, the post-fire rehabilitation identifies which areas BLM would prioritize for management) within the Great Basin region (Table 10). The FIAT assessments also identify site-appropriate management strategies for fire operations and post-fire decisions. These assessments provide direction about the extent, location, and rationale for management opportunities to address potential threats to sage-grouse. This comprehensive and forward-looking approach to both prevention and post-fire treatments in the Great Basin represents a distinct change in approach and emphasis since we made our 2010 finding.

TABLE 10—FIAT ASSESSMENT PROJECTS FOR FIVE PRIORITY LANDSCAPES IN THE GREAT BASIN REGION

[Adapted from BLM 2015a, entire]

Potential treatment type		FIAT Assessment area					Totals
		MZ III	MZ IV		MZ V		
			Southern Great Basin	Northern Great Basin	Snake/ Salmon/ Beaverhead	Central Oregon	
Habitat Restoration	ha	1,203,333	1,951,113	603,792	436,589	840,277	5,035,104
	ac	2,973,499	4,821,300	1,492,000	1,078,835	2,076,367	12,442,001
Fuels Treatments	ha	7,322	185,508	35,329	231	n/a	228,390
	ac	18,092	458,400	87,300	571	n/a	564,363
Linear Fuels Treatments	km	2,398	8,530	644	156	5,309	17,036
	mi	1,490	5,300	400	97	3,299	10,586
Fire Operations ¹	ha	3,689,627	4,829,644	2,121,162	361,645	3,268,267	13,270,346
	ac	9,117,260	11,934,300	5,241,500	893,643	5,605,006	32,791,709
Post-Fire Rehabilitation (ESR) ² .	ha	7,133	3,960,905	1,502,963	203,865	2,069,505	7,744,370
	ac	17,625	9,787,600	3,713,900	503,760	5,113,853	19,136,738
Conifer Treatments	ha	954,090	1,254,729	205,621	224,530	354,151	2,993,121
	ac	2,357,606	3,100,500	508,100	554,824	875,126	7,396,156

TABLE 10—FIAT ASSESSMENT PROJECTS FOR FIVE PRIORITY LANDSCAPES IN THE GREAT BASIN REGION—Continued
[Adapted from BLM 2015a, entire]

Potential treatment type		FIAT Assessment area					Totals
		MZ III	MZ IV		MZ V		
			Southern Great Basin	Northern Great Basin	Snake/ Salmon/ Beaverhead	Central Oregon	
Invasive Plant Treatment ³	ha	1,196,979	164,748	90,407	212,909	396,197	2,061,239
	ac	2,957,796	407,100	223,400	526,109	979,024	5,093,429

¹ Fire operations include preparedness, prevention, and suppression activities. As opposed to proactive, site-specific planned treatments, fire operations and post-fire rehabilitation treatments are reactive responses to random wildfires.

² Post-fire rehabilitation includes the BLM's ESR Program and the USFS's BAER Program. Program policies limit available funding from 1 to 3 years.

³ For the purposes of FIAT, invasive species were limited to invasive annual grasses.

The planning, implementation, and monitoring of the FIAT assessments are a multiyear process. Planning is completed for some FIAT assessment projects, and implementation has begun

(Table 11). Others similar projects are in early planning stages, but are expected to be implemented in the near future. To date, the BLM has made substantial investments in fuels and restoration

treatments to address the impacts of fire and invasives on sage-grouse habitats, especially within the FIAT assessment areas.

TABLE 11—FIAT PROJECTS IMPLEMENTED IN FISCAL YEAR 2015 AS OF AUGUST 30, 2015
[BLM 2015h, attachment 1]

FY15 FIAT and other sage-grouse fuels program work						
Treatment	Completed			In-progress		
	Number of projects	ha	ac	Number of projects	ha	ac
Conifer Removal	324	56,052	138,508	146	22,210	54,884
Wildfire Pre-suppression	130	16,778	41,460	74	2,217	5,480
Habitat Restoration	248	74,111	183,134	90	25,971	64,176
Totals	702	146,941	363,102	310	50,398	124,540

Secretarial Order 3336—On January 5, 2015, the Secretary signed Secretarial Order 3336 (Secretarial Order), which sets forth enhanced policies and strategies for preventing and suppressing rangeland fire and for restoring sagebrush landscapes impacted by fire across the Great Basin region (DOI 2015b, entire). The Secretarial Order establishes a Rangeland Fire Task Force (Task Force), which completed an Implementation Plan (DOI 2015d, entire) that established a roadmap to accomplish the objectives of the Secretarial Order. The Implementation Plan also provided a timeline and methodology to be used in developing two separate reports on short- (2015 western fire season) and long-term (2016 western fire season and beyond) actions and activities that will be implemented to further address the impacts of wildfire in the Great Basin. The Secretarial Order complements the FIAT process by providing support and resource commitments for some of the projects identified in the FIAT assessments. For example, the

Secretarial Order emphasizes the research on wildfire and invasive plant prevention and restoration (DOI 2015b, entire) that will support the adaptive management of FIAT assessment projects.

Further, the Secretarial Order provides clear direction to all affected Department of the Interior bureaus (DOI 2015b, entire), in particular BLM, for prioritizing actions to address key elements of wildfire management, including effective rangeland management, fire prevention, fire suppression, and restoration at a landscape scale. Building on BLM and USFS' long and successful history of managing wildfire in the Western United States, the Secretarial Order focuses the existing rangewide commitment to effective wildfire management—as well as invasive species control and restoration—to protect large, intact sagebrush landscapes against the destructive effects of wildfire and invasive species. For example, BLM has dedicated increased resources to all aspects of fire management within the species' range

for the 2015 wildfire season. Similarly, BLM is actively pursuing the long-term directives in the Final Report component of the Secretarial Order, such as a national seed strategy, to support effective restoration efforts (DOI 2015a).

Initial Report

On March 1, 2015, the Task Force completed “SO 3336—The Initial Report: A Strategic Plan for Addressing Rangeland Fire Prevention, Management, and Restoration in 2015” (DOI 2015c, entire), detailing activities that could be undertaken in advance of the 2015 western fire season to improve the efficiency and effectiveness of wildfire management efforts. The actions identified in the Initial Report included priorities to strengthen planning and preparedness, such as increasing capabilities of rangeland fire protection associations (RFPA) and volunteer departments, utilizing veteran crews, ensuring fire management organizations are prepared and functional, and increasing initial attack and extended attack capability. In

response, the BLM has allocated additional resources to reflect these FY15 priorities (BLM 2015h; DOI 2015a; DOI 2015e), including:

- Allocating 6 million dollars in additional base funding to bolster fire programs for the long term.
- Allocating approximately 10.6 million dollars to hire additional seasonal firefighters and to support equipment (e.g., dozers, water tenders, etc.). Using this funding, the BLM hired 100 additional firefighters in 2015, and DOI gave each Great Basin State supplemental funding to cover staffing shortages. With supplemental funds from the DOI, the BLM also purchased new equipment for the 2015 fire season. An additional 20 single-engine air tankers were pre-positioned near critical sagebrush habitat throughout the western United States. Helicopters were mobilized to address sage-grouse priority areas, and the helitack crew size was increased in order to provide more efficient initial attack. An additional jet lead plane was available to insure support for retardant planes mobilized

to protect these critical areas. The BLM has also purchased several dozers, dozer transports, water trailers, and semi-trucks to boost or maintain the BLM's initial attack resource capability and initial attack success rate in critical sagebrush areas in the Great Basin.

- Committing 500,000 dollars to train rural fire departments and RFPAs in important sagebrush ecosystems and sage-grouse habitat areas.
- Providing training for more than 200 veterans to work on 20-person firefighting crews. California, Nevada, and Oregon BLM offices have hired returning veterans who bring skills such as physical fitness, endurance, leadership, communications, and operation of heavy equipment.

In addition to these actions, the BLM dedicated fuels program funding for fuels treatment and fire suppression to Great Basin States (BLM 2015h). Fuels treatment projects are prioritized and implemented based on location, opportunities for success, and overall benefit to protecting, conserving, and restoring sagebrush ecosystems and key sage-grouse habitat. Fire management

actions taken by the BLM during the 2015 wildfire season has resulted in fewer acres of sage-grouse habitat burned in the early fire season compared to past years with similar weather and fuel conditions (BLM 2015h). For example, the Fuels Treatment Effectiveness Monitoring (FTEM) system is a database that captures anecdotal information when a wildfire intersects a past fuels treatment (BLM 2015h). So far in 2015, two fires in sage-grouse habitat (i.e., the "499" wildfire in Prineville, Oregon and the "Hwy 290" wildfire in Winnemucca, Nevada) have been entered into the system and demonstrate the effectiveness of the fuels treatment. Additionally, fuels treatments have reduced the size of unplanned wildfires, assisted in providing opportunities to stop or slow the spread of the wildfire, provided for greater firefighter safety, and protected sage-grouse habitat (BLM 2015h). Currently the BLM has completed more than 80 percent of the action items and activities outlined in the Initial Report (Table 12).

TABLE 12—SECRETARIAL ORDER INITIAL REPORT ACTIONS IMPLEMENTED IN FISCAL YEAR 2015

[McKnight, BLM, 2015, pers. comm.]

Status	Action item and description	Deliverable
Section 7.b.i. Integrated Response Plans		
Completed ...	Action Item #1: Increase the capabilities and use of rural/volunteer fire departments and RFPAs and enhance the development and use of veteran crews.	Coordinate with State, tribal, and local government partners to leverage training assets and capabilities. Specifically, the DOI/BLM will seek to deliver training to approximately 2,500 cooperators and increase the utilization of veteran crews.
Completed ...	Action Item #2: Ensure local, multi-agency coordination (MAC) groups are functional and MAC plans are updated.	Report out from States. MAC groups, working with local Federal wildland fire suppression agencies, tribes, State fire suppression agencies, local fire departments, RFPAs, and other cooperators.
Completed ...	Action Item #3: Develop and implement minimum draw-down level and step up plans to ensure availability of resources for protection in priority greater sage-grouse habitat.	Report out from States. All units managing priority sage-grouse habitat will develop and implement a minimum draw-down level and step up plans to clearly identify those suppression resources necessary in order to maintain an effective, aggressive initial attack capability.
Completed ...	Action Item #4: Apply a coordinated, risk-based approach to wildfire response to ensure initial attack response to priority areas.	Report out from States. Review and update CAD systems to ensure initial attack response to priority sage-grouse areas in protection of sage-grouse habitat.
Completed ...	Action Item #5: Develop a standardized set of briefing materials.	Prepare standardized briefing materials on sagebrush-steppe and sage-grouse wildfire protection for incoming Type 1–3 Incident Management Teams and other fire management resources.
Completed ...	Action Item #6: Review and update local plans and agreements for consistency and currency to ensure initial attack response to priority greater sage-grouse areas.	Report out from States. Update and approve all Fire Prevention Plans, Wildland Fire Decision Support System data, Fire Danger Operating Plans, Preparedness Level Plans, and Agreements and Annual Operating Plans.
Completed ...	Action Item #7: Develop supplemental guidance for the use of "severity funding".	Review severity funding policy and update guidance.
Ongoing	Action Item #8: Evaluate the effectiveness of action plans.	Develop annual reporting metrics for effectiveness monitoring of wildland fire response, with particular emphasis on the effectiveness of measures to improve success in rangeland fire response, based upon CAD changes, and reporting of success and/or failure as it pertains to Federal Plans and FMPs, and effectiveness of enhanced training and capacity measures.
Ongoing	Action Item #9: Increase the availability of technology and technology transfer to fire management managers and suppression resources.	Increase access to digital maps and mapping software by providing appropriate technology (such as smartphones and tablets) to fire managers and suppression personnel. Remove barriers for acquisition of appropriate software and hardware.

TABLE 12—SECRETARIAL ORDER INITIAL REPORT ACTIONS IMPLEMENTED IN FISCAL YEAR 2015—Continued
[McKnight, BLM, 2015, pers. comm.]

Status	Action item and description	Deliverable
Completed ...	Action Item #10: Improve the description and awareness of critical resource values threatened in various stages of the fire response process including large fire management.	Improve the collection of information about critical resource values threatened, including sage-grouse habitat and populations, on the existing Incident Status Summary (ICS 209) and ensure this information is captured in the Incident Management Situation Report (SIT Report).
Completed ...	Action Item #11: Ensure compliance and evaluation of the implementation plan action items.	During annual preparedness reviews, review all CAD systems and MAC plans for compliance with the action plans outlined in Action Items #1 through #4.
Section 7.b.ii. Prioritization and Allocation of Resources		
Completed ...	Action Item #1: Communication plan	Establish protocols for providing Federal agency leadership with regular briefings and information on wildfire activity, fire conditions, and significant issues in relation to rangeland fire and the implementation of the Secretarial Order throughout the 2015 wildfire season in order to provide leadership with an accurate understanding and insight to the conditions on the ground. Senior leadership will regularly communicate national strategic priorities and expectations to line officers and fire staffs during the wildfire season.
Completed ...	Action Item #2: Review and update the delegation of authority for the National Multi-Agency Coordination (NMAC) Group.	Ensure roles and responsibilities.
Completed ...	Action Item #3: Issue national level "Leader Intent".	Provide expectations for 2015.
Completed ...	Action Item #4: Engage Geographic Multi-Agency Coordination (GMAC) groups.	Communicate Leaders Intent.
Ongoing	Action Item #5: Develop "Delegation of Authority" template for use by local line officers.	Create standard language for use in a Delegation of Authority template that identifies the sage-steppe ecosystem and protection of species as a priority. Line officers will use this standard template when delegating authority to an Incident Commander who has responsibility for managing a wildfire incident within a FIAT area or has nexus to one. Delivery to Districts.
Completed ...	Action Item #6: Engage line officers to communicate Leaders' Intent and expectations.	Each agency use appropriate internal mechanisms to communicate intent and expectations to regional and unit-level managers.
Section 7.b.v. Post Fire Restoration		
Ongoing	Action Item #1: Review and update Emergency Stabilization (ES) and Burn Area Rehabilitation (BAR) policy guidance to address rating and evaluation criteria, project design to promote the likelihood of treatment success, cost containment, monitoring, and continuity and transition to long-term restoration activities and treatments.	Update BAR evaluation and rating criteria and review ES policy and procedures.
Ongoing	Action Item #2: Address acquisition, financial management, and other procedures that pose challenges to timely project implementation.	Work with Departmental and bureau acquisition and finance offices to provide funding and project continuity at the beginning of, and across, fiscal years.
Ongoing	Action Item #3: Accelerate schedule approving BAR projects consistent with the guidelines established for the 2015 fire season.	Accelerate preliminary approvals that will allow sufficient lead time to complete cultural and other clearances (e.g., NEPA and National Preservation Act of 1966 [Section 106]6), procurement planning, and other advance work that will take place prior to the application of full funding at the beginning of the fiscal year.
Completed ...	Action Item #4: Identify non-fire programs and activities that will fund treatments and restoration activities for the long term in conjunction with BAR and ES policy and program review to be conducted in 2015.	Funding of ES and BAR projects will be evaluated based on opportunities and commitments from non-fire program and activities if the work that is proposed will extend beyond the ES and BAR duration.
Ongoing	Action Item #5: Identify requirements for National Fire Plan Operations and Reporting System (NFPORS) capabilities.	Implementation of new criteria for project evaluation and oversight may require updates and changes to NFPORS.
Section 7.b.ix. Seed Strategy		
Completed ...	Action Item #1: Develop the draft National Seed Strategy and Implementation Plan.	Complete the National Seed Strategy and Implementation Plan.
Completed ...	Action Item #2: Identify a forum to discuss and highlight current native seed and restoration techniques and research.	Attend the Institute for Applied Ecology's National Native Seed Conference.
Completed ...	Action Item #3: Provide an opportunity to discuss current research, case-studies, and tools that inform applied restoration opportunities in the Great Basin.	A series of 15 webinars on seeding and restoration entitled, "The Right Seed in the Right Place at the Right Time: Tools for Sustainable Restoration" are offered through May 2015.

The BLM has longstanding national and local policies that require monitoring vegetation treatments (both implementation and effectiveness monitoring) and guidance to apply monitoring data for adaptive management. These planning policies require the BLM to set land use goals and objectives, and to ensure that all vegetation treatments are responding to those goals and objectives. The FIAT process requires partnership with cooperators, agencies, and others involved in land or wildlife management in the FIAT assessment areas, which helps ensure BLM's treatments are benefitting the sagebrush ecosystem and that proposed treatments provide direct and indirect benefits to sage-grouse populations.

The management strategies identified by the FIAT process are consistent with broader land use plan direction. Habitat restoration treatments (*e.g.*, biological, chemical, seeding, and broadcast burning) are effective at reducing fine fuel loads and ultimately decrease fire spread and area burned. Chemical applications are effective at removing nonnative annual grasses and promoting growth and establishment of native species. Seeding treatments implemented by the BLM are effective at reducing undesirable species and promote the establishment of desirable species because they are timed to achieve a high probability of success. Conifer removal treatments are implemented to reduce fuel loading and effectively reduce fire intensity, fire spread, and area burned. Wildfire pre-suppression activities alter vegetation composition, reducing the negative impacts from wildfire and invasives. Projects are planned using fire behavior analysis tools that consider topography, weather patterns, fire history, and fuel conditions to ensure effectiveness. These treatments ultimately slow fire spread and reduce fire size and area burned (DOI 2015e, entire). Fuels treatment effectiveness monitoring reports of 722 wildfire/fuels treatment intersections since 2001 demonstrate fuels treatment effectiveness within the BLM (BLM 2015b, p. 1). Of the wildfire/treatment interactions reported, 85 percent of the treatments helped control the wildfire, and 90 percent changed the fire behavior (BLM 2015b, p. 2). The BLM found that hazardous fuels treatments reduced the size of many unplanned ignitions, assisted in providing opportunities to stop or slow the spread of wildfire, provided for greater firefighter safety, allowed opportunities to manage unplanned ignitions for resource benefits, reduced

the burn area rehabilitation needs and costs, reduced smoke emissions, and allowed for greater resiliency of the environment in returning to a functional ecosystem following wildfire (BLM 2015b, p. 1). The BLM's post-fire emergency stabilization and burned area rehabilitation treatments are planned, deliberate actions that promote land stabilization and rehabilitation of burned landscapes. The BLM is aggressively treating burned areas where there is a high probability of cheatgrass invasion (BLM 2015h). Post-fire recovery treatments are designed to promote native vegetation and to inhibit the establishment of nonnative annual grasses. Some previous post-fire seeding restoration attempts were found to be ineffective, with seeded areas as likely to have sage-grouse occupancy compared to non-seeded areas (Arkle *et al.* 2014, p. 15). However, post-fire seeding restoration was more likely to be successful in higher elevation areas with particular climate regimes and when projects were implemented in years preceding cool, wet growing seasons (Arkle *et al.* 2014, p. 15). Therefore, the FIAT process prioritizes restoration activities in areas with higher resiliency and resistance to fire based on soil and moisture regimes (Chambers *et al.* 2014b, p. 453). These treatments are effective at addressing the impacts posed by invasive plants and ultimately address future wildfire threats.

Once implemented, projects and treatments identified by FIAT will follow the same monitoring protocols as non-FIAT management actions, in accordance with overarching guidance in the Federal Plans. Specifically, monitoring that evaluates the implementation and effectiveness of FIAT management strategies will follow The Greater Sage-Grouse Monitoring Framework (BLM and USFS 2014, entire). Given past effectiveness and ongoing monitoring efforts, the BLM expects 95 to 99 percent of all habitat restoration, wildfire pre-suppression, and conifer removal projects that are completed or in progress to effectively ameliorate the impacts of wildfire and invasive plants to sage-grouse (DOI 2015e, p. 9).

At the time of this writing, the 2015 fire season is under way, and we cannot currently predict the outcome of the season in terms of impacts to sage-grouse habitat. Similarly, it is premature to assess how implementation of the wildfire and invasive plant conservation efforts discussed above are working to address impacts during this fire season. At the time of publication, approximately 200,000 ha (500,000 ac)

of sage-grouse habitat has been estimated to be affected by wildfires this year, including approximately 12 ha (30 ac) of SFA. Much of the area burned is associated with a single wildfire that occurred along the Idaho and Oregon border—the Soda Fire. This fire does provide some insight into the implementation of the wildfire conservation measures.

The Soda Fire started on August 10, 2015, burning approximately 114,000 ha (283,000 ac) of Federal, State, and private lands in southwestern Idaho and eastern Oregon (NIFC 2015). Almost all of the burned area is sage-grouse habitat, with more than 20,000 ha (about 50,000 ac) designated by BLM as PHMA for the species. Despite extreme fire behavior, firefighters safely suppressed this wildfire with no loss of life and no serious injuries to firefighters or the public. An interagency Emergency Stabilization and Rehabilitation (ES&R) team of more than 40 natural resource specialists has completed 5 days working on the ground to assess damage and threats to life, property, and resources on BLM-managed lands in both Idaho and Oregon. The ES&R team is now designing treatments to mitigate threats and begin the rehabilitation of the burned area (BLM 2015h). Rehabilitation of burned areas on State and private lands affected by the Soda Fire is being handled through similar authorities and processes by Idaho Department of Lands (IDL) and the NRCS. Other local, State, and Federal organizations are participating throughout the process. A Memorandum of Understanding (MOU) established in 2014 between BLM, Idaho Department of Fish and Game, and IDL plays a key part in authorizing restoration efforts and processes on State land, particularly in PHMAs and Important Habitat Management Areas (IHMAs).

The Soda Fire is one of many examples of why the Secretary of the Interior issued Secretarial Order 3336 to prioritize resources to address the threat of wildfire in sagebrush habitats for Federal land managers. We expect that the actions outlined in the Secretarial Order and BLMs commitments to implement other new strategies and tools identified (BLM 2015h) above will ultimately prove valuable in reducing the negative effects of wildfire on sage-grouse habitat. Importantly, the rapid completion of many of the near-term action items outlined in the Initial Report—many of these measures were in place *before* the onset of the 2015 fire season—signal a strong commitment from wildland fire managers to implement these measures into the future.

Final Report

The “SO3336—Final Report: An Integrated Rangeland Fire and Management Strategy” (DOI 2015c, entire), completed May 1, 2015, outlines a long-term approach to improving the efficiency and efficacy of actions to better prevent and suppress wildfire and to improve efforts to restore fire-impacted landscapes both including and beyond 2016. This approach involves targeted investments to enhance efforts to manage wildfire in the Great Basin, based on relative resilience and resistance of habitat to fire. The Final Report also outlines longer term actions to implement the policy and strategy set forth in the Secretarial Order, including the continued implementation of approved actions associated with the National Cohesive Wildland Fire Management Strategy (DOI 2014, entire) that provides guidance for the safe and effective suppression of wildfires. The actions outlined in the Final Report primarily focus on the Great Basin region, but DOI intends for the strategies developed under the Final Report to be applied rangewide where there is benefit to sagebrush ecosystem habitat and sage-grouse. Measures outlined in the Final Report include the following:

- Designing and implementing comprehensive, integrated fire response plans for the FIAT assessment areas in the Great Basin subject to fire and invasives;
- Providing clear direction on the prioritization and allocation of fire management resources and assets;
- Expanding the focus on fuels reduction opportunities and implementation;
- Fully integrating the emerging science of ecological resilience into design of habitat management, fuels management, and restoration projects;
- Reviewing and updating emergency stabilization and burned area rehabilitation policies and programs to integrate with long-term restoration activities;
- Committing to multiyear investments for the restoration of sagebrush ecosystems, including consistent long-term monitoring protocols and adaptive management for restored areas;
- Implementing large-scale experimental activities to remove cheatgrass and other invasive annual grasses through various tools;
- Committing to multiyear investments in science and research; and
- Developing a comprehensive strategy for acquisition, storage, and distribution of seeds and other plant materials.

The Secretarial Order places a priority on “protecting, conserving, and restoring the health of the sagebrush-steppe ecosystem and, in particular, sage-grouse habitat, while maintaining safe and efficient operations,” and looks to the allocation of fire resources and assets associated with wildfire to reflect

that priority. In preparing the Final Report, the Task Force considered a wide variety of possible actions for conserving habitat for the sage-grouse and other wildlife species as well as economic activity, such as ranching and recreation, associated with the sagebrush ecosystem in the Great Basin. The strategy outlined in the Final Report builds upon the National Cohesive Wildland Fire Management Strategy (DOI 2014, entire) and is intended to ensure improved coordination with local, State, Tribal, and regional efforts to address the potential threat of wildfire at a landscape level.

In 2015, BLM initiated implementation of the National Seed Strategy, a key program included in the Secretarial Order (BLM 2015c, entire; BLM 2015h, entire). The “National Seed Strategy for Rehabilitation and Restoration 2015–2020” (Seed Strategy) provides a coordinated approach for stabilization, rehabilitation, and restoration treatments. The Seed Strategy also provides a framework for actively working with the private sector in order to build a “seed industry” for rehabilitation and restoration. This program was developed specifically in response to concerns about the wildfire and invasive plant cycle in the sagebrush ecosystem, and was identified in the Secretarial Order. The Seed Strategy has the following four goals:

1. Identify seed needs, and ensure the reliable availability of genetically appropriate seed;
2. Identify research needs and conduct research to provide genetically appropriate seed and to improve technology for native seed production and ecosystem restoration;
3. Develop tools that enable managers to make timely, informed seeding decisions for ecological restoration; and
4. Develop strategies for internal and external communication.

The Seed Strategy ensures that adequate supplies of native seed will be available for sagebrush ecosystem restoration. The use of locally appropriate native seed will improve restoration success, serving as an important tool in the suppression of invasive plant infestations after habitat disturbances, such as wildfire. The measures in the Seed Strategy are consistent with COT Report conservation recommendations for post-wildfire restoration (USFWS 2013, p. 40). The initiation of the Seed Strategy by BLM is evidence of DOI’s commitments to fully implement the measures included in the Secretarial Order and serves as an important tool

for the minimization of the wildfire-invasive plant cycle across the species’ range (BLM 2015h, entire).

We analyzed the certainty of implementation and effectiveness of the Secretarial Order pursuant to PECE (68 FR 15100, March 28, 2003). As noted above, 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 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 the effectiveness of the conservation efforts to contribute to make listing a species unnecessary.

The majority of the actions identified in the Initial Report have been implemented (BLM 2015h, entire). Specifically, the following actions have taken place: Investments targeted to enhance efforts to manage wildfire in the Great Basin; a process has been established for allocating funds to support policies and strategies for preventing and suppressing wildfire and for restoring sagebrush landscapes impacted by fire across the Great Basin; and funds were provided this year to support efforts under the Secretarial Order (BLM 2015h, entire). The agencies have the legal authorities to carry out the responsibilities under the Secretarial Order and it builds on the BLM and USFS’ long and successful history of managing wildfire in the Western United States. Therefore, we expect that the efforts will continue to be implemented to accomplish the objectives of the Secretarial Order.

The Secretarial Order is expected to work with FIAT and other authorities to further help address the effects associated with wildfire suppression and restoration and the spread of invasive species. The Secretarial Order provides an implementation plan and specific objectives including short-term actions for the 2015 fire season and long-term actions needed to meet the objectives identified in the order. Pursuant to the Secretarial Order, protocols for monitoring vegetation treatments (both implementation and effectiveness monitoring) were established and guidance was developed to apply monitoring data for adaptive management (BLM 2015h, entire).

We expect that the measures will be effective in reducing the impacts of wildfire and invasive plants to sage-grouse and its habitats. The COT Report recommends containing wildfire within the normal range (including size and

frequency), eliminating intentional fires, and restoring burned sagebrush habitats (USFWS 2013, p. 40). As the COT Report noted, reduction of the threat of wildfire is difficult (USFWS 2013, p. 40). However, the Secretarial Order, FIAT and other authorities and actions working in concert have provided the direction needed as described in the COT Report. Many of the actions identified in the Initial Report have already been implemented (BLM 2015h, entire). The actions yet to be fully implemented from the Initial and Final Report have a high level of certainty of implementation, given BLM's past track record of implementation and their commitments and policy direction for future implementation (BLM 2015h, entire). The Secretarial Order and associated actions, both short and long term directly address the recommendations found in the COT Report, are based on the best available

information, and address the major issues related to wildfire prevention and suppression, as well as restoration of areas impacted by wildfire and invasive plants. We expect that the Secretarial Order and associated actions, both short- and long-term, will be implemented and will be effective in reducing the effects to sage-grouse and its habitat from wildfire and invasive species sufficient enough be considered in making our determination.

Resilient Landscapes Funding and Projects—The Wildland Fire Resilient Landscapes (WFRL) program is a new approach to achieve fire resiliency goals across landscapes with the collaborative efforts defined in the National Cohesive Wildland Fire Management Strategy (DOI 2014, entire), and in support of Secretarial Order 3336—Rangeland Fire Prevention, Management, and Restoration. The WFRL program provides opportunities for the DOI

bureaus, working together with other Federal, tribal, State, and local governmental and nongovernmental partners, to identify and complete projects that are intended to contribute significantly to restoring fire resilience in a variety of fire-adapted ecosystems across the country. The Fiscal Year 2015 appropriation provided 10 million dollars to the Fuels Management program to fund resilient landscape activities, as a pilot initiative. Ten proposals were selected for funding in 2015; three projects, representing 68 percent of the funding, are located within the range of sage-grouse, and support the goals of the Secretarial Order (Table 13). The Fiscal Year 2016 President's Budget proposes funding for the WFRL program at 30 million dollars to provide multiyear support for landscape-scale projects and expand the program to new partnerships.

TABLE 13—FISCAL YEAR 2015 WILDLAND FIRE RESILIENT LANDSCAPES PROGRAM PROJECTS FUNDED WITHIN THE RANGE OF SAGE-GROUSE

Collaborative	Location/lead agency	Project objective	Project acres (millions)	Approved funding
Bruneau-Owyhee	Located in Idaho	Treat conifer encroachment to benefit fire resiliency and sage-grouse habitat.	>1	\$166,000
Greater Sheldon-Hart Mountain.	Lead: BLM	Focus on restoring sagebrush shrub and native perennial grass/forb communities by controlling juniper expansion.	~4	3,984,250
Southern Utah	Located in parts of Oregon, Nevada, California.			
	Lead: Service			
	Located in Utah	Remove encroaching pinyon pine and juniper, diversify age class of sagebrush communities, establish desired understory to restore resilience, benefiting sagebrush-dependent wildlife.	7.4	2,605,000
	Lead: BLM			
Totals			>12	6,755,250

State Fire Management Programs—Federal, State, and local land and wildlife management agencies collaborate and work under national fire guidance strategies to achieve common goals and objectives. Within the Great Basin region, State Forest Action Plans address the coordinated management of wildfire. State and local fire management agencies view all wildfires as “full suppression” incidents, and make every effort to suppress fires safely and quickly with a strong initial attack. Many States have agreements with their neighboring States to ensure that a rapid initial attack is possible, even if it is from a neighboring State or jurisdiction. Additionally, they may utilize a “unified command” concept to assist in coordination and cooperation (Havlina *et al.* 2015, p. 26). Specific projects are detailed in the State Forest Action Plans to reduce fuels, improve preparedness and initial attack response, identify equipment and training needs, and

ensure safe, rapid, and aggressive response to wildfire ignitions, and address rehabilitation of wildfire-damaged lands to mitigate the spread of invasive plants (Havlina *et al.* 2015, pp. 25–27). For example, Utah's Forest Action Plan (UDFFSL 2015; pp. 33–35) was updated in 2015 to include five Sage-grouse Management Areas (SGMAs) (Box Elder, Bald Hills, Sheep Rock Mountains, Hamlin Valley, and Ibapah) as high priorities in the wildfire risk assessment and as part of the Governor's Catastrophic Wildfire Reduction Strategy. Collectively, these five SGMAs hold 26 percent of the sage-grouse in the State of Utah (UDFFSL 2015, p. 35).

The Oregon State Plan recognizes wildfire as one of the most significant impacts to sage-grouse and their habitat in Oregon and the Great Basin. The Plan also recognizes the interrelated nature of the threat from wildfire with the threats from nonnative annual grasses and

juniper encroachment. The Plan outlines more than 40 conservation actions to address the impacts from wildfire, which are defined as any activity or action which, when implemented or continued to be implemented, will reduce potential threats to sage-grouse and will improve or maintain healthy sagebrush-steppe habitat. These conservation actions are categorized into four areas: Reducing wildfire risk, wildfire suppression, building capacity and supporting local efforts, and post-fire rehabilitation. All of the conservation actions for wildfire are predicated on the FIAT as well as the Secretarial Order, use data specific to Oregon, and are coordinated with the goals and objectives of the BLM's Federal Plans as well as local jurisdictions.

Local Fire Management Programs—Many communities throughout sage-grouse habitat in the Great Basin have rangeland fire protection associations

(RFPAs). The RFPAs are remotely located firefighting units staffed by public volunteers. The RFA volunteers are trained and equipped to respond to wildland fires with the intent to control wildfires at the smallest size that can be safely accomplished. Their location in remote areas allows firefighters to access fires quickly, which increases success of controlling fires before they grow in size, become more challenging to suppress, and cause greater effects to sage-grouse. In Oregon, 18 RFPAs have been created and currently field more than 600 volunteer fire fighters and more than 200 pieces of water-handling fire equipment to protect more than 2 million ha (5 million ac) from wildfire. In southern Idaho, there are currently seven RFPAs with 230 trained members who support wildland firefighters to protect more than 1.4 million ha (3.5 million ac) of the sagebrush ecosystem from catastrophic wildfire. On June 23, 2015, Governor Brian Sandoval signed emergency regulations related to the formation of RFPAs within the State of Nevada (NRS 472 per AB 163, sec. 3.5(1) of the 78th Session of the Nevada legislature).

Wildfire and Invasive Plants Summary

In 2010, we concluded that wildfire was one of the primary factors linked to declines of sage-grouse due to long-term loss of sagebrush and conversion of sagebrush habitats to invasive annual grasses. Loss of sagebrush habitat to wildfire had been increasing in the western portion of the sage-grouse range mainly due to an increase in wildfire occurrence, intensity, and severity (Miller *et al.* 2011, p. 183). We found this change to be the result of incursion of nonnative annual grasses, primarily cheatgrass. The positive feedback loop between cheatgrass and wildfire facilitates future fires and precludes the opportunity for sagebrush, which is killed by fire, to become reestablished. Cheatgrass and other invasive plants also alter habitat suitability for sage-grouse by reducing or eliminating native forbs and grasses essential for food and cover.

While the manner in which wildfire and invasive plants affect sage-grouse has not changed since the 2010 finding, there has been a significant change in the approach to rangeland firefighting and fuels management to address these potential threats. Through development of the FIAT, as well as the Secretarial Order, the BLM and USFS have developed and implemented wildfire management strategies and actions intended to reduce the impact of wildfire and invasive plants (BLM 2015h, entire). Similarly, a paradigm

shift is occurring in the way land managers and the larger conservation community approach invasive plant control and in particular the relationship between invasive plants and wildfire.

Without management, current burn rates would likely continue, potentially impacting another 17 to 25 percent of the species' range within the Great Basin over the next 20 to 30 years. If this level of wildfire did occur, sage-grouse populations in the Great Basin could decline 43 percent over the next 30 years (Coates *et al.* 2015, p. 32), and some small populations could be extirpated. However, we expect that the rates of wildfire and invasive plant habitat loss seen over the past decades will be reduced by conservation efforts. The FIAT assessments that are included in the Federal Plans and the actions implemented under the Secretarial Order provide enhanced policies, strategies, and tools for preventing and suppressing wildfire and for restoring landscapes affected by fire across the Great Basin region. Many of those measures are in place for the current fire season (DOI 2015a). As a result, sagebrush habitats will now be given priority consideration in the treatment of fuels, the deployment of firefighting resources, and the rehabilitation of burned areas. Much of that effort will be focused in those areas most resistant to wildfire and invasive plants, where more than half the breeding habitat in the Great Basin occurs and where prevention and restoration projects are most likely to be successful; this strategy is consistent with recommendations provided in the COT report (USFWS 2013, pp. 40–42) and a recent study of wildfire impacts over the next 30 years (Coates *et al.* 2015, p. 34). Further, if wildfires do occur, monitoring of sage-grouse habitat and population responses to that impact will occur so that other land use activities can be adjusted, if necessary. In response to monitoring, development allowable under the Federal Plans may be adjusted based on adaptive management criteria to provide an immediate, corrective response to any identified triggers for population or habitat declines. While not directly related to habitat losses due to fire, these provisions provide a backstop for other disturbance if adaptive management triggers are exceeded. The continued long-term implementation of these wildfire management strategies, in coordination with the Federal Plans and Oregon State Plan (see *Sagebrush Landscape Conservation Planning* for additional details) reduce the risk, or

the degree to which, fire and invasive plants are likely to impact sage-grouse. We expect that the current management emphasis will reduce future losses.

Grazing and Rangeland Management

In 2010, we evaluated the effect of grazing on sage-grouse (including domestic livestock, free-roaming equids, and wild ungulates) and concluded that improper grazing was likely having negative impacts to sagebrush and sage-grouse at local scales, but that population-level impacts were unknown. However, given the widespread nature of grazing, the potential for population-level impacts could not be ignored (75 FR 13910, March 23, 2010, p. 13942). In this section we evaluate the best available information on the impacts of livestock grazing on sage-grouse and on conservation actions since 2010 intended to ameliorate those impacts. We have no new information regarding impacts of native ungulates on sage-grouse populations, which were not considered a substantive threat in 2010; therefore, our analysis focuses exclusively on domestic livestock grazing. The impacts on the species and its habitat of free-roaming equid grazing are addressed in a separate section of this document (see *Free-Roaming Equids*).

Improper grazing by domestic livestock during the late 1800s and early 1900s, along with severe drought, affected sagebrush ecosystems across the range of sage-grouse (Knick *et al.* 2003, p. 616). Improper grazing, for the purposes of this assessment, is defined as grazing practices that are inconsistent with local ecological conditions and result in degradation of habitat for local wildlife species. This historical improper grazing caused long-term changes in plant communities and soils (Knick *et al.* 2003, p. 611). In low-elevation Wyoming big sagebrush and low sagebrush habitat, improper grazing reduced perennial herbaceous vegetation and caused high levels of ground disturbance, which promoted the establishment of exotic annual grass species such as cheatgrass (Mack 1981, pp. 148–152). In higher elevation mountain big sagebrush habitat, improper grazing likely reduced fine fuels and decreased fire frequency, resulting in the expansion of fire-sensitive native conifers (Miller and Tausch 2001, pp. 19–26). In both instances, these shifts in the vegetative community have facilitated changes in the wildfire cycle, leading to loss of sage-grouse habitat (see *Wildfire and Invasive Plants*, above).

Livestock grazing is currently the most widespread land use in the sagebrush ecosystem and occurs in all MZs (Knick *et al.* 2011, p. 219; Boyd *et al.* 2014, p. 62). Livestock grazing may positively or negatively affect the structure and composition of sage-grouse habitat (Factor A), depending on the intensity and timing of grazing and local climatic and ecological conditions (Crawford *et al.* 2004, pp. 10–12; Aldridge *et al.* 2008, p. 990; Boyd *et al.* 2014, p. 63). As a result, drawing broad inferences regarding the current impact of grazing on sagebrush habitats across the range of sage-grouse is difficult.

The total number of livestock that currently graze within sage-grouse habitats is unknown. No rangewide data set is available describing the level of livestock grazing that occurs on private lands across the occupied range. Most grazing on Federal lands is managed by BLM and USFS (GAO 2005, p. 5). The BLM and USFS index the number of livestock grazed by Animal Unit Months (AUMs), which takes into account both the number of livestock and the amount of time they spend on public lands. An AUM is defined by BLM as the amount of forage needed to sustain one cow and her calf, one horse, or five sheep or goats for 1 month. The number of AUMs allowed depends upon land health assessments that evaluate the ecological condition of an area and its ability to support grazing (BLM and USFS 2015, entire). The number of AUMs permitted on Federal lands has gradually declined since the 1960s (Mitchell 2000, pp. 64–68). This decline was concurrent with a decline in productivity of western shrublands due to previous grazing history, changes in soils and vegetation, or drought (Knick *et al.* 2011, p. 232). The reduction in AUMs permitted on public lands over time may not translate to a reduction in the effects of grazing in sagebrush systems (Knick *et al.* 2011, p. 232).

Properly managed grazing may benefit sage-grouse. Light to moderate livestock grazing can help maintain perennial vegetation that provides important food and cover for sage-grouse (Crawford *et al.* 2004, pp. 2–12; Boyd *et al.* 2014, p. 63). It can also help control invasives and woody plant encroachment, which may improve habitats and may reduce wildfire risk (Connelly *et al.* 2004, p. 7–49; Boyd *et al.* 2014, p. 68). The net impact of different use levels will vary in accordance with climatic variability, local environment, and season of use (Crawford *et al.* 2004, pp. 10–12). Implementing proper grazing practices that maintain adequate residual grass height and cover under shrubs provides for suitable cover and minimizes the

negative effects of grazing on sage-grouse productivity (Boyd *et al.* 2014, p. 64).

Alternatively, improperly managed grazing can have adverse impacts to sage-grouse habitat. Improper grazing directly influences the composition, productivity, and structure of herbaceous plants in sagebrush plant communities (Boyd *et al.* 2014, p. 64), which in turn influences the quality and quantity of food and cover for sage-grouse (Fleischner 1994, pp. 633–635). By reducing protective vegetative cover, improper grazing may make nesting and brood-rearing habitats less suitable for sage-grouse. Sage-grouse rely on the cover of tall grasses and shrubs to hide from predators, especially during the nesting season, and females will preferentially choose nesting sites based on the height of grasses and shrubs (Hagen *et al.* 2007, p. 46). Grass height is a strong predictor of nest survival and hiding cover can increase nest success, a key vital rate for sage-grouse (Doherty *et al.* 2014, pp. 322–323). Loss of this hiding cover may increase predation during nesting and brood-rearing, subsequently reducing reproductive success rates (Gregg *et al.* 1994, p. 165). Maintaining adequate residual grass height and cover under shrubs minimized the negative effect of grazing on sage-grouse productivity (Boyd *et al.* 2014, p. 64).

Improper livestock grazing can reduce food available to sage-grouse, which can impact reproductive success and chick survival (Coggins 1998, p. 30; Aldridge and Brigham 2003, p. 30; Pederson *et al.* 2003, p. 43). Improper livestock grazing in mesic, brood-rearing habitat may further reduce food resources by altering soils and hydrology and reducing herbaceous plants (Braun 1998, p. 147; Dobkin *et al.* 1998, p. 213). Improper livestock grazing may also reduce the cover and height of sagebrush in key wintering habitats (Rasmussen and Griner 1938, p. 852), potentially affecting the condition and survival of sage-grouse during the winter when resources are scarce. However, implementing appropriate grazing practices can maintain habitat and food resources for sage-grouse or, under very specific conditions, improve conditions by stimulating succulent forb growth (Evans 1986, p. 67; Crawford *et al.* 2004, p. 12; Beck and Mitchell 2000, p. 997).

Beyond habitat impacts, improper grazing can also directly affect sage-grouse (Factor E). Nearby livestock can cause females to flush from their nests (Coates *et al.* 2008, p. 426), inadvertently revealing the nest and its eggs to predators, such as ravens (*Corvus corax*) (Coates 2007, p. 33) and

the abundance of raven predators in sage-grouse habitats may increase near livestock grazing (Coates *et al.*, in press). Livestock can trample or disturb nests (Crawford *et al.* 2004, p. 12). However, no information is available about the extent these potential impacts may be occurring across the occupied range. When they do occur, adverse impacts are likely limited to the local population.

Construction and development associated with grazing, such as watering developments and fences, can have a variety of impacts such as habitat fragmentation and the facilitation of predators and disease. There have been documented incidences of sage-grouse drowning in stock tanks, which can have localized population-level effects (Boyd *et al.* 2014, p. 65), but the rangewide impact is unknown. Grazing management that strategically considers placement and design of fences and livestock water developments could protect other habitats by localizing and minimizing the area of impact. In addition, the timing of water diversions can minimize these impacts and provide mesic vegetation and wet meadow habitats during critical brood-rearing periods when the availability of succulent plants may be limited (Boyd *et al.* 2014, pp. 65–66).

Conservation Efforts

Since 2010, State and Federal agencies have worked collaboratively to develop regulatory mechanisms to reduce or eliminate the impact of improper livestock grazing on sage-grouse habitats. The BLM and USFS amended or revised Federal Plans to set appropriate rangeland health standards in sage-grouse habitats that are required to maintain a Federal grazing permit. States developed and implemented State plans that govern issuance of grazing permits on some State lands. Other conservation efforts designed to improve grazing, including voluntary efforts, are discussed below.

Federal Plans—The BLM and USFS are currently the principle land managers within the range of the sage-grouse, and collectively manage more than 98 percent of the livestock grazing on Federal lands (GAO 2005, p. 5). Nearly all federally owned sage-grouse habitat is managed for livestock grazing (BLM and USFS 2015, entire). Grazing permits and leases generally cover a 10-year period and are renewable if the BLM or USFS determine that the terms and conditions of the expiring permit or lease are being met (BLM and USFS 2015, entire). Permits include standards and guidelines that describe specific conditions required to achieve land

health and the recommended techniques to achieve these standards on each allotment (Knick *et al.* 2011, p. 222; BLM and USFS 2015, entire), as well as mandatory terms and conditions to ensure that land health standards (LHS) are being met (43 CFR 4130). If LHS are not being met or terms and conditions are not being followed, the BLM and USFS have the authority to modify the terms and conditions of grazing permits to correct any deficiencies, suspend the permit, or to revoke the grazing permit entirely (33 CFR 222.4; 43 CFR 4180.2).

In our 2010 finding, we identified concerns with BLM and USFS management of rangelands, contributing to our finding that regulatory mechanisms were not sufficient (75 FR 13910, March 23, 2010, pp. 13975–13980). Historically, not all allotments have been monitored to ensure compliance with LHS and permit terms and conditions, and there was no mandated prioritization of field checks to ensure compliance within sage-grouse habitats. Between 1997 and 2007 the percent of allotments monitored for LHS ranged from 22 percent to 95 percent across surveyed States, with an overall average of 57 percent (Veblen *et al.* 2014, p. 72). Of the allotments monitored, 15 percent failed to meet LHS due to improper livestock grazing (Veblen *et al.* 2014, p. 72).

The Federal Plans represent a major shift in grazing management and monitoring since 2010, with respect to meeting LHS and sage-grouse conservation objectives (BLM and USFS 2015, entire). The Federal Plans manage grazing specifically for sage-grouse habitat objectives by evaluating the numbers and distribution of livestock, evaluating environmental conditions such as drought, closing or changing allotments, managing riparian habitat for sage-grouse, and authorizing water developments only if they would not adversely impact sage-grouse. Specific grazing guidelines have been developed based on the best available science and are applied in upland and riparian/wet meadow habitats to maintain or achieve desired conditions of sagebrush, forbs, and perennial grasses. Upland vegetation guidelines will be applied seasonally and within 4 to 6.2 miles from leks, depending on site-specific information. Riparian and wetland protective measures will be applied in all sage-grouse habitat areas. Further, BLM directed resources in 2015 to fund monitoring crews, and funded activities, like data management, to ensure successful implementation of the monitoring commitments (Lueders, BLM, 2015, pers. comm.). The

President's Budget request for BLM included 8 million dollars to directly support monitoring the implementation and effectiveness of the land use plans (BLM 2015d, p. II–5–6).

Given the large number of allotments across the occupied range, the Federal Plans ensure that the most important habitats are prioritized for protection. Permit review, renewal, and/or modifications occur first in SFAs, followed by PHMA and allotments containing riparian areas. The same prioritization is used for field checks to ensure compliance with permit terms and conditions. In addition, the USFS commits to modify grazing permit conditions and existing livestock improvements within 2 years and mitigate any adverse effects from grazing improvements within 5 years (BLM and USFS 2015, entire). Progress at achieving rangeland health objectives at multiple spatial scales is monitored by BLM and USFS using a habitat assessment framework that provides a consistent approach and similar data set (BLM and USFS 2015, entire).

The Federal Plans' vegetation standards and grazing management measures are consistent with the best available science on sage-grouse habitat needs and the COT report recommendations to minimize grazing impacts (USFWS 2013). The Federal Plans also include monitoring requirements and adaptive management that will ensure that the measures will be effective for the long term and that grazing occurs at proper levels for sage-grouse conservation. With changes in management direction and immediate allocation of resources, full implementation of the Federal Plans will, over time, address effects due to improper grazing. As a result of the Federal Plans, and associated monitoring commitments and adaptive management approach, the risk of improper grazing occurring on Federal lands across the occupied range is greatly reduced from 2010 levels.

State Plans—State plans in Montana and Wyoming include measures to reduce the impact of improper grazing to sage-grouse on State-owned or managed lands. Montana's State plan requires that State Trust grazing lands maintain and improve sage-grouse habitat in core and connectivity areas on State Trust lands in Montana (Montana EO 10–2014, pp. 7–17). In addition, Montana's plan includes voluntary incentives to conserve sagebrush habitats on private and State-owned lands in core and general habitat areas (Montana EO 10–2014, pp. 7–27). Under the Wyoming Plan, in order to receive a permit, new grazing operations on

State Trust Lands must demonstrate that they will not cause declines in sage-grouse populations. While the amount of grazing on lands subject to these State requirements and incentives is minimal compared to that on Federal lands, these measures will reduce the potential for improper grazing that could negatively affect sage-grouse.

Sage Grouse Initiative—Rangeland health inside PACs has been improved through SGI practices by applying grazing systems, re-vegetating former rangeland with sagebrush and perennial grasses, and controlling invasives. To date, grazing systems have been implemented on more than 985,000 ha (2.4 million ac); seeding projects have occurred on more than 19,000 ha (over 48,000 ac); and weed management projects were implemented on more than 6,000 ha (over 15,509 ac), and restoring more than 70 ha (179 ac) of wet meadow (NRCS 2015a, p. 6). To maximize conservation gain, SGI targets their efforts within PACs. Of the more than 985,000 hectares (2.4 million acres) enrolled in grazing systems, 76 percent are clustered within the following five populations: Powder River Basin, Yellowstone Watershed, and the Dakotas in MZ I; Wyoming Basin in MZ II; and Snake/Salmon/Beaverhead in MZ IV (NRCS 2015a, p. 7). In addition more than 74 percent of the newly seeded acres are concentrated in the following five populations: Dakotas, and Yellowstone Watershed in MZ I; Northwest Colorado in MZ II; and Northern Great Basin and Box Elder in MZ IV (NRCS 2015a, p. 7). Although participation in SGI programs is voluntary, participants that receive financial assistance enter into binding contracts or easements to ensure that conservation practices are applied according to schedule and in compliance with NRCS standards and specifications. As part of implementation, the SGI includes a monitoring and evaluation component that measures the response of sage-grouse populations and associated vital rates in order to gauge effectiveness and provide an adaptive management framework to SGI programs. For the private lands involved with this program, SGI has removed the risk of habitat degradation due to improper grazing through the implementation of accepted habitat management tools, and restored previously affected habitat to benefit sage-grouse.

Candidate Conservation Agreements—Lands currently enrolled in CCAAs reduce the potential threat of improper grazing on private lands through implementation of grazing management plans that we have

determined maintain or enhance habitat for sage-grouse. Approved grazing management plans include measures concerning the types of livestock and the appropriate timing, location, duration, and frequency for grazing. All private lands within the species' range in Oregon and Wyoming are eligible for enrollment in CCAAs. Rangelandwide, approximately 745,000 ha (1.8 million ac) of private lands have landowner commitments in the programmatic CCAAs in Oregon and Wyoming. In addition, approximately 1.4 million ha (about 3.5 million ac) are covered by CCAAs covering range management on BLM-administered lands in Oregon and Wyoming, and covering maintenance operations on DOE lands in Idaho (BLM 2013a). The CCAAs require the same conservation measures as the CCAAs, including grazing management plans and habitat enhancement. These CCAAs and CCAAs are consistent with the recommendations of the COT Report (USFWS 2013, p. 45) for conservation measures that will effectively reduce impacts to sage-grouse.

Grazing and Rangeland Management Summary

Livestock grazing is the most widespread land use in the sagebrush ecosystem, and impacts can be positive, negative, or neutral depending on management practices and site-specific characteristics. Improper grazing practices can have adverse effects to sage-grouse and its habitat, and may work synergistically with other potential threats, such as invasive plants and wildfire, to increase impacts. However, well-managed grazing practices can be compatible with sagebrush ecosystems and sage-grouse persistence. In 2010, we concluded that grazing was likely having localized negative effects, but due to the widespread extent of the activity, greater impacts were possible. Since our 2010 finding, updated Federal Plans have been amended or revised in the species' range to ensure that appropriate grazing prescriptions are applied on Federal lands, covering more than half of the range of sage-grouse. As discussed in the *Federal Plans* section above,

monitoring and adaptive management provisions within the Plans contribute to the certainty that livestock grazing will be permitted at levels compatible with sage-grouse persistence. Further, prioritization of field checks and permit reviews provides additional assurances that these regulatory mechanisms will be effective in those areas with the highest breeding bird densities. Rangelandwide, the Federal Plans, along with the Wyoming, Montana, and Oregon State Plans, reduce impacts from grazing to approximately 90 percent of the modeled breeding habitat across the species' range (see *Sagebrush Landscape Conservation Planning* for a detailed discussion of conservation measure implementation and effectiveness). In addition to these regulatory mechanisms on Federal lands, SGI and State CCAAs provide well-coordinated programs to encourage private landowners to address the impact of improper grazing on non-Federal lands. Taken together, these conservation efforts reduce the potential threat of improper livestock grazing from the levels assessed in 2010. Therefore, we conclude that, although livestock grazing is widespread in the sagebrush ecosystem, and we expect some continued impacts from improper grazing at local scales, existing Federal regulations with full implementation, in combination with voluntary efforts on non-Federal rangelands are reducing the prevalence of improper grazing and its impacts to sage-grouse.

Free-Roaming Equids

In 2010, we evaluated the effect of free-roaming equids (also known as free-roaming horses and burros) on sage-grouse and concluded that grazing (including grazing by free-roaming equids, native ungulates, and livestock) can have negative impacts to sagebrush (Factor A) and consequently to sage-grouse at local scales. Further, we concluded that the impacts of grazing at large spatial scales, and thus on population-levels, was unknown, but given the widespread nature of grazing, the potential for population-level impacts could not be ignored (75 FR 13910, March 23, 2010, p. 13942).

Free-roaming horses (*Equus caballus*) and burros (*E. sinuatus*) were first brought to western North America in the late 16th century. A number of equids subsequently escaped captivity or were released forming free-roaming populations (Beever 2003, p. 888; Garrett and Oli 2013, p. 847). When the BLM began monitoring free-roaming equid populations in the 1970s, they reported the total number of free-roaming horses to be approximately 17,000 individuals, although some believe this was an underestimate (BLM 2005a, p. 3). With protection afforded by the Wild Free Roaming Horse and Burro Act of 1971 (Pub. L. 92–195) (Horse and Burro Act), the number of horses on public lands rose sharply, and by 1980 the number of free-roaming equids had increased to 65,000–80,000 animals (Beever 2003, p. 888, BLM 2005a, p. 3). Active management, starting in the 1980s, reduced free-roaming equid numbers to more than 40,000 by 1999 and to about 37,186 in 2003 (BLM 2005a, p. 3).

The BLM and USFS manage free-roaming equids on Federal lands according to the Wild Free-Roaming Horses and Burros Act of 1971. The BLM's implementing regulations designated Herd Areas as places used as habitat by a herd of free-roaming equids at the time the law was passed (43 CFR part 4700). The BLM evaluated each Herd Area to determine if it had adequate food, water, cover, and space to sustain healthy and diverse free-roaming equid populations over the long term. The areas that met those criteria were designated as Herd Management Areas (HMAs). The BLM manages HMAs to maintain the appropriate management level (AML) of free-roaming equids to be in balance with other public rangeland species, resources, and uses in a given area. The USFS has designated Territories for the management of free-roaming equids and manages them in a similar way. The HMA/Territories currently overlap with about 12 percent of the sage-grouse occupied range, primarily in Oregon, Nevada, and Wyoming (Figure 8).

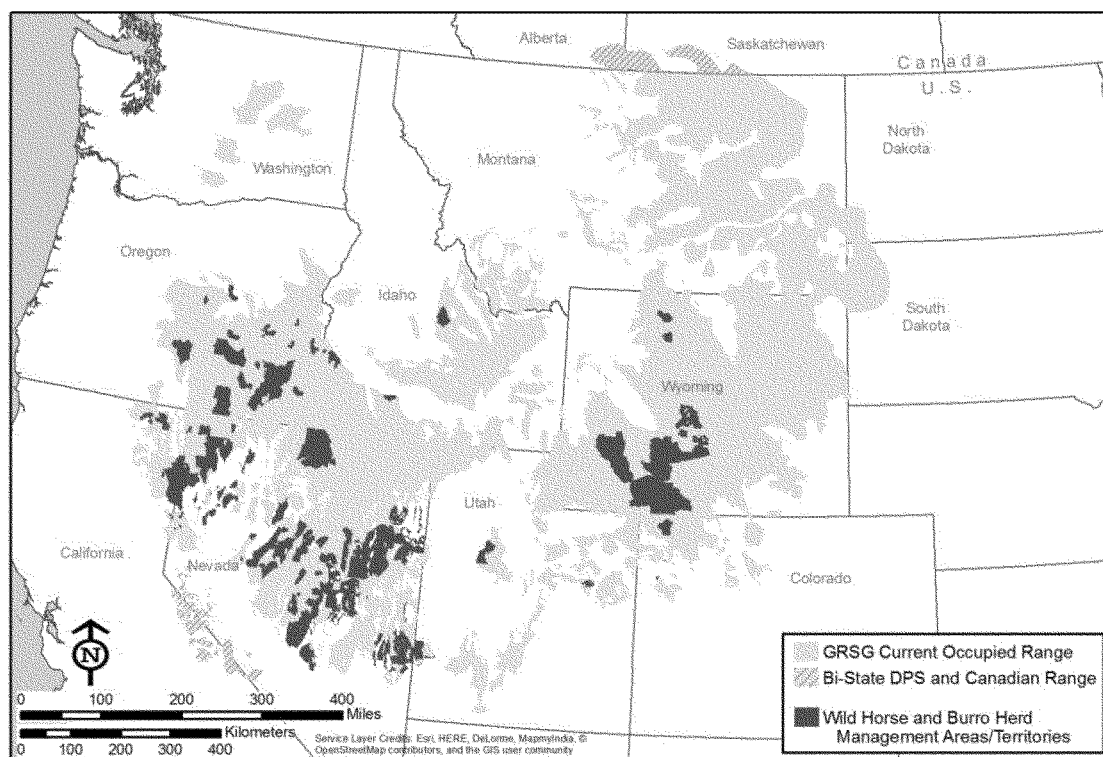


Figure 8. Free-roaming Equid Management Areas within the sage-grouse occupied range.

In 2010, the BLM estimated that 31,000 free-roaming equids were found on BLM-administered lands (75 FR 13910, March 23, 2010, p. 13941). Currently, the BLM estimates 58,150 free-roaming equids (about 47,329 horses and 10,821 burros) exist on BLM-administered rangelands in 10 western States, including two States outside the range of the sage-grouse (BLM 2015e). In 2014, USFS estimated that, on lands it manages, there are an additional 7,447 free-roaming equids (Shepherd & Froli 2015, BLM and USFS, pers. comm.). The number of free-roaming equids on public lands has been over AML for more than 15 years (BLM 2014c, p. 1). The extent to which free-roaming equids occur on land outside of designated Federal management areas is unknown.

The current population of free-roaming equids is estimated to be nearly double the amount that the BLM and USFS have determined can exist in balance with other public land resources and uses (BLM 2015e, p. 1). Free-roaming equids reproduce rapidly and can have rates of increase averaging 15 to 20 percent annually (BLM 2015e, p. 1). Assuming a population of 45,000 animals and a 20 percent annual growth rate, Garrett *et al.* (1991, p. 647) estimated that 9,000 horses must be removed annually to maintain a stable population. The number of horse and

burro removals by BLM have not kept this pace in recent years, with removals declining from 8,255 in 2012, to 4,176 in 2013, to 1,863 in 2014 (BLM 2015e, entire). At the same time, numbers of horses and burros in BLM corrals and pastures is close to capacity (BLM 2015e, entire).

Free-roaming equids' use of sagebrush landscapes have different ecological consequences than livestock grazing at both local and landscape scales due to biological and behavioral differences (Beever 2003, pp. 888–890; Beever and Aldridge 2011, p. 273). Equids are generalists, but grasses comprise the majority of their diet throughout the year (McInnis and Vavra 1987, p. 61). Because of physiological differences, a horse forages longer and consumes 20 to 65 percent more forage than a cow of equivalent body mass (Wagner 1983, p. 121; Menard *et al.* 2002, p. 127). Unlike domestic cattle and other wild ungulates, equids can crop vegetation closer to the ground, potentially limiting or delaying recovery of plants (Menard *et al.* 2002, p. 127). Equids tend to move to higher elevations in late spring until early fall, which may increase the interactions with sage-grouse, as sage-grouse often move to higher elevation communities to more mesic habitats with forbs throughout the summer (Beever and Aldridge 2011, pp. 285–

286). Conversely, equids tend to spend less time at water, and range farther from water sources than cattle (Beever and Aldridge 2011, p. 286). Because of these differences, greater habitat impacts occur when both horses and cattle are present, compared to when only cattle are present (Beever and Aldridge 2011, p. 286).

As with all herbivores, equid effects on ecosystems vary markedly with elevation, density, season, and duration of use (Beever and Aldridge 2011, p. 273). In some contexts, equid grazing can reduce shrub cover as equids trample, rub against, and consume shrubs (Plumb *et al.* 1984, p. 132; Beever *et al.* 2003, pp. 119–120; Beever *et al.* 2008, p. 180). Equid grazing has also been associated with reduced plant diversity, altered soil characteristics, lower grass cover, lower grass density, and 1.6 to 2.6 times greater abundance of cheatgrass (Beever *et al.* 2008, pp. 180–181). Sage-grouse need grass- and shrub-cover for protection from predators, particularly during nesting season (Connelly *et al.* 2000a, pp. 970–971). Reduction in shrub and grass cover can result in increased predation pressure on both nests and birds. The greatest risk of adverse effects to habitat occurs in the areas with large numbers of horses over AML; the area of greatest concern is Nevada (MZs III, IV, and V)

where free-roaming equid populations are estimated to be more than twice AML.

In addition to adverse effects in sagebrush habitats, free-roaming equids can also negatively affect important meadow and brood-rearing habitats that provide forbs and insects for chick survival (Beever and Aldridge 2011, p. 277; Crawford *et al.* 2004, p. 11; Connelly *et al.* 2004, p. 7–37), as streams and springs within sagebrush ecosystems receive heavy use by horses (Crane *et al.* 1997, p. 380; Beever and Brussard 2000, pp. 243, 246–247). Brood-rearing habitat is often limited in availability compared to other sage-grouse habitats; therefore, any impacts to these areas can adversely affect local populations (NRCS 2015a, p. 44).

Conservation Efforts

Wild Free-Roaming Horses and Burros Act of 1971—The Wild Free-Roaming Horses and Burros Act of 1971, as amended, charges the BLM and USFS with managing wild [free-roaming] equids to achieve a thriving ecological balance with the land (Pub. L. 92–195). The BLM and USFS manage free-roaming equids by conducting surveys, administering fertility control drugs, gathering excess horses, and facilitating adoptions (National Academy of Sciences 2013, pp. 55–73). The BLM plans gathers based on population estimates and vegetation monitoring, but takes into account issues such as areas where equids have moved onto private property or severe local conditions are affecting the health of the herd. The scheduled gathers may be influenced by court orders or emergency situations. Planned gather numbers are based on the available space in holding facilities, anticipated adoptions, and budgets (BLM 2015e, p. 1).

Management of herd size by Federal agencies is an ongoing challenge. Free-roaming equid populations grow rapidly, and in most areas, they have no natural predators (National Academy of Sciences 2013, p. 1). The Wild Free-Roaming Horses and Burros Act (Pub. L. 92–195) requires that free-roaming equid populations be managed at appropriate management levels, and allows for the removal of excess animals for adoption, sale, or destruction. Free-roaming equid management is expensive and often controversial, sometimes limiting options to manage free-roaming equids at appropriate levels (National Academy of Sciences 2013, pp. 1–2).

Federal Plans—The Federal Plans address the impacts of free-roaming equids by prioritizing management in areas most important for sage-grouse

conservation (BLM and USFS 2015 entire). Management actions are prioritized for SFAs and PHMAs, and are managed for AML. Rangeland health assessments will be conducted in PHMAs and SFAs, and herd management area plans (HMAPs) will be amended to incorporate sage-grouse habitat objectives. The plans provide that, if needed to achieve AML and sage-grouse habitat objectives, gathers and population growth suppression techniques would be utilized in prioritized areas. Additionally, if needed, free-roaming equids would be removed or excluded from areas following emergencies, such as wildfire or drought. Further, monitoring and adaptive management criteria provide an additional layer of management to address species or habitat declines regardless of the sources of the impact. The BLM has committed to completing the actions within SFAs in the next 5 years; free-roaming equid management in PHMAs will be the next priority after SFAs (BLM 2015h, entire; DOI 2015a, p. 3).

The Federal Plans' direction to manage free-roaming equid populations at appropriate levels reduces impacts from free-roaming equids into the future. The inclusion of sage-grouse objectives in HMAPs ensures that future decision making is done with consideration of sage-grouse ecological needs. Managing SFAs and PHMAs at AML substantially reduces the potential for habitat degradation in those areas. Based on past BLM and USFS plans and planning efforts, we expect the Federal Plans, including these free-roaming equid measures to be implemented for the next 20 to 30 years.

Sheldon-Hart Mountain National Wildlife Refuge Complex—The Hart Mountain National Wildlife Refuge (NWR) removed free-roaming equids and cattle in the 1990s. Cattle were also removed from the Sheldon NWR in the 1990s. The last gather to remove all equids from Sheldon NWR occurred in the fall of 2014 (Collins, USFWS, pers. comm. 2015). Recovery of plant communities in sagebrush ecosystems, aspen woodlands, and riparian habitats have been documented since these removals (Earnst *et al.* 2012, entire; Davies *et al.* 2014, entire; Batchelor *et al.* 2015, entire). Together, free-roaming equid and livestock removals from Sheldon-Hart Mountain NWR have improved conditions for 9.1 percent of the sage-grouse modeled breeding habitat in MZ V. This area has been identified as important to long-term sage-grouse viability due to the high density of breeding birds and the

connectivity to adjacent populations (USFWS 2014a, entire).

Candidate Conservation Agreements—CCAAs and CCAs, which together can cover up to about 1.4 million ha (3.5 million ac) in Oregon, include conservation measures for free-roaming equids. To date, approximately 745,000 ha (1.8 million ac) are currently enrolled in CCAAs rangewide. Measures include monitoring of free-roaming equid impacts in sage-grouse habitat and reporting to BLM for consideration of horse and burrow relocation (USFWS 2014d, p. 52; USFWS 2015b, p. 55; USFWS 2015c, p. 53; USFWS 2015d, p. 54; USFWS 2015e, p. 53; USFWS 2015f, p. 54). Although not regulatory in nature, these measures will assist BLM in their management of free-roaming equids.

Free-Roaming Equid Summary

In our 2010 finding, we reported that approximately 36,000 free-roaming equids occurred in 10 western States (including 2 States outside the range of sage-grouse) and HMAs/Territories occupied approximately 12 percent of the range of sage-grouse. The number of free-roaming equids has increased since 2010, with about half occurring in Nevada where estimated free-roaming equid population levels are twice AML. Since our 2010 finding, the Federal Plans provide a suite of actions that, with full implementation, will manage free-roaming equids to substantially reduce potential impacts to sage-grouse, as recommended by the COT Report (USFWS 2013, pp. 46–47). Some localized degradation of habitat will likely continue, particularly in Nevada, as implementation of these actions will take time. However, full implementation of the measures outlined in the Federal Plans will reduce impacts in the most important areas for sage-grouse (see *Sagebrush Landscape Conservation Planning* for a detailed discussion of conservation measure implementation and effectiveness). Important habitats that are designated as SFAs will receive priority management to reduce wild-equid population levels that can exist in the sagebrush ecosystem without adverse effects to sage-grouse habitats (BLM 2015h, entire). In addition, conservation efforts directed at these issues have been implemented on other lands since 2010, most notably the removal of horses from Sheldon NWR in 2014, which provides habitat for an important breeding bird stronghold. As a result, while some localized impacts to habitat are likely to continue in the near future, management measures by the BLM and USFS substantially reduce

the impact of free-roaming horses and burros across the range of the species.

Conifer Encroachment

In 2010, we evaluated the effect of pinyon juniper encroachment and concluded that it contributed to habitat fragmentation, particularly in the Great Basin portion of the range. Pinyon and juniper and some other native conifers were expanding due to decreased fire-return intervals, livestock grazing, and increases in global carbon dioxide concentrations associated with climate change, among other factors. The 2010 finding recognized the potential value of conifer removal treatments, particularly when done in the early stages of encroachment when sagebrush and forb encroachment is still intact (75 FR 13910, March 23, 2010).

Prior to 1860, two-thirds of the Great Basin was treeless and occupied by sagebrush ecosystems (Miller *et al.* 2008, p. 13), but since that time the extent of pinyon-juniper has increased ten-fold (Miller and Tausch 2001, pp. 15–16). Based on 1999–2012 imagery (LANDFIRE 1.3.0), approximately 4.7 million ha (more than 11.5 million ac) of conifer woodlands occur within the current range of sage-grouse, comprising more than 6 percent of the current occupied range. Conifer encroachment is of greatest concern in MZs III, IV, and V, but is present at least locally in all MZs (USFWS 2013, pp. 23–36).

Conifer expansion presents a stressor to sage-grouse because sites invaded by conifers do not provide suitable sage-grouse habitat (Factor A). For example, when juniper increases in mountain big sagebrush communities, shrub cover declines and the season of available succulent forbs is shortened due to soil moisture depletion (Crawford *et al.* 2004, p. 8). Sage-grouse have been found to avoid areas where conifers have encroached (Doherty *et al.* 2010b p. 1547; Casazza *et al.* 2011, p. 163; Baruch-Mordo *et al.* 2013, p. 239). Trees may also offer perch sites for avian predators, potentially increasing the predation risk (see *Predation*, below).

The extent of conifers within the species' range is anticipated to expand in the future unless effectively treated. Rangewide, 6 to 13 percent of sage-grouse habitat may be at risk of conifer encroachment (Manier *et al.* 2013, p. 92). The most pronounced risks are across the Great Basin (Manier *et al.* 2013, p. 92) where approximately 35 percent of sagebrush habitat is estimated to be at high risk of alteration by pinyon-juniper in 30 years, 6 percent at moderate risk, and 60 percent at low risk (Connelly *et al.* 2004, pp. 7–8 to 7–14). While pinyon-juniper expansion

appears less problematic in the eastern portion of the range (MZs I, II and VII) and silver sagebrush communities (primarily MZ I), conifer encroachment is an impact mentioned in Wyoming, Montana, and Colorado State sage-grouse conservation plans, indicating that this is of some concern in these States as well (Stiver *et al.* 2006, pp. 2–23). Based upon current habitat information, approximately 10 percent of the occupied range in the Great Basin and 2 percent of the occupied range in the Rocky Mountains are impacted by conifer encroachment (USFWS 2015a). Efforts are under way to more precisely identify areas at risk of conifer encroachment; that information is currently unavailable, but will help target removal efforts in the future. Conifer encroachment rates have been estimated between 0.4 and 4.5 percent annually (Sankey and Germino 2008, p. 413). Encroachment rates are predicted to increase with long-term changes in climate (see *Climate Change and Drought*, below; Neilson *et al.* 2005 cited in Miller *et al.* 2011, p. 145).

Miller *et al.* (2005, p. 24) characterized three stages of woodland succession: Phase I, where conifer are present but shrubs and herbaceous species remain the dominant vegetation that influence ecological processes (e.g., hydrologic, nutrient and energy cycles); Phase II, where conifer are co-dominant with shrubs and herbaceous species, resulting in modifications of ecological processes; and Phase III, where conifer becomes the dominant species, with reduced shrub canopy cover and herbaceous species diversity. Approximately 80 percent of sites invaded by conifers are still in Phase I and Phase II, where some native shrubs and bunchgrasses are present (Miller *et al.* 2008, p. 9). Transition of sagebrush habitats from Phase II to Phase III is of particular concern because treatment options become more limited in Phase III (Johnson and Miller 2006, p. 8). Without intervention, 75 percent of conifer encroachment in the western portion of the sage-grouse range may transition into Phase III within the next 30–50 years (Miller *et al.* 2008, p. 12).

Conservation Efforts

Since 2010, considerable effort has been undertaken to remove conifers, thus reducing the impacts of conifer encroachment to sage-grouse habitat. Federal Plans and State Plans provide commitments to reduce conifer encroachment. The SGI has been actively treating conifer encroachment on private lands across the species' range. Lastly, private land owners have pursued conifer removal projects,

including commitments associated with enrollment in CCAAs.

The effectiveness of these current and planned treatments varies with the technique used and proximity of the site to invasive plant infestations, among other factors (Knick *et al.* 2014, p. 553). The plant-community response to these treatments is not always consistent or predictable, and succession may not move in a desirable direction following treatment (Miller *et al.* 2014, entire). Areas treated for conifers have the greatest likelihood of sage-grouse using them after treatment when implemented in areas still containing some sagebrush, near mesic habitats, and near sage-grouse populations (Cook 2015, p. 96). Sage-grouse appear to be more likely to use treated areas when suitable habitat is limited in an area (Frey *et al.* 2013, pp. 269–270). We are not aware of any study documenting a direct correlation between conifer treatments and sage-grouse population response. Successful treatment of conifers in the future requires targeted management of conifers in the most important habitats for sage-grouse.

Sage Grouse Initiative—Most of the conifer treatments completed to date have been accomplished on private lands by the SGI. Since 2010, SGI has removed conifers from 163,995 ha (405,241 ac) primarily in Phase I and II encroachment areas in the Great Basin (MZs III, IV, V) (NRCS 2015a, p. 7). Eighty-four percent of these treatments occurred in PACs in the Great Basin. Nearly half of these acres are in Oregon (MZ V), where conifer encroachment was reduced by 68 percent on private lands (NRCS 2015a, p. 2). The SGI in Oregon targeted conifer removal in PACs near active leks and other occupied seasonal habitats (NRCS 2015a, p. 18). SGI will invest an additional 80 million dollars over the next 3 years to implement restoration and enhancement projects on approximately 1.4 million ha (3.4 million ac), including conifer treatment projects (NRCS 2015a, p. 29; NRCS 2015b, p. 6). Given the past accomplishments and the continued dedication of NRCS to sage-grouse conservation, we are confident that these investments in conifer treatments will continue.

Candidate Conservation Agreements—Approximately 745,000 ha (1.8 million ac) are currently enrolled in CCAAs rangewide. Lands enrolled in CCAAs require removing undesirable conifers/junipers encroaching into sage-grouse habitats (USFWS 2014d, p. 47; USFWS 2015b, p. 50; USFWS 2015c, p. 48; USFWS 2015d, p. 49; USFWS 2015e, p. 48; USFWS 2015f, p. 49).

Federal Plans—The Federal Plans completed in 2015 include commitments to remove conifers through implementation of the FIAT. The FIAT assessments include treatment schedules for mechanical and prescribed fire removal. Conifer removal is prioritized in areas closest to occupied sage-grouse habitat and where juniper encroachment is in Phase I or Phase II. Cumulatively, the FIAT step-down assessments identify approximately 3 million ha (7.4 million ac) of conifer treatments for five priority landscapes (*i.e.*, Central Oregon, Northern Great Basin, Snake/Salmon/Beaverhead, Southern Great Basin, and Western Great Basin/Warm Springs Valley) in the Great Basin region (MZs III, IV, and V).

Conifer Encroachment Summary

The potential threat of conifer encroachment has changed since the last status review. In 2010, we found habitat fragmentation, due in part to conifer encroachment, to be a threat to the species; regulatory mechanisms and conservation efforts were insufficient to address this threat. Based on past trends and the current distribution of pinyon-juniper relative to sagebrush habitat, we anticipate that expansion will continue at varying rates across the landscape and cause further loss of sagebrush habitat. However, projects to remove conifers near sage-grouse habitat have been implemented for PACs, and regulatory measures included in Federal and State plans have resulted in a paradigm shift in land management objectives and practices that will further reduce conifer impacts on sage-grouse and sagebrush habitat. The Federal agencies have committed to continue conifer removal projects in the most important habitats identified in the COT Report (USFWS 2013, pp. 16–29) and the FIAT Assessments (BLM 2015a, *entire*). For a detailed discussion of conservation measure implementation and effectiveness, see *Sagebrush Landscape Conservation Planning*.

Mining

In 2010, we evaluated mining as part of the energy development assessment and concluded that energy projects contributed to habitat loss and fragmentation. Mining was identified as occurring across the species' range, but was most prevalent in Nevada (MZs III, IV, and V) and Wyoming (MZs I and II). At that time, regulations addressing effects from mining were determined to be inadequate. As a result, the 2010 finding concluded that habitat loss and fragmentation, caused in part by mining and inadequate regulatory mechanisms,

were significant threats to the species such that listing was warranted under the Act (75 FR 13910; March 23, 2010).

Mining has occurred throughout the range of sage-grouse since the mid-1800s (Nevada Mining Association 2015), and mining in sagebrush habitats continues today (American Mining Association 2014). Mining is generally divided into three categories, based on the type of mineral extracted: Locatable, leasable, and salable minerals (BLM 2015f, p. 1). Additionally, each of these mining categories has its own specific regulations. Locatable minerals are hard rock minerals whose extraction is subject to the General Mining Law of 1872, such as gold, silver, and copper. Leasable minerals include resources such as coal, oil, and gas. Saleable minerals are more common, lower value resources, such as sand and gravel (BLM 2015f, p. 1). The extent of mining for any individual mineral varies widely, as does the size and activity of individual mines, making generalizations of impacts difficult.

Consistent with our 2010 finding (70 FR 13910, March 23, 2010, pp. 13948–13949), we do not have a comprehensive dataset about existing and proposed mining activity to do a quantitative analysis of potential impacts to sage-grouse. In 2010, we were aware of approximately 25,500 ha (63,000 ac) of existing mining-related disturbance within the range of sage-grouse; those mining projects and associated impacts are likely continuing today. These projects likely removed sagebrush habitat when first implemented (70 FR 13910, March 23, 2010, pp. 13948–13949) and continue to have indirect effects to sage-grouse populations near the project sites through disturbance from noise, human presence, equipment, and explosives (Moore and Mills 1977, *entire*). Overall, the extent of these projects directly affects less than 0.1 percent of the sage-grouse occupied range. Although direct and indirect effects may disturb local populations, ongoing mining operations do not affect the sage-grouse rangewide.

Currently, surface and subsurface mining activities are conducted in all 11 States within the sage-grouse range (Minerals Education Coalition 2015; National Mining Association 2014a BLM 2011, *entire*). Minerals are not distributed evenly across the sage-grouse landscape, and as a result, mining activities tend to be localized or regional. Coal is primarily found in the Rocky Mountain States, while lithium has been mined exclusively in Nevada (although a more recent discovery has been made in southwestern Wyoming) (Mining.com 2014). Precious metals,

while being mined to some degree in all 11 States across the sage-grouse range, primarily occur in Nevada and Colorado (USGS 2013).

By reducing and fragmenting habitats and disturbing individual sage-grouse, mining can directly or indirectly affect sage-grouse. Surface and subsurface mining can reduce sagebrush habitat, ranging from potential losses of many thousands of hectares at large industrial mines to 4 ha (10 ac) or less at smaller mining operations (Factor A). Habitat loss and fragmentation could preclude movements of sage-grouse between seasonal habitats (Connelly *et al.* 2011a, pp. 82–83; Knick and Hanser 2011, *entire*). In addition, indirect effects associated with mining include disturbance from increased human presence, traffic, blasting, reduced air quality, noise, increased dust, and an increased abundance of human-associated predators (Factor E) (Moore and Mills 1977, *entire*; Brown and Clayton 2004, p. 2). Mining operations can also contaminate water sources in sage-grouse habitats (Moore and Mills 1977, pp. 115, 133; Adams and Pickett 1998, p. 486; Ramirez and Rogers 2002, pp. 434–435). Settling ponds near mines could also provide breeding areas for mosquitos and increase the risk of WNV (Walker and Naugle 2011, p. 132).

Projections of future mining activities are difficult, as market prices for any specific mineral commodity vary greatly. The overall extent of mining activities in the United States has remained fairly consistent over the past 5 years (National Mining Association 2014b, p. 1), although coal production, including the number of coal mines, within the range of sage-grouse has generally declined since 2008 (EIA 2015, p. 93). We anticipate that some amount of mining will occur within the range of the sage-grouse indefinitely, depending on the extent of the desired mineral resource, development of new mining techniques, and market conditions. Conservation efforts are discussed below.

Conservation Efforts

Since 2010, a number of landscape-scale efforts have been undertaken to reduce impacts to sage-grouse across the range, including habitat loss and fragmentation from mining. The Federal Plans are the primary tools for managing mining impacts to sage-grouse. State plans in Wyoming and Montana include regulatory mechanisms to address impacts from mining. These conservation efforts are consistent with the recommendations in the COT Report (USFWS 2013, p. 49). The Federal and State plans, as well as individual efforts

reported to the CED, are discussed in detail below.

Federal Plans—In the United States, mining activity is authorized under an array of statutes affecting resources administered or leased by the BLM, both on federally administered lands as well as other lands where mineral rights have been reserved to the United States (*i.e.*, split-estate lands). The BLM's statutory and regulatory authority depends upon the nature of the mineral deposit (*i.e.*, leasable, salable, or locatable). The General Mining Law of 1872 called for all locatable mineral deposits on Federal lands to be free and open to exploration and purchase (BLM 2011c, p. 3), limiting the ability to manage these activities for sage-grouse conservation. Only areas that have been withdrawn to mineral entry by a special act of Congress, regulation, or Secretary of the Interior public land order are truly closed to locatable mineral entry. Coal is administered by the Office of Surface Mining Reclamation and Enforcement, which in turn may delegate their authority to the States.

The majority of mining activity within the sage-grouse range occurs on Federal lands where the Federal Plans direct the management of mineral development (BLM and USFS 2015, entire). Except in Wyoming, all PHMA is closed to new mineral material sales and leasable mineral operations, with exceptions for Free Use Permits and the expansion of existing operations. Free Use Permits allow governmental agencies and nonprofit organizations to extract and use mineral materials for up to 10 years (BLM 2013b, p. 1). Any proposed expansion of existing mining operations in PHMA would require design features to minimize impacts and would require mitigation of any impacts. Wyoming remains open to new mining activities within PACs, but those activities are restricted by a disturbance and density cap as per the Wyoming Plan (see *Wyoming State and Federal Plans*, above).

The Federal Plans designate the most important sagebrush habitat as SFAs where locatable mineral withdrawal is recommended, except in Wyoming where only a portion is recommended for withdrawal. For proposed coal projects, the BLM will determine at the time of a new lease if an area is suitable for development. During that evaluation, PHMA will be considered essential for sage-grouse conservation, ensuring that decisions are made with consideration of sage-grouse conservation needs. General sage-grouse habitats (GHMA) are open to mineral development, but are subject to stipulations designed to protect sage-

grouse. In addition to these mining-specific measures, no discretionary anthropogenic activities in PHMA would be allowed to impact more than 3 percent (or 5 percent in Wyoming and Montana) of the total sage-grouse habitat within a Biologically Significant Unit (BSU). Any authorized activities that result in loss of sage-grouse habitat would require mitigation in an amount or manner that results in a net conservation benefit to the species. Further, in response to monitoring, activities allowable under the Federal Plans may be adjusted based on adaptive management criteria to provide an immediate, corrective response to identified triggers for population or habitat declines. Due to limitations explained above, the disturbance caps may have limited applicability to some types of mining activities, but do place limits on other disturbance if adaptive management triggers are exceeded.

These measures reduce potential mining impacts to sage-grouse on approximately 14 million ha (35 million ac) of PHMA. The restrictions on leasable and salable mining in PHMA eliminate nearly all potential habitat loss associated with those activities. To the limited extent those activities could occur in PHMA, design features would be required to minimize disturbance, and mitigation would be required for any impacts. The laws governing locatable mineral development and coal mining limit the ability to completely remove this threat from PHMA. Locatable mineral development is likely to continue in the future, but it is difficult to know the location or extent of future mining activity within the range of sage-grouse. The SFAs contain the habitats and populations most important to the long-term conservation of the species and needing protection from future mining impacts, and at this time we are currently unaware of planned mining activity in these areas that rise to the level of causing population-level impacts to sage-grouse.

Within the areas of greatest conservation importance (SFAs), DOI will recommend withdrawal from locatable mineral entry. We support the recommendations for mineral withdrawal in SFAs that would remove potential impacts on approximately 4 million ha (10 million ac) of sage-grouse habitat. In Wyoming, the BLM adopted the State strategy, which has proven to be effective in directing activities outside of habitat and limiting impacts when they do occur (see *State Plans*, below). These measures minimize mining impacts in priority habitats for the life of the management plans, estimated to be the next 20 to 30 years.

Based on what we know today, no mining activities are likely to result in loss of these important areas for conservation, but we recognize that economic changes or technological advances may increase the risk of development in the future. Therefore, the long-term protection of the sage-grouse habitat in the SFAs from locatable mineral development will ensure that these important populations are conserved into the future.

State Plans—State plans in Wyoming and Montana include regulatory mechanisms that reduce impacts to sage-grouse from mining on applicable lands. The Wyoming and Montana Plans include controlled surface use, lek buffers, and seasonal and noise restrictions to reduce impacts in Core Areas (Montana EO 10–2014, pp. 14–19; Wyoming EO 2015–4, entire).

The States also implement Federal regulations for coal mining. Coal mining is regulated by the Surface Mining Control and Reclamation Act of 1977 (SMCRA), which is implemented by the Office of Surface Mining and Reclamation. This Federal law requires consideration of fish and wildlife resource information for the permit and adjacent area, along with a detailed analysis by the permittee on how impacts will be minimized or avoided. Permittees must also include a plan for enhancement of fish and wildlife resources on the permit area. The OSM has delegated the regulatory authority for implementing the SMCRA to five States within the range of sage-grouse: Wyoming, Montana, Utah, Colorado, and North Dakota. Sage-grouse, therefore, must be considered in the implementation of the SMCRA, and coal mining, in those States. The implementation agency must consider impacts on fish and wildlife, including sage-grouse. Sage-grouse are also typically addressed in all States within its range during the development of coal resources simply due to its status as a State trust resource.

Mining Summary

The impacts of mining have been reduced since the last status review. In 2010, we concluded that habitat fragmentation, due in part to mining, was a significant threat to the species, and regulatory mechanisms were not sufficient to address the threat. The scattered nature and intensity of mining, coupled with market uncertainty, makes it difficult to accurately predict impacts to sage-grouse on a rangewide basis. If future locatable mineral development occurred, it could have local impacts to leks and populations. This type of mining impact is most likely to occur in

Nevada where locatable mineral development has occurred the most historically; however, predictions of future mining activities would be speculative. The regulatory mechanisms in the Federal and State Plans will be effective in reducing potential mining impacts on State owned-lands, and in the case of Wyoming and Montana, in Core Areas. Controlled surface use directs activities outside of sage-grouse habitat to minimize the potential for habitat loss and fragmentation. Indirect impacts from human activity, noise, and traffic are reduced by lek buffers and seasonal and noise restrictions. When mining does occur, disturbance caps ensure that no more than 3 percent of the habitat in an area is impacted in most areas, and no more than 5 percent in Wyoming and Montana. Collectively, the Federal and State plans reduce impacts related to various types of mining on 90 percent of sage-grouse breeding habitat (see *Sagebrush Landscape Conservation Planning* for a detailed discussion of conservation measure implementation and effectiveness).

Renewable Energy

In 2010, we evaluated the impacts of renewable energy development (wind, solar, and geothermal) on sage-grouse, and concluded that it was a threat to the species (75 FR 13910, March 23, 2010, pp. 13949–13954). At that time, renewable energy development was increasing across the species' range, and regulatory mechanisms were inadequate to address impacts to the species.

Development of commercially viable renewable energy continues to increase across the sage-grouse range (EIA 2015, entire; DOE 2014, entire). Studies examining the impacts of renewable energy development on sage-grouse populations are limited. Renewable energy facilities typically require many of the same features for construction and operation as do nonrenewable energy resources, and, therefore, we anticipate their impacts will be similar. These include direct habitat loss and habitat fragmentation (Factor A) through construction and operation of an energy facility, and indirect effects resulting from the presence of power lines, human activity, introduction of invasive plants and novel predators, and noise (Connelly *et al.* 2004, pp. 7–40 to 7–41; Holloran 2005, p. 1; Pruett *et al.* 2009, p. 1258; Patricelli *et al.* 2013, p. 231; Howe *et al.* 2014, p. 46; see *Nonrenewable Energy, Mining, and Infrastructure*).

Given the incentives provided by the Energy Policy and Conservation Act, and State mandates, we anticipate the

development of commercially viable renewable energy will continue into the future. However, since 2010, conservation efforts have been implemented to direct the location of development to reduce renewable energy impacts across the occupied range of the species. The potential future extent and impacts of the three primary kinds of renewable energy within the occupied range of sage-grouse (wind, solar, and geothermal) are discussed further below, as well as the conservation efforts that ameliorate the effects.

Wind

Wind energy development is facilitated by Federal and State energy laws and policies that encourage its development. In 2008, the DOE issued an initiative to increase wind energy production by 20 percent by 2030 (DOE 2014, entire). Idaho and California provide tax incentives and loan programs for renewable energy development (State of Idaho 2015; California Energy Commission 2015), and Colorado and Nevada have laws requiring increased renewable energy production (AFWA and USFWS 2007, p. 8; Nevada Public Utilities Commission 2015). With the advent of Federal tax credits for wind energy facilities, wind development increased 20 percent in 2013 (Esterly and Gelman 2013, p. 3).

The current amount of implemented wind development within the species' occupied range is low. A geospatial assessment of currently implemented projects reveals that, within the species' occupied range, about 1,400 ha (3,500 ac) have been impacted by wind energy development; these projects occur in MZs I, II, III, and IV and impact less than approximately 0.002 percent of the occupied range (USFWS 2015a). The BLM has issued several ROWs in support of continued and future wind development that may influence sage-grouse habitats, but actual development of these ROWs into commercial facilities is not certain (Manier *et al.* 2013, p. 61).

Wind energy has the potential for development throughout the sage-grouse's occupied range. The National Renewable Energy Laboratory has modeled and mapped the wind resources in each of the States and classified the potential for wind power generation. All MZs contain areas where wind resources have been identified as economically developable over the next 20 years. More than 14 percent of the sage-grouse occupied range has high potential for commercial wind power, with MZs I and II having the greatest

potential (BLM 2005b, p. 5–103; NREL 2014, p. 2). In a separate assessment, the BLM estimated that 600 km² (232 mi²) of BLM-administered lands could be developed within the sage-grouse's range before 2025 (BLM 2005b, pp. ES–8, 5–2). We are aware of four preliminary, planning-stage wind project proposals in Montana (MZ I) that may encroach into sage-grouse habitat (USFWS 2015a). Adverse impacts to sage-grouse could occur if these projects were implemented, but whether or not these proposals may be further refined, or even constructed, is unknown.

Wind development projects can have a variety of direct and indirect impacts to sage-grouse (LeBeau *et al.* 2014, entire). Habitat loss and fragmentation can occur from the construction of wind farms and associated facilities such as power lines, roads, power substations, meteorological towers, and work facilities (BLM 2005b, pp. 3.1–3.4). Sage-grouse, similar to other lekking birds, have been found to avoid human-made structures such as power lines and roads (*e.g.*, Holloran 2005, p. 1; Pruett *et al.* 2009, p. 1258). Wind power facilities may provide perches and subsidized food that attracts predators and increases predation on sage-grouse (LeBeau *et al.* 2014, p. 528). Noise from turbines or associated human activities may interfere with normal foraging, resting, and breeding behaviors and contribute to higher stress levels and reduced fitness (Patricelli *et al.* 2013, p. 231). Sage-grouse could be killed by flying into turbine rotors or towers (Erickson *et al.* 2001, entire), although reports of this happening are limited.

Solar

Like other forms of renewable energy, solar energy development has increased in recent years, but minimal activities have occurred within the range of sage-grouse. Currently, only two solar projects have been constructed within the range of sage-grouse, in Nevada and Oregon (USFWS 2015a). The primary impact from solar facilities is habitat loss due to the installation of solar panels and diversion of water to support the facilities (Manier *et al.* 2013, p. 66). However, at this time large-scale solar-generating systems have not contributed to any calculable direct habitat loss for sage-grouse.

Future impacts from solar energy development are forecast to be extremely limited. In 2012, the BLM assessed potential solar development on their lands within six western States (BLM 2012). That assessment provided direction to exclude solar development from identified sage-grouse habitat on BLM public lands in Nevada and Utah.

Future development on private lands is possible, but the best available information does not indicate that any large-scale solar projects are planned on private lands within the range of sage-grouse at this time.

Geothermal

Geothermal exploration and development activity on Federal lands has been sporadic, but activity has increased in recent years. Currently, four geothermal facilities have been constructed within the range of sage-grouse in MZs III and IV, totaling 57,384 ha (141,800 ac; Manier *et al.* 2013, p. 70). The BLM has approved several geothermal leases throughout MZs III, IV, and V and covering approximately 0.29 percent of the occupied range, but the potential of these leases being developed is unknown. Many of these leases have existing stipulations protecting sage-grouse seasonal habitats (BLM and USFS 2015, entire). No geothermal development has occurred in MZs I and II, although geothermal potential exists throughout these MZs (Manier *et al.* 2013, p. 70).

The greatest potential for future commercial geothermal energy development is within MZs III, IV, and V (EIA 2009, entire). Currently, approximately 1,800 km² (694 mi²) of active geothermal leases exist on public lands primarily in the Southern (MZ IV) and Northern Great Basin (MZ III) (Knick *et al.* 2011, p. 245). However, it is unknown what portion of these leases will ever realize an operational geothermal project. Nevada is predicted to experience the greatest increase in geothermal growth across the United States (BLM and USFS 2008, pp. 2–35).

Impacts from geothermal energy development have not been studied, but are expected to be similar to oil and gas development (Manier *et al.* 2013, p. 70). Direct habitat loss could occur from development of well pads, structures, roads, pipelines, and transmission lines. Sage-grouse could be disturbed by human activity during installation and operation of geothermal projects (EIA 2009, entire). Water needed for installation and operation of geothermal facilities could deplete local water sources and potentially impact brood-rearing habitat.

Conservation Efforts

Since 2010, State and Federal agencies have worked collaboratively to develop regulatory mechanisms to reduce or eliminate the potential threat of new renewable energy development. The BLM and USFS amended or revised Federal Plans to restrict development in priority habitats. States developed and

implemented State plans that govern development on State and private lands. These efforts are in addition to direction to conserve sage-grouse that was provided by wind, solar, and geothermal assessments conducted by the BLM.

Federal Plans—The Federal Plans substantially reduce potential impacts to sage-grouse from renewable energy development on more than half the species' occupied range. The Federal Plans generally exclude new utility-scale and commercial solar and wind developments on 14 million ha (35 million ac) of PHMA (BLM and USFS 2015, entire). Within the 13 million ha (32 million ac) of GHMA, renewable energy project locations are to be prioritized for development outside sage-grouse habitat. In addition, in Nevada, California, Utah, and Colorado, the Solar Energy Development Programmatic Environmental Impact Statement (EIS) (BLM 2012, entire) excludes solar development in sage-grouse habitat, protecting a majority of the habitat areas on BLM lands with solar potential. Based on a geospatial assessment of these measures, the Federal Plans reduce the percentage of modeled breeding habitat potentially impacted by solar development from 15 percent to less than 1 percent and by wind development from 42 percent to 6 percent.

For geothermal projects, NSO is required in the 14 million ha (35 million ac) of PHMA for all States except Nevada and Wyoming. In Nevada, limited geothermal development could occur on Federal lands if it is determined that sage-grouse will not be impacted (BLM and USFS 2015, entire). In Wyoming, geothermal projects are subject to use restrictions including disturbance caps. Geothermal projects are allowed in GHMA, with measures such as timing limitations to minimize impacts. Priority will be given first to leasing and authorizing developing geothermal projects outside of PHMA and GHMA, then to non-habitat areas within PHMA and GHMA, and lastly to the least suitable sage-grouse habitat. Based upon a geospatial assessment of the land uses, the Plans reduce the percentage of breeding habitat potentially impacted by geothermal development from 33 percent to 4 percent (USFWS 2015a).

State Plans—Three State Plans provide regulatory mechanisms that effectively reduce impacts from renewable energy development in that State. In Wyoming, the Wyoming Plan does not allow wind energy development, the primary type of renewable energy pursued in Wyoming, in Core Areas, effectively removing this

potential threat on approximately 6 million ha (15 million acres) of important sage-grouse habitat. Since 2007, Wyoming has denied 27 lease applications for wind development on State trust lands due to this restriction in Core Areas. On State lands or where State authorizations are required, Montana's Plan requires avoidance of wind development in Core Areas and recommends no such development within 4 miles of active leks in general habitat (unless best available science demonstrates there will be no decline in sage-grouse populations) (Montana EO 10–2014, pp. 18, 19, 21). Oregon's Plan requires avoidance, minimization, and compensatory mitigation actions for development in sage-grouse habitat on State and private land and, in conjunction with BLM's Federal Plan, caps the amount of disturbance on sage-grouse core habitat to 3 percent per PAC (Oregon OAR 635–140–0025, entire; and Oregon OAR 660–023–0115, entire).

Renewable Energy Summary

In 2010, renewable energy was identified as a potential contributor to habitat fragmentation, and we concluded that regulatory mechanisms were not sufficient to address the threat in the future. Since 2010, regulatory mechanisms provided by Federal Plans and Wyoming, Montana, and Oregon Plans that eliminate or restrict most new renewable energy development in important sagebrush habitats substantially reduce this potential impact on approximately 90 percent of the sage-grouse breeding habitat. Some renewable energy development will occur in the future, primarily on private land or in GHMA, but it is impossible at this time to predict if, where, or how much development could occur. Avoidance and minimization measures included in the Wyoming, Montana, and Oregon Plans and the Federal Plans would reduce potential impacts if those projects did occur (see *Sagebrush Landscape Conservation Planning* for a detailed discussion of conservation measure implementation and effectiveness), consistent with recommendations in the COT Report (USFWS 2013, pp. 43–44). Based on previous land use planning efforts, we expect these regulatory measures to be in place for the next 20 to 30 years.

Urban and Exurban Development

In 2010, we evaluated the impact of urban and exurban development together with agricultural conversion and infrastructure, and determined that collectively those land uses were contributing to habitat fragmentation (75 FR 13910, March 23, 2010, p. 13931).

Furthermore, the 2010 finding concluded that habitat fragmentation and inadequate regulatory mechanisms were threats to the species such that listing was warranted under the Act (75 FR 13910, March 23, 2010).

Impacts from European settlement began in the southwestern portion of the sage-grouse range (MZ III) as early as the 1600s and were widespread in the northern portion of the range by the mid-1800s (Schroeder *et al.* 2004, pp. 371–372). Today, urban and exurban development are part of the human footprint on the landscape along with other anthropogenic features, such as roads and power lines (Leu *et al.* 2008, p. 1119; Bar-Massada *et al.* 2014, p. 429). We consider urban areas to be those areas that are densely developed residential, commercial, and industrial built-up areas (U.S. Census Bureau 2012, p. 1) and typically have a housing density of more than one unit per 0.4 ha (more than one unit per ac) (Brown *et al.* 2005, p. 1853). Exurban development includes both development at the fringe of urban areas and rural residential development, typically with a housing density of one unit per 0.4 to 16 ha (1 to 40 ac) (Brown *et al.* 2005, p. 1853). Exurban development has been one of the fastest growing land uses in the United States in recent years (Hansen *et al.* 2005, pp. 1893–1894; Theobald 2005, p. 1).

Most urban development is at the edge of the sage-grouse range while exurban development is scattered throughout the range, though limited to private lands (Connelly *et al.* 2004, p. 7–25; Knick *et al.* 2011, p. 212). Major urban areas include the Columbia River Valley in Washington (MZ VI), the Snake River Valley in Idaho (MZ IV), and the Bear River Valley in Utah (MZ II) (Connelly *et al.* 2004, p. 7–25). Using the information in Theobald 2014 (entire), we completed a geospatial assessment of 2010 Census data and estimated that urban and exurban development directly affects less than 1 percent of the sage-grouse occupied range. Indirect areas of influence related to increased predator impacts may extend up to 3.0 km (1.86 mi) from these direct footprints (Bui *et al.* 2010, p. 65). Factoring in these indirect effects, urban and exurban development could influence approximately 12.4 percent of the sage-grouse's occupied range. Since human population data only considers primary residences, the impact of exurban development in rural areas, especially areas affected by seasonal and recreational use, is likely underestimated (Brown *et al.* 2005, p. 1852).

Urban development affects sage-grouse habitat through the removal of vegetation and subsequent construction of buildings and associated infrastructure (Factor A; Knick *et al.* 2011, p. 217). In contrast to urban areas, exurban areas may continue to provide some sagebrush habitat, but it is typically less suitable due to associated anthropogenic disturbances (Connelly *et al.* 2004, p. 7–26). Both urban and exurban development can result in an increase in predation from pets and novel predators typically associated with humans (*e.g.*, ravens, skunks [*Mephitis mephitis*], fox), invasive plants, and recreation impacts. Noise associated with urban and exurban development may also affect breeding activity and other sage-grouse behavior (Factor E); however, little information is available that assesses this impact relative to urban activities (Blickley *et al.* 2012, p. 470). Sage-grouse avoid human development for nesting and brood-rearing (Aldridge and Boyce 2007, p. 508). Approximately 99 percent of active leks are in landscapes with less than 3 percent developed lands; whereas inactive leks have more than 25 times the development and human density of active leks (Wisdom *et al.* 2011, p. 462; Knick *et al.* 2013, p. 1547). Sage-grouse extirpation was determined to be most likely in areas that had a human population density of at least four persons per 100 ha (four persons per 0.01 km² or 247 ac) (Aldridge *et al.* 2008, pp. 983 and 991).

Human populations have increased in size and spatial extent over the past century, particularly in the western portion of the sagebrush biome (Stiver *et al.* 2006, Appendix C–2; Torregrosa and Devoe 2008, p. 10). Between 2000 and 2039, the U.S. population is projected to increase by 29 percent, with much of that increase likely to happen in western States (Torregrosa and Devoe 2008, p. 10). The areas of the species' occupied range at highest risk of development are private lands along the southeastern, southwestern, and southern portions of the species' range, and south of the Snake River, and in the Columbia Basin (USFWS 2013, pp. 16–29). If these projected population increases occur, the human footprint from development and resultant impacts will also increase, leading to additional habitat loss and fragmentation in those areas. Over half of the sage-grouse's occupied range is on federally owned lands that are not at risk of urban and exurban development. Nonetheless, development on adjacent private lands could have indirect impacts, as discussed above.

Conservation Efforts

Avoiding or minimizing additional urban and exurban development in sage-grouse habitats requires identifying habitats most at risk to development, developing and implementing land policies to acquire, maintain, or enhance habitat, and promoting ecologically sustainable private lands and ranches in sage-grouse habitat (Stiver *et al.* 2006, p. 33). Because urban and exurban development occurs primarily on private lands, conservation efforts focused on private land management, such as CCAAs and SGI, are most effective in ameliorating this impact.

Candidate Conservation Agreements—CCAAs are an effective tool for eliminating future development on private lands within the occupied range of sage-grouse. This outcome is because landowners enrolled in sage-grouse CCAAs have agreed not to pursue subdivision of rangeland, new building construction, or other new associated infrastructure. To date, all private lands within the species' range in Oregon and Wyoming are potentially covered by CCAAs; approximately 745,000 ha (1.8 million ac) have landowner commitments, effectively removing the risk of urban and exurban development in these areas.

Sage Grouse Initiative—Conservation easements are voluntary agreements between a landowner and with a land trust, the NRCS, or other organizations or agencies that maintain the land in private ownership with development restrictions that are typically permanent. Conservation easements can permanently protect sagebrush habitat from subdivision while providing compensation to landowners. The NRCS, through implementation of the SGI, has entered approximately 182,870 ha (451,884 ac) into conservation easements through fiscal year 2013 (NRCS 2015a, p. 38). Most easements for sage-grouse are located inside PACs (79 percent), and 94 percent of them provide permanent protection from future development.

State Plans—The Montana, Wyoming, and Oregon Plans include measures to address urban and exurban development. The Montana Plan regulates habitat loss due to urbanization on State lands and on private lands if a project needs an authorization from the State. The Montana Plan includes seasonal, timing, and noise restrictions; disturbance caps; lek buffers; and other conservation measures to reduce the potential threat of urbanization (Montana EO 10–2014, pp. 13–21). The Wyoming Plan includes

disturbances from exurban and urban development in calculations of their disturbance caps, which are used to limit overall disturbance in Core Areas. Oregon's State regulations require cities and counties to avoid sage-grouse habitat when amending land use planning designations that could increase opportunities for urban and exurban development or when making changes to their codes that may affect sage-grouse habitat. To the extent that urban and exurban development were to occur, it also would be subject to regulations (requiring avoidance, minimization, and compensatory mitigation) and a cap on the amount of disturbance on sage-grouse core habitat to 3 percent per PAC (Oregon OAR 635–140–0025, entire; and Oregon OAR 660–023–0115, entire).

Federal Plans—Lands administered by the BLM and USFS are not directly affected by urban and exurban development, as those agencies are not authorized to permit those land uses. The Federal Plans require that any PHMAs and GHMAs be retained in Federal management, thus preventing transfer to private landownership that could result in urban or exurban development. Limited exceptions to this provision could be allowed if transfer of land ownership would benefit sage-grouse or not cause any adverse effects. As a result of the Federal land ownership and limitations on transference provided by the Federal Plans, the risk of urban and exurban development is reduced on approximately 90 percent of the breeding habitat across the species' range.

Summary of Urban and Exurban Development

The 2010 finding concluded that growing human populations and associated urban and exurban development were adversely affecting sage-grouse. Urban and exurban development is expected to continue to affect sagebrush habitat throughout the sage-grouse range, causing localized impacts to individuals and populations. The impacts are not anticipated to occur evenly across the range; they are expected to occur primarily upon private lands and likely near existing developed areas as populations expand. Fifty-three percent of the occupied range is on federally owned lands where urban and exurban development is unlikely to occur, although associated infrastructure and indirect effects are possible. Existing urban and exurban development will continue to affect sagebrush habitat at many locations scattered throughout the sage-grouse's

range, causing impacts to individuals or populations. Substantial private land conservation efforts that are consistent with the recommendations of the COT Report (USFWS 2013, pp. 50–51), including SGI's completion of more than 182,870 ha (451,884 ac) of conservation easements, have minimized potential impacts of new development throughout the range.

Recreation

In 2010, we evaluated the effect of recreation on sage-grouse and concluded that it was not a threat to the species (75 FR 13910, March 23, 2010, pp. 13984–13985). We have no new information at this time to change the conclusion that recreation is not a threat to the species. Recreational hunting of sage-grouse is discussed in another section (see, *Hunting*) and is not discussed in this section.

Recreational activities occur across the range of the species (42 of the 48 sage-grouse populations; USFWS 2013, pp. 16–29), but are of limited severity and typically concentrated in specific, designated areas, such as trails and campgrounds. Recreational activities include hiking, camping, fishing, horseback riding, mountain biking, off-highway vehicle use, and wildlife viewing (Ouren *et al.* 2007, p. 2; Ibrahim and Cordes 2008, p. 14; Knight 2009, p. 167; NDOW 2014, p. 1). The majority (72 percent) of recreational visits to BLM-administered lands occurred in areas not containing sagebrush (ECONorthwest 2014, p. 13), indicating that sage-grouse habitat may be affected less frequently by recreation than other areas. Little information exists about the level of impacts that may be occurring from recreational activities (ECONorthwest 2014, p. 13); however, off-highway vehicle impacts to sage-grouse habitat have been reported in a few areas in Oregon (Hagen 2011, pp. 197–198). Impacts have also been reported at leks in Oregon and Nevada, where regular lek viewing has caused disturbance (Budeau, Oregon Department of Fish and Wildlife, 2014a, pers. comm.; Espinosa, Nevada Department of Wildlife, 2014a, pers. comm.).

Though limited in extent and frequency, recreational activities can have a variety of direct and indirect effects to sage-grouse. Although rare, people can crush eggs or strike birds with vehicles (Factor E) (Connelly *et al.* 2000b, p. 228; Wiechman 2013, p. 12). Activities could degrade habitat, introduce invasive plants, or increase wildfire risk (Factor A) (NWCG 1999, pp. 6–7, Ouren *et al.* 2007, p. 16; Knick *et al.* 2011, p. 219). Noise and

movement associated with recreational activity may disrupt sage-grouse behavior or movement patterns (Factor E) (Blickley *et al.* 2012, pp. 467–470, Patricelli *et al.* 2013, p. 242). Predation (Factor C) may increase due to increases in trash associated with recreational activities or due to the presence of pets accompanying humans (Knick *et al.* 2011 p. 219; Young *et al.* 2011, pp. 126–127).

Given the limited data about recreational activities occurring in sage-grouse habitat, it is difficult to accurately predict future impacts on sage-grouse throughout the range. However, based on historical and current trends, recreational activities are likely to continue on the landscape indefinitely. Recreational activities may increase over time in correlation to predicted increases in human populations.

Conservation Efforts

Federal Plans—The Federal Plans include conservation measures consistent with the COT Report recommendations (USFWS 2013, p. 50) to reduce recreation impacts (BLM and USFS 2015, entire). The Federal Plans exclude new recreational facilities in PHMA, with limited exceptions when needed for safety or when beneficial to sage-grouse. Off-highway vehicle travel will be limited to existing routes and trails and that have neutral or net positive impacts on sage-grouse in PHMA and GHMA. Additional measures to minimize potential impacts that might result from development of recreational facilities and infrastructure include seasonal and timing restrictions, lek buffers, disturbance caps, and mitigation.

State Plans—The Montana State Plan includes conservation measures, such as seasonal and noise restrictions and lek buffers, to reduce impacts from new recreation facilities on State lands and private lands where State authorization is required (Montana E.O. 10–2014, pp. 4, 13–21). In addition, most States discourage recreational viewing of sage-grouse during the breeding season and do not provide lek locations to the general public (Budeau, Oregon Department of Fish and Wildlife 2014a, pers. comm.; Robinson, North Dakota Game and Fish Department, 2014a, pers. comm.; Schroeder, Washington Department of Fish and Wildlife 2014, pers. comm.; Wightman, Montana Fish, Wildlife, and Parks 2014a, pers. comm.). In addition, Wyoming and Washington have measures to minimize impacts from recreational lek viewing, including wildlife harassment laws (Christiansen, Wyoming Game and Fish Department,

2014a, pers. comm.; Schroeder, Washington Department of Fish and Wildlife, 2014, pers. comm).

Summary of Recreation

In the 2010 finding, we concluded that recreation was not a threat to the species. No additional evidence has been discovered or presented suggesting that recreational activities or the associated impacts have changed since the 2010 finding. Recreation continues to be an activity that occurs sporadically across the range of the species, with some localized impacts, but no population-level effects to the species. Together, the Federal Plans and Wyoming, Montana, and Oregon State Plans reduce impacts from recreation to the areas identified as PHMA and GHMA, which encompass approximately 90 percent of the modeled breeding habitat across the species' range (see *Sagebrush Landscape Conservation Planning* for a detailed discussion of conservation measure implementation and effectiveness). Therefore, we conclude that recreation is not a threat to the species, now or in the future.

Climate Change and Drought

In 2010, we evaluated the effect of climate change and drought on sage-grouse (75 FR 13910; March 23, 2010; pp. 13954–13957). While the direct impact of climate change on sage-grouse was unknown, we found climate change to be intensifying other threats such as fire and invasive species. We found drought not to be a substantial threat to the species across its range.

Climate Change

Our analysis of impacts to sage-grouse attributable to climate change includes the consideration of ongoing and projected changes in climate across the sage-grouse's range. 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). 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). 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. 8–19). In seeking to evaluate the potential impacts of climate change on sage-grouse, we have weighed relevant information, including areas of uncertainty, together with our understanding of sage-grouse biology and ecology.

Increases in global and regional ambient temperature and variable changes in precipitation are projected out to the end of the 21st century (IPCC 2013, p. 19). Some degree of uncertainty is inherent in these and other projections of future change; however, climate change will likely affect to some degree the entire range of sage-grouse, with the greatest potential adverse impacts occurring in the southern Great Basin (Schlaepfer *et al.* 2011, p. 380).

Direct impacts of climate on individual birds are unknown for most species, including sage-grouse (Factor E), but climate is likely to influence the distribution and quality of sage-grouse habitat (Factor A) (Miller *et al.* 2011, pp. 174–179; Gardali *et al.* 2012, p. 3). The natural distribution of sagebrush is driven by soil-water availability (Schlaepfer *et al.* 2014, p. 349; Schlaepfer *et al.* 2015, pp. 7–8), which is influenced by the amount and seasonality of precipitation and by temperature (Bradford *et al.* 2014, p. 595). Changes in precipitation timing and increases in ambient temperature are projected to lead to increased evaporation and transpiration in sagebrush habitat and a lengthening summer period of dry soil conditions (Bradford *et al.* 2014, p. 599). These conditions are projected to be most pronounced along the southern edge of the current distribution of sagebrush (MZs III and VII), and particularly at low elevations (Schlaepfer *et al.* 2015, p. 13; Still and Richardson 2015, p. 33). In these areas, climate change may result in northward and upslope shifts in frost-sensitive woodland vegetation into areas currently suitable for sagebrush (Neilson *et al.* 2005, pp. 153–155; Comer *et al.* 2012, p. 142; reviewed in Friggens *et al.* 2012, pp. 8–11; Rehfeldt *et al.* 2012, p. 126), potentially altering, or displacing sagebrush habitat. It is unknown to what extent these changes could result in habitat loss and fragmentation, but adverse effects to populations could occur if habitat loss exacerbates impacts from other stressors (Johnson *et al.* 2011, pp. 447–450; Miller *et al.* 2011, pp. 183–184; Wisdom *et al.* 2011, pp. 465–468).

Beyond affecting sagebrush directly, the effects of climate change can interact with and increase effects from other stressors (Chambers *et al.* 2014c, p. 368), such as invasive plants, drought, and wildfire. For example, cheatgrass grows best with wet and warm conditions, so increasing temperature coupled with increased winter and spring precipitation is likely to facilitate its spread (Balch *et al.* 2013, p. 174). Combined, these stressors could have additive impacts to sagebrush habitat (Bradford *et al.* 2014, p. 599; Chambers *et al.* 2014c, entire) as discussed further in *Cumulative Effects*. Climate change is likely to shift the distribution of sagebrush at the southernmost extent of the species' range, including areas in MZ III (Schlaepfer *et al.* 2011, p. 380). Any other effects of climate change are unknown at this time, and the extent of potential cumulative effects is also unknown.

Drought

Drought is a natural, periodic occurrence throughout the range of the sage-grouse. Large-scale drought lasting a decade, similar to the 1930s Dust Bowl drought, has occurred once or twice per century on average (Woodhouse and Overpeck 1998, p. 2706; Ault *et al.* 2014, p. 7529), and periodic drought regularly influences sagebrush ecosystems (Bar-Massa *et al.* 2006, p. 1; Miller *et al.* 2011, p. 145; Miller *et al.* 2011, p. 145). In the future, certain portions of the range (MZs I and VI and portions of MZs II and IV) are forecast to have increased risk and higher severity of drought, though the entire range will likely be affected (Cook 2015, p. 6).

Drought impacts to sage-grouse habitat may affect adult survival, nesting success, and chick survival (Factor A). Structural composition of plants vital for sustaining sage-grouse nesting success, including plant height and percent plant cover, may be affected during drought (Hanf *et al.* 1994, p. 41). Decreases in insects and forbs important for sage-grouse chick survival during drought may negatively affect sage-grouse populations (Johnson and Boyce 1990, p. 91; Crawford *et al.* 2004, p. 6; Aldridge and Bridgman 2003, p. 31; Fischer *et al.* 1996, p. 197). Drought has been correlated with declines in populations (Patterson 1952, p. 33; Braun 1998, p. 139) and has coincided with periods of low population levels (Connelly and Braun 1997, pp. 231–232). In the period 1950–2003, drought had a weak negative effect on sage-grouse persistence, with extirpation most likely in areas having three or

more severe droughts per decade (Aldridge *et al.* 2008, pp. 983, 992).

Based on precipitation and temperature projections, drought frequencies are expected to increase across the country, especially in the Rocky Mountain and southwestern States, including all sage-grouse MZs (Strzepek *et al.* 2010, p. 1).

The risk of decade-scale drought occurring within the southern MZs within the sage-grouse range (MZs III, V, and VII and portions of MZs II and IV) this century is estimated between 20 and 70 percent (Ault *et al.* 2014, pp. 7541–7542). The probability of decade-scale drought in the northern MZs (MZs I and VI and portions of MZs II and IV) is between 10 and 50 percent (Ault *et al.* 2014, pp. 7541–7542).

Conservation Efforts

Ameliorating the impacts of climate change and drought to sage-grouse involves addressing other impacts to the species to improve the resilience of the species and its sagebrush habitat under changing environmental conditions. Maintaining large expanses of undisturbed habitat is the best way to address potential impacts that could lead to habitat fragmentation; as discussed in other impacts sections and *Sagebrush Landscape Conservation Planning*, new regulatory mechanisms and conservation efforts are in place to address those potential impacts. In addition, many conservation actions have been implemented to address those other impacts that are most influenced by climate change and drought, such as wildfire, invasive plants, improper grazing, and conifer encroachment. Full discussions of the best management practices, conservation efforts, and regulatory mechanisms associated with these compounding impacts are included under each impact section in *Summary of Information Pertaining to the Five Factors*.

Climate Change and Drought Summary

The understanding of impacts from climate change and drought has not changed substantially from the 2010 finding. Climate change effects on the timing and amount of precipitation could adversely affect sagebrush habitat and food availability, with potential negative consequences for sage-grouse survival and recruitment; however, the extent and nature of this potential impact is not understood. Drought is a natural part of the sagebrush ecosystem, and sage-grouse abundance has been shown to fluctuate in correlation to drought conditions. Climate change and drought are most likely to affect individuals and populations at the

southern extent of the species' range; however, the extent or nature of those effects to sage-grouse are unknown at this time. The greatest concern from climate change and drought is their potential to increase wildfire and invasive plant impacts in the Great Basin. If hotter and drier conditions lead to increased burn rates, then increased habitat loss due to wildfire could be predicted (see *Wildfire and Invasive Plants*, above); however, the extent to which climate change and drought may change burn rates is unknown. Therefore, based on the best available information, climate change and drought are not threats to sage-grouse, now or in the future.

Predation

In 2010, we evaluated the effect of predation on sage-grouse and concluded that predation was not a threat to the species (75 FR 13910, March 23, 2010, p. 13973). We concluded that landscape fragmentation is likely contributing to increased predation on sage-grouse. However, except in localized areas where habitat is compromised, we found no evidence to suggest that predation is limiting sage-grouse populations rangewide. New information developed since that time does not alter our conclusion.

Predation (Factor C) is the most commonly identified cause of direct mortality for sage-grouse during all life stages (Blomberg *et al.* 2013b, p. 347; Caudill *et al.* 2014, p. 808). Rangewide, sage-grouse are exposed to a number of different predators, including raptors, small mammals, and snakes (Schroeder *et al.* 1999, pp. 10–11; Coates *et al.* 2008 pp. 424–425; Lockyer *et al.* 2013, p. 248). However, sage-grouse have co-evolved with their predators, resulting in the development of cryptic plumage and behavioral adaptations that have allowed them to persist despite this mortality factor (Coates and Delehanty 2008, p. 635; Hagen 2011, p. 96). Sage-grouse mortality rates due to predation vary widely by location and time of year, and short-term studies are often not representative of population dynamics for the species across the range (Taylor *et al.* 2012b, p. 337).

The habitat fragmentation and development that began across the sagebrush ecosystem in the late 19th century (see *Habitat Fragmentation*, above) has caused predator dynamics to change (Fichter and Williams 1967, p. 225; Baxter *et al.* 2007, p. 266; Coates and Delehanty 2010, p. 240). Decreased habitat quality and quantity has created a situation in which the sage-grouse are more vulnerable to predation (Connelly *et al.* 1991, p. 524; Coates 2007, pp. 38–

39; Hagen 2011, p. 96). Agricultural development, landscape fragmentation, and encroaching human populations may increase the diversity and density of predators (Summers *et al.* 2004, p. 523; Coates and Delehanty 2010, p. 246; Dinkins *et al.* 2014, p. 639). Degraded and fragmented landscapes can benefit predators by increasing their kill efficiency, as well as subsidizing their food and nest or den substrate (Hagen 2011, p. 100). The abundance of red foxes (*Vulpes vulpes*), raccoons (*Procyon lotor*), crows (*Corvus brachyrhynchos*), and ravens, which historically were rare in the sagebrush landscape, has increased in association with human-altered landscapes (Luginbuhl *et al.* 2001, p. 570). Raven abundance has increased as much as 1,500 percent in some areas of western North America since the 1960s (Coates and Delehanty 2010, p. 244). Several studies have documented negative effects to sage-grouse associated with increased corvid populations (corvids are a group of birds that include ravens, crows, magpies (*Pica* spp.), and jays) (Holloran 2005, p. 58; Coates 2007, p. 130; Conover *et al.* 2010, p. 335; Lockyer *et al.* 2013, p. 242; Coates *et al.* 2014, pp. 73–74; Howe *et al.* 2014, p. 36). Ravens may prefer certain sage-grouse habitats, such as big sagebrush communities and wet meadows, and the abundance of ravens may increase near livestock grazing and agriculture (Coates *et al.*, in press).

High predator abundance within a sage-grouse nesting area may negatively affect sage-grouse productivity without causing direct mortality. The increase in the numbers of corvids within the sagebrush ecosystem is an important change because sage-grouse nests are at greater risk of predation by these visual predators (Conover *et al.* 2010, p. 335). Even low but consistent raven presence can influence sage-grouse reproductive behavior (Bui 2009, p. 32; Dinkins *et al.* 2012, p. 606). Sage-grouse females tend to select nest and brood-rearing locations that are farther away from predator perches and have lower densities of avian predators (Dinkins *et al.* 2012, p. 606; Dinkins *et al.* 2014, p. 637). When nesting in areas with relatively higher abundances of ravens, females reduce the amount of time they spend off their nests, potentially compromising their ability to secure sufficient nutrition to complete the incubation period (Coates and Delehanty 2008, p. 636).

Data are lacking that definitively link sage-grouse population trends with predator abundance. At the rangewide scale, predation is not believed to be a widespread factor limiting sage-grouse

population growth (Connelly *et al.* 2000a, p. 975; Connelly *et al.* 2004, p. 10–1). However, in localized areas where habitat is compromised by human activities, predation could be limiting local sage-grouse populations (Coates 2007, p. 131; Bui 2009, p. 33; Lockyer *et al.* 2013, p. 242). Holloran (2005, p. 58) attributed increased sage-grouse nest depredation to high corvid abundances in western Wyoming, which resulted from anthropogenic food and perching subsidies in areas of natural gas development. Mammalian predators and ravens are suspected of causing sage-grouse population decline and extirpation in Washington (Schroeder *et al.* 2014, p. 10). Raven abundance was also strongly associated with sage-grouse nest failure in Nevada, resulting in negative effects on sage-grouse reproduction (Coates 2007, p. 130; Lockyer *et al.* 2013, p. 242). Studies on increasing raven populations have also been recently conducted in Idaho (Coates *et al.* 2014, entire; Howe *et al.* 2014, entire) and central Utah (Conover *et al.* 2010, entire).

Since 2010, conservation efforts have been implemented to address predation and associated impacts. Conservation measures can limit the effects of predation by preventing habitat fragmentation caused by transmission lines, roads, and nonnative vegetation (Howe *et al.* 2014, p. 46). As discussed in other sections of this finding, regulatory measures provided by the Federal Plans and certain State Plans limit new development within important sage-grouse habitat, thus reducing habitat fragmentation that facilitates increased predation (see *Nonrenewable Energy Development, Mining, Renewable Energy, and Urban and Exurban Development*). Measures to remove predator perches or subsidized food sources could minimize effects, but predator removal programs have not yet proven to be effective, as predator populations quickly rebound without continual control (Coates 2007, p. 152; Hagen 2011, p. 99).

In summary, predation was identified as a potential threat in the 2010 finding and will likely continue to have adverse impacts to local populations, particularly in areas where habitat fragmentation has occurred. Mortality due to nest predation by ravens or other human-subsidized predators is increasing in some areas (*e.g.*, in MZs III, VI, and VII), at times causing local population declines, and in extreme cases, local extirpations. However, information about the rangewide extent of predation is limited and there is no indication that predation is causing a rangewide decline in population trends.

Since the 2010 finding, regulatory mechanisms from Federal Plans and Wyoming, Montana, and Oregon State Plans have been implemented that limit additional future habitat loss and fragmentation to the areas identified as PHMA and GHMA which encompass approximately 90 percent of the modeled breeding habitat across the species' range (see *Sagebrush Landscape Conservation Planning* for a detailed discussion of conservation measure implementation and effectiveness). These restrictions on future development will effectively eliminate new disturbances that remove cover habitat and facilitate the expansion of predators, thus reducing the potential for predation on sage-grouse.

Disease

In 2010, we evaluated the effect of disease (Factor C) on sage-grouse and concluded that disease was not a threat to the species (75 FR 13910, March 23, 2010, p. 13970). In that finding, we determined that, while WNV was affecting some populations, no evidence existed that disease was a substantial mortality factor for the persistence of sage-grouse across the species' range (75 FR 13910, March 23, 2010, p. 13970). We have no new information to indicate that analysis has changed.

Sage-grouse are host to numerous parasites and pathogens (Connelly *et al.* 2004, pp. 10–4 to 10–8; Christiansen and Tate 2011, pp. 114–118). The presence of parasites or pathogens is not synonymous with the presence of disease or population-level impacts (Connelly *et al.* 2004, p. 10–3; Christiansen and Tate 2011, p. 114). To date, most parasites and pathogens found in sage-grouse are not known to cause substantial, chronic mortality or other adverse impacts to sage-grouse populations (reviewed in Christiansen and Tate 2011, pp. 114, 119–125).

West Nile virus is known to have localized impacts to sage-grouse populations (Christiansen and Tate 2011, p. 122; Walker and Naugle 2011, p. 139). Similar to other North American bird species (McLean 2006, p. 54), sage-grouse are highly susceptible to WNV, with mortality rates nearing 100 percent of infected birds (McLean 2006, pp. 53–54; Clark *et al.* 2006, p. 18). West Nile virus is transmitted among birds mainly through a mosquito-bird-mosquito infection cycle that relies on optimal climate conditions and movement of birds (McLean 2006, p. 52). The mosquito (*Culex tarsalis*) is the primary vector of WNV in sage-grouse (Naugle *et al.* 2005, p. 617). Most sage-grouse infected with WNV die in as few as 6

days, but a small proportion of infected birds survive, as evidenced by the presence of WNV-specific antibodies in live birds (Walker *et al.* 2007b, p. 691; Dusek *et al.* 2014, p. 726). High mortality rates from WNV can reduce average annual adult survival, a limiting factor in sage-grouse population growth (Johnson and Braun 1999, p. 81; Taylor *et al.* 2012b, p. 343). Population-level impacts can also result from WNV mortality in juvenile sage-grouse by decreasing recruitment into the breeding population the following year (Kaczor 2008, p. 65; Taylor *et al.* 2012b, p. 343).

West Nile virus has been detected across the species' range, with localized outbreaks occurring in 10 of 11 States and 1 of 2 Canadian provinces in the species' range (WNV has not been detected in Washington or Saskatchewan (USFWS 2014b)); however, sage-grouse are likely to have been infected in Saskatchewan as well (Walker and Naugle 2011, p. 133). West Nile virus infections in other species in Washington suggest that sage-grouse in the Columbia Basin could be exposed to the disease (USGS NWHC 2014). West Nile virus was first detected in sage-grouse in 2003, with localized outbreaks occurring from 2004 to 2009 (Naugle *et al.* 2004, p. 705); no outbreaks have been recorded since 2009 (USFWS 2014b). However, no rangewide disease surveillance program exists to know for certain the extent of outbreaks across the species' range, and it is likely that many WNV-related sage-grouse mortalities go undocumented.

Although WNV is present throughout the range of sage-grouse, on a finer scale WNV presence depends upon water sources that provide aquatic breeding habitat for mosquitoes (Zou *et al.* 2006, p. 1035; Doherty 2007, pp. 60–61). The development of anthropogenic water sources could provide breeding habitat for mosquitoes that contribute to WNV outbreaks. In addition, WNV outbreaks in humans are associated with drought conditions and high ambient temperature in spring and summer (Epstein and Defilippo 2001, p. 106), and drought conditions likely increase the probability of WNV outbreaks in sage-grouse as well. When high temperature and drought combine, sage-grouse are concentrated in shrinking mesic habitats (Schrage *et al.* 2011, p. 2). Under these conditions, contact between mosquitoes and birds increases, and the risk of WNV transmission and an outbreak among sage-grouse is elevated (Walker and Naugle 2011, p. 131).

The primary conservation measure for WNV is the control of mosquitoes and their breeding habitat (Walker and

Naugle 2011, pp. 140–141). Measures that limit development that creates new mosquito breeding habitat or measures that manage existing water features so that mosquitoes cannot use them to breed (e.g., circulating water, using larvicides, or mosquito fish (*Gambusia* spp.)) are most effective in reducing future WNV outbreaks. As discussed in other sections of this finding, regulatory measures provided by the Federal Plans and the Wyoming, Montana, and Oregon Plans limit new development within important sage-grouse habitat, thus reducing the risk of anthropogenic water sources being constructed that could provide mosquito breeding habitat (see *Nonrenewable Energy Development, Mining, Renewable Energy, and Urban and Exurban Development*). In addition, the Federal Plans contain RDFs that will minimize the risk of WNV outbreaks, such as requirements for water feature installation to minimize the likelihood of mosquito breeding (see *Sagebrush Landscape Conservation Planning* for a detailed discussion of conservation measure implementation and effectiveness). The SGI program includes assistance to private landowners to manage water features in a way that minimizes the likelihood of mosquito breeding.

With the exception of WNV, we could find no evidence that disease poses an impact to sage-grouse across the species' range. West Nile virus currently is a localized stressor that has had impacts on some sage-grouse populations, having caused declines and in some cases local extirpations of populations in North Dakota, South Dakota, southeast Montana, and Idaho. In those affected areas, WNV is likely to have an adverse effect on population growth rates, with small populations being at greatest risk of extirpation if outbreaks reduce population size below a threshold where recovery is no longer possible (Walker and Naugle 2011, pp. 137–139, 140). The incidence of WNV is likely to continue across the species' range in the future. The factors most likely to affect future occurrence are climate change and the abundance and the distribution of anthropogenic surface water. Conservation measures that limit and or manage the development of new artificial water sources will minimize habitat availability for mosquitoes that could spread WNV. As noted in our 2010 finding, a complex set of environmental and biotic conditions that support the WNV cycle must coincide for an outbreak to occur, and the annual patchy distribution of the disease is currently keeping population-level

impacts at a minimum (75 FR 13910, March 23, 2010, p. 13970).

Recreational Hunting

In 2010, we evaluated the effect of recreational hunting on sage-grouse and concluded that recreational hunting is not a threat to the species (75 FR 13910; March 23, 2010; p. 13965). In 2010, we also determined that the effects of falconry hunting and poaching are negligible due to their extremely limited extent (75 FR 13910; March 23, 2010; p. 13965). We have no new information about falconry hunting or poaching to change those determinations; therefore, they will not be discussed further in this status review.

During the late 1800s and early 1900s, the sage-grouse was heavily exploited by both commercial and sport hunters (Factor B) (Patterson 1952, pp. 30–33; Autenrieth 1981, pp. 3–11). State wildlife agencies were sufficiently concerned with the observed declines in the 1920s and 1930s that many closed their hunting seasons and others reduced bag limits and season lengths as a precautionary measure (Patterson 1952, pp. 30–33; Autenrieth 1981, p. 10). By the 1950s, populations were considered recovered and recreational hunting was again allowed throughout the range (Patterson 1952, p. 242; Autenrieth 1981, p. 11). In recent years, hunting seasons and bag limits have fluctuated and become more conservative across the species' range as States responded to changing population numbers and perceived threats to birds (Reese and Connelly 2011, p. 104).

In 2014, sage-grouse hunting took place in 8 of the 11 States where sage-grouse occur. Sage-grouse are listed as a threatened species in Washington (Stinson *et al.* 2004, p. 1), and hunting has been closed since 1988. Sage-grouse has not been hunted in Saskatchewan since 1938, and Alberta closed the season in 1996 (Aldridge and Brigham 2003, p. 25). In 1998, sage-grouse was designated as endangered in Canada, and hunting is prohibited there (Connelly *et al.* 2004, p. 6–3). North Dakota closed its hunting season in 2008 due to low lek count numbers, and it has remained closed. South Dakota closed its hunting season in 2013 due to low lek count numbers; it also remained closed in 2014. Montana Fish and Wildlife Commission closed all or parts of 32 counties to sage-grouse hunting in 2014, and shortened the hunting season from 2 months to 1 month.

Sage-grouse hunting is regulated by State wildlife agencies. Hunting seasons are reviewed annually, at which time States can adjust harvest management

based on updated abundance information and adaptive management criteria established in State wildlife management plans. Information on abundance and local habitat conditions is used to make any adjustments to the hunting season necessary to reduce the potential for additive mortality. Seasonal adjustments take the form of changes to the number of permits issued, changes to the season length or bag limit, or total closure of the hunting season. Bag limits and season lengths are relatively conservative compared to prior decades (Connelly 2005, p. 9; Gardner, California Department of Fish and Game, 2008, pers. comm.; USFWS 2014b). Emergency closures, changes in permit numbers, and implementation of more conservative hunting seasons have been used for populations in decline or in areas experiencing other issues of potential concern (Budeau, Oregon Department of Fish and Wildlife, 2014b, pers. comm.; Christiansen, Wyoming Game and Fish Department, 2014b, pers. comm.; Espinosa, Nevada Department of Wildlife, 2014b, pers. comm.; Griffin, Colorado Parks and Wildlife, 2014, pers. comm.; Moser, Idaho Department of Fish and Game, 2014, pers. comm.; Robinson, Utah Division of Wildlife Resources, 2014b, pers. comm.; Wightman, Montana Fish, Wildlife, and Parks, 2014b, pers. comm.).

Recreational hunting is anticipated to continue into the future, though it is difficult to make accurate predictions about specific levels of hunting mortality because States make adjustments annually. Given the downward trend in hunting mortality reported over the last several decades, mortality rates from hunting will likely continue to decrease. Rangewide, hunting seasons are more conservative than in the past, which has resulted in a reduction in sage-grouse hunting mortality across all sex and age classes (USFWS 2014b). Many States have reported estimated hunting mortality to be lower than the 10 percent mortality cap recommended by Connelly *et al.* (2000a p. 976) (Christiansen 2010, p. 12; Budeau 2014b, pers. comm.).

In 2010, we concluded that hunting was not a threat to the species and based on current information about harvest rates, it continues not have substantial impacts to sage-grouse. To date, changes in the management of sage-grouse hunting have resulted in a substantial reduction in sage-grouse hunting mortality rangewide.

Scientific and Educational Use

In 2010, we evaluated the potential overuse of sage-grouse for scientific and educational purposes and determined

that it was not a threat to the species (75 FR 13910, March 23, 2010). Scientific use was occurring at low levels, but no evidence existed to indicate that scientific use was affecting populations or abundance trends. No educational use was known at that time. As discussed further below, we have no new information indicating that the level of utilization for scientific purposes has changed since the 2010 status review.

Sage-grouse are one of the most intensely researched and monitored birds in North America. Scientists researching or monitoring sage-grouse typically observe, approach, capture, handle, band, or attach radio transmitters to individual sage-grouse to study their movements, behaviors, and population dynamics. Translocations have been used for a variety of scientific purposes, such as a management tool to restore or augment declining populations of sage-grouse and to improve the genetic diversity of populations (Alberta Environment and Sustainable Resource Development 2013, p. viii; White 2013, p. 9; Schroeder *et al.* 2014, p. 8; Yakama Nation 2015, entire).

During research-related activities, scientists could unintentionally kill, disturb, or reduce the survival of individual sage-grouse (Factor B) (Connelly *et al.* 2003, p. 32; Gibson *et al.* 2013, p. 773). Despite these potential impacts, sage-grouse mortalities from scientific activities are extremely rare. Annually, less than 3 percent of the sage-grouse captured for research or monitoring activities die as a result of their capture and handling (USFWS 2014b). Radio transmitters have had negative impacts to individual birds (Connelly *et al.* 2003, p. 32; Colorado Parks and Wildlife 2013, p. 48; USFWS 2014b), but no population-level impacts have been observed.

Survival rates of translocated sage-grouse vary from 36 percent in central Idaho (Musil *et al.* 1993, p. 88) to greater than 45 percent in north-central Utah (Baxter *et al.* 2013, p. 809) and 62.4 percent in northeastern California (Bell and George 2012, p. 373). The efficacy of translocation efforts have been questioned because translocation success, as measured by persistence of reintroduced populations or increases of extant populations, has been low (Reese and Connelly 1997, pp. 235–238). However, more recent attempts have been successful (Alberta Environment and Sustainable Resource Development 2014, p. 6; Baxter *et al.* 2006, p. 182). When translocation protocols are followed, translocated female sage-grouse survive just as well as resident

individuals and quickly integrate into the local population (Bell and George 2012, p. 373). Sage-grouse translocated into the Columbia Basin in Washington (MZ VI) have generally survived (White 2013, p. 9; Schroeder *et al.* 2014, pp. 8, 17, 21). Translocations will likely continue at similar rates, and there is no evidence that the removal of sage-grouse from source populations has caused declines in abundance.

In summary, although research or monitoring of sage-grouse could potentially affect individuals, the best available information does not indicate that adverse impacts are occurring at the population level. Information gained through these methods has directly benefited the species. In addition, while translocations have variable success rates, the best available information does not indicate that the translocations affect the populations from which the birds were removed. Although sage-grouse are intensely studied and monitored, there is no evidence to indicate that sage-grouse use for scientific purposes is affecting the species locally or rangewide.

Contaminants

In 2010, we determined that contaminants were not a threat to the sage-grouse (75 FR 13910, March 23, 2010, pp. 13982–13984). Sage-grouse exposed to contaminants may become sick or die (Factor E), and contaminants may reduce or remove sage-grouse habitats (Factor A). Types of contaminants that potentially affect sage-grouse include but are not limited to pesticides, products from mining and energy development, human waste, fire retardants, and airborne pollutants from roads, vehicles, and other machinery (Beck and Mitchell 2000, p. 997; Olsgard *et al.* 2009, p. 178; Hansen *et al.* 2011, p. 593; Christiansen and Tate 2011, p. 125). Contaminants may be intentionally introduced into sage-grouse habitats to improve conditions for crops and livestock, extract nonrenewable and nuclear energy resources, construct infrastructure, and manage wildfires (Larson *et al.* 1999, p. 115; Gibbons *et al.* 2015, p. 105). Spills or leaks along pipelines, highways, roads, and railroads can also unintentionally release contaminants into sage-grouse habitats.

In the past, pesticides were used to remove sagebrush, other unwanted woody shrubs, invasive plants, and nuisance insects in sage-grouse habitats in order to improve conditions for agricultural crops and livestock (Connelly *et al.* 2004, p. 7–28; Beck *et al.* 2012, p. 445). Exposure to pesticides and herbicides can kill sage-grouse,

cause abnormal behavior, or degrade sagebrush habitat (Blus and Connelly 1998, p. 23; Christiansen and Tate 2011, p. 125; Mineau and Palmer 2013, p. 20; Gibbons *et al.* 2015, p. 105). However, Federal and State regulations to protect air and water quality and ban certain pesticides have likely reduced applications in sagebrush habitats. Generally, pesticides and herbicides are now used to improve sagebrush habitats for native wildlife rather than for livestock (Beck *et al.* 2012, p. 446), and properly applied pesticides should not poison sage-grouse (Call and Maser 1985, p. 15; APHIS 2002, p. 10). Furthermore, light applications of some herbicides may benefit sage-grouse by decreasing the shrub canopy and increasing the cover of grasses and forbs that are important to sage-grouse during the nesting and brood-rearing periods (Crawford *et al.* 2004, p. 2). Therefore, pesticides do not likely affect more than individual sage-grouse.

Nonrenewable energy development and chemical spills could expose sage-grouse to contaminants, such as oil, gas, and waste products. Sage-grouse may encounter harmful radiation, metals, minerals, or contaminated fluids and waste released by nuclear facilities, nonrenewable energy developments, and mines (Ramirez and Rogers 2002, pp. 434–435; Beyer *et al.* 2004, p. 116; Hansen *et al.* 2011, p. 593). Although nonrenewable energy development can expose sage-grouse to contaminants, there is only one documented case of a dead, oil-covered sage-grouse discovered in a wastewater pit near an oil and gas well (Domenici 2008, USFWS, pers. comm.). Deaths or injury from wastewater pits are likely rare as sage-grouse typically do not require free water (Schroeder *et al.* 1999, p. 6) and the intense noise, activity, and lack of vegetative cover around the pits likely deter sage-grouse. Therefore, contaminants released from nonrenewable and chemical spills are not likely to affect more than individual sage-grouse.

Conservation Efforts

The risk of exposure to contaminants is often related to anthropogenic activities that also present potential impacts to sage-grouse, such as nonrenewable energy development and mining, as discussed in other sections of this finding. Any conservation measures that minimize the exposure of sage-grouse to those activities also minimize the risk of exposure to contaminants. Regulatory measures provided by the Federal Plans and the Wyoming Plan limit new development within important sage-grouse habitat, thus

potentially reducing the risk of contaminant exposure in those areas (see *Nonrenewable Energy*, and *Mining*). Based on previous Federal plans, we expect these regulatory mechanisms to be implemented for the next 20 to 30 years.

Summary of Contaminants

While potential exposure to contaminants occurs across the species' range, the best available information indicates that killing or injury of birds is rare and has not had population-level impacts. Regulatory mechanisms that substantially reduce new energy development and mining in important habitats further reduce the potential for impacts to sage-grouse. For a detailed discussion of conservation measure implementation and effectiveness, see *Sagebrush Landscape Conservation Planning*.

Military Activity

In 2010, we did not identify military activity as an impact to the species. Since 2010, we have become aware of several military facilities that overlap to varying degrees with the occupied range of sage-grouse and which have confirmed sage-grouse presence. Military installations in Idaho, Montana, Nevada, Utah, Washington, and Wyoming encompass less than 1 percent of the currently estimated sage-grouse range. With the exception of YTC, most of the installations have little habitat or sage-grouse on the property. The YTC contains one of the two sage-grouse populations in MZ VI (Stinson and Schroeder 2014, p. 3), and was designated as a PAC in the COT Report (USFWS 2013, p. 39).

Military training and testing activities have the potential to negatively impact sage-grouse (Factor E) and their habitats. Training activities can ignite wildfires resulting in habitat loss and fragmentation (Factor A). This issue has been a particular concern in MZ VI, where approximately one quarter of the remaining sage-grouse in the MZ are located on YTC (Stinson and Schroeder 2013, p. 3). In addition to impacts from wildfire, habitat can be degraded by cross-country maneuvers with military vehicles if they crush vegetation, compact soil, or introduce invasive plants (Stinson and Schroeder 2014, p. 3). These kinds of impacts are limited, because the levels of military surface training occurring across the sage-grouse range are limited.

Compared to surface training, the military manages more extensive sections of the sage-grouse occupied range as Special Use Airspace for both testing and training. Military training

airspace occurs over portions of all MZs. Recent research has demonstrated that sage-grouse are sensitive to noise (Blickley *et al.* 2012, p. 467); however, this study did not examine aircraft noise (Blickley *et al.* 2012, entire). The behavioral response of sage-grouse to overflight noise has not been examined. Potential impacts include increased detectability by predators and disruption of breeding and nesting behavior if sage-grouse repeatedly flush in response to the noise (Blickley *et al.* 2012, pp. 467–470).

The U.S. military must balance its role of public land steward with its primary mission of maintaining a well-trained, combat-ready fighting force. The Sikes Act (16 U.S.C. 670a–670f, as amended), enacted in 1960 with subsequent amendments, provides for cooperation between the DoD and DOI for planning, developing, and maintaining fish and wildlife resources on military lands (see *Regulatory Mechanisms*, below). The Sikes Act applies to Federal land under DoD control and requires military services to establish Integrated Natural Resources Management Plans (INRMPs) to conserve natural resources for their military installations. Through installation-specific INRMPs, developed in cooperation with the Service and State fish and wildlife agencies, the military has implemented conservation and mitigation actions for sage-grouse.

The YTC continues to manage habitat in Washington that supports one of two populations of sage-grouse in the State. Management of sage-grouse and its habitat at YTC is described in the Western Sage-Grouse Management Plan (Livingston 1998, entire), which is incorporated in the Cultural and Natural Resource Management Plan (CNRMP) (DoD 2002, entire). The CNRMP specifies management prescriptions and actions for sage-grouse and their habitat, including identifying conservation objectives and measures for habitat quantity and quality necessary for maintaining a sage-grouse population at or above the 10-year average of 200 birds. Direct protection of sage-grouse and their habitat is done through timing and area restrictions, including air space restrictions. Vegetation restoration of sagebrush ecosystems is required to address habitat impacted by wildfire and military training activities. Wildfire protection measures are required to prevent, contain, and rapidly extinguish wildfires. Monitoring of sage-grouse and their habitats, including monitoring of habitat restoration activities, is conducted within YTC jurisdictional boundaries.

In 2011, additional measures were implemented to protect sage-grouse on YTC. The Fort Lewis Army Growth and Force Structure Realignment Record of Decision's realigned sage-grouse protection area (SGPA) boundaries to incorporate new sage-grouse habitat use information and updated habitat management objectives (DoD 2011, entire). As a result, all but one active lek on the installation are protected. In addition, vegetation management of five primary containment areas within SGPAs was changed to fit with wildfire management objectives; flight restrictions were revised to cover newly proposed SGPAs; WNV surveillance and control was increased; and construction of forb greenhouse facilities was proposed for use in habitat restoration projects. The Army is currently updating the YTC resource management plan to reflect these improved sage-grouse conservation measures.

Overall, military installations cover less than 1 percent of the species' occupied range, and most installations have little or no sage-grouse habitat on or near their property. The YTC is the only installation where impacts to sage-grouse are a potential concern, in part because two of the four populations in MZ VI occur on that installation. The CNRMP has been effective in minimizing impacts to these populations, and its implementation is expected to continue into the future. Based on studies of noise impacts from others activities, it is possible that overflight noise could affect sage-grouse, but no research has been done to know if this impact actually occurs and any assessment of potential impacts would be speculative.

Small Populations

In 2010, we determined that small population size could result in extirpation of some populations, but was not a threat to sage-grouse rangewide (75 FR 13910, March 23, 2010, p. 13985). As summarized below, although small population size likely places some populations at risk of extirpation, sage-grouse is a widely distributed species with large, interconnected populations at the core of the range (USFWS 2013, pp. 16–29 and Appendix A). As discussed below, we again find that small population size is not a rangewide threat to the species, now or in the future.

Overall, small, isolated populations are more susceptible to impacts and relatively more vulnerable to extinction due to potential losses of genetic diversity, demographic and environmental fluctuations, and susceptibility to environmental

catastrophes (Pimm *et al.* 1988, p. 757; Frankham and Ralls 1998, p. 442). As population size decreases, a population's susceptibility to adverse impacts and its risk of extinction can increase. In general, the minimum population size needed to sustain the evolutionary potential of a species has been estimated to be approximately 500 to 5,000 adult individuals so that the population retains sufficient genetic diversity needed to avoid the detrimental effects of inbreeding (Traill *et al.* 2010, p. 32). Although we know of no published estimates of minimum population sizes in sage-grouse, up to 5,000 individual sage-grouse may be necessary to maintain an effective population size of 500 birds based on individual male breeding success, variation in reproductive success of males that do breed, and the survival rate of juvenile birds (Aldridge and Brigham 2003, p. 30; 75 FR 13910, March 23, 2010, p. 13985).

A number of sage-grouse populations across the species' range have been identified as at risk due to their small

population size (Figure 9 and Table 14). These small populations (Table 14) may lack connectivity to other habitats and populations, and may have experienced negative population impacts from other stressors, such as WNV outbreaks, recent wildfire, habitat loss, and habitat fragmentation (USFWS 2014b). These populations may be at increased risk of extirpation due to their isolation, low population numbers, and continued impacts from natural and human-caused sources (Pimm *et al.* 1988, p. 757). Further, these small populations may be at risk from loss of genetic diversity. For example, populations in Jackson Hole and Gros Ventre in Wyoming and southeastern Montana were genetically isolated with reduced genetic diversity compared to nearby populations (Schulwitz *et al.* 2014, p. 567). Sage-grouse populations in Canada (MZ I) are also small, with less than 100 sage-grouse counted in 2012 (Alberta Environment and Sustainable Resource Development 2013, p. 8). Some of the small populations have already been

estimated below minimum population values (Garton *et al.* 2011, entire; WAFWA 2015, entire), suggesting their ability to persist long term may have already been compromised if that value is correct.

Although small, some of the identified sage-grouse populations may not have experienced declines in genetic diversity. For example, small sage-grouse populations in northern Montana may have a sufficient number of dispersing sage-grouse to maintain genetic diversity. Additionally, despite population declines and habitat loss, sage-grouse populations occupying fragmented landscapes at the northern extent of the species' range (Bush *et al.* 2011, p. 539) and in a peripheral population in northeastern California (Davis *et al.* in press) exhibited high genetic diversity with no evidence that these populations were genetically depressed. However, increased habitat fragmentation could cause demographic declines in these small, peripheral populations (Bush *et al.* 2011, p. 539).

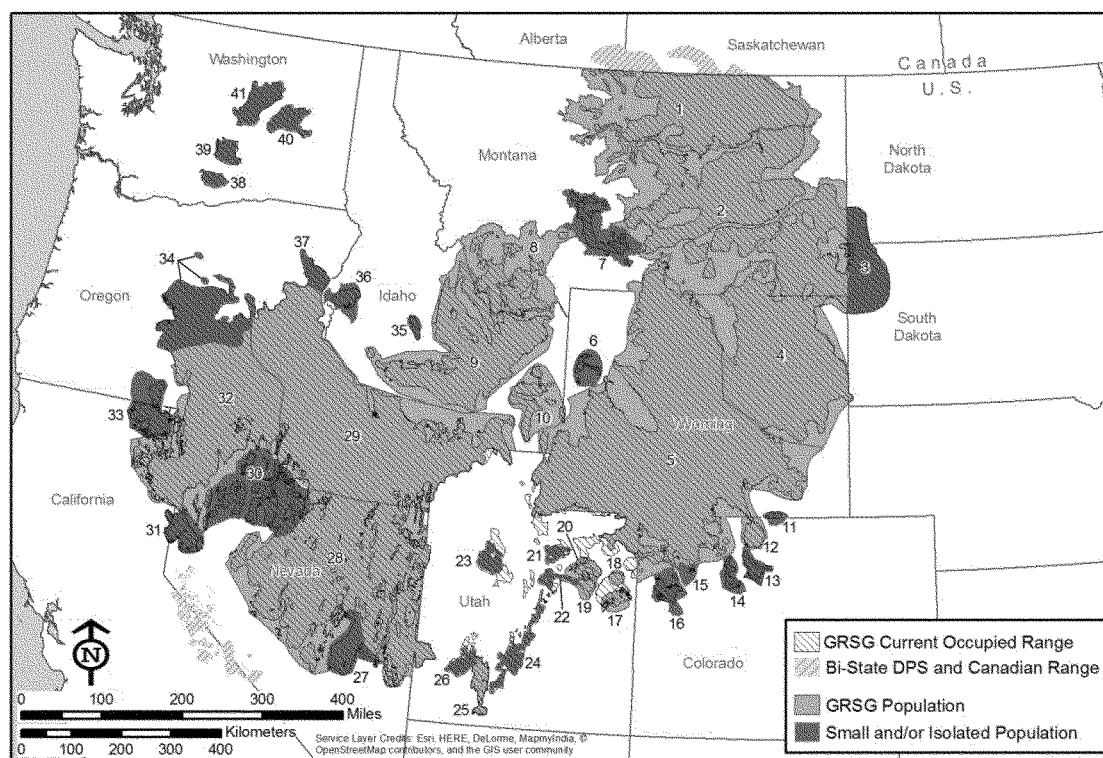


Figure 9. Sage-grouse populations identified as 'small' and/or 'isolated' in the Conservation Objection Team Final Report (USFWS 2013, pp. 16–29). For the purposes of the status review, Ibapah (UT) and Hamlin Valley (UT) were joined with the rest of the southern Great Basin population.

TABLE 14—SAGE-GROUSE POPULATIONS THAT HAVE BEEN IDENTIFIED AS SMALL AND/OR ISOLATED
[USFWS 2013, pp. 16–29]

Management zone	Population ID No.	Population name (state)
I	3	Dakotas (ND/SD).
II	6	Jackson Hole (WY).
	11	Laramie (CO/WY).
	13	Middle Park (CO).
	14	Eagle-South Routt (CO).
III	21	Strawberry Valley (UT).
	22	Carbon (UT).
	23	Sheeprock Mountains (UT).
	24	Parker Mountain & Emery (UT).
	26	Bald Hills (UT).
	30	Northwest Interior (NV).
	27	Quinn Canyon Range (NV).
	¹ 28	¹ 28 Ibapah (UT; <i>portion of the Southern Great Basin</i>).
		Hamlin Valley (UT; <i>portion of the Southern Great Basin</i>).
IV	7	Belt Mountains (MT).
	10	East Central (ID).
	35	Sawtooth (ID).
	36	Weiser (ID).
	37	Baker (OR).
V	31	Warm Springs Valley (NV).
	33	Klamath (OR/CA).
VI	38	Yakama Indian Nation (WA).
	39	Yakima Training Center (WA).
	40	Crab Creek (WA).
	41	Moses Coulee (WA).
VII	15	Meeker-White River (CO).
	16	Parachute-Piceance-Roan Basin (CO).

¹ For the purposes of the status review, the Ibapah (UT) and Hamlin Valley (UT) populations were joined with the rest of the southern Great Basin population.

As summarized above, the potential loss of the small, Columbia Basin populations in Washington (MZ VI), which contain approximately 0.6 percent of the estimated rangewide abundance (Doherty *et al.* 2015, entire), would not represent a significant loss for the status of the sage-grouse as a whole (See *Columbia Basin Population* section). However, the four populations in MZ VI are identified above as being at risk due to small population size and are reliant on management actions, such as translocations, to maintain the population size and its genetic diversity. These populations also face potential habitat loss and fragmentation from agricultural conversion (See *Agricultural Conversion* section above) and military training activities (See *Military Activities* section above). Connectivity between these populations is also very limited (Crist *et al.* 2015, p. 12). Although the populations in MZ VI have declined from historical levels, are exposed to a variety of potential impacts, and have limited connectivity, population trends in MZ VI are currently stable (WAFWA 2015, pp. 40–41), likely due to active management and translocations. Further, the State of Washington has protected sage-grouse as a State threatened species since 1998

and developed a recovery program (Stinson *et al.* 2004, entire).

Although some populations of sage-grouse are small and/or isolated (Table 14), with some at risk of extirpation, the remaining populations of sage-grouse are well distributed across the overall range of the species (see *Distribution and Population Abundance and Trends*, above). The number and size of these more robust populations provide redundancy for the sage-grouse, and the wide distribution of the populations across the species' overall range provides resiliency. Additionally, the rangewide distribution of the larger populations provides representation, by capturing the variation of habitat and climatic conditions across the species' range such that the loss of any of the small populations will not result in the loss of ecological diversity. These small or isolated populations represent only a small percentage of the overall species' range, and the relative population index and their potential loss may affect connectivity (Crist *et al.* 2015, p. 18) but is unlikely to put the entire species at risk now or in the future.

Regulatory Mechanisms

In the 2010 finding, we concluded that existing regulatory mechanisms were inadequate to protect the species

(75 FR 13910, March 23, 2010, p.13982). Since 2010, there have been substantial changes in regulatory protections for sage-grouse and their habitats (Factor D). The most significant change is the Federal Plans and the Montana, Wyoming, and Oregon State Plans, which collectively manage approximately 90 percent of the breeding habitat (See *Sagebrush Landscape Conservation Planning* section above). Combined, these efforts have substantially improved the regulatory mechanisms across the range of the sage-grouse since the 2010 finding, such that we now determine that existing regulatory mechanisms adequately address effects to the species and its habitats (Factor D). Other Federal and State laws and local authorities are discussed below.

Federal Laws

In addition to the Federal Plans, other Federal laws provide regulatory authorities to Federal agencies to address sage-grouse and habitat management for the species.

Other BLM Authorities—The Mineral Leasing Act of 1920, as amended, and the Mineral Leasing Act for Acquired Lands of 1947, as amended, gives the BLM responsibility for oil and gas leasing on BLM, USFS, and other

Federal lands, as well as private lands where mineral rights have been retained by the Federal Government. The Geothermal Steam Act of 1970, as amended (84 Stat. 1566; 30 U.S.C. 1001–1025), provides the Secretary of the Interior with the authority to lease public lands and other Federal lands, including USFS lands, for geothermal exploration and development in an environmentally sound manner. This leasing authority has been delegated to the BLM. The BLM implements the Mineral Leasing Act through 43 CFR 3200.

The General Mining Law of 1872, as amended, opened the public lands of the United States to mineral acquisition by the location and maintenance of mining claims. Mineral deposits subject to acquisition in this manner are generally referred to as locatable minerals. Locatable minerals include metallic minerals (e.g., gold, silver, lead, copper, zinc, and nickel), nonmetallic minerals (e.g., fluor spar, mica, gypsum, tantalum, heavy minerals in placer form, and gemstones), and certain uncommon variety minerals. Under the new Federal Plans, locatable minerals have been recommended for withdrawal in the SFAs. Valid existing rights would not be impacted by these recommended withdrawals. Withdrawals on BLM and USFS lands are processed under the BLM's withdrawal regulations (43 CFR 2310) and, if 5,000 acres or more, shall be subject to the Congressional review provision (43 U.S.C. 1714(c)).

Other Federal Agencies—Other Federal Agencies in the DoD, DOE, and DOI (including the Bureau of Indian Affairs, the Service, and National Park Service) are responsible for managing less than 5 percent of the species' occupied range (Knick 2011, p. 28). Regulatory authorities and mechanisms relevant to these agencies' management jurisdictions include the National Park Service Organic Act (39 Stat. 535; 16 U.S.C. 1, 2, 3, and 4), the National Wildlife Refuge System Administration Act (16 U.S.C. 668dd–668ee), and the Department of the Army's Integrated Natural Resources Management Plans for their facilities within sage-grouse habitats. Due to the limited amount of land administered by these agencies, we have not described them in detail here. However, most of these agencies do not manage specifically for sage-grouse on their lands, except in localized areas (e.g., specific wildlife refuges, reservations). A notable exception, where substantial populations of sage-grouse occur, is the YTC (discussed above under *Military Activity*).

The YTC continues to manage habitat in Washington that supports one of two

populations of sage-grouse in the State. As a joint base, YTC is now a sub-installation of the Fort Lewis McChord Army installation. Management of sage-grouse and its habitat at YTC is dictated by management direction described in their Western Sage Grouse Management Plan (Livingston 1998, entire), which is tied to their CNRMP (DoD 2002, entire), combined with changes contained in the Fort Lewis Army Growth and Force Structure Realignment Record of Decision (DoD 2011, entire) (also known as Grow the Army). The 2002 CNRMP is currently being updated into a newer Integrated Natural Resources Management Plan, but is not yet final. The Grow the Army Final Environmental Impact Statement analyzed the environmental and socioeconomic impacts of stationing approximately 5,700 soldiers and their families at Fort Lewis and additional aviation, maneuver, and live-fire training needs at both installations.

The CNRMP specifies management prescriptions and actions for sage-grouse and their habitat, including identifying conservation objectives and measures for habitat quantity and quality necessary for maintaining a sage-grouse population at or above the 10-year average of 200 birds. Direct protection of sage-grouse and their habitat (*i.e.*, mating, nesting, and brood-rearing) is achieved through timing and area restrictions, including air space restrictions. Vegetation restoration of sagebrush ecosystems is required to address habitat impacted by wildfire and military training activities. Wildfire protection measures are required to prevent, contain, and rapidly extinguish wildfires. Monitoring of sage-grouse and their habitats, including monitoring of habitat restoration activities, are conducted within YTC jurisdictional boundaries. Army participation in sage-grouse recovery planning efforts and adaptive management through implementation reviews are also required.

The Grow the Army Record of Decision realigned sage-grouse habitat and core use area protection boundaries to incorporate new sage-grouse habitat use information and updated habitat management objectives. New leks were incorporated into the management scheme, SGPAs were reconfigured, vegetation management of fire primary containment areas within SGPAs were changed to fit with wildfire management objectives, flight restrictions were revised to cover newly proposed SGPAs, WNV surveillance and control was increased, and construction of forb greenhouse facilities were proposed for use in habitat restoration

projects. The SGPAs currently protect almost all active leks at YTC. The Grow the Army Record of Decision also established Army commitment to updating their Sage-Grouse Management Plan; participating in sagebrush ecosystem conservation partnerships to promote sagebrush ecosystem conservation, restoration, and protection from wildfire in and around the PAC; and establishment of a candidate conservation agreement with the Service.

Coal mining is regulated by the provisions identified in the Surface Mining Control and Reclamation Act of 1977 (SMCRA), which is implemented by the Office of Surface Mining and Reclamation. This Federal law requires consideration of fish and wildlife resource information for the permit and adjacent area, including species listed under the Endangered Species Act, along with a detailed analysis by the permittee on how impacts will be minimized or avoided. SMCRA also requires that activities permitted under this law cannot result in the jeopardy of a listed species, or the destruction of adverse modification of designated critical habitat. Species-specific standards and procedures must also be developed if necessary to protect listed species and their habitats (USFWS 1996). Permittees must also include a plan for enhancement of fish and wildlife resources on the permit area. While SMCRA does not specifically address candidate species, protection must be given to all potential future listed species that may be affected by coal mining activities (USFWS 1996, p. 4).

The OSM has delegated the regulatory authority for implementing SMCRA to five States within the range of sage-grouse: Wyoming, Montana, Utah, Colorado, and North Dakota. Sage-grouse, therefore, must be considered in the implementation of SMCRA, and coal mining, in those States. The implementation agency must consider impacts on fish and wildlife, including sage-grouse. Sage-grouse are also typically addressed in all States within the species' range during the development of coal resources simply due to its status as a State trust resource.

State Mining Regulations

The Utah Executive Order provides a regulatory mechanism to minimize potential effects from mining to sage-grouse habitat on State and private lands (Utah EO 2015–002). The Utah Executive Order requires the Utah Division of Oil, Gas and Mining to coordinate with the Utah Division of Wildlife Resources before issuing

permits for energy development. The Executive Order further directs the Utah Division of Oil, Gas and Mining to implement recommendations provided by the Utah Division of Wildlife Resources that could require avoidance and minimization measures on State and private lands consistent with the conservation plan. However, these measures are subject to the statutory requirements to protect rights on private property and avoid waste of the mineral resource.

State General Wildlife Protection Laws

All States across the range of sage-grouse have laws and regulations that provide for the general protection, conservation, propagation, management, and use of wildlife and that regulate the taking of wildlife, including sage-grouse (see Connelly *et al.* 2004, pp. 2–2 through 2–11). While these statutes limit direct taking of sage-grouse, none provide specific and binding protections for sage-grouse habitat.

Many States have laws to list and protect threatened and endangered species, but these laws vary in their statutory provisions to protect species from threats (George and Snape 2010, pp. 345–346). Sage-grouse are listed as a threatened species by the State of Washington under the authorities of RCW 77.12.020. Threatened status in Washington means that a species cannot be hunted (WAC 2015, 232–12–011) and also requires the State to develop a recovery plan, which must include target population objectives, criteria for reclassification, an implementation plan, and a monitoring plan (WAC 2015, 232–12–297). However, implementation of recovery plan actions is discretionary and subject to funding.

Several States list the sage-grouse as a “species of concern,” (e.g., Montana) or “species of special concern (e.g., California, South Dakota), but these are administrative designations and do not afford any substantive regulatory protections.

State Sage-Grouse Hunting Regulations

Sage-grouse hunting is regulated by State wildlife agencies. Hunting seasons are reviewed annually, and States can adjust limits on updated abundance information and adaptive management criteria established in State wildlife management plans. States maintain flexibility in hunting regulations through emergency closures or season changes in response to unexpected events that affect local populations. As discussed in more detail under the *Hunting* section, 8 of the 11 States with sage-grouse had open hunting seasons for sage-grouse in 2014, with hunting

prohibited in Washington, South Dakota, North Dakota, and Canada (Aldridge and Brigham 2003, p. 25; Connelly *et al.* 2004, p. 6–3; Stinson *et al.* 2004, p. 1). In 2014, Montana closed hunting of sage-grouse across much of the State and reduced the length of the hunting season to respond to population declines (Montana Fish, Wildlife and Parks 2014). South Dakota closed its hunting season for sage-grouse in 2013 and 2014. As evidenced by recent changes, States can and have adopted more conservative hunting seasons based on new information and population levels. Rangewide, hunting seasons are more conservative than in the past, which has resulted in a large reduction in sage-grouse hunting mortality. Therefore, hunting regulations are adequate in managing hunting impacts to sage-grouse.

State Noxious Weed Laws

Some State regulations require that landowners control noxious weeds on their property, but designations of noxious weeds and the development of noxious weed lists vary by State. For example, only five States list medusahead as a noxious, regulated weed, but the grass is problematic in at least two additional States. Similarly, despite the proliferation of cheatgrass across the range of the sage-grouse, Colorado is the only western State that recognizes the grass as a noxious weed (USDA 2015). Therefore, State regulations that address noxious weeds may help reduce impacts to sage-grouse in local areas, but large-scale control of the most problematic invasive plants is currently unfeasible and uncoordinated (Pyke 2011, p. 543; Ielmini *et al.* 2015, pp. 2–3). While State noxious weed laws are not effectively addressing potential impacts from invasive plants, measures provided by the Federal and State plans, as discussed above, have substantially reduced the potential threat of invasive plants (see *Wildfire and Invasive Plants*).

Canadian Federal and Provincial Laws and Regulations

Sage-grouse were first listed in Canada in 1997 as threatened by the Committee on the Status of Endangered Wildlife in Canada because of very small and declining populations in Saskatchewan and Alberta. The species' status was changed to endangered in 1998, and sage-grouse are now federally protected in Canada as an endangered species under schedule 1 of the Species at Risk Act (SARA). This designation protects sage-grouse and their nests and eggs on Federal lands and prohibits unauthorized killing, harming,

harassing, capturing, taking, possessing, collecting, buying, selling, or trading of individuals of the species (SARA 2002, p. 17). SARA also provides for identification of habitat on Federal lands that is critical to the survival and recovery of species designated as threatened or endangered, and the Canadian Government is responsible for ensuring that critical habitat is protected. Although voluntary measures are the preferred method for protecting critical habitat, SARA provides the means for the government to promulgate regulations to ensure that critical habitat is not destroyed (SARA 2002, pp. 27–30). However, at this time, no such regulations have been developed for sage-grouse critical habitat.

On December 4, 2013, the Canadian Government issued an Emergency Order for the protection of the sage-grouse under SARA (CWS 2013, entire). The Emergency Order prohibits construction of new tall (greater than 1.2 m [3.9 ft]) structures, new roads, and new fences and destruction of native plants, and requires nightly noise reduction in April and May (CWS 2013, p. 112). These restrictions apply to critical habitat identified on 1,672 km² (646 mi²) of Federal and provincial crown lands in southeastern Alberta and southwestern Saskatchewan (CWS 2013, p. 111).

In 2014, the Canadian Government finalized an amended recovery strategy for sage-grouse (Environment Canada 2014, entire). In addition to updating the 2008 document to reflect the most recent scientific information about the status of sage-grouse in Canada and establishing population objectives, the 2014 amended strategy completed the identification of critical habitat for the species in accordance with SARA (Environment Canada 2014, p. 23). The 2008 recovery strategy did not identify critical habitat, citing a lack of information (Lungle and Pruss 2008, p. 27). In 2009, a replacement for the critical habitat section of the strategy identified “necessary, but not sufficient” critical habitat in breeding, nesting, and brood-rearing habitat for sage-grouse in Alberta and Saskatchewan (Lungle and Pruss 2009, p. 2) for a total of 165 km² (63 mi²). The amended recovery strategy identifies 2,812 km² (1,086 mi²) of year-round habitat and 12.5 km² (4.8 mi²) of lek critical habitat in Saskatchewan and Alberta (Environment Canada 2014, pp. 23–30). Therefore, as a result of the amended recovery strategy and the Emergency Order combined, a total of 3,354 km² (1,295 mi²) of Federal and provincial crown lands in Saskatchewan and Alberta, including Grasslands National Park in Saskatchewan, is

identified as critical habitat for sage-grouse (Environment Canada 2014, p. iv; Parks Canada 2015, p. 693). The amended recovery strategy also includes numerous nonregulatory actions for the protection of critical habitat and the recovery and conservation of sage-grouse.

The sage-grouse is listed as endangered at the provincial level in Alberta and Saskatchewan, affording additional protections to the species on provincial and private lands. Recreational hunting has been closed in Saskatchewan since at least the 1930s (Weiss and Prieto 2014, p. 1), and in Alberta since 1995 (Alberta Environment and Sustainable Resource Development 2013, p. 1). In Saskatchewan, sage-grouse were designated as threatened in 1987 under The Wildlife Regulations (Saskatchewan 1981, entire), and as endangered in 1999 under the province's Wildlife Act of 1998 (Weiss and Prieto 2014, pp. 1, 13). The Wildlife Act states that, without a license, no one may "kill, injure, possess, disturb, take, capture, harvest, genetically manipulate or interfere with or attempt to do any of those things . . . export or cause to be exported from Saskatchewan . . . [or] traffic in" designated species (Saskatchewan 1998, p. 20). Sage-grouse habitat in Saskatchewan is protected under The Wildlife Habitat Protection Act, which prohibits sage-grouse habitat from being sold or cultivated (Saskatchewan 1983, p. 4). Restrictions put in place under the Wildlife Act formerly prohibited development within 500 m (1,640 ft.) of leks and prohibited construction activities within 1,000 m (3,281 ft.) of leks between March 15 and May 15 (Aldridge and Brigham 2003, p. 32). In our 2010 finding, we deemed these buffers inadequate to protect sage-grouse from disturbance. These activity restrictions were revised in 2012 to increase lek buffers to 3,200 m (10,499 ft.); include 1,000-m (3,281-ft) buffers between development and lekking, brood-rearing, and wintering habitat; and make these restrictions apply year-round instead of only during the breeding season (Environment Canada 2014, p. 16; Weiss and Prieto 2014, p. 13).

Alberta's Wildlife Act requires that an Endangered Species Committee provide recommendations to the provincial Minister regarding designation of endangered species in Alberta and development of recovery plans, which may include population goals, conservation strategies, and the identification of critical habitat (Alberta Wildlife Act 2000, p. 13). The law states that "[a] person shall not willfully

molest, disturb or destroy a house, nest or den of prescribed wildlife" (Alberta Wildlife Act 2000, p. 25), but does not require development and implementation of recovery plans for species designated as endangered. However, Alberta Environment and Sustainable Resource Development has designated more than 3,880 km² (1,500 mi²) as conservation habitat for sage-grouse, including areas adjacent outside of federally identified critical habitat (Nicholson, Alberta Environment and Sustainable Resource Department, 2015, pers. comm.). All known active and inactive leks are protected by 12-ha (30-ac) Protective Notations designated by the Province, and Protective Notations covering the range of sage-grouse in Alberta prohibit public land sales and potentially restrict surface development (Alberta Environment and Sustainable Resource Development 2013, pp. 19–20). In addition, in 2013 the Alberta Department of Energy restricted all new surface access for oil and gas development through subsurface addenda to leases or other drilling rights accorded to private businesses (Nicholson, Alberta Environment and Sustainable Resource Department, 2015, pers. comm.). Aside from Protective Notations, regulation of new surface access, and the protection of individual sage-grouse by provincial law, efforts to recover the species and protect its habitat in Alberta (e.g., Alberta Environment and Sustainable Resource Development 2013, pp. 18–21) are nonregulatory.

Regulatory Mechanisms Summary

In 2010, we concluded that regulatory mechanisms in place at that time were not adequate to reduce the threats to the species and its habitat, and that the absence of adequate regulatory mechanisms was a threat to the species, then and into the foreseeable future. Since then, there have been major changes in the regulatory mechanisms that avoid or minimize impacts to sage-grouse and their habitats. Most importantly, BLM and USFS adopted amended or revised Federal Plans to conserve sage-grouse over more than half of its occupied range (See *Federal Plans* section above). The Federal Plans include provisions to address activities that could occur in sage-grouse habitats and threats identified in 2010 as having inadequate regulatory measures including: Oil and gas development, wildfire and invasive plants, infrastructure, and improper livestock grazing. In addition, the Federal Plans include provisions to avoid or minimize impacts authorized in sage-grouse habitats for monitoring, adaptive

management, limitations on anthropogenic disturbance, and requirements for mitigation. The Federal Plans are the foundation of land-use management on BLM and USFS managed lands. We are certain that the Federal Plans will be implemented and that the measures included are based on the best scientific information and are effective at avoiding and minimizing impacts to the species and its habitat.

Since 2010, of the 11 States within the occupied range of the sage-grouse, 10 have revised and adopted grouse conservation plans and regulatory mechanisms to address threats to the species and its habitat identified in 2010. State sage-grouse conservation plans in Wyoming, Montana, and Oregon contain regulatory mechanisms that minimize impacts to the species and its habitat. Since 2008, the Wyoming Plan has effectively minimized impacts within core habitats, protecting the highest density areas for the species within the State. The Montana and Oregon regulatory mechanisms include proven conservation measures, including disturbance caps, density restrictions, and lek buffers, to minimize disturbance to important habitats. In combination, the Federal and three State plans, cover 90 percent of the sage-grouse breeding habitat. Taken together, these efforts have substantially altered the regulatory landscape across the range of sage-grouse since the 2010 finding, such that we now determine that existing regulatory mechanisms adequately address effects to the species and its habitat (Factor D).

Other Conservation Plans

Since 2010, all States except California have drafted, revised, finalized, or implemented conservation plans for the sage-grouse to address threats to the sage-grouse. These plans take different approaches, but in general, they identify important conservation objectives and provide mechanisms to incentivize conservation. We anticipate that state plans and related efforts will continue into the future and will strengthen as implementation continues. In this section we provide a summary of the non-regulatory conservation plans (See *Conservation Efforts* section above for a description of the Wyoming, Montana, and Oregon Plans and the *Regulatory Mechanisms* section above for a description of the Utah Executive Order).

California

California does not have a State Sage-grouse Conservation Plan. California

recognizes sage-grouse as a State-species of special concern that should be considered during the State's environmental review process. The California Environmental Quality Act (CEQA) (Public Resources Code sections 21000–21177) requires that State agencies, local governments, and special districts consider impacts that their proposed project may have to species of concern, including sage-grouse.

Colorado

Colorado has contributed to greater sage-grouse conservation and research, working with numerous partners over the last several decades. This coordination spans from local and State levels, to rangewide participation. The State conservation plan for greater sage-grouse (State of Colorado 2008, entire) has been implemented since 2008 over 1.5 million ha (approximately 3.7 million ac) across all landownership types. The plan uses voluntary conservation strategies to address and promote the conservation of sage-grouse in Colorado. It provides guidance to address impacts to sage-grouse from habitat fragmentation and conversion, agriculture, urbanization, conifer encroachment, recreation, nonrenewable energy, and other impacts.

The plan and the State of Colorado recommend measures to help reduce impacts from nonrenewable energy development. Colorado regulations require that effects to sage-grouse be considered by the Colorado Oil and Gas Conservation Commission (COGCC) and the Colorado Department of Reclamation and Mining Safety during their permitting processes. In addition, Colorado Parks and Wildlife (CPW) makes recommendations based on the State's conservation plan designed to reduce impacts to greater sage-grouse from nonrenewable energy development (State of Colorado 2008, pp. 22, 109, 123, 313, 325–331).

In addition, the State of Colorado issued an Executive Order (Colorado E.O. D 2015–004) in May 2015 to promote the conservation of greater sage-grouse and further implement the 2008 conservation plan. This order enhances communication and coordination among State agencies, including CPW, the State Land Board, and COGCC, as well as designating a single point of contact for external greater sage-grouse communications. Under the order, the COGCC will evaluate its existing wildlife siting rules for potential improvement and develop a comprehensive tracking system for development in sensitive wildlife habitat. Lastly, the order also prioritizes

the completion of the Colorado Habitat Exchange, a voluntary compensatory mitigation tool for impacts to the species.

Dakotas

North and South Dakota finalized State management plans that emphasized working cooperatively with private landowners due to the relatively large acreages of private lands in those States. Both States have provided assistance working through the Sage Grouse Initiative under NRCS and are continuing sage-grouse research efforts to prioritize the best sage steppe habitat for conservation, expand core areas, and further their understanding of WNV. Both States have closed sage-grouse hunting seasons.

South Dakota has provided additional firefighting resources and in the past has restricted off-road travel if drought conditions may elevate fire danger during hunting seasons (State of South Dakota 2014, p. 23). Further, the South Dakota Department of Game, Fish and Parks works with the South Dakota School and Public Lands Office, Public Utilities Commission, and the Department of Environment and Natural Resources to provide comments and input if oil and gas development, wind development, or other proposed projects may impact sage-grouse core areas (State of South Dakota 2014, pp. 23, 24).

Idaho

Earlier this year, the Governor signed an Executive Order adopting Idaho's Sage-grouse Management Plan, which focuses on the management of invasive vegetation, fuels and wildfire (Idaho E.O. 2015–04). The plan provides wildfire suppression guidance to complement Secretarial Order 3336, and commits the State to assist with fire rehabilitation and with implementation of fuel breaks, weed control, and conifer removal in mixed State and Federal ownerships. Under the plan, Idaho assumes responsibility for development, coordination, and equipping and training for Rangeland Fire Protection Associations to provide rapid response to sagebrush fires. In FY 2016 the Idaho legislature appropriated over \$500,000 for various sage-grouse conservation efforts of which \$120,000 was dedicated to better support RFPA implementation and effectiveness (S–1128). In Idaho, RFPAs currently account for approximately 230 firefighters in 6 areas in Idaho resulting in protection of approximately 5.7 million acres within greater sage-grouse habitat. An additional 4 RFPAs are in development within greater sage-grouse habitat. Idaho's Governor directed that all State

agencies, to the extent consistent with existing State law, apply the elements of Idaho's Sage-grouse Plan to all land ownerships across the State (Idaho E.O. 2015–04).

Nevada

The State of Nevada has implemented several measures to conserve habitat in the State. On September 26, 2008, the Governor of Nevada signed Executive Order 2008–10–29 calling for the preservation and protection of sage-grouse habitat in the State of Nevada. The Executive Order directs the Nevada Department of Wildlife (NDOW) to work with State and Federal agencies and the interested public to implement Nevada's conservation plan for sage-grouse (Nevada E.O. 2008–10–29). The Executive Order also directs other State agencies to coordinate with the NDOW in these efforts. Further, the Nevada Conservation Credit System establishes a mitigation market to facilitate exchanges between credit sellers and buyers. In November 2012, the Governor signed Executive Order 2012–09 establishing the Sagebrush Ecosystem Council, a multiagency and multidiscipline group that was tasked with developing a conservation strategy for sage-grouse in Nevada. In October 2014, the Sagebrush Ecosystem Council finalized the Nevada Greater Sage-grouse Conservation Plan (State of Nevada 2014, entire). The Nevada plan creates the Conservation Credit System, which creates financial incentives for private landowners to conserve sage-grouse habitat for use as compensatory mitigation. Nevada's plan requires that any development that affects greater sage-grouse habitat in Nevada will need to acquire credits to compensate for those effects before the development proceeds. In addition, on June 23, 2015, the Governor signed emergency regulations related to the formation of Rural Fire Protection Associations (RFPAs) within the State of Nevada (NRS 472 per AB 163, sec. 3.5(1) of the 78th Session of the Nevada legislature). RFPAs, as seen in other States, help support fire suppression efforts by adding capacity and resources for fire suppression.

Utah

Utah issued a final conservation plan for the sage-grouse on February 14, 2013, and the Governor of Utah's Executive Order (Utah E.O. 2015/002) mandated its implementation on February 25, 2015. Utah's Plan and Executive Order includes mechanisms aimed at addressing threats to sage-grouse associated with fire, invasive species, predation, conifer

encroachment, recreation, energy development, and the removal of sagebrush. The Utah Plan applies to all lands within the State's 11 Sage-Grouse Management Areas (SGMAs) across approximately 3 million ha (7.5 million ac), which conserves 90 percent of the State's greater sage-grouse habitat and approximately 94 percent of the State's population. Many of the conservation measures in the plan are voluntary and rely on negotiated incentive-based covenants, easements, or leases to achieve conservation on private lands, School and Institutional Trust Administration Lands, and local government lands (See Regulatory Mechanisms section above for a discussion of the Utah Executive Order). In 2014, Utah's incentive-based approach, coupled with efforts from State, Federal, and private partners, exceeded the Utah conservation plan objectives, reporting 249,170 acres of habitat enhancement and restoration (UDNR 2014, p. 5).

The Utah Plan addresses fire control, suppression, and rehabilitation by providing an organizational framework for partners to prioritize suppression efforts and fire rehabilitation, and leverage funding and agency resources (State of Utah 2013, p. 13). The Utah Governor's Executive Order also directs the Utah Division of Forestry, Fire and State Lands to prioritize fuels-mitigation activities and pre-attack planning and coordination with other Federal and local fire suppression partners, second only to the protection of human life and structures (State of Utah 2015, p. 4). Furthermore, the Utah Governor's Catastrophic Wildfire Reduction Strategy was completed in 2013, establishing a Statewide steering committee and regional working groups to develop a Statewide risk map that will include prioritized sage-grouse habitat areas (UDNR 2014, page 10).

Washington

Sage-grouse are State-listed as threatened in Washington. The State's recovery plan and actions implemented to date have relied heavily on voluntary conservation actions, on which the State and its partners have made progress (Stinson *et al.* 2004, entire). For example, sage-grouse have been translocated to the Columbia Basin from Idaho, Oregon, Nevada, and Wyoming to help supplement and maintain the Washington population (Livingston *et al.* 2006, pp. 2–3; Schroeder *et al.* 2014, pp. 8, 14–15).

Finding

As required by the Act, we considered the five factors in assessing whether the

sage-grouse is endangered or threatened throughout all of its range. We examined the best scientific and commercial information available regarding the past, present, and foreseeable future threats faced by sage-grouse. Foreseeable future describes the extent to which we can reasonably rely upon predictions about the future (DOI 2009). In this context, "reliable" does not mean "certain": It means sufficient to provide a reasonable degree of confidence in the prediction. Because information for each threat may be reliable for different periods of time, each threat may have different extents of foreseeability. The final conclusion may be a synthesis of this information.

For the purposes of this determination, we conclude that the foreseeable future is 20 to 30 years. This timeframe is based on the time horizons for which various threats can be reliably projected into the future. Many of the analyses on which we have relied, such as the fire modeling and the period for climate change predictions, cover a 30-year timeframe. Additionally, other potential threats will be governed by Federal and State Plans across the most important habitats as long as these plans are in place. Based on our assessment of existing BLM and USFS land use plans, the typical lifespan is 20 to 30 years (BLM 2015g). While these plans are in place, the extent of impacts from energy development, infrastructure, grazing, mining, and other regulated activities will be dictated by stipulations in these plans. Therefore, we can reliably predict over 20 to 30 years the extent of impacts from fire, climate change, and potential effects to the species and habitat addressed by the Federal Plans. Beyond these timeframes is a high degree of uncertainty, which precludes credible predictions of the effectiveness of actions that will be implemented beyond the planning horizon and how the species may or may not respond. Exceeding this timeframe, we have concluded, goes into the realm of speculation.

Our regulations direct us to determine if a species is endangered or threatened due to any one or a combination of the five threat factors identified in the Act (50 CFR 424.11(c)). We consider cumulative effects to be the potential threats to the species in totality and combination; this finding constitutes our cumulative effects analysis. The discussions above evaluated the individual impact of the following potential threats to the sage-grouse: Nonrenewable energy development (Factor A), infrastructure (Factor A), agricultural conversion (Factor A), wildfire and invasive plants (Factor A

and E), improper grazing (Factor A), free-roaming equids (Factor A), conifer encroachment (Factor A), mining (Factor A), renewable energy (Factor A), predation (Factor C), disease (Factor C), urbanization (Factor A), recreation (Factor A), climate change (Factor E), drought (Factor A), hunting (Factor B), scientific and educational use (Factor B), contaminants (Factor A), military activities (Factor A), and small populations (Factor E). We also evaluated the inadequacy of existing regulatory mechanisms (Factor D). As discussed above, based on new information and effective regulatory mechanisms implemented since the 2010 finding, we determined that none of these impacts are substantial threats to the sage-grouse individually. Additionally, despite past reductions in occupied range, sage-grouse currently occupy 56 percent of their historical range. In this section, we evaluate whether some or all of these impacts act cumulatively to increase the overall scope and magnitude of potential effects to the sage-grouse now and into the foreseeable future such that cumulative effects are a threat to the species.

The sagebrush ecosystem has changed over time. Prior to the influence of human settlement, the sage-grouse inhabited parts of 13 states and 3 Canadian provinces. Before European settlers converted sagebrush habitats to croplands and pasturelands in the 1800s, natural events, such as blizzards, droughts, and large wildfires historically impacted sage-grouse. With the arrival of European settlers, agricultural conversion, urbanization, energy development, and other activities increased the loss and fragmentation of sage-grouse habitats across the overall range. Due to the historical loss and fragmentation of sagebrush habitats, sage-grouse now occupy approximately 56 percent of their historical range. Despite historical losses of occupied range, today the sage-grouse is relatively well-distributed across portions of 11 states and 2 Canadian provinces. The sagebrush ecosystem upon which the sage-grouse depends remains one of the largest, most widespread ecosystems in the United States, spanning approximately 70 million ha (173 million ac).

Declines in the extent of the sagebrush ecosystem and sage-grouse populations have been a concern for more than 25 years. Since 1999, we have reviewed 8 petitions and reviewed the status of the species 3 times. In our first evaluation completed in 2005, we found that listing the sage-grouse was not warranted because the species occurred over a large area and potential threats

were not well defined. In 2010, we determined that sage-grouse were warranted for listing due to a long-term decline in abundance throughout their range, habitat loss and fragmentation, and inadequate regulatory mechanisms to address threats.

The 2010 finding serves as the baseline for this current review. In the 2010 finding, we concluded that sage-grouse was warranted for listing because of habitat loss and fragmentation due to a variety of causes, such as nonrenewable energy development, agricultural conversion, wildfire, and infrastructure and the inadequacy of regulatory mechanisms to address these conditions. We acknowledged the existence of substantial landscape elements containing high-quality habitat and abundant sage-grouse, particularly in southwestern Wyoming and in the northern Great Basin, but expressed concern that, without adequate regulatory mechanisms, habitat loss, and abundance, declines would continue (75 FR 13910, March 23, 2010, pp. 13986–13988). As noted in that finding, when determining its listing priority status, we considered the threats that the sage-grouse faced to be moderate in magnitude because the threats did not occur everywhere across the range, and, where they were occurring, they were not of uniform intensity or of such magnitude that the species required listing immediately to ensure its continued existence. While sage-grouse habitat had been lost or altered in many portions of the species' range, substantial habitat still remained to support the species in many areas of its range (75 FR 13910, March 23, 2010, pp. 14008–14009).

In the 2010 finding, we identified the types of conservation actions that would remediate or ameliorate these threats, and encouraged land managers and other interested parties to implement such measures. In particular, we noted that the Federal Plans could provide adequate regulatory mechanisms to address the threats of nonrenewable and renewable energy development and infrastructure if they were amended to consider sage-grouse conservation needs (75 FR 13910, March 23, 2010, p. 13982). Further, we recommended changes in prevention, suppression, and restoration activities to address threats from the wildfire and invasive plant cycle. This current finding describes the extent to which recent conservation efforts—particularly the Federal and State Plans—have addressed the impact of potential threats and positively affected the species' status.

Since 2010, Federal and State agencies have collaborated on the

development of landscape-scale conservation efforts to protect the most important habitats across the range of the species (as discussed in detail in *Changes Since the 2010 Finding*, above). The 2013 COT Report outlined where those most important habitats occurred (also known as PACs) and identified them as the areas necessary for species' resilience, redundancy, and representation. The COT Report also provided conservation objectives and recommended conservation actions to preserve the PACs and served as the foundation of a landscape-level conservation strategy (Federal, State, and private) developed and implemented by BLM, USFS, SGI, the States of Wyoming, Montana and Oregon, and private landowners. Together, the Federal Plans, Wyoming Plan, Montana Plan, and Oregon Plan reduce potential threats on 90 percent of sage-grouse breeding habitat across the species' range. These conservation efforts result in the preservation of large expanses of undisturbed habitat supporting the largest, best-connected sage-grouse populations into the foreseeable future.

The Federal Plans, Wyoming Plan, Montana Plan, and Oregon Plan provide adequate regulatory mechanisms to reduce the threats of human-caused habitat disturbance on the most important sage-grouse habitats (as discussed in detail in the *Changes Since the 2010 Finding*, above). The Federal Plans designate PHMAs, and the State Plans designate Core Areas, all of which correspond closely with the PACs identified in the COT Report and include important breeding and seasonal habitats for the species. The PHMAs and Core Areas are managed for sage-grouse habitat objectives, primarily by excluding or avoiding major new surface-disturbing activities that could cause habitat destruction (BLM and USFS 2015, entire). For example, in many important habitats, the Federal Plans require NSO for nonrenewable energy development, which results in no new oil and gas wells or associated infrastructure being constructed within PHMAs. For the few ongoing land uses that could continue to occur in PHMAs, such as limited wind development in certain areas and existing rights for nonrenewable energy or mining, the Federal, Wyoming, Montana, and Oregon Plans work together to limit the total amount of human-caused habitat disturbance on PHMAs and Core Areas to no more than 3 to 5 percent. To prevent indirect impacts to sage-grouse that could occur from land uses in areas outside of PHMAs and Core Areas, the

Federal Plans, Wyoming Plan, Montana Plan, and Oregon Plan all require lek buffers so that breeding birds will not be disturbed by human activities. Lastly, the Federal Plans require any project that may adversely affect sage-grouse (in both PHMA and GHMA) to minimize impacts by implementing RDFs and mitigating to a net conservation benefit for sage-grouse. As a result of these measures, the Federal and three State Plans reduce the potential threat of habitat loss caused by human-caused disturbances on approximately 90 percent of breeding habitat across the species' range. These measures were effective immediately upon the implementation of the Federal Plans, the Wyoming Plan, the Montana Plan, and the Oregon Plan and will be in place for the next 20 to 30 years.

Wildfire and its interaction with invasive annual grasses, especially cheatgrass, is a significant risk to the sage-grouse and its habitat. In 2010, we determined that the combination of wildfire and invasive plants was a threat to the sage grouse and a major contributor to our finding that protection for the sage-grouse was warranted. Some wildfires will continue in the Great Basin, as we cannot manage the lightning strikes that spark many wildfires. Between 2000 and 2014, just less than one percent of sage-grouse habitat has burned per year. A recent modeling study predicts there could be a 43 percent decline in sage-grouse abundance within the next 30 years unless effective management is implemented to reduce the effects of wildfire and invasive plants.

The Federal and State Plans include commitments to change ongoing land uses and to prioritize wildfire management and invasive plant treatments in ways that reduce the synergistic threat of flammable invasive vegetation and altered wildfire regimes to sage-grouse habitats (as discussed in detail in *Changes Since the 2010 Finding*, above). Within the Great Basin, where wildfire is most prevalent, the majority of breeding habitat is in habitats that are most resilient to invasive plants and wildfire. To reduce the magnitude and severity of future wildfires, FIAT assessments prioritize wildfire and invasive plant management strategies in those most resilient areas that reduce the risk of habitat loss from wildlife and invasive plants. Fire and its impacts will be managed across the landscape by the implementation of the FIAT assessments and the Secretarial Order that prioritize suppression of wildfire in sage-grouse habitat. When a wildfire occurs in sage-grouse habitat, suppression in sage-grouse habitat will

continue to receive the highest priority allocation of wildfire suppression and rehabilitation management, after human safety. After a wildfire, the FIAT assessments and the commitments in the Secretarial Order ensure that restoration will be initiated in the immediate aftermath of the fire, when restoration is most effective in preventing invasive plant infestations. To reduce impacts from grazing and free-roaming equids that could stimulate the wildfire and invasive plant cycle, the Federal Plans require that livestock and free-roaming equids be managed at levels that achieve sage-grouse habitat objectives in the 4.5 million ha (11 million ac) of SFAs, and after that in the 14 million ha (35 million ac) of PHMA. Implementation of these measures began in 2015, with the completion of the Secretarial Order, and will continue throughout the 20- to 30-year lifespan of the Federal Plans. The work needed to protect the highest priority areas for conservation (SFAs) will be completed within 5 years (BLM 2015h, entire; DOI 2015a, p. 3). The new focus and prioritization of wildfire suppression and restoration for sage-grouse is an unprecedented change in wildfire fighting in sagebrush habitats that has been successfully implemented during the 2015 wildfire season. As described in the Wildfire and Invasive Plants section above, we expect the Secretarial Order and all other wildfire related actions will be implemented and effective. This sustained change in wildfire strategies reduce the risk that fire and invasive plants are likely to impact sage-grouse now and into the future. While we expect to see some continued loss of habitat and sage-grouse in the future due to wildfire and invasive plants, we do not expect that the species will be at risk of extinction or likely to become so due to risks posed by wildfire and invasive plants.

In addition to the benefits provided by the regulatory mechanisms and management activities in PHMAs and SFAs, the Federal Plans require new minimization measures in GHMA, where habitat is important for connectivity between populations and restoration opportunities (as discussed in detail in Changes Since the 2010 Finding, above). In GHMA, the plans reduce potential threats from human-caused disturbances by avoiding certain uses, such as infrastructure. When land-uses are allowed, science-based lek buffers (Manier *et al.* 2014, entire) are required for any projects implemented in GHMAs to ensure that the project is sited at a distance away from leks so that breeding sage-grouse are not

disturbed. All projects implemented in GHMAs include RDFs to minimize indirect effects to sage-grouse, such as design and management of water features so that mosquito habitat is not created that could provide a vector for WNV. Lastly, all projects implemented in GHMAs (and PHMAs) are required to be fully mitigated to a net conservation gain for sage-grouse; these measures are a substantial improvement from management in 2010, where no avoidance, minimization, or mitigation was required. GHMA corresponds with approximately 27 percent of breeding habitat rangewide. These measures were effective immediately upon the implementation of the Federal Plans and will be in place for the next 20 to 30 years.

Some other minor potential threats exist such as hunting, disease, predation, recreational activities, and scientific use. As discussed in the assessment of those potential threats (see Summary of Information Pertaining to the Five Factors, above), some minor or localized adverse effects may occur, but the best available information does not indicate that rangewide population-level effects are occurring. For example, while sage-grouse hunting continues to be allowed in several States, it is highly regulated and monitored with season and bag limits adjusted based on population monitoring so that this activity does not negatively impact the sustainability of this species. In addition, some of those potential threats are ameliorated by the Federal and State Plans, as the exclusion or limitation on land uses thereby further minimizes these minor potential threats. For example, exclusion of surface development of nonrenewable energy in PHMA and Core Areas and RDFs for those projects in GHMA prevents the creation of human-made water sources that provide breeding habitat for mosquitos that are vectors for WNV, thus reducing the potential for disease outbreaks in sage-grouse populations.

In addition to the Federal and State Plans, extensive work by private landowners is an important part of the rangewide sage-grouse conservation effort that has been implemented since 2010 (as discussed in detail in Changes Since the 2010 Finding, above). Private lands comprise about 39 percent of the species' range and contain some key habitat types that are important to sage-grouse. Since 2010, SGI has completed targeted sage-grouse habitat restoration and enhancement actions on more than 1.8 million ha (4.4 million ac) of private ranchlands throughout the species' occupied range. This work includes conifer removal, which will be

strategically implemented through use of new conifer mapping (NRCS 2015a, 19). It also includes more than 180,000 ha (450,000 ac) of conservation easements that protect sage-grouse habitat from future agricultural conversion or urban and exurban development. The SGI is also actively engaged in the BLM and USFS efforts to address the wildfire and invasive plants cycle by working with ranchers to implement grazing practices and fuels treatments to improve resistance and resilience of the sagebrush ecosystem. The NRCS has committed 198 million dollars to continue these efforts, with a goal of doubling previous accomplishments by 2018 (NRCS 2015a, p. 30, NRCS 2015b, p. 6).

Private lands conservation has occurred in Oregon and Wyoming with the completion of CCAAs that provide opportunities for enrollment for all private lands within those States (as discussed in detail in Changes Since the 2010 Finding, above). Programmatic and Umbrella CCAAs in these States provide sage-grouse guidance for ranch management practices, ensuring that enrolled lands will be managed to benefit sage-grouse. The programmatic agreements in Oregon provide a framework for other landowners to easily enroll without a large amount of time and paperwork, making it likely that others will enroll in the future. These agreements have resulted in substantial private lands conservation for sage-grouse. For example, landowners in Oregon have either completed enrollment or have signed formal letters of intent to enroll, representing more than 575,000 ha (1.4 million ac) of private rangeland in Oregon. In Wyoming, a completed umbrella CCAA covers important private lands in the range of the sage-grouse, and 36 private landowners have completed CCAAs in Wyoming under this programmatic CCAA. Collectively, there are 180,223 ha (445,343 ac) of private and State lands in the umbrella CCAA.

To summarize, in the 2010 finding, we determined that the regulatory mechanisms needed to address the loss and fragmentation of sage-grouse habitats were inadequate. Five years later, and following an unprecedented conservation planning effort by Federal, State, local, and private partners, we now determine that regulatory mechanisms and conservation efforts adequately address the loss and fragmentation of sage-grouse habitats based on the following reasons:

- The BLM and USFS have successfully amended or revised 98 land use plans that

govern approximately 50 percent of the sage-grouse occupied range. These plans now clearly outline the expectations for management that will conserve sage-grouse habitat on BLM and USFS lands.

- The States of Wyoming, Montana, and Oregon completed plans with regulatory mechanisms that effectively reduce the loss and fragmentation of sage-grouse habitats. Collectively, the Federal Plans and three State Plans reduce impacts on more than 90 percent of sage-grouse breeding habitat under this umbrella of Federal and State protection.

- The implementation of the FIAT and Secretarial Order is reducing and restoring habitat lost to wildfire in important sage-grouse habitats and making the protection and rehabilitation of sage-grouse habitats a priority second to human health and safety. During the 2015 wildfire season, we are already seeing the positive results of these focused efforts to reduce habitat loss and fragmentation from wildfire.

- The SGI, led by the NRCS, is working with private landowners across the range of the sage-grouse. The initiative targets land within priority sage-grouse habitat and is improving rangeland health on more than 2.4 million acres.

- We have worked with the States and private landowners, especially in Oregon and Wyoming, to implement CCAAs that cover more than 1.8 million acres. These agreements will ensure the conservation of sage-grouse habitat while providing working landscapes for the landowners.

The Act defines an endangered species as any species that is “in danger of extinction throughout all or a significant portion of its range” and a threatened species as any species “that is likely to become endangered throughout all or a significant portion of its range within the foreseeable future.”

We recognize that all impacts to the species have not been completely eliminated, and that existing and ongoing activities will continue to affect the species and its habitat. Therefore, it is likely that, over the foreseeable future, there will be some reduction in available habitat quantity and quality, some decrease in the relative population index, and local range contraction (including the loss of some small populations on the edges of the species’ range). The conservation efforts included in this analysis, however, have significantly reduced the impacts in the most important habitats for the species. These areas are highly correlated with the PACs identified in the COT Report as areas necessary for sufficient representation, resilience, and redundancy to ensure persistence of the species.

The conservation efforts by Federal, State, and private partners have greatly changed the likely trajectory of the species from our 2010 projections when we determined that the species warranted listing. We conclude that,

taking into account the potential, but now minimized, effects to the species over the foreseeable future, the species is not likely to become endangered within the foreseeable future because of the number of large, connected populations distributed across the species’ range and the unprecedented level of conservation actions now in place for 90 percent of the breeding habitat across the species’ range. In other words, even with the remaining likely reduction in habitat and populations discussed above, the sage-grouse will retain sufficient representation, resilience, and redundancy throughout the foreseeable future.

The sage-grouse has a broad distribution across the seven MZs, 11 States, and 2 Canadian Provinces. Despite historical reductions in occupied range, sage-grouse occupy approximately 703,453 km² (271,604 mi²), more than 50 percent of their historical range. The species occurs over a variety of habitats that vary by vegetation, elevation, soil type, and precipitation. Through this broad distribution in these varied ecological conditions, the species will maintain representation. The species will continue to exist in the large and most of the small populations across the range, providing species redundancy now and into the future. The larger populations, which comprise the core of the species’ range and are protected through Federal and State Plans, will be more resilient to direct impacts and are expected to rebound following disturbance. In summary, for sage-grouse, maintaining representation, redundancy, and resilience means having multiple and geographically distributed populations throughout the varied habitats across the species’ range, and we conclude that this goal is achieved through the Federal and State Plans.

The new Federal land-management paradigm is established in 98 amended Federal Plans that reduce and minimize threats to the species in the most important habitat for the species. Several States have adopted their own regulatory measures to reduce habitat loss and fragmentation on non-Federal lands. Many private landowners have also engaged in proactive conservation efforts that provide additional benefits to the species and indicate a shift in cultural attitudes towards the sagebrush ecosystem. Together, the Federal Plans and State Plans in Wyoming, Montana, and Oregon reduce threats on approximately 90 percent of the breeding habitat across the species’ range. Looking ahead, we expect these

conservation efforts will continue to be implemented for the next 20 to 30 years, ensuring the protection of the most important habitats so that large sage-grouse populations continue to be distributed across the species’ range. These conservation efforts occur in the areas needed for redundancy, representation, and resilience of the species.

Therefore, we find that the magnitude and imminence of threats either individually or in combination do not indicate that sage-grouse is currently in danger of extinction (endangered). Further, based on our analysis and the conservation provided by the conservation efforts described throughout this document, we find that the magnitude and imminence of threats either individually or in combination do not indicate that the sage-grouse is likely to become endangered within the foreseeable future (threatened). Therefore, based on our assessment of the best available scientific and commercial information, we find that listing the sage-grouse as a threatened or an endangered species is not warranted at this time.

Significant Portion of the Range

Under the Act and our implementing regulations, a species may warrant listing if it is in danger of extinction or likely to become so throughout all or a significant portion of its range. The Act defines “endangered species” as any species which is “in danger of extinction throughout all or a significant portion of its range,” and “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.” The term “species” includes “any subspecies of fish or wildlife or plants, and any distinct population segment (DPS) of any species of vertebrate fish or wildlife which interbreeds when mature.” We published a final policy interpreting the phrase “Significant Portion of its Range” (SPR) (79 FR 37578, July 1, 2014). The final policy states that (1) if a species is found to be endangered or threatened throughout a significant portion of its range, the entire species is listed as an endangered or a threatened species, respectively, and the Act’s protections apply to all individuals of the species wherever found; (2) a portion of the range of a species is “significant” if the species is not currently endangered or threatened throughout all of its range, but the portion’s contribution to the viability of the species is so important that, without the members in that portion, the species would be in danger of extinction, or

likely to become so in the foreseeable future, throughout all of its range; (3) the range of a species is considered to be the general geographical area within which that species can be found at the time the Service or the National Marine Fisheries Service makes any particular status determination; and (4) if a vertebrate species is endangered or threatened throughout an SPR, and the population in that significant portion is a valid DPS, we will list the DPS rather than the entire taxonomic species or subspecies.

The SPR policy is applied to all status determinations, including analyses for the purposes of making listing, delisting, and reclassification determinations. The procedure for analyzing whether any portion is an SPR is similar, regardless of the type of status determination we are making. 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, or likely to become so in the foreseeable future, throughout all of its range, we list the species as an endangered (or threatened) species and no SPR analysis will be required. If the species is neither in danger of extinction nor likely to become so throughout all of its range in the foreseeable future, we then determine whether the species is in danger of extinction or likely to become so in the foreseeable future throughout a significant portion of its range. If it is, we list the species as an endangered or a threatened species, respectively; if it is not, we conclude that listing the species is not warranted.

When we conduct an SPR analysis, we first identify any portions of the species' range that warrant further consideration. The range of a species can theoretically be divided into portions in an infinite number of ways. However, there is no purpose to analyzing portions of the range that are not reasonably likely to be significant and endangered or threatened. To identify only those portions that warrant further consideration, we determine whether there is substantial information indicating that (1) the portions may be significant and (2) the species may be in danger of extinction in those portions or likely to become so within the foreseeable future. We emphasize that answering these questions in the affirmative is not a determination that the species is endangered or threatened throughout a significant portion of its range—rather, it is a step in determining whether a more detailed analysis of the issue is required. In practice, a key part of this analysis is whether the threats are geographically concentrated in some

way. If the threats to the species are affecting it uniformly throughout its range, no portion is likely to warrant further consideration. Moreover, if any concentration of threats applies only to portions of the range that clearly do not meet the biologically based definition of “significant” (*i.e.*, the loss of that portion clearly would not be expected to increase the vulnerability to extinction of the entire species), those portions will not warrant further consideration.

If we identify any portions that may be both: (1) Significant; and (2) endangered or threatened, we engage in a more detailed analysis to determine whether these standards are indeed met. The identification of an SPR does not create a presumption, prejudgment, or other determination as to whether the species in that identified SPR is endangered or threatened. We must go through a separate analysis to determine whether the species is endangered or threatened in the SPR. To determine whether a species is endangered or threatened throughout an SPR, we will use the same standards and methodology that we use to determine if a species is endangered or threatened throughout its range.

Depending on the biology of the species, its range, and the threats it faces, it may be more efficient to address the “significant” question first, or the status question first. Thus, if we determine that a portion of the range is not “significant,” we do not need to determine whether the species is endangered or threatened there; if we determine that the species is not endangered or threatened in a portion of its range, we do not need to determine if that portion is significant.

Because we determined that the sage-grouse is neither endangered nor threatened throughout all of its range, due largely to the effective reduction and amelioration of threats by ongoing and future regulatory mechanisms and other conservation efforts, we must next determine whether the sage-grouse may be endangered or threatened in a significant portion of its range. To do this, we must first identify any portion of the species' range that may warrant consideration by determining whether there is *substantial information* indicating that: (1) The portions *may be* significant, and (2) the species *may be* in danger of extinction in those portions or is likely to become so within the foreseeable future. We note that a positive answer to these questions is not a determination that the sage-grouse is endangered or threatened within a significant portion of its range, but rather a positive answer to these

questions confirms whether a more detailed analysis is necessary.

While the overall range of the sage-grouse could be subdivided into numerous portions, there are four primary biological divisions based on differences in populations and the concentrations of potential threats. These four portions are: The bi-State population in Nevada and California; the Columbia Basin population in Washington; and the Rocky Mountain and Great Basin portions of the range. We previously evaluated the status of the bi-State population and determined that listing is not warranted. We now consider the Columbia Basin population to be part of the Great Basin portion of the range. The range of the sage-grouse is the general geographical area within which the species is found at the time of this finding. Specifically, the current range of the sage-grouse covers 11 States (Washington, Oregon, California, Nevada, Idaho, Montana, Wyoming, Colorado, Utah, South Dakota, and North Dakota), and two Canadian provinces (Alberta and Saskatchewan), and encompasses all the current populations of sage-grouse, with the exception of the bi-State sage-grouse Distinct Population Segment, and the intervening habitat (Figure 1, above). Analyzing the threats to the Rocky Mountain and Great Basin populations also satisfies the requirement of the Act to address populations and threats in significant portions of the sage-grouse's overall range.

We first evaluated whether potential threats to the sage-grouse might be geographically concentrated in any one portion of its range. We examined impacts to sage-grouse from fire, invasive plants, conifer encroachment, agricultural conversion, renewable- and nonrenewable-energy development, mining, infrastructure, fences, improper grazing, free-roaming equids, urban and exurban development, recreation, climate change, drought, recreational hunting, scientific and educational purposes, disease, predation, contaminants, military activities, small populations, the inadequacy of regulatory mechanisms, and cumulative effects. In our rangewide finding, we determined that impacts to the sage-grouse are found throughout its range. Although these potential threats occur throughout the current range, they are concentrated differently between eastern and western portions of the range. Additionally, there are differences in the composition and ecology of sagebrush habitats in the eastern versus the western portions of the range, and sage-grouse are variably distributed across the landscape from

east to west (see Habitat and Distribution section above). The type and focus of conservation efforts to reduce and ameliorate potential threats vary between eastern and western portions of the range due to the differences in concentration. Therefore, these differences in sagebrush habitats, the distribution of sage-grouse, the concentrations of potential threats, and conservation efforts suggest that eastern and western portions of the range could be significant and warrant additional analysis.

The eastern, or Rocky Mountain portion (MZs I, II, and VII), of the species' current range covers approximately half of the occupied range, contains approximately 49 percent of the sage-grouse estimated abundance, and generally contains sagebrush habitat that is higher in elevation and receives greater amounts of precipitation (Figure 1). The western or Great Basin (MZs III, IV, V, and VI) portion of the species' current range similarly covers about half of the occupied range and approximately 51 percent of the sage-grouse, but contains sagebrush habitat that is lower in elevation and receives less precipitation (Figure 1). Concentrations of potential threats differ between these two portions of the range, with nonrenewable energy development, agricultural conversion, and infrastructure more concentrated in the Rocky Mountain portion, while wildfire and invasive species are more concentrated in the Great Basin portion. The Great Basin portion of the range includes the sage-grouse populations in the Columbia Basin (MZ VI).

Because some potential threats are more concentrated in either the Rocky Mountain or Great Basin portions, we determine that the Rocky Mountain and Great Basin portions warrant further consideration as potential significant portions of the range. Next we evaluate whether the sage-grouse is threatened or endangered in either the Rocky Mountain or Great Basin portions of its current range.

The current range of the sage-grouse could theoretically be divided into an infinite number of portions. In the first step of our significant portion of the range analysis, we identified the Rocky Mountains and the Great Basin as portions that warrant further consideration. Both portions represent approximately half of the current range, and the entire sage-grouse population is distributed equally between both portions. As we discussed in the Bi-State Distinct Population Segment section of this document above, the Columbia Basin represents less than 1

percent of the species' occupied range less than 3 percent of the breeding habitat, and its loss would not result in a significant gap in the occupied range of the sage-grouse. Therefore, the Columbia Basin does not contribute to the overall viability of the species and does not meet the definition of "significant" under the SPR policy. We did not identify any other portions within these larger portions that warrant further consideration because the potential threats are not substantially concentrated within any areas other than the Rocky Mountain or Great Basin portions, that are particularly large, constitute a particularly high percentage of the species' range, or are likely to be particularly important for the representation, resilience, or redundancy of the species. Therefore, we conclude that any portions of the range within the Rocky Mountain and Great Basin portions that we have identified do not warrant further consideration as significant portions of the range.

Status of the Rocky Mountain Portion of the Current Range

In our 2010 finding, we were concerned with long-term declines in abundance trends for the Rocky Mountain MZs (MZs I, II, and VII), and we identified a number of threats likely contributing to those declines (75 FR 13910, March 23, 2010). The most important threats identified for the Rocky Mountain portion of the range were habitat loss and fragmentation from energy development, infrastructure, and agricultural conversion; disease—particularly WNV; loss of habitat from improper livestock management; and inadequacy of regulatory mechanisms limiting human-caused impacts. Of these threats, the most significant of these involved a combination of habitat loss and fragmentation from infrastructure and energy development, and inadequate regulatory mechanisms to address these impacts.

The potential threats from fire, invasive grasses, free-roaming equids, conifer encroachment, and urban and exurban development have only limited, localized impacts to sage-grouse in the Rocky Mountain portion of the range now and into the foreseeable future. In addition, our evaluation of the Rocky Mountain portion of the current range focuses primarily on those potential threats most likely to affect, individually or cumulatively, sage-grouse in the Rocky Mountains, which does not include urban and exurban development, recreation, climate change and drought, recreational hunting,

scientific and educational uses, contaminants, and military activity. Those threats that are likely to affect sage-grouse in the Rocky Mountains are summarized below. Full discussions of each of these potential threats can be found in Summary of Information Pertaining to the Five Factors (above).

Due to new regulatory mechanisms and conservation efforts, the potential threats identified in 2010 have been adequately ameliorated in the Rocky Mountain portion of the range. Historically, agricultural conversion reduced and fragmented sage-grouse habitats in the Rocky Mountain portion of the range, primarily in MZ I. However, the new cropland risk model (described above in the *Summary of Information for Agricultural Conversion*) indicates that future agricultural conversion is unlikely to have substantial impacts in MZ I of the Rocky Mountain portion of the current range, and future conversions to agriculture are unlikely to occur at greater rates or magnitudes outside of MZ I. Further the implemented regulatory mechanisms effectively reduce impacts from nonrenewable energy development, such that less than 17 percent of the sage-grouse population and 12 percent of the breeding habitat in the Rocky Mountain portion of the range could be exposed to nonrenewable energy development in the future.

We identified improper livestock management as a source of habitat loss and fragmentation in 2010. Since that time, rangeland-health standards in the Federal Plans, Wyoming and Montana State Plan requirements, and SGI practices of applying grazing systems, vegetating former rangeland with sagebrush and perennial grasses, and controlling invasive grasses, effectively ameliorate this threat to the sage-grouse in the Rocky Mountain portion of the range, now or in the future.

Renewable energy development has not occurred extensively within the Rocky Mountains, but potential exists, particularly for wind development. Infrastructure exists throughout the Rocky Mountains and will likely continue into the future. For each of these impacts, the regulatory mechanisms provided by Federal Plans, the Montana Plan, and the Wyoming Plan substantially reduce this potential impact by restricting new development in important sagebrush habitats. Coal mining, the primary kind of mining occurring in the Rocky Mountains, has generally declined since 2008. Regulatory mechanisms provided by the Federal Plans exclude new leasable (except coal) and saleable mineral

development on more than 14 million ha (35 million ac) of PHMA. Because of the effective regulatory mechanisms that protect important habitats, these types of development are not threats to sage-grouse within the Rocky Mountain portion of the range, now or in the future.

As described in the Summary of Information Pertaining to the Five Factors (above), we also evaluated the impacts of predation and disease and found that, although they present localized impacts, they were not likely to result in population-level effects. This remains true when reviewing the information for the Rocky Mountain portion of the range.

Conservation Efforts in the Rocky Mountain Portion of the Current Range

Since the 2010 finding, many parties have collaborated to develop comprehensive strategies that ameliorate the major potential threats, consistent with the COT Report. The Federal Plans and Wyoming and Montana Plans provide adequate regulatory mechanisms to reduce the threats of human-caused habitat disturbance on the most important sage-grouse habitats (as discussed in detail in the Changes Since the 2010 Finding, above). The Federal Plans designate PHMA, and the Wyoming and Montana Plans designate Core Areas, all of which correspond closely with the PACs identified in the COT Report. In the Rocky Mountain portion of the range, more than 67 percent of the sage-grouse breeding habitat distribution is protected as PHMA and more than 30 percent is protected as GHMA.

The Federal Plans address the primary potential threats that reduce and fragment sage-grouse habitats on BLM- and USFS-administered lands in the Rocky Mountain portion of the range, including infrastructure and energy development. All forms of development—from energy, to transmission lines, to recreation facilities and grazing structures—would be avoided in PHMA unless a further assessment found that the project would not adversely affect the sage-grouse. Consistent with COT guidance, a limited amount of development could occur in GHMAs, although additional conservation measures, such as lek buffers, seasonal and timing restrictions, and project-design features, will minimize potential effects in GHMA.

In conjunction with the Federal Plans, the Wyoming Plan incorporates stipulations and conservation measures, such as controlled surface use, seasonal and noise restrictions, consultation requirements, density of development

restrictions, and lek buffers to reduce impacts associated with energy development on all lands within Core Areas in Wyoming. The Montana Plan includes a regulatory mechanism similar to the Core Area Strategy to reduce impacts associated with energy development in Core Areas on State-owned lands and private lands when a State authorization is required. The Montana Plan also requires similar conservation measures to reduce impacts, such as seasonal and noise restrictions, density development restrictions, and lek buffers.

Finally, conservation efforts on private lands through SGI and CCAAs reduce potential threats in the Rocky Mountain portion of the range. SGI efforts with ranchers to address grazing systems and fences, to implement habitat restoration, and to provide conservation easements have protected sage-grouse habitat from further fragmentation; NRCS' commitment to adaptive management, partnerships, and flexibility in conservation approaches ensures continued and constantly improving conservation on private lands within sage-grouse habitat. In Wyoming, a completed umbrella CCAA covers important private lands in the range of the sage-grouse, and 30 private landowners have completed CCAAs in Wyoming under this programmatic CCAA. Collectively, there are 180,223 ha (445,343 ac) of private and State lands committed within the umbrella CCAA, 112,212 ha (277,282 ac) of which are located within sage-grouse Core Areas, and 8,235 ha (20,348 ac) are in connectivity areas.

By taking a landscape-level view that spans land ownership in the Rocky Mountain portion of the range, these conservation efforts have significantly reduced the potential threats to sage-grouse now and in the foreseeable future. Many of these conservation efforts are regulatory mechanisms on Federal lands that are managed consistently by BLM and USFS in the five Rocky Mountain States (MT, WY, CO, ND, and SD). Similar regulatory mechanisms are provided by Montana and Wyoming State Plans and Executive Orders to reduce potential impacts on non-Federal lands in those States. These regulatory mechanisms are finalized, are currently being implemented, and are likely to continue to be implemented for the next 20 to 30 years. In addition, SGI and private land owners have implemented conservation projects across the Rocky Mountain portion of the range, further contributing to sage-grouse conservation. The SGI has committed to continue this work for the next 3 years, ensuring private land

conservation will continue to be implemented through the authorization of the next Farm Bill (NRCS 2015a, p. 2). All of these conservation actions are consistent with the COT Report recommendations and scientific literature, which indicates they will effectively conserve sage-grouse.

Conclusion for the Rocky Mountain Portion of the Current Range

Based on Federal and State regulations and conservation efforts, the risk and exposure of the sage-grouse to the potential threats of nonrenewable-energy development, agricultural conversion, and habitat fragmentation from infrastructure and other development are significantly reduced. These conservation efforts are ameliorating the potential threats and decreased the amount and rate of development well below what was expected, and by minimizing and mitigating impacts to sage-grouse, have significantly addressed threats facing sage-grouse as described in the 2010 finding, the COT Report, and other published scientific findings. In the Rocky Mountain portion, some habitat loss associated with energy development, infrastructure, agricultural conversion, and urbanization will continue into the future.

Some sage-grouse populations may continue to decline in some parts of the Rocky Mountains. However, the existing and future effective regulatory mechanisms and conservation efforts in the Rocky Mountain portion of the range will protect the most important habitats and maintain relatively large, well-distributed, and interconnected sage-grouse populations across much of the eastern portion of its range. Since the 2010 finding, there has been an unprecedented and substantial proactive conservation effort to reduce potential habitat loss and fragmentation from infrastructure and energy development. More than 67 percent of the sage-grouse breeding habitat in the Rocky Mountains is protected by PHMA, where no development will occur, and more than 30 percent is protected by GHMA, where required conservation measures will avoid and reduce adverse effects. Therefore, we determined that, due to the combination of regulations on Federal lands and regulatory and voluntary measures on private lands that provide adequate avoidance and mitigation, these potential threats are effectively being reduced in the Rocky Mountain portion of the range.

Therefore, we conclude that sage-grouse in the Rocky Mountain portion of

the current range are not in danger of extinction or likely to become so within the foreseeable future, due to the existing effective conservation efforts implemented since 2010 and future conservation efforts. Sage-grouse will remain well-distributed and interconnected into the foreseeable future as these conservation efforts are implemented. Therefore, the sage-grouse is not threatened or endangered in the Rocky Mountain portion of its current range.

Status of the Great Basin Portion of the Current Range

In our 2010 finding, we identified long-term declines in sage-grouse abundance trends for the Great Basin MZs, and we identified a number of threats likely contributing to those declines (75 FR 13910, March 23, 2010). The most important threats identified in the 2010 finding for the Great Basin were: Wildfire, invasive plants, conifer invasion, habitat fragmentation, climate change, loss of habitat quality due to improper livestock and free-roaming equid grazing, and the inadequacy of regulatory mechanisms to address human-caused impacts such as energy and infrastructure development. Of these threats, the greatest concern in the Great Basin was habitat loss and fragmentation from wildfire and invasive plants. Currently, the primary potential threats to sage-grouse in the Great Basin include wildfire and its synergistic effects with invasive plants. We will also specifically summarize habitat loss and fragmentation due to conifer encroachment, mining, renewable energy, and infrastructure in the Great Basin. Our evaluation of the Great Basin portion of the current range focuses primarily on those potential impacts most likely to affect, individually or cumulatively, sage-grouse in the Great Basin and does not include urban and exurban development, recreation, predation, climate change and drought, recreational hunting, scientific and educational uses, contaminants, and military activity. Full discussions of each of these potential threats can be found in Summary of Information Pertaining to the Five Factors (above).

Wildfire and its synergistic relationship with invasive species, climate change and drought, improper grazing, and free-roaming equids was identified in the 2010 finding as the most serious threat to sage-grouse populations in the Great Basin. Wildfire is a natural and integral part of the Great Basin landscape, and will continue into the future. A recent study predicts that a 43 percent decline in Great Basin sage-

grouse populations could occur by 2044 if no additional management is implemented to address the wildfire and invasive plant cycle. If conservation measures reduce the area burned by at least 25 percent, the rate of population decline is likely to be reduced. Further, the study emphasizes the importance of implementing conservation actions in areas of moderate and high resistance and resiliency and containing high densities of sage-grouse. The FIAT Assessments and Secretarial Order conservation measures are consistent with this recommendation to prioritize implementation actions in places most likely to be effective and to provide the greatest benefit for sage-grouse. Therefore, we conclude the continued implementation of FIAT and the Secretarial Order will reduce the rate of decline in the Great Basin over the next 30 years.

Through the Federal Plans, the BLM and USFS have established land health standards that now consider and incorporate sage-grouse habitat needs. The Federal Plans restrict grazing in areas that are not meeting standards, and the agencies will manage free-roaming equid populations at levels that minimize impacts to the most important sage-grouse habitats. Voluntary conservation through SGI's invasive species removal programs, improved grazing practices, and the enhancement and protection of healthy rangeland conditions further improve habitat for sage-grouse in the Great Basin. Finally, State conservation efforts in Oregon have further reduced the impacts of wildfire, invasive plants, grazing, and free-roaming equids through regulatory mechanisms.

These and many other positive conservation activities described in this finding were not implemented, planned, or certain to occur when the 2010 warranted finding was completed, leading us to conclude that sage-grouse warranted protections of the Act. The regulatory mechanisms and commitments to manage wildfire and invasive plants will result in a substantial reduction of habitat lost to these impacts, such that sage-grouse populations will continue to be distributed and connected across the Great Basin. Therefore, because the potential impacts have been substantially reduced by effective regulatory mechanisms and the ongoing implementation of conservation efforts, wildfire and the associated synergistic effects from invasive species, climate change and drought, improper grazing, and free-roaming equids are not substantial threats to the sage-grouse

within the Great Basin portion of the range, now or in the future.

In addition to wildfire and its synergistic impacts, habitat loss from conifer encroachment has also been identified as a concern in the Great Basin. Conifers are a natural component of the sagebrush ecosystem, and, if not actively managed, are expected to continue to expand, resulting in additional loss of habitat in the Great Basin. However, Federal and State Plan vegetation objectives and on-the-ground removal of conifers through SGI and State efforts have reduced impacts of this potential threat. For the next 3 years, SGI has committed to continue this work, ensuring private land conservation will continue to be implemented (NRCS 2015a, p. 2; NRCS 2015b, p. 6). As a result of direction provided in State and Federal Plans and ongoing implementation of SGI, the rate of encroachment and habitat loss is reduced such that conifer encroachment is not a threat in the Great Basin portion of the range, now or in the future.

Development due to mining, renewable energy, and infrastructure continues to occur in the Great Basin. As discussed above (see *Mining*), mining potential is difficult to predict. The Federal Plans contain regulatory mechanisms to avoid and minimize potential impacts from mining in important sage-grouse habitat. Similarly, infrastructure and development of renewable energy is currently present across the Great Basin and will likely continue at some level, but regulatory mechanisms provided by Federal Plans reduce potential future development by eliminating or capping disturbance in important sagebrush habitat and by implementing project design features to minimize impacts (e.g., buffers, noise restrictions, etc.).

Conservation Efforts in the Great Basin Portion of the Current Range

Since the 2010 finding, many parties have collaborated to develop comprehensive strategies that would substantially ameliorate the major potential threats, consistent with the COT Report. Through Federal Plans, State Plans, and voluntary conservation on private lands through CCAA and SGI, the Great Basin is being actively managed for the benefit of sage-grouse.

The Federal Plans provide clear management regulations with measurable objectives to address invasive annual grasses, conifer encroachment, improper grazing, and free-roaming equids. They prioritize management in the most important habitat (PHMA), which encompasses approximately 60 percent of the

breeding habitat in the Great Basin. All forms of development—from energy, infrastructure, and grazing structures—would be avoided in PHMA unless further assessment found the project not to have any adverse effects on the species. Consistent with COT guidance, a limited amount of development could occur in GHMAs, which support 23 percent of the breeding habitat in the Great Basin (USFWS 2013, pp. 43–52). In those instances, additional measures such as lek buffers, seasonal and timing restrictions, and project design features will minimize potential indirect effects that could occur. A more comprehensive discussion on these measures and their expected effects is provided earlier in this finding (see Summary of Information Pertaining to the Five Factors, above).

The majority of sage-grouse habitat in the Great Basin occurs on Federal lands, making the Federal Plans' implementation most important for sage-grouse conservation in the Great Basin. However, States can help reduce potential threats through collaboration with Federal land managers and by promoting conservation outside Federal lands. To date, Oregon is the only State in the Great Basin that completed and implemented a plan that provides regulatory mechanisms. The Oregon Plan provides regulatory protections for sage-grouse habitat across all land ownerships, a coordinated mitigation system, wildfire management measures, and a development cap for Core Areas that is coordinated with the Federal Plans.

Threat reduction is also enhanced on private lands in the Great Basin through the SGI and associated Farm Bill programs. Throughout the western States, SGI has implemented targeted sage-grouse conservation practices on more than 4.4 million acres, and has allocated more than \$424 million in project funding. In the Great Basin portion of the Range, SGI efforts with ranchers to address grazing systems and fences, to implement habitat restoration, and to provide conservation easements have protected sage-grouse habitat from further fragmentation. The NRCS made funding available from 2010 through 2018 to fund and implement the SGI program (NRCS 2015a, p. 2, NRCS 2015b, p. 6). Since 2010, SGI has implemented action on more than 1,000 ranches. NRCS' commitment to adaptive management, partnerships, and flexibility in conservation approaches ensures continued and constantly improving conservation on private lands within sage-grouse habitat. Based on the track record of successfully implemented conservation actions

consistent with the COT Report recommendations and commitments to continue implementing the program, we conclude that the SGI program provides substantial conservation benefits to sage-grouse in the Great Basin, now and in the future.

The greatest amount of private lands conservation in the Great Basin has occurred in Oregon. In 2015, we completed a series of programmatic CCAAs for sage-grouse that potentially covers all private lands in the range in Oregon. In Oregon, more than 575,000 ha (1.4 million ac) of rangeland have been effectively conserved for sage-grouse through enrollment of private landowners in CCAAs. These programmatic agreements provide a framework for other landowners to easily enroll without a large amount of time and paperwork, making it likely that others will be enrolled in the near future.

This coordinated approach to conserve sage-grouse and sagebrush habitat has resulted in substantial reductions in all of the potential threats facing sage-grouse in the Great Basin in the foreseeable future. Many of these conservation efforts on Federal lands are consistent across the five States due to the management by BLM and USFS, while programs on non-Federal lands vary from State to State due to different regulatory, political, ecological, and economic circumstances in the respective States. Since 2010, many of the specific measures described in this finding are under way or are being finalized with actions to be implemented during the coming years. We have a high degree of certainty that the majority of the planned future actions will be implemented and will reduce the magnitude of potential threats facing the sage-grouse in the Great Basin.

Conclusion for the Great Basin Portion of the Current Range

Based on Federal, State, and private landowner efforts, the potential threats of wildfire (and associated, synergistic impacts from invasive plants, climate change and drought, improper grazing, and free-roaming equids), conifer encroachment, mining, and infrastructure have been reduced. Some habitat loss in the Great Basin portion associated with wildfire and invasive plants and conifer encroachment will continue into the future, and it is likely that sage-grouse populations will continue to decline in some parts of the Great Basin. However, we expect that the existing and future effective conservation efforts in the Great Basin portion of the range will reduce declines

and will protect the most important sage-grouse habitat, resulting in relatively large, well-distributed, and interconnected populations across much of the western portion of its range. Since the 2010 warranted finding, Federal, State, and local entities to identify specific needs of this species and to provide resources for the conservation and protection of the species and its habitat. Due to these conservation efforts, the species will remain well-distributed and interconnected into the foreseeable future as these measures are implemented. Therefore, the sage-grouse is not a threatened or endangered species in the Great Basin portion of its range.

Conclusion

Our review of the best available scientific and commercial information indicates that the sage-grouse is not in danger of extinction nor likely to become endangered within the foreseeable future throughout all of its range. Additionally, we determined that the sage-grouse is not in danger of extinction now or within the foreseeable future throughout either the Rocky Mountain or Great Basin portions of its range. Therefore, the sage-grouse is not in danger of extinction nor likely to become endangered within the foreseeable future throughout a significant portion of its range. Therefore, we find that listing the sage-grouse as an endangered or threatened species under the Act is not warranted at this time.

The completion of this status review is not the end of our commitment to sage-grouse conservation. Our determination today is based on the best scientific and commercial data currently available. That determination, however, cannot guarantee that the sage-grouse (or other sagebrush ecosystem species) will not in the future warrant listing under the Act. New threats may develop, management may change, or the species may not prove as resilient as we concluded based on the currently available science. Thus, although our best judgment today indicates that successful sage-grouse conservation will be achieved by continued implementation of the regulatory mechanisms and conservation efforts we relied on in our finding above, we and our partners must carefully monitor threats to the sage-grouse and its response to those threats. Therefore, we will work with our Federal and State partners to conduct a sage-grouse status review in 5 years. This status review will inform adaptive management and guide future research needs to ensure that conservation efforts continue to

benefit sage-grouse into the future. In the meantime, to ensure the long-term successes of this unprecedented conservation effort, we will continue to work with our partners to augment and improve current management within the sagebrush ecosystem. If at any time new information indicates that the provisions of the Act may be necessary to conserve sage-grouse, we can initiate listing procedures, including, if appropriate, emergency listing pursuant to section 4(b)(7) of the Act.

References

A complete list of references cited is available on the Internet at <http://www.regulations.gov> and upon request from the Mountain-Prairie Regional Office (see **ADDRESSES**).

Author(s)

The primary author(s) of this notice are the staff members of the U.S. Fish and Wildlife Service.

Authority

The authority for this action is section 4 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Dated: September 21, 2015.

Daniel M. Ashe,

Director, U.S. Fish and Wildlife Service.

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