State of
UTAH

Utah Conservation Plan For Greater Sage-Grouse

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GOVERNOR'S LETTER

Dear Fellow Utahns:

I am pleased to introduce the *2019 Utah Conservation Plan for Greater Sage-Grouse* — a product of a comprehensive five-year review. This plan is effective January 1, 2019 and will continue to be in effect for five years, unless revoked or revised by directive from my office.

In 2017, I directed state officials to conduct a comprehensive review of the *2013 Conservation Plan for Greater Sage-Grouse* (2013 Plan). I asked state agencies and stakeholders to review the success of the 2013 Plan and identify strategies to improve upon the conservation goals and strategies identified in the 2013 Plan.

This Plan is the outcome of that stakeholder review process. It effectively builds upon prior conservation strategies while identifying policies that will continue to protect, maintain and increase sage-grouse populations and habitats throughout the state. The management actions identified in this Plan are based on the best available science and research and are supported by our local working groups.

Developing existing partnerships with governments and interested stakeholders to continue to conserve sage-grouse throughout Utah will remain a priority for my administration. With your help, commitment, innovation and collaboration, Utahns will continue to successfully conserve sage-grouse and the habitats upon which they depend for generations to come.

Sincerely,

Gary R. Herbert
Governor

Executive Summary

IN FEBRUARY 2013, Gov. Gary R. Herbert authorized the Conservation Plan for Greater Sage-Grouse in Utah. It was a detailed, scientifically based plan that established goals and measurable objectives for the conservation of greater sage-grouse in Utah. As a result of that plan and other ongoing conservation efforts—including similar state-led efforts across the West—the U.S. Fish and Wildlife Service (USFWS) announced on Oct. 2, 2015 that greater sage-grouse are "not warranted" for listing under the Endangered Species Act.

Gov. Herbert ordered state officials to coordinate with stakeholders in 2017 to review that 2013 plan, and to ensure that Utah's conservation efforts continue to incorporate new and best-available science, data and knowledge. This Utah Conservation Plan for Greater Sage-Grouse (Plan) is the revised and updated outcome of that stakeholder review process. It effectively:

- Builds upon the progress made during past planning processes.
- Improves implementation of future actions by incorporating important lessons learned.
- Seeks to clarify the State of Utah's conservation approach to its stakeholders.
- Provides a proven conservation framework to ensure that greater sage-grouse will remain "not warranted" for listing under the Endangered Species Act.

The goal of this Plan is to protect, maintain and increase sage-grouse populations and habitats within Sage-Grouse Management Areas (SGMAs). That goal will be accomplished by meeting the two primary objectives of this plan, which are to:

- Maintain and increase sage-grouse populations statewide, and within each SGMA.
- Maintain, protect and increase sage-grouse seasonal habitats within SGMAs.

To meet those objectives, this Plan identifies strategies to address localized threats to sage-grouse populations in Utah. Those strategies include—but are not limited to—the following:

- Identify the highest-priority sage-grouse habitats and migration corridors, and protect at least 5,000 of those acres annually through conservation easements, or other mechanisms.
- Improve and increase sage-grouse seasonal habitats by 75,000 acres each year, including riparian and mesic habitats.
- Monitor sage-grouse population trends annually and, if necessary, implement adaptive management responses to ensure that priority populations remain viable and stable.
- Coordinate with local, state and federal fire-fighting jurisdictions to include sage-grouse habitats as a priority during pre-fire attack planning and suppression, second only to the protection of human life and property.
- Fund, support and implement critical research that supports the implementation of this Plan.

With the ongoing commitment, innovation and collaboration of the State of Utah and its many conservation partners, this Plan will continue to conserve sage-grouse and the habitats upon which they depend, while still balancing the socioeconomic needs of the people of Utah.

Background Information

IN MARCH 2010, the USFWS found that greater sage-grouse (*Centrocercus urophasianus;* sage-grouse) were warranted for listing under the Endangered Species Act. That finding was attributed to habitat fragmentation and "inadequate regulatory mechanisms" designed to protect habitats at the local, state and federal levels (USFWS 2010).

The USFWS chartered a range-wide team of partners to review that finding and identify the highest-priority threats to sage-grouse populations across their range. In 2013, that team developed the *Greater Sage-Grouse Conservation Objectives Team (COT) Final Report*, which now informs conservation actions across the range of sage-grouse.

The COT report emphasized that sage-grouse are a landscape species, and long-term species conservation would require the cooperation of western states and federal agencies to negate the need for a listing of the species. The report also identified the need to protect the "best-of-the-best" habitats. Finally, the COT report recognized that due to variation in range-wide and local environmental conditions, state wildlife management agencies are in the best position to determine the appropriate conservation goals for the species. In response to those findings, the U.S. Bureau of Land Management (BLM), the U.S. Forest Service (USFS), the State of Utah (State) and the other western states with sage-grouse populations each initiated proactive planning processes that sought to collectively address the threats identified in the COT report.

Within Utah, Gov. Gary Herbert chartered a task force in 2012 to review relevant information and develop a statewide plan to conserve sage-grouse and their habitats—while balancing the socioeconomic growth of the state. From February to October of 2012, the task force met frequently to review local and range-wide data and information. The task force also received comments and advice through the governor's Public Lands Policy Coordinating Office (PLPCO) and from other interested parties, including state and federal partners, industry representatives, conservation organizations, local residents, landowners, local sage-grouse working groups, university researchers and government officials. Based on that feedback, the task force developed a conservation plan for sage-grouse populations and habitats in Utah that identified local population dynamics, site-specific threats, research needs and aggressive management strategies. The task force later became the Sage-Grouse Plan Implementation Council (PIC).

Gov. Herbert authorized the Conservation Plan for Greater Sage-Grouse in Utah in February 2013, and authorized its implementation through 2017 (PLPCO 2013). The Plan's foundations were based on the principles originally set forth in the COT report, but refined to fit local conditions and objectives and to use the best available science. The Plan identified the state's SGMAs, which represent the highest-priority areas (i.e., "the best-of-the-best") for sage-grouse conservation in Utah. This strategic landscape-management approach optimizes conservation investments by favoring areas that are likely to yield the greatest conservation benefits, rather than areas that have limited or compromised potential for conservation. The Plan also summarized the state-of-the-science for sage-grouse in Utah, and articulated a science-based conservation goal and quantifiable objectives that would stabilize and grow sage-grouse populations throughout the state. The participating agencies and partners have worked cooperatively to implement the Plan since its finalization.

Many local partners and communities came to

recognize the Plan as the basis for the conservation of sage-grouse in Utah. Gov. Herbert signed an executive order (EO/2015/002; Appendix 1) on Feb. 25, 2015 to ensure the plan would be implemented and that sage-grouse would not be listed under the Endangered Species Act. That executive order mandated that all relevant State agencies participate in the implementation of the Plan. Since that time, those State agencies have developed a Memorandum of Understanding with the Utah Division of Wildlife Resources (UDWR) and PLPCO (Appendix 1). Those agreements set agency-specific directives related to the implementation of the executive order and the Plan. The participating agencies enter records into an online coordination database to continually track the statewide implementation of the governor's executive order. The database records enable UDWR and PLPCO to monitor compliance with the executive order, and to report on the certainty of Plan implementation during future listing determinations and conservation reviews.

> "On Oct. 2, 2015, the USFWS found that sage-grouse did not warrant listing under the Endangered Species Act."

To ensure local support and implementation of on-the-ground conservation actions, the Utah State University (USU) Community-Based Conservation Program (CBCP) organized and facilitated local working groups (LWG) throughout Utah. The State of Utah endorsed and incorporated the CBCP LWG process and their local plans into the statewide Plan in 2013. Currently, there are 11 regional LWGs operating in Utah, and each of those groups has developed locally relevant, site-specific conservation plans that fit within the statewide Plan's framework. The local plans—along with annual progress reports, community newsletters, lists of local participants and meeting minutes—are posted online at *www.utahcbcp.org*.

On Oct. 2, 2015, the USFWS found that sage-grouse did not warrant listing under the Endangered Species Act. That decision was based on new scientific information, regulatory certainty and voluntary conservation put in place since 2010, including state-led conservation actions (USFWS 2015). In the course of that finding, the USFWS described the criteria of state and federal conservation plans that were most important in their decision, including:

- Provides elements of regulatory certainty.
- Relies on proven conservation measures, including disturbance caps, seasonal restrictions, identification of priority habitats and populations, and adaptive management strategies in response to monitoring information.
- Eases development stipulations in non-priority areas, thus incentivizing disturbance away from priority habitats.
- Incorporates state statute, administrative rules and executive orders to guide and ensure the implementation of the plan.
- Clearly articulates the management authority of state and private entities in accordance with a governor's executive order.
- Incorporates guidance from the COT report.
- Provides funding certainty and a commitment to long-term implementation.
- Includes avoidance, minimization and compensatory mitigation strategies that synchronize with federal land-use processes.
- Incorporates detailed fire-management strategies.
- Clearly defines agency responsibilities during implementation.
- Aligns local, state and federal plans and processes.

Gov. Herbert ordered state officials to conduct a stakeholder-outreach process in 2017

to review the 2013 Plan. This process ensured that Utah's conservation efforts continue to incorporate recent findings, as well as new and best-available science, data and knowledge. In August 2017, the PIC convened to discuss the current plan and agreed upon a collaborative review, revision and reauthorization process. The PIC requested that state officials meet with various stakeholders, including all LWGs, to gather detailed feedback and recommendations, and to report their findings and recommendations to the PIC for further discussion.

After conducting that review, UDWR and PLPCO, with help from the PIC, concluded that the Plan was an effective, adaptive and widely supported framework for continued conservation of sage-grouse in Utah. They also concluded that periodic revisions to the Plan are essential to ensure longterm conservation success. A revised Plan would incorporate the best practices identified by the USFWS in 2015, integrate new scientific research and lessons learned from its implementation, and better clarify and communicate its content with affected stakeholders.

This Plan is the revised and updated outcome of that stakeholder review process. It builds upon the progress made during past planning processes, improves implementation of future actions by incorporating important lessons learned, seeks to clarify the State of Utah's conservation approach to its stakeholders, and provides certainty that sage-grouse will remain "not warranted" for listing under the Endangered Species Act.

State of the Science

UTAH'S POPULATIONS

The State of Utah has a long history of successful wildlife management and conservation. In the case of the sage-grouse, significant contributions to the science, management and conservation of the species have been achieved under state management authority (Appendix 2). Utah currently supports an estimated 6.8% of the total range-wide population of sage-grouse (Western Association of Fish and Wildlife Agencies [WAFWA] 2015a). Utah's populations occupy habitats that reflect the natural topography and geography of Utah, which is characterized by mountainous terrain that is separated by broad valleys in the Great Basin and by deeply incised canyons in the Colorado Plateau. Those habitats occur throughout a mix of intact blocks and natural fragments in the Great Basin, and in naturally disconnected "islands" of habitat in the Colorado Plateau (Dahlgren et al. 2016a). Recent estimates show that sage-grouse now occupy as much as 8 million acres (about 41%) of their historical range in Utah (Beck et al. 2003).

The State of Utah has conducted annual breeding surveys of sage-grouse, known as "lek counts," since 1959. Leks are relatively open areas where male sage-grouse congregate during the breeding season to engage in courtship displays, known as "strutting." There are currently more than 500 known lek locations in Utah. Every spring, biologists count the number of strutting males on known leks (using the protocols described in Appendix 3) because the males are visible, easily counted, serve as a widely accepted and reliable monitoring standard, and provide an accurate index of sage-grouse population change (Dahlgren et al. 2016b). Lek count data are then used to monitor short-term and long-term population trends statewide, and within each SGMA (Appendix 4).

Utah's populations naturally fluctuate at the statewide and SGMA scale. Populations increase and decrease annually, with a peak in populations every eight to ten years (Garton et al. 2011). The statewide population of sage-grouse in Utah has shown a stable-to increasing population trend over the past 20 years (Appendix 4).

SEASONAL HABITATS

When planning and implementing conservation actions that benefit sage-grouse populations, it is essential to understand their seasonal movements and habitats (USFWS 2013). Generally, sage-grouse seasonal habitats have been defined using four broad categories: breeding, summer, winter and transitional.

- **Breeding habitats** consist of areas where pre-nesting, lekking, nesting and early brood-rearing activities occur.
- **Summer habitats** consist primarily of late brood-rearing areas.
- **Winter habitats** are areas where sagebrush is available above the snow throughout the winter for food and cover.
- **Transitional habitats** are those that link or connect seasonal habitats through migration corridors.

Some individual sage-grouse are considered non-migratory, using a specific landscape to meet all their seasonal habitat requirements, while others may migrate more than 30 miles between seasonal habitats (Connelly et al.

2000). Within populations, individuals may also exhibit unique movement strategies between seasonal habitats (Connelly et al. 2000).

To better understand where seasonal habitats occur in Utah and how they are being used, researchers and biologists at USU, Brigham Young University (BYU) and UDWR—with help from private, local, state and federal government partners—have been collecting Very High Frequency (VHF) and Global Positioning System (GPS) telemetry-based locations from sage-grouse for more than two decades. Those records are maintained in a database of more than 500,000 sage-grouse seasonal location and habitat-use records. That database is the most comprehensive, single source for local sage-grouse population occurrences in existence, and it is fundamental to conserving populations of sage-grouse in Utah. Therefore, where site-specific data is available, this Plan emphasizes the protection and enhancement of those seasonal habitats, rather than just lek locations and coarsely defined seasonal buffers around those leks.

In general, the seasonal movements of Utah's sage-grouse populations reflect the amount of habitat available to them. Populations occupying smaller isolated habitats move shorter distances than populations occupying larger contiguous habitats (Dahlgren et al. 2016a), which are more typical of habitats in other states. The seasonal movement distances for Utah's sage-grouse populations were generally less than those reported range-wide, but were reflective of the localized and naturally non-contiguous nature of many sagebrush habitats in the southern Great Basin and Colorado Plateau. Therefore, the best-available science suggests that sage-grouse populations in Utah are limited by the amount of habitat that is available to them (i.e., "space-limited").

Within each SGMA, seasonal habitats have been mapped and classified, based on current or potential sage-grouse habitat conditions (Appendix 5).

If in the review of any proposal or other action, differences between seasonal habitat maps and the on-the-ground situation become apparent, the on-the-ground boundaries shall be the authoritative resource.

Habitat

Habitat areas include the combined total of seasonal habitats used by sage-grouse at some point during their lifecycle. Habitat includes the geographical extent of leks, nesting, brood-rearing (including early and late brood-rearing), transitional (i.e., migration corridors) and winter areas, as defined and identified in Appendix 5.

Non-habitat

Non-habitat areas within SGMAs include lands that do not contribute to the lifecycle of sage-grouse. There have been efforts to minimize the amount of non-habitat incorporated within the boundaries of the SGMAs, but given the topographic, physiographic and land-cover features within Utah—combined with the landscape scale of habitat use and multi-spatial scales of mapping details—the inclusion of some non-habitat was unavoidable. As in other instances related to this Plan, on-the-ground delineation of non-habitat shall be the authoritative resource.

Opportunity Areas

Opportunity areas are those portions of an SGMA that currently do not contribute to the lifecycle of sage-grouse, but they are areas where restoration or rehabilitation efforts can provide additional habitat when linked to existing sage-grouse populations. In Utah, the majority of these areas are lands that have been altered due to wildfire or the proliferation of invasive plant species. Examples include areas where pinyon pine, Utah juniper, deciduous shrubs or other plant species have encroached upon sagebrush habitat, rendering it unsuitable for sage-grouse. Opportunity areas may be transformed into either habitat or non-habitat, based upon natural events or management choices, and they may be used to mitigate disturbance within habitat as appropriate.

Past efforts to delineate and map opportunity areas statewide have proven difficult and have

led to complications during implementation. Therefore, opportunity areas will not be mapped, but will be identified on the ground, using the criteria listed above and during appropriate circumstances (e.g., while evaluating the impacts of a proposed project or the potential benefits of conifer-removal projects).

Habitat Maps

Sage-grouse habitat occurs in a dynamic continuum on the landscape, making it difficult to draw distinct lines that permanently or precisely delineate habitats. Habitat maps provide an extremely useful tool for identifying habitat at a large scale; however, on-the-ground consultation is needed to confirm habitat at a site-specific scale.

In 2016, researchers at USU—with input from UDWR, BLM and USFS biologists—developed statewide sage-grouse habitat maps using known lek locations and more than 20,000 VHF sage-grouse telemetry locations collected across Utah from 1998–2014. These maps depicted habitat suitability on a scale from 0 to 100 at 1 km spatial resolution. Specifically, the maps compared environmental (e.g., vegetation, topography, soils and climate) and anthropogenic (e.g., developed land cover, road density and power line density) conditions at occupied leks and sage-grouse use locations, versus unoccupied leks and random background locations statewide. A random forest model was used to create draft sage-grouse habitat maps.

Biologists throughout the state then worked to ground-truth and verify the draft maps. The finalized habitat maps utilize the best-available science coupled with expert and local biological opinion. These seasonal habitat maps will be updated in 2019 by USU—in conjunction with UDWR, BLM and USFS—using sage-grouse location data collected from more than 500 GPS transmitters deployed between 2015 and 2019. By 2019, more than 1 million new sage-grouse locations will be available to update and refine the existing maps.

The seasonal habitat maps that accompany this Plan contain representations of these boundaries and are for informational and management purposes only. The maps contained herein—and displayed online—are not meant to represent a survey-grade boundary, nor are they intended to be the final authority for habitat delineations. Parties should consult with UDWR to determine the precise delineation of habitat for any particular development proposal. If in the review of any proposal or other action, differences between the maps and the on-the-ground situation become apparent, the on-the-ground boundaries shall be the authoritative resource.

For a complete explanation of the seasonal-habitat mapping process, see Appendix 5. To view the most current habitat maps, visit *wildlife.utah.gov/sagegrouse*.

Utah's Habitat Guidelines

CONNELLY et al. (2000) published broad sage-grouse habitat guidelines that were based on a synthesis of scientific findings from the northern range of the species. But their conclusions lacked spatial representation of sage-grouse populations in the southern Great Basin and desert shrub areas (Messmer 2013, Dahlgren et al. 2016a). Connelly et al. (2000) stated that their guidelines might not be appropriate for universal application to range wide sage-grouse habitats. Despite this caveat, the BLM adopted portions of those guidelines in its Utah Greater Sage-Grouse Approved Resource Management Plan Amendment (BLM 2015), and the USFS relied upon those standards when publishing its grazing guidelines in the 2015 Land Management Plan Amendments (USFS 2015).

This has been problematic for rangeland management in Utah, as most of Utah's sage-grouse occur in desert shrub areas that receive less annual precipitation than those in the northern range of the species. To address this issue, Dahlgren et al. (in-review) analyzed habitat and sage-grouse location data that was collected across the state of Utah from 1998-2013. They conducted a cluster analysis of spatially continuous vegetation, climatic, and elevation data to develop guidelines that are specific to Utah's sage-grouse habitats.

Using this approach, Dahlgren et al. (in-review) identified three distinct clusters of sage-grouse breeding (i.e., nesting and early brood-rearing) and late brood-rearing habitats in Utah. The three clusters were named Low, Wasatch, and Parker, which represent low, mid and high elevation sage-grouse habitats, respectively. For each cluster, they identified specific vegetation characteristics, or guidelines, that managers can use to assess sage-grouse habitat conditions based on local variability (Table 1).

Dahlgren et al. (in-review) identified sub-

	Habitat Cluster	Shrub Cover	Shrub Height	Sagebrush Composition	Sagebrush Cover	Grass Cover	Grass Height	Forb Cover	Forb Height
Breeding	Wasatch	≥19 %	≥ 23 cm	≥ 83 %	≥ 14 %	≥ 8 %	≥ 12 cm	≥ 4 %	≥ 6 cm
	Low	≥ 17 %	≥ 30 cm	≥ 36 %	≥ 7 %	≥ 5 %	≥ 15 cm	≥ 2 %	≥ 6 cm
	Parker	≥ 22 %	≥ 15 cm	≥ 71 %	≥ 18 %	≥ 4 %	≥ 9 cm	≥ 1 %	≥ 5 cm
Late Brood-Rearing	Wasatch	≥ 15 %	≥ 20 cm	≥ 77 %	≥ 17 %	≥ 8 %	≥ 10 cm	≥ 6 %	≥ 6 cm
	Low	≥ 10 %	≥ 26 cm	≥ 28 %	≥ 4 %	≥ 5 %	≥ 20 cm	≥ 2 %	≥ 8 cm
	Parker	≥ 19 %	≥ 11 cm	≥ 77 %	≥ 16 %	≥ 6 %	≥ 9 cm	≥ 2 %	≥ 5 cm

Table 1. Vegetation characteristics, or guidelines, developed by Dahlgren et al (in review) for Greater Sage-Grouse in Utah

stantial discrepancies between their recommended guidelines, those presented in Connelly et al. (2000), and those adopted in the BLM and USFS plans. In general, sage-grouse in Utah selected sites with vegetation that was shorter and sparser than those recommended in Connelly et al. (2000). The discrepancies were greater in the more arid Low cluster than in the higher elevation Wasatch and Parker clusters. Dahlgren et al. (in-review) demonstrated that lower sagebrush cover and shrub height are more appropriate for the Low and Wasatch clusters for both breeding and late brood-rearing habitats than the federal plans would suggest for Utah.

Dahlgren et al. (in-review) concluded that land management agencies should re-examine sage-grouse habitat guidelines across Utah. Their findings are more consistent with local conditions, and are more appropriate guidelines for shrub cover and height, as well as sagebrush composition and cover.

These general guidelines are a helpful tool that, in some instances, can help inform local land management decisions. However, these general habitat guidelines do not represent a required condition, and should not be confused with narrowly or rigidly defined and applied habitat standards.

UTAH'S SAGE-GROUSE MANAGEMENT AREAS

The provisions of this plan apply to the sage-grouse populations within the following Utah SGMAs (Figure 1; Appendix 6):

- Bald Hills
- Box Elder
- Carbon
- Hamlin Valley
- Ibapah
- Panguitch
- Parker Mountain-Emery
- Rich-Morgan-Summit
- Sheeprock Mountains
- Strawberry
- Uintah

The boundaries of these SGMAs are subject to change based on new science and data. Visit wildlife.utah.gov/sagegrouse *to view and download the most up-to-date maps, boundaries and shapefiles.*

The extensive database of seasonal location and habitat data described above was used to delineate Utah's 11 SGMAs. This approach, based on the best-available research and data, recognized and accepted current land uses and identified potential future uses that may conflict with species conservation (PLPCO 2013, Doherty et al. 2010). Those SGMAs encompass more than 90 percent of Utah's breeding populations, seasonal movements and the landscapes that provide the greatest potential to increase sage-grouse "usable space" through habitat protection and enhancements (Dahlgren et al. 2016a). Based on seasonal habitat records, Utah's SGMAs encompassed 88%, 80% and 89% of all breeding, summer and winter locations, respectively. When weighted by the sum of maximum males counted for each lek within each study area, the percentages increased to 97%, 95% and 96% of breeding, summer and winter locations, respectively.

Sage-grouse habitats outside the SGMAs are not required for long-term conservation of the species. Much of this habitat has already been heavily disturbed by human and natural causes, and it is not suitable for enhancement or improvement. Therefore, sage-grouse populations in these areas are not considered essential to perpetuate the species in Utah, and no specific management actions for this habitat are recommended.

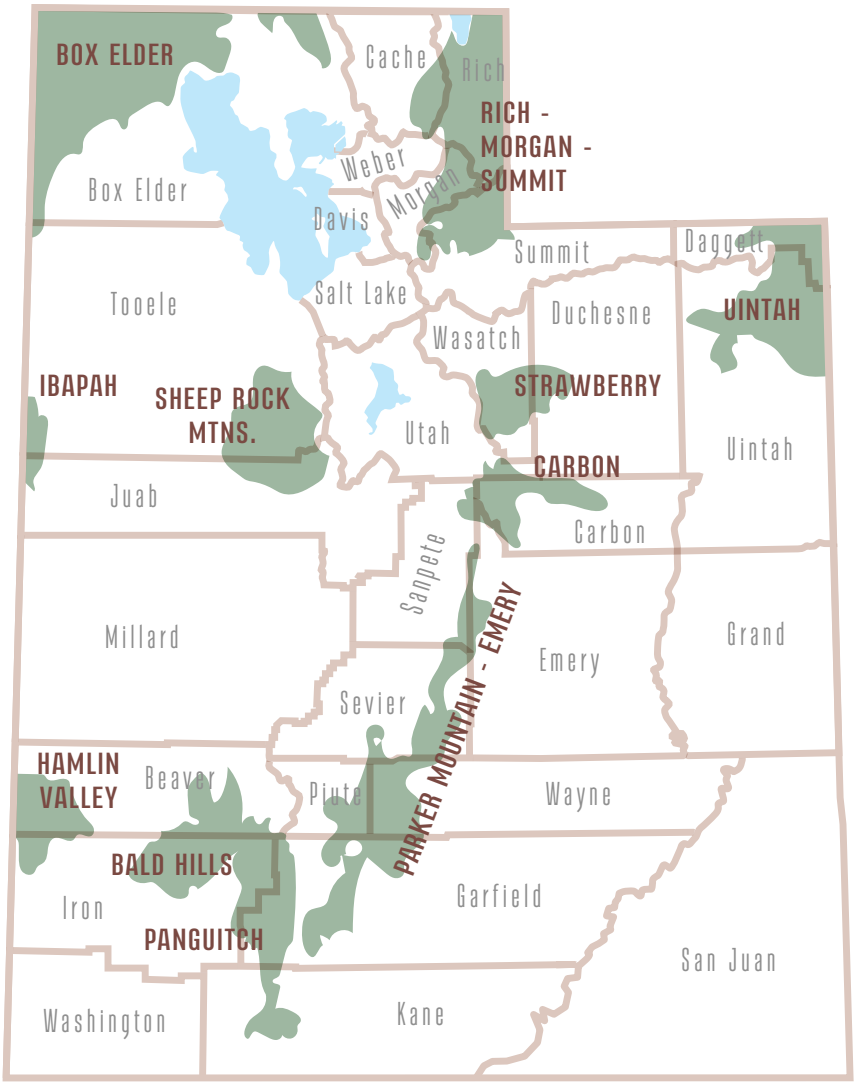
The boundaries of each SGMA reflect the biological and geographical realities of the areas currently occupied by a population or populations of sage-grouse. The 11 SGMAs incorporate only 13% of Utah's landmass (7.4 million acres out of the 54.3 million acres that comprise Utah), but they account for more than 90% of all sage-grouse in Utah. The SGMAs also represent the best opportunity for high-value, targeted conservation efforts for the species. The SGMA boundaries are based upon the locations of occupied leks, telemetry locations, the identification of nesting

and brood-rearing habitat, which, on average, is within a three-mile radius of the occupied leks (Dahlgren et al. 2016a), and associated winter and other seasonal habitat.

The maps that accompany this Plan contain representations of these boundaries and are for informational and management purposes only. The maps contained herein—and displayed online—are not meant to represent a survey-grade boundary, nor are they intended to be the final authority for habitat delineations. Parties should consult with UDWR to determine the precise delineation of habitat for any particular development proposal. If in the review of any proposal or other action, differences between the maps and the on-the-ground situation become apparent, the on-the-ground boundaries shall be the authoritative resource. Those who wish to propose modifications to the SGMA boundaries should follow the procedures outlined in Appendix 6.

SAGE-GROUSE RESPONSE TO CONIFER REMOVAL

This Plan places emphasis on increasing the amount of habitat available (i.e., "usable space," Guthery 1997) for sage-grouse as a means of increasing both productivity and connectivity. The reduction and removal of pinyon pine (*Pinus edulis*) and juniper (*Juniperus* spp.; together conifer)



encroachment in SGMAs where the sagebrush and herbaceous understory is relatively intact may provide the greatest potential to create sage-grouse habitat in Utah. Research suggests that sage-grouse will use areas where conifers have been removed within a short period of time (less than one to three years) after a treatment occurs. This is even more likely if the treatment site has sagebrush remaining in the understory, mesic areas nearby and the site is near existing sage-grouse use areas (Frey et al. 2013, Cook et al. 2017). Field observations in 2015 documented one female successfully nesting in areas where conifer-removal projects were taking place. The female nested under sagebrush in an area where the conifer canopy had been removed by a bullhog masticator (Sandford et al. 2015). In the four years before the bullhog treatment, sage-grouse use had never been documented in that area. In addition, Sandford et al. (2017) reported that female sage-grouse on the Box Elder SGMA that nest in or near conifer treatment areas have increased nest and brood success.

See Appendix 2 at wildlife.utah.gov/sagegrouse *for a complete and continually updated summary of the relevant science that has been conducted on sage-grouse range-wide and in Utah.*

TRANSLOCATIONS TO AUGMENT DECLINING POPULATIONS

Translocations have long been recommended to reestablish, augment and sustain genetic diversity in declining wildlife populations, including sage-grouse (Reese and Connelly 1997). The State of Utah has experimented with sage-grouse translocations to enhance existing populations for many years.

At one time, the Strawberry SGMA in central Utah was a dramatic example of the decline of sage-grouse populations in Utah. Griner (1939) estimated that 3,000–4,000 sage-grouse inhabited this high-mountain valley in the 1930s. Bunnell (2000) estimated the Strawberry SGMA population at 250–350 sage-grouse in 1999, representing a population decrease of 88–94%. Most of this decline was attributed to anthropogenic disturbances, including roads, the construction of Strawberry Reservoir (and the resulting inundation of habitats), increased predation and reductions in habitat quantity and quality.

In response to these declines, Baxter et al. (2013) from 1998–2009 translocated 353 sage-grouse into the Strawberry SGMA from the Rich-Morgan-Summit SGMA and the Parker Mountain-Emery SGMA. Additionally in 2009–2010, Duvuvuei et al. (2017) translocated an additional 60 sage-grouse from the Parker Mountain-Emery SGMA to Anthro Mountain in 2009–2010. The population in Strawberry SGMA is now estimated at more than 500 breeding adults. This increase is attributed to the success of those translocation efforts, as well as habitat improvements and enhanced predator control (Baxter et al. 2007, Baxter et al. 2008, Baxter et al. 2013). Characteristics common to successful sage-grouse translocations include suitable contiguous sagebrush habitats enveloped by geomorphic barriers, a residual resident population, pre-nesting releases and targeted predator management (Baxter et al. 2008, Baxter et al. 2013).

From 2009–2010, Gruber-Hadden et al. (2016) and Duvuvuei et al. (2017) compared vital rates and behaviors of 60 translocated and 15 resident radio-marked female sage-grouse and their broods on Anthro Mountain, which is located in the Ashley National Forest of northeastern Utah. Translocated birds from the Parker Mountain-Emery SGMA were released within 200 m of an active lek on Anthro Mountain. That source population was selected because it was robust and stable, was ≥ 100 km from the release site, was genetically compatible to Anthro Mountain sage-grouse (Briedinger et al. 2013) and was similar to Anthro Mountain in topography and elevation.

Adult survival, nest success and brood success estimates for both resident and translocated birds varied annually, but they were lower than range-wide averages (Gruber-Hadden et al. 2016). Adult survival was higher in 2010 than 2009, and survival differed depending on resident status (i.e., resident, newly translocated and

previously translocated). Nest success was higher for resident birds than translocated birds and was positively related to grass height. In 2009 and 2010, chick survival to day 50 was higher for the chicks of resident females than it was for the chicks of translocated females. Chick survival for both groups was positively related to grass cover and grass height. Area of occupancy for translocated (45 km2) and resident females (40 km2) overlapped by 68%. Duvuvuei et al. (2017) reported that while adult and yearling newly translocated females had similar survival rates, adult translocated females were more likely to raise a brood in their first year in the release area. Thus, managers should consider translocating a higher ratio of adult-to-yearling females in future translocation efforts to see a more immediate effect on population growth in the release area. The low overall vital rates for both groups suggested that managers may need to fully consider the potential interaction of vegetation structure, seasonal habitat juxtaposition and their potential relationship to predation when planning future translocations.

> "Sage-grouse translocation appears to be an important and effective tool in reversing local population declines in areas of population strongholds."

Currently, range-wide sage-grouse conservation is largely focused on implementing conservation measures within population strongholds (e.g., Priority Areas of Conservation; U.S. Fish and Wildlife Service 2013), and around known sage-grouse leks in areas of importance for breeding and early brood rearing (Fedy et al. 2014, Doherty et al. 2016). Row et al. (2018) concluded that by only implementing those recommendations, conservation planners may fail to improve and maintain functional connectivity for sage-grouse. Although they acknowledged that population strongholds (e.g., SGMAs) likely have much higher suitability values, they recommended maintaining some areas outside of these regions as an alternative strategy to maintain overall population connectivity.

Cross et al. (2018) in support of Row et al. (in press) identified the sage-grouse population in the Strawberry SGMA as a keystone node for connecting sage-grouse populations in northern, southern and eastern Utah. They suggested—based on genetic analyses of feathers collected from this area—that the populations are connected. This assumption contradicted Dahlgren et al. (2016a) and didn't acknowledge the influence of past sage-grouse translocations as a source of sampling bias in their analyses. Neither Cross et al. (2018) nor Row et al. (2018) mentioned the role of these translocations in their results, or acknowledged that these translocations biased their conclusions. This bias could lead managers to inappropriately focus conservation measures in areas outside of population strongholds (e.g., SGMAs), in direct contradiction to the recommendations of the COT report and best-available science.

Focusing their conservation efforts within population strongholds, Chelak and Messmer (2016) are working to restore a declining sage-grouse population in the Sheeprock Mountains SGMA of central Utah. The area consists of 611,129 acres, of which more than 80% are owned and managed by the BLM and the USFS. Key threats associated with sage-grouse declines in that area, as identified by the West Desert Adaptive Resources Management (WDARM) LWG, include wildfire, invasive species (annual grasses and forbs), loss of riparian or mesic habitats, increased predation, habitat fragmentation, dispersed recreation and conifer encroachment (WDARM 2007).

Robinson and Messmer (2013) provided much of the information about the status of the sage-grouse population in the Sheeprock Mountains SGMA. They monitored radio-marked sage-grouse in the SGMA from 2005–2006 to determine the factors affecting the vital rates in

this isolated population. During the study, they identified three new leks that had not been previously documented. In 2006, they counted more than 190 males on leks during spring lek counts. Nesting, brood success and the ratio of chicks per successful brood were higher in 2005 than 2006. They attributed these annual differences in vital rates to seasonal variation in precipitation. However, chick-recruitment estimates (regardless of year) were lower than reported in the published literature.

Adult sage-grouse survival rate estimates in the Sheeprock Mountains SGMA were also lower than those listed in published reports from other populations. These differences may reflect the effect of increased predation in the SGMA. Robinson and Messmer (2013) recommended that sage-grouse conservation strategies in the SGMA should continue to emphasize protection of brood-rearing and seasonal habitat. However, they also concluded that the risk of population extirpation as a consequence of extended droughts (predicted by climate change models) and the invasion of predators would remain problematic for this population. Subsequent to this study, the numbers of males counted on leks have continued to decline and have not increased in the cyclic manner observed for other populations in the state. By 2015, only 23 males were counted on three leks. Based on these findings, the State of Utah—with strong support from the BLM, USFS and local conservation partners—initiated aggressive adaptive-management measures.

The strategies identified by WDARM to reverse the decline in the Sheeprock sage-grouse populations have been referred to as an "all-hands, all-lands approach." This cross-jurisdictional and partner-based approach includes expanded efforts to remove conifer from sagebrush

habitat, restore mesic areas for brood rearing, perform enhanced predator control, carefully manage dispersed recreation, and translocate genetically similar sage-grouse from adjacent areas. The WDARM further recommended that translocation and adaptive-management efforts should be paired with research that monitors conservation outcomes and helps improve ongoing adaptive management efforts.

Preliminary research results suggest that these efforts are yielding positive outcomes for local sage-grouse populations (Chelak and Messmer 2016, Chelak and Messmer 2017). To date, 120 sage-grouse (90 females and 30 males) have been translocated to the Sheeprock Mountains SGMA, and their vital rates are being monitored. The researchers are also monitoring the seasonal movements and habitat use of 53 sage-grouse (12 adult males, 23 adult females, and 4 yearling males and 14 yearling females equipped with VHF and GPS radio transmitters). In 2018, 14 of the 17 monitored nests (82%) hatched a total of 85 chicks. One new lek has been discovered as a result of these efforts, and nest-initiation rates have increased from a low of 20% in 2016 to more than 80% in 2018. Brood survival has increased from 40% to 100%, and the number of strutting males has increased from a low of 20 males in 2016 to more than 60 in 2018, which is a 200% increase.

These results suggest that a state-led, integrated adaptive-management strategy—one that is focused on mitigating the identified local species conservation threats—is yielding the desired conservation outcomes. In addition, sage-grouse translocation appears to be an important and effective tool in reversing local population declines in areas of population strongholds.

Threat Assessment

THREATS TO SAGE-GROUSE have been evaluated at range-wide, statewide and local levels, using information from state wildlife agencies, researchers, federal agencies and local working groups. A team of state representatives and federal partners created the Greater Sage-Grouse Conservation Objectives: Final Report (COT Report; USFWS 2013). The COT Report describes and evaluates various range-wide threats to sage-grouse populations that could lead to habitat loss and fragmentation.

The COT Report has formed the basis for threat evaluation in federal resource management plans, Endangered Species Act listing decisions and other federal sage-grouse population evaluations. The COT Report, along with numerous assessments conducted before and since 2013, also recognizes the broad and pervasive threat from fire, non-native and invasive plant species and pinyon-juniper expansion (Connelly et al. 2004, Connelly et al. 2011, USFWS 2015, Coates et al. 2017).

The Utah CBCP facilitated a threat analysis in Utah using elements of the Comprehensive Action Planning (The Nature Conservancy 2007) process. That process clarified the threats that were most pervasive at the statewide (i.e., primary) scale, as well as the local (i.e., secondary) scale, including large portions of individual SGMAs, or localized and discrete portions of individual SGMAs (Messmer et. al. 2008). The State of Utah then incorporated the findings of that process into the Utah Greater Sage-Grouse Management Plan (UDWR 2009), and later incorporated them into the Plan in 2013. As a result, the following threat categories continue to form the basis for Utah's approach to sage-grouse conservation:

STATEWIDE THREATS

- Fire
- Invasive plant species
- Pinyon-juniper (conifer) woodland encroachment

LOCAL THREATS

- Extractive mineral development and infrastructure
- Renewable energy development and infrastructure
- Transmission corridors and tall structures
- Excessive predation
- Improper grazing and vegetation management
- Recreation and OHV use

This Plan identifies the highest-priority strategies to address specific threats (See page 32). Those strategies include details about the methodologies and spatial scale that will yield the greatest conservation benefits for sage-grouse in Utah.

Wildfire

Habitat loss due to fire is the single greatest threat to sage-grouse in Utah. Fire can lead to direct loss of essential sagebrush and can result in invasive plants replacing native vegetation. Although human-caused and natural ignitions are difficult to predict, pre-suppression, suppression response and post-fire restoration can have a large impact on the severity of fire effects.

To reduce the size and frequency of cata-

strophic fires, Gov. Herbert established the Catastrophic Wildfire Reduction Steering Committee. The committee developed the Catastrophic Wildfire Reduction Strategy in 2013 to guide a collaborative strategy to protect the health and welfare of Utahns and Utah lands (Utah 2013).

In 2015, Gov. Herbert signed an executive order, *Implementing the Utah Conservation Plan for Greater Sage-Grouse*, to further focus Utah's efforts (Appendix 1). That order mandated the Utah Division of Forestry, Fire and State Lands (FFSL) to prioritize fire-fuel mitigation activities near or in SGMAs. It also set SGMAs as the second priority during pre-attack planning, after human life and structures.

It is a high priority to proactively reduce or eliminate the spread of invasive species—particularly cheatgrass—that can alter fire cycles after a wildfire. When fire burns sage-grouse habitat, there is an immediate and persistent negative influence on sage-grouse populations (Connelly et al. 2000, Smith and Beck 2017).

Naturally ignited fire should be addressed as a serious threat. Prescribed fire is not typically an effective restoration tool for sage-grouse. Fire can increase the grass and forb cover that sage-grouse need for brood and late-summer habitat, but it also removes critical sagebrush cover and generally requires reseeding to reestablish sagebrush after a fire (Beck et al. 2009, Beck et al. 2012).

Invasive Plant Species

Habitat loss because of invasive plants—like whitetop, medusahead, knapweed, cheatgrass and others—is a serious threat to sage-grouse habitat. These species outcompete native communities and reduce habitat suitability by displacing grasses, forbs and shrubs that are essential components of sage-grouse habitat (Miller and Eddleman 2001). Invasive species, especially annual grasses, also increase the probability of fire ignition and spread, which leads to sagebrush areas becoming annual grasslands (Billings 1994, Miller and Eddleman 2001). Other invasive plant species alter soil and other characteristics of the environment, which makes it difficult and costly to reestablish native ecosystems. An aggressive response to new infestations is key to keeping invasive species from spreading.

Invasive plant infestations in Utah have reached critical levels, with estimates of yearly invasive-species treatments at more than 37,000 acres of public and private lands. Preventing and controlling infestations of this magnitude is a difficult task for most landowners and land managers. The cost of managing these infestations increases annually with their aggressive spread across the landscape. As weed infestations expand to new areas, the funding appropriated/allocated each year in government programs is often barely enough to cover base salaries, with little room for program advancement to address the growing threat from invasive plant infestations. In response to these findings, the State of Utah—in cooperation with the Utah Weed Control Association (UWCA) and numerous private, local and federal partners—developed the Utah Strategic Plan for Managing Noxious and Invasive Weeds (UWCA 2004).

In 2013, the Utah Legislature authorized an annual appropriation of $2 million to implement the strategies in UWCA (2004). The Utah Department of Agriculture and Food (UDAF) manages those allocations through cooperative contracts with Cooperative Weed Management Areas (CWMAs); federal, state and local governments; and private property owners. In State Fiscal Year 2018 alone, the treatment and restoration of more than 88,000 acres—on federal, state and private lands—was requested through the Invasive Species Mitigation (ISM) program and leveraged more than $3.5 million in matching funds.

Across the West, there is growing recognition of the range-wide impacts invasive weeds have on sage-grouse habitats. This recognition has catalyzed range-wide momentum toward coordinated, consolidated and targeted strategies to address the threat. Within that context, WAFWA hosted the Western Invasive Weed Summit (WAFWA 2015b).

The summit attendees included representatives from state and federal wildlife and land-management agencies, scientists,

weed-control officials, fire and rangeland managers, ranchers, Native American tribes and nongovernmental organizations. Summit participants discussed the many challenges associated with invasive weeds, as well as the barriers that stand in the way of addressing the threat to sagebrush ecosystems. Those collaborative efforts helped produce short-term and long-term range-wide strategies that now inform local efforts to combat invasive weeds in Utah and benefit sagebrush ecosystems.

Pinyon-Juniper (Conifer) Woodland Encroachment

Range-wide, pinyon pine and juniper (conifer) cover expands into sagebrush habitat by approximately 200,000 acres each year (Stiver et al. 2006). Within the 7.4 million acres that comprise Utah's SGMAs, approximately 3.1 million acres had greater than 4% conifer cover as of 2011 (Falkowski et al. 2014, Falkowski et al. 2017). The rate of conifer encroachment peaked in the first half of the 20th century; however, there is ongoing expansion into sagebrush communities and infill of low-density conifer stands (Miller et al. 2008). As young conifer trees move into sagebrush areas, they displace the grass and forb understory (Tausch et al. 2009, Pyke et al. 2015). Mature conifers will completely displace all sagebrush, grass and forb cover (Tausch et al. 2009, Pyke et al. 2015). Even at low densities that appear benign, conifer trees will displace sage-grouse, impact migratory movements and decrease survival rates.

Sage-grouse avoid areas that have low levels of conifer encroachment (Coates et al. 2017). There is a decreased nesting probability at 3% conifer cover and the possibility of lek abandonment at 4% (Baruch-Mordo et al. 2013, Severson et al. 2017a). Conifer cover also has a detrimental impact on winter habitat, and sage-grouse will avoid wintering areas with conifer cover at a 0.65 km2 scale (Doherty et al. 2008). Remaining conifer cover within 500 meters of a conifer-reduction treatment area also has a negative impact on the probability of use (Cook et al. 2017).

In addition to altering distribution, conifer cover in otherwise suitable sage-grouse habitat can reduce sage-grouse survival rates. Survival rates are much higher for individuals that avoid even low-density conifer cover (Coates et al. 2017). If individual birds pass through conifer cover areas—instead of avoiding them—the risk of daily mortality increases by 52%, 42% and 16% for juveniles, yearlings and adults, respectively (Prochazka et al. 2017). Conifer removal is most effective for improving sage-grouse survival when cover reaches 1.5% or lower (Coates et al. 2017).

Conifer removal also leads to improvements in sagebrush and understory cover, although the response depends on site potential (Miller et al. 2014, Bybee et al. 2016, Bates et al. 2017). Conifer removal has a positive effect on water storage, which results in greater peak storage, later snowmelt, increased stream flow and delayed water input to ecosystems (Roundy et al. 2014, Kormos et al. 2017).

A large-scale study in Oregon and Nevada showed that sage-grouse were 22% more likely to nest in recently treated areas, and 43% more likely to nest within the areas surrounding a treatment (Severson et al. 2017b). The treatments also resulted in a 6.6% increase in female annual survival and an 18.8% increase in nest survival. That could translate to a 25% increase in population growth, relative to control areas (Severson et al. 2017c).

Conifer encroachment threatens much of Utah's sage-grouse habitat and will continue to threaten the available habitat. Research suggests that sage-grouse will begin to use areas where conifers have been mechanically removed in a relatively short period of time (less than one to three years) after treatment. This is especially true if the treatment site has sagebrush remaining in the understory, is near an area with moderate amounts of water and is near existing sage-grouse use areas (Frey et al. 2013, Sandford et al. 2015, Cook et al. 2017, Sandford et al. 2017). Research also shows that conifer reduction improves vegetative habitat suitability, as measured by shrub and grass height (Severson et al. 2017d).

Within three years of treatment, researchers saw an increase in nest and brood survival (Sandford et al. 2017), while increasing usable space.

Extractive Mineral Development and Infrastructure

Oil, gas and mining development can result in direct loss of sage-grouse habitat. Facilities, access roads and indirect impacts—like noise, dust, traffic collisions and increased predator concentrations—all may affect sage-grouse populations to a varying degree from site to site.

Studies have observed negative impacts on leks up to 4.8 km from well pads (Harju et al. 2010). There is a 61% decrease in lek counts associated with a high density of wells (Taylor et al. 2013). Lek counts show a one- to four-year time lag related to development, along with a 24% decline in associated lek counts (Gregory and Beck 2014). Lek attendance declined at a rate of 2.5% per year in relation to increased oil and gas well density (Green et al. 2017). Habitat loss from other developments, like roads and housing, can have similar impacts on sage-grouse and their habitat. In addition to decreases in lek counts, development can impact juvenile survival, nest initiation, brood habitat use, chick survival and winter habitat selection (Lyon and Anderson 2003, Aldridge and Boyce 2007, Doherty et al. 2008, Carpenter et al. 2010, Holloran et al. 2010, Fedy et al. 2014).

A low-density oil and gas development in Colorado, however, did not see these decreases in sage-grouse populations (Rice et al. 2016). In Utah, a single lek was monitored that was initially located within a proposed coal mine site, but later moved adjacent to the development as the disturbance occurred. In that instance, population fluctuations of that single lek were similar to the surrounding population; however, 91% of

observed locations were outside of the mining area (Peterson et al. 2016). Those results have been attributed to site-specific planning, application of avoidance and minimization measures, and implementation of compensatory mitigation projects nearby.

These findings suggest that in some instances, it is possible that carefully planned, low-density development can take place without long-term negative effects on sage-grouse populations. But such developments should be carefully considered on a case-by-case basis prior to regulatory approvals and implementation. If such low-density developments do take place, they must be carefully planned, must account for seasonal habitat dynamics, and should be accompanied by careful monitoring and appropriate mitigation measures.

> "This Plan identifies the highest-priority strategies to address specific threats. Those strategies include details about the methodologies and spatial scale that will yield the greatest conservation benefits for sage-grouse in Utah."

Renewable Energy Development and Infrastructure

Wind turbines, solar arrays, transmission lines, access roads and other aspects of renewable energy development may result in a direct loss or fragmentation of sage-grouse habitat. In areas that surround habitat, the indirect effects of the development—including noise, traffic and increased predator populations—can also influence sage-grouse movements, survival and reproduction.

Lek counts located near wind energy development sites dropped 56% within a three-year period, compared to control leks located further from wind energy sites (LeBeau et al. 2017a). The risk of nests and broods failing decreased as the distance to wind turbines increased (LeBeau et al. 2014). A later study also found that areas with a higher percentage of surface disturbance associated with a wind facility decreased the probability that the area would be used as brood rearing or summer habitat, although it did not impact nest, brood or hen survival (LeBeau et al. 2017b). See the Extractive Mineral Development (pg. 23) and Transmission Corridors and Tall Structures (pg. 24) for a more detailed discussion of these effects.

Transmission Corridors and Tall Structures

Current knowledge about the influence of power lines and other tall structures on sage-grouse is limited. However, some of the observed declines in sage-grouse populations have been attributed to the construction, operation and maintenance of anthropogenic infrastructure such as tall structures and associated linear features (i.e., energy developments, roads and power lines) (USFWS 2013). Grassland birds, including sage-grouse, may be particularly vulnerable to tall anthropogenic structures because they evolved in landscapes void of such structures (Messmer et al. 2013, Hovick et al. 2014). Tall structures—including electrical transmission and distribution lines, cell towers, meteorological towers and light poles—can provide the common raven (*Corvis corax*) and other avian predators with elevated perches and nesting sites in habitats, where these structures would historically be unavailable (Howe et al. 2014). Decreases in lek counts have been associated with increases in the density of communication towers (Johnson et al. 2011). Likewise, mortality risks for sage-grouse hens and broods was greater in areas that were closer to potential raptor perches (Dinkins et al. 2014).

Hansen et al. (2016) documented an overall reduction in sage-grouse habitat quality during a winter that followed the construction of a transmission line. Installing a new transmission line in a pre-existing corridor, though, did not

change sage-grouse distribution (Hansen et al. 2016). Wisdom et al. (2011) identified transmission power lines as a potential factor in the extirpation of sage-grouse from historical ranges. In contrast, Johnson et al. (2011) did not detect any relationship between distance to power lines and lek trends. Beyond these studies, researchers have relied on untested causal mechanisms to infer the negative effects of power lines on sage-grouse (Messmer et al. 2013). For example, Knick et al. (2011) used reported foraging distances of golden eagles (*Aquila chrysaetos*; McIntyre 2002) and common ravens (Marzluff et al. 1997, Boarman et al. 1999) to estimate that electric power transmission lines had a negative impact on 50% of all sagebrush within the range of sage-grouse.

Coates et al (2014a) reported the number of common ravens increased within 2.2 km of transmission corridors in southern Idaho—in patchy non-native vegetation adjacent to big sagebrush—with the greatest potential effect on common raven populations within 570 m of structures (Coates et al. 2014a, Howe et al. 2014). Losing continuous stands of sagebrush also favors an increased number of nesting common ravens. Ravens are more likely to nest on human-created structures than other avian predators (Coates et al. 2014b). Researchers studied using deterrents to reduce predator perching rates on tall structures. One study showed that using deterrents did not lead to an observable difference in perching rates (Prather and Messmer 2010), but another found that deterrents can reduce both the perching rate and prey captures (Dwyer and Doloughan 2014).

Lack of information on specific causal mechanisms—those related to increases in avian predator density associated with tall structures—has increased the uncertainty for wildlife and land managers tasked with developing best-management practices (BMP) for power lines in sagebrush habitats (UWIN 2011, Messmer et al. 2013, Walters et al. 2014). The USFWS and Avian Power Line Interaction Committee (APLIC) have recommended seasonal and spatial buffers as BMPs for power lines placed near leks in sage-grouse breeding habitats to minimize the potential for negative impacts (APLIC 2015). However, UWIN (2011), Messmer et al. (2013) and Manier et al. (2014) concluded the BMP buffer zones vary widely (e.g., 0.3 to 8.0 km) because of challenges associated with interpreting the area influenced by power lines. In addition, differences between transmission and distribution lines—which serve different purposes and can therefore occur in different landscapes and at differing heights—have not been previously assessed.

To address these issues, Kohl et al. (under review), evaluated the effects of power lines on sage-grouse breeding ecology within Utah, portions of southeastern Idaho and southwestern Wyoming from 1998–2013. Overall, power lines negatively affected lek trends and persistence up to a distance of 2.7 and 2.8 km, respectively. Female sage-grouse were displaced by transmission lines during the nesting and brooding seasons at distances up to 1.1 and 0.8 km, respectively. Nest and brood success were also negatively affected by transmission lines, up to distances of 2.6 and 1.1 km, respectively. Distribution lines did not affect sage-grouse habitat selection or reproductive fitness. The analyses demonstrated the value of habitat quality in mitigating potential power line impacts. Conservation planners can minimize the effects of new transmission power lines by placing them in existing anthropogenic corridors and/or incorporating buffers within 2.8 km from active leks. Given the uncertainty in their analyses regarding sage-grouse response to distribution lines—coupled with their necessary role in providing electric power service directly to individual consumers—they recommended that buffers for these power lines be considered on a case-by-case basis. Micrositing to avoid important habitats and habitat reclamation may play important roles in reducing the impacts of new power line construction.

Excessive Predation

Some LWGs identify predation as a localized threat in portions of their respective SGMAs, primarily due to the increased populations of nest-predating corvids (e.g., ravens) and the

emergence or increase of canids (e.g., red fox) and other native mesopredators (e.g., badgers and skunks).

Predation alone is not generally a limiting factor to population growth on a large-scale basis (Hagen 2011, Dinkins et al. 2016). However, predator control can help to increase sage-grouse survival in small, isolated populations when control efforts are concentrated and targeted, and in localized areas where excessive predation is occurring (Baxter et al. 2013). Excessive predation of sage-grouse is most often tied to poor habitat quality and availability—specifically hiding and nesting cover—and particularly in areas with significant anthropogenic disturbance.

When other habitat factors have increased vulnerability to predation and a localized population is threatened, predator control can temporarily increase sage-grouse annual survival and reproductive rates (Baxter 2013). Common ravens should be the primary focus of localized predator-control efforts (Conover and Roberts 2017). Common ravens can influence sage-grouse incubation behavior, nest site selection and brood habitat (Coates and Delhanty 2008, Dinkins et al. 2012). Across studies, the results of raven control have varied, but there is strong evidence that localized, intense and continued raven removal can increase nest survival and help increase local sage-grouse populations (Baxter 2013, Peebles 2015, Peebles and Conover 2016).

Predator control that targets raptors is of limited utility due to protections in the Migratory Bird Treaty Act and in the Bald and Golden Eagle Protection Act. But modest removals of nesting corvids are currently allowable by federal law. Removals should take place in a localized, strategic and intensive manner—and at maximum levels allowable by law—to ensure the greatest localized conservation benefit is achieved.

Improper Livestock Grazing and Vegetation Management

Grazing by domestic livestock remains the predominant anthropogenic land-use across the sagebrush ecosystem in North America, occurring in 87% of remaining sage-grouse habitat (Crawford et al. 2004, Knick and Connelly 2011,

Dettenmaier et al. 2017). Livestock grazing is a major use in most SGMAs in Utah (Messmer et al. 2008).

Compared to other anthropogenic activities, the impacts of livestock grazing are more diffuse across the landscape (Knick et al. 2011, Boyd et al. 2014). Grazing that follows best-management practices can improve habitat quality and seasonal nutrition, and thereby enhance local sage-grouse populations (Beck and Mitchell 2000). Improperly managed grazing and some range-management practices designed to reduce sagebrush cover, however, can negatively affect sage-grouse populations (Beck and Mitchell 2000).

The USFWS (2015) identified improper livestock grazing as a potential local conservation threat to sage-grouse because of reported negative impacts associated with reductions of the herbaceous cover required for nest concealment and brood nutrition (Gregg et al. 1994, Schroeder and Baydack 2001, Holloran et al. 2005, Hagen 2011, Dahlgren et al. 2015). However, Smith et al. (2018) reported that the methods used to sample herbaceous cover at sage-grouse nest sites—particularly grass height—were biased. This bias may have contributed to inappropriate management recommendations regarding the role of grass stubble height and livestock grazing to sage-grouse nest fate.

Danvir et al. (2005) and Dahlgren et al. (2015) reported that sage-grouse populations in northeastern Utah responded positively (i.e., increased number of males counted on leks and number of broods observed) to long-term (more than 25 years) high-intensity, low-frequency (HILF) rest and deferred-rotation grazing practices, combined with sagebrush reduction treatments implemented on Deseret Land and Livestock (DLL). In 2011, USU initiated research on DLL and adjacent BLM and USFS livestock grazing allotments to determine if sage-grouse vital rates (i.e., nest and brood success and juvenile and adult survival) differed by study area, and if any of the observed differences were related to vegetation composition and structure (Dettenmaier and Messmer 2014, 2015 and 2016).

The study sites were in Rich County (northeastern Utah), and they constitute the southwestern portion of the Wyoming Basin Sage-Grouse Management Zone II (Knick and Connelly 2011). The DLL study area consists of 80,600 hectares (200,000 acres) of private lands and 6,300 hectares (15,567 acres) of federal BLM lands located in the lower elevations. DLL has been managed as a cohesive unit under HILF rest and deferred-rotation prescribed grazing practices since 1979. The federal allotments known as the Three Creeks (3C) consist of a collection of 29 individual BLM and USFS grazing allotments and private lands that cover a combined total of 56,900 hectares (146,000 acres). This area is managed using season-long grazing practices (see Payne 2011 for a complete description of the grazing practices). Sage-grouse nest survival was higher on DLL (33%) than on the 3C parcel (17%). Habitat analyses also revealed that four sage-grouse habitat metrics (i.e., vegetation concealment, sagebrush, perennial bunchgrass and forb height) were greater in nesting habitats on DLL than on 3C. Differences were detected in these vegetation parameters despite disparities in precipitation and stocking rates between study areas. The DLL study area received 7 cm (3 inches) less annual precipitation on average and had stocking rates ~50% greater (0.76 vs. 0.46 AUM · ha-1) than 3C did (Dettermaier and Messmer 2014–2016).

Dettermaier and Messmer (2014–2016) demonstrated the potential for HILF grazing management practices implemented in xeric sagebrush rangeland areas to benefit sage-grouse. However, they also identified the complexities in conducting research to answer fundamental questions regarding the role of livestock grazing in managing xeric sagebrush rangeland landscapes for multiple purposes. Grazing studies implemented to evaluate the effects on wildlife and their habitats must account for these land-use legacy effects when making comparisons between studies and drawing conclusions (Ripplinger et al. 2015, Dettenmaier et al. 2017). This is particularly relevant in cold, arid systems, as shorter growing seasons and chronic water

limitations increase the time required for plant communities to recover from disturbance. Ripplinger et al. (2015) suggested that the legacy effects from historical land uses and management actions in the study area may persist well beyond 50 years.

In addition, vegetation treatments that reduce sagebrush cover generally produce a negative impact on sage-grouse and other wildlife populations in Wyoming Big Sage habitats (*A.t. wyomingensiss*; Beck et al. 2012). In one study, lek counts were lower after prescribed burning and mechanical sagebrush treatments (Smith and Beck 2017).

But in the right circumstances—and when done in the right manner—there may be a positive influence from limited chemical or mechanical treatments. Treatments can enhance the use of brood habitat in some sagebrush communities at high elevations with moderate water sources and small-scale mountain big sagebrush (*A.t. vaseyana*; Dahlgren et al. 2006, Baxter et al. 2017). However, research has not linked these increases to long-term population increases.

Sagebrush removal—even in sagebrush sites located at high elevations with moderate water sources—may lead to population declines and small changes in winter habitat availability (Carpenter et al. 2010, Dahlgren et al. 2015). Consequently, sagebrush removal should only take place in limited circumstances, at limited spatial scales and only when local site conditions and seasonal habitat needs are carefully considered. While research reported in peer-reviewed literature demonstrates the potential for negative impacts of sagebrush-reduction treatments to increase livestock forage on sage-grouse habitat (Beck and Mitchell 2000), few studies have linked livestock grazing at the landscape level to vital rates for ground-nesting grassland birds such as the sage-grouse (Dettenmaier et al. 2017). To open up mature and dense stands of sagebrush to promote forb and grass production in high-elevation grasslands, DLL combined sagebrush treatments with a HILF rest and deferred-rotation grazing system (Dahlgren et al. 2015). Nesting sage-grouse depend on forbs and insects during the incubation period, and newly hatched chicks are almost entirely dependent on these same food items until they are about six weeks old. Preliminary data suggest that the increase in forbs and grasses following such range treatments provided greater forage for livestock, but may have also improved sage-grouse brooding habitat (Danvir et al. 2005).

To follow-up on those findings, researchers from USU are now deploying GPS rump-mounted radio-transmitters on birds captured on DLL and 3C to better describe the range of sage-grouse behavioral responses to the presence of livestock and grazing. In addition to learning more about why sage-grouse nest success is better on DLL than on 3C, they are evaluating if brood-rearing habitat-use patterns and vital rates differ under prescribed rotational and season-long grazing practices.

Land and wildlife managers are also examining another grazing-related issue: Overabundant populations of wild horses (*Equus ferus*) and burros (*E. asinus*) can cause sites to have more invasive annual grasses, fewer native grasses, lower plant diversity, reduced shrub cover and fragmented shrub canopy—all of which degrade habitat for sage-grouse (Beever and Aldridge 2011). The BLM is required under the Wild Free-Roaming Horses and Burros Act of 1971, to conduct annual population inventories to estimate the number of wild horses and burros inhabiting federal lands in the West. To promote healthy conditions on the range, the BLM determines Appropriate Management Level (AML), which is the number of wild horses and burros that can thrive in balance with other public land resources and uses (Danvir 2018). The range-wide AML is 26,690 horses and burros. Wild horses and burros that exceed AML are to be removed from the range, in accordance with the 1971 law, as amended.

The current estimated on-range wild horse and burro population (as of March 1, 2018) is 81,951, a 13% increase over the 2017 estimate of 72,674 (which doesn't include animals that were removed last year as part of a management action). Thus, the current West-wide, on-range

population exceeds AML by more than 55,000. In Utah, the BLM manages 19 wild horse and burro Herd Management Areas (HMAs) on nearly 2.5 million acres. The combined AML for all HMAs in Utah is 1,956 animals. Since 1971, the BLM has removed approximately 12,850 animals from public rangelands in Utah as part of its efforts to maintain healthy horses and burros on healthy public rangelands. Animals removed from public rangelands are offered to the public for adoption, and unadopted animals are cared for on open pastures for the rest of their lives. In early 2018, the BLM estimated that 4,848 wild horses and 344 burros inhabited federal lands in Utah. The estimated total statewide total is 5,192 or 2.6 times AML. Much of the area inhabited by wild horses and burros overlaps SGMAs located in western Utah.

The State of Utah and the USU Berryman Institute co-hosted a summit in Salt Lake City, Utah on Aug. 22–24, 2017. The goal of the summit was "full implementation of the 1971 Wild Horse and Burro Management Act." Participation was by invitation and included representatives of state, local and tribal governments, academia, public land users, conservation groups, wildlife interest groups and federal agencies. The workshop included a tour to view on-the-ground management issues and symposia to discuss wild horse and burro policy issues, legal matters, science and best-management practices. Participants shared their preferences regarding the future management of the BLM's wild horse and burro program. Summit participants who voted in the session indicated their level of support for various suggestions to address horse and burro issues (BLM 2018).

Options with high levels of support included the commercial use of horses for protein, euthanizing unadoptable horses for population control and allowing sale without restrictions. Some of those options are controversial, but the State of Utah will continue to work with the BLM and other partners to implement collaborative and broadly supported solutions to reduce excessive numbers of wild horses and burros in Utah's SGMAs.

Recreation and OHV Use

Certain recreational activities can lead to direct habitat loss. For example, unmanaged off-highway vehicles (OHV) may directly destroy habitat when driving through sagebrush and creating new trails. Unmanaged OHV recreation—and the resulting noise—can also disturb sage-grouse and may increase their susceptibility to predators. One study found that increasing road edge can lead to an increase in common raven populations and their predation threat (Walker and Marzluff 2015). Recreational OHVs, all-terrain vehicles (ATVs) and other recreational vehicles, also have the potential to transport invasive weeds, especially in areas where the ground has been disturbed, leading to habitat degradation.

Guiding Principles

BASED ON THE SCIENCE discussed herein, and the highest-priority threats in Utah, the following principles guide the development and implementation of this conservation Plan:

- Conservation actions should focus on protecting existing, highest-priority seasonal habitats and areas that provide for the year-round lifecycle needs of the species. These actions should occur at a spatial scale that is appropriate for the life history of the species.
- Support for—and adaptive implementation of—range-wide and local research is critical to sustaining successful conservation outcomes, while also addressing various socio-economic needs and impacts.
- Addressing the most pervasive statewide and local threats to the species—and doing so in the areas with the greatest potential for success—will lead to the greatest conservation outcomes.
- Continued incorporation of proven conservation measures—including disturbance caps, seasonal restrictions, identification of priority habitats and populations, and adaptive management strategies—will allow for increased reliance on this plan during future listing determinations.
- A commitment to continued coordination among local, state and federal partners—and to cooperative policies and processes—leads to better conservation outcomes and increases the certainty of this plan's implementation.
- Combining voluntary and incentive-based programs on private, local government, SITLA and state lands—with reasonable and cooperative regulatory programs on federally managed lands—is the most effective long-term means to conserve sage-grouse populations in Utah.

Conservation Goal, Objectives & Strategies

CONSERVATION GOAL

Protect, maintain and increase sage-grouse populations within the established SGMAs throughout Utah.

POPULATION OBJECTIVE

Maintain stable or increasing sage-grouse population trends statewide—and within each SGMA—based on annual evaluations described in Appendix 4.

HABITAT OBJECTIVE

Protect, maintain and increase sage-grouse habitats within SGMAs at or above 2013 baseline disturbance levels (Gifford et al. 2014), subject to the provisions determined in 1(b) below.

CONSERVATION STRATEGIES

1. To meet the population and habitat objectives, the State of Utah will use the following strategies to implement this plan and address the highest-priority statewide and local threats:

1a. Continue to implement the measures outlined in Govs. executive order (EO/2015/002)—as amended and referenced herein—to conserve sage-grouse populations and habitats while allowing for multiple uses of state, private and federal lands.

1b. Work with the BLM and USFS to determine the most appropriate methods to monitor and implement a disturbance cap of 3%, above the 2013 baseline of existing disturbance identified by Gifford et al. 2014, across all private and government ownerships and jurisdictions within SGMAs. When complete, share the findings with the Plan Implementation Council (PIC) for consideration and inclusion into Appendix 9. Update the PIC on permanent surface disturbance monitoring and implementation of the disturbance cap annually.

1c. Monitor sage-grouse populations annually, using the methods described in Appendix 3.

1d. If the 20-year population trend in any SGMA falls below monitoring thresholds described herein and in Appendix 4—or could potentially fall below those thresholds based on other data or information—form a state-led local response team of resource experts to identify the causal factor(s) for the population decline. The team would then implement appropriate adaptive-management responses to ensure that declining sage-grouse populations in Utah remain viable and stable.

1e. If deemed appropriate, coordinate with federal partners to develop a comprehensive memorandum of understanding (MOU) that will guide the cooperative implementation of the elements identified in this Plan and federal land-use management plans (e.g., compensatory mitigation and adaptive management).

1f. Quantify the average annual rate of sage-grouse habitat loss within SGMAs due to perma-

nent disturbance, invasive species, wildfire and conifer encroachment to inform 4(d).

1g. Continue to support the LWGs across Utah to ensure local support and expertise throughout the implementation of this Plan.

1h. Continue to fund, support and implement critical research that supports the implementation of this Plan and future improvements to this Plan.

Strategies to Address Wildfire

2. Implement the actions outlined in EO/002/2015 and related MOUs, along with the Governor's Catastrophic Wildfire Reduction Strategy, relevant sections of State code, and the National Cohesive Wildland Fire Management Strategy, to reduce the size, severity and frequency of wildfires in and adjacent to SGMAs:

2a. Coordinate across relevant state agencies to ensure maximum conservation and risk reduction benefit to sage-grouse populations on all land management projects, prescribed fires, and fire suppression actions in and adjacent to SGMAs by.

i. Pre-suppression: Landscapes across all jurisdictions are resilient to fire-related disturbances in accordance with management objectives. Human populations and infrastructure can withstand a wildfire without loss of life and property.

a. Prioritize fuels mitigation to protect habitats within and near SGMAs, second only to the protection of human life and property, with the goal of reducing threats to sage-grouse from wildfire.

b. Incorporate the SGMA reference data layer into the Utah Wildfire Risk Assessment Portal. Use that information to evaluate the risk of wildfire in every SGMA and to inform wildfire risk reduction strategies and decision-making in and around SGMAs. Increase public participation in education campaigns and efforts to develop fire-adapted communities within or near SGMAs.

c. Increase and improve inter-agency wildfire prevention campaigns to reduce human-caused ignitions that could threaten SGMAs.

ii. Suppression: All jurisdictions participate in making and implementing safe, effective and efficient risk-based wildfire management decisions.

a. Ensure that every acre in every SGMA is officially covered by an initial attack resource (i.e., federal or state agency or local fire department).

b. Coordinate with local, state and federal fire management agencies to prioritize SGMAs during pre-season initial attack planning and suppression, second only to the protection of human life and property.

c. Support the development of increased wildfire response capacity from local fire departments, including enhanced training and opportunities for Northland Wildlife Coordination Group qualifications, additional or upgraded equipment and gear based on FD needs, improved communications and coordination between local, state and federal agencies, etc.

iii. Post-Fire rehab

a. Coordinate and ensure the implementation of post-fire rehabilitation and restoration of sage-grouse seasonal habitats within SGMAs to benefit sage-grouse to the maximum extent possible.

b. Work with Legislature to create and fund an ongoing Catastrophic Fire Reduction Fund to ensure adequate fi-

nances to implement the Catastrophic Wildfire Reduction Strategy, National Cohesive Strategy, and measures outlined in this Plan and EO/002/2015.

2b. Maintain records, as appropriate, about agency consultations sufficient to demonstrate the issues discussed, the specific areas within SGMAs involved, resolution of the issues discussed and outcomes achieved.

2c. Report state agency coordination outcomes to the Governor's Office annually.

2d. Examine statutory barriers that are impeding the actions outlined herein and work toward legislative solutions where needed.

Strategies to Address Invasive Plant Species

3a. Continue to cooperatively implement the strategies outlined in the Utah Strategic Plan for Managing Noxious and Invasive Weeds (2004), including on-the-ground projects that address the threat of invasive weeds on sagebrush ecosystems.

3b. Participate in the continued development and implementation of the strategies outlined in WAFWA (2015b), which addresses challenges and barriers to successful invasive plant species management throughout western U.S.

3c. Update the strategic plan identified in 3(a) to incorporate new science, lessons learned and new strategies that address the challenges and barriers identified in WAFWA (2015b).

3d. Coordinate the implementation of the strategic plan identified in 3(a) with post-fire restoration actions prescribed in 2(a) iii.

Strategies to Address Pinyon-Juniper (Conifer) Woodland Encroachment

4a. Using the Utah Wildlife Migration Initiative (WMI), identify the highest-priority sage-grouse habitats and migration corridors within or adjacent to occupied habitats.
4b. Work with federal, state and private landowners to protect an average of at least 5,000 acres annually of the highest-priority habitats identified in 4(a) through voluntary conservation covenants, leases, easements, transfers, acquisitions or other legal or regulatory tools.

4c. Using Utah's Watershed Restoration Initiative (WRI), remove conifer as appropriate in areas protected in 4(b) to ensure that existing functional habitats remain intact.

4d. Using the WRI, maintain existing sage-grouse habitats by offsetting the impacts identified in 1(f) by creating additional habitat within or adjacent to occupied habitats at an equal rate each year—or 25,000 acres each year—whichever is greater.

4e. Increase sage-grouse habitats by using the WRI—and other state, federal and private partnerships—to restore or create 50,000 acres of habitat within or adjacent to occupied habitats each year, in addition to those acres identified in 4(d).

4f. Using the WRI, implement active, passive and natural riparian and mesic restoration projects, including in coordination with those treatments described in 4(d) and 4(e), to increase nesting and brood-rearing habitats.

Strategies to Address Extractive Mineral Development, Renewable Energy Development, Transmission Lines, Tall Structures, and Associated Infrastructure

5a. Implement the actions outlined in EO/002/2015 and related MOUs, to ensure the coordinated implementation of the provisions of this Plan, including:

- **i.** Coordinate all new regulatory actions proposed within SGMAs among all relevant state and federal agencies—pursuant to federal authorities, EO/002/2015 and related MOUs—to fascilitate implementation of this Plan.

ii. During project coordination within SGMAs, recommend that the regulatory entity or project proponet voluntarily implement the Compensatory Mitigation Framework and Management Protocol outlined herein.

iii. Monitor permanent surface disturbance within SGMAs and implement permanent surface disturbance criteria and decision protocols, consistent with the 3% disturbance cap identified in 1(b).

iv. Work with private, state and federal landowners to develop mitigation credits on private lands, using the mitigation tools described herein.

v. Work with federal land-management agencies to develop an MOU to use the mitigation credits described herein to offset the impacts of permanent disturbance on federal lands.

vi. Maintain records, as appropriate, about agency consultations sufficient to demonstrate the issues discussed, the specific areas within SGMAs involved, resolution of the issues discussed and outcomes achieved.

vii. Report state agency coordination outcomes to the governor's office annually.

Strategies to Address Excessive Predation

6a. Each year, in SGMAs where sage-grouse populations are negatively affected by ravens, red foxes or other predators, work with federal and state agencies—as well as private landowners and the public—to identify problem areas and then remove the maximum number of red foxes, ravens and other predators from those areas, as authorized by law.

6b. Use habitat-improvement projects to minimize and reduce predator impacts on nesting birds. These projects could include removing trees or structures that serve as raptor perches and creating additional habitat and cover to help sage-grouse hide from nest predators.

6c. Identify and develop reliable funding sources to support a targeted, adaptable and sustainable predator-removal strategy.

6d. Work with federal partners to increase the maximum take of *Corvid spp*. allowable by law, and then secure permanent funding sources to implement predator control at those levels indefinitely.

Strategies to Address Improper Grazing and Vegetation Management

7a. Implement the actions outlined in EO/002/2015 and related MOUs to ensure the coordinated implementation of the provisions of this Plan, including:

i. Coordinate with relevant state and federal agencies during implementation of the Grazing Improvement Program (GIP) to ensure that projects in SGMAs are consistent with the provisions of this Plan.

ii. If improper grazing is negatively affecting sage-grouse in a particular area, coordinate with relevant state and federal agencies and stakeholders to adaptively implement voluntary grazing-improvement strategies that are consistent with the provisions of this Plan.

iii. Ensure that state funding is not used for projects that materially eliminate sagebrush in SGMAs, unless UDAF and UDWR jointly agree that such a project will not negatively impact sage-grouse.

iv. Host workshops for GIP coordinators, UDWR biologists and other relevant practitioners to share the latest scientific findings related to grazing and vegetation treatments in sage-grouse habitats. Ensure that all workshop participants work toward consistent, appropriate and adaptive implementation of those findings

when achieving 7(e).

v. Work with private landowners to locate livestock fences away from leks, where possible, and use the Natural Resources Conservation Service (NRCS) fence standards (U.S. Department of Agriculture, Natural Resources Conservation Service 2012).

vi. Coordinate all new regulatory actions proposed within SGMAs among all relevant state agencies—pursuant to EO/002/2015 and related MOUs—to enable compliance with this Plan.

vii. Coordinate with federal, state and private partners to identify areas where wild horse and burro herds in SGMAs exceed the AML, and then work toward identifying and implementing broadly supported collaborative strategies to meet AML in those areas.

viii. Maintain records, as appropriate, about agency consultations sufficient to demonstrate the issues discussed, the specific areas within SGMAs involved, resolution of the issues discussed and outcomes achieved.

ix. Report state agency coordination outcomes to the governor's office annually.

Strategies to Address Recreation and OHV Use

8a. Implement the actions outlined in EO/002/2015 and related MOUs to ensure the coordinated implementation of the provisions of this Plan, including:

i. Coordinate all new regulatory actions proposed within SGMAs among all relevant state and federal agencies—pursuant to federal authorities, EO/002/2015 and related MOUs—to enable compliance with this Plan.

ii. Participate in local, state and federal travel-management processes within SGMAs, and recommend that the regulatory entity implement the Compensatory Mitigation Framework and Management Protocol outlined herein.

iii. Maintain records, as appropriate, about state agency consultations sufficient to demonstrate the issues discussed, the specific areas within SGMAs involved, resolution of the issues discussed and outcomes achieved.

iv. Report state agency coordination outcomes to the governor's office annually.

Plan Implementation

SUCCESSFUL implementation of this Plan will require the cooperation of many people, policies, processes, organizations and agencies. The development and maintenance of this Plan is the responsibility of PLPCO, with assistance from the Utah Department of Natural Resources (DNR) on its development and implementation. Together, those entities will cooperatively oversee the development and implementation of this Plan, and are jointly responsible for coordinating with relevant partners and stakeholders to ensure its success.

GOVERNOR'S EXECUTIVE ORDER AND AGENCY RESPONSIBILITIES

On Feb. 25, 2015, Gov. Gary R. Herbert signed an executive order (EO/2015/002), titled *Implementing the Utah Conservation Plan for Greater Sage-Grouse*. That executive order, as amended and referenced herein, requires all relevant State of Utah agencies and executive offices to comply with and facilitate the implementation of this Plan. Utah's PLPCO oversees the development, coordination and implementation of this plan, in close cooperation with the DNR and the UDWR.

To further facilitate the implementation of the executive order and this Plan, MOUs were executed between PLPCO, the UDWR and the primary state agencies whose operations affect the implementation of this Plan (Appendix 1). The executive order and the MOUs require state agencies to coordinate the implementation of this plan when conducting activities that affect sage-grouse populations in SGMAs. The executive order and MOUs also require annual reporting of those coordination efforts to the governor's office. State agency actions that affect sage-grouse populations in SGMAs that are not specifically outlined in the executive order or related MOUs are also subject to the provisions of this plan, and therefore must be coordinated in a manner similar to agency actions outlined and referenced herein. The executive order, MOUs and annual agency summary memos can be found in Appendix 1.

In addition to the executive order and its related MOUs, the State of Utah may enter into an MOU(s) with the USFS and the BLM that guide and support the cooperative implementation of this plan and federal land-use plans.

PLAN IMPLEMENTATION COUNCIL

The director of PLPCO may establish and convene a Plan Implementation Council (PIC) to give advice and make recommendations to PLPCO and UDWR concerning the creation, revision and implementation of this Plan. The PIC shall consist of one standing member, or his/her designee, who represents:

- PLPCO
- UDWR
- DNR
- UDAF
- FFSL
- Utah Division of Oil, Gas and Mining (OGM)
- SITLA
- BLM
- USFS
- USFWS
- NRCS

In addition to those standing members, at-large members may be appointed to represent the primary industries and organizations whose interests may be affected by the provisions of this Plan. At-large members are appointed in

writing by the director of PLPCO, in consultation with the executive director of DNR and the director of UDWR. At-large members will serve two-year terms and can be reappointed to serve additional terms where necessary. The director of PLPCO may, at the time of appointment or reappointment, adjust the length of terms to ensure that the terms of PIC members are staggered so that approximately half of the PIC is appointed every two years. Members of the PIC will serve voluntarily and, if a vacancy occurs for any reason, the replacement shall be appointed for the unexpired duration of the term. The PIC shall be staffed by personnel identified by the State, and shall meet at least once annually, or more often as determined by the director of PLPCO. No actions taken by this committee shall supersede the State's authorities.

UTAH'S COMPENSATORY MITIGATION PROGRAM AND POLICIES

The State of Utah's Compensatory Mitigation Program (Program; Appendix 7) was established, in part, by the Utah Legislature under Utah Code 79-2-501 et. seq., Utah Administrative Rule R634-3 (Compensatory Mitigation Program), and this Plan. Key program rules, definitions and mechanisms for developing and tracking mitigation credits and debits are fully explained in Utah Administrative Rule R634-3, Compensatory Mitigation Program, as amended. The Program is administered by Utah's DNR.

In Utah, compensatory mitigation is part of a three-step process for conserving sage-grouse habitat, while balancing responsible economic

growth and development. Before an organization uses compensatory mitigation, it should take any necessary steps—in consultation with the DWR and DNR—to employ the Management Protocol (Appendix 8) and the mitigation hierarchy principles below.

Mitigation Hierarchy Principles

— ***Avoidance Actions***

Avoidance actions eliminate disturbance to sage-grouse and their habitats, using techniques such as:

- Planning and siting disturbance activities in non-habitat areas or in areas outside of SGMAs
- Adhering to seasonal noise restrictions

State and federal agencies, together with private landowners, should voluntarily attempt to eliminate actions that cause permanent disturbance to sage-grouse habitat. If avoidance actions eliminate permanent disturbance to sage-grouse habitats, then no compensatory mitigation is necessary.

— ***Minimization Actions***

Minimization actions reduce the amount, duration or impact of habitat disturbance, for example:

- Consolidating development activities into a smaller footprint
- Reducing noise levels below identified thresholds
- Reducing traffic volume on a road

In the event a landowner—whether federal, state or private—cannot avoid permanent disturbance to sage-grouse habitats, then efforts should be taken to voluntarily minimize the amount, duration or impacts of the disturbance. After minimization actions are implemented, then compensatory mitigation should be voluntarily used to offset unavoidable impacts. Minimization actions do not prevent the need for compensatory mitigation, but may reduce the amount of mitigation necessary to offset the permanent disturbance to sage-grouse habitats.

disturbance of seasonal habitat types within any SGMA. The State of Utah recommends that for every one acre of functional sage-grouse habitat permanently disturbed, four acres of functional habitats or corridors should be created, restored and/or preserved, as identified in the amended Utah Administrative Rule R634-3. Utah's compensatory mitigation ratio accounts for direct and indirect impacts that may result from permanent disturbance, differences in habitat type and quality and uncertainty related to mitigation success. This ratio reduces project costs by simplifying the analysis of these factors, while also ensuring effective conservation outcomes.

"Utah's compensatory mitigation ratio accounts for direct and indirect impacts that may result from permanent disturbance, differences in habitat type and quality and uncertainty related to mitigation success. This ratio reduces project costs by simplifying the analysis of these factors, while also ensuring effective conservation outcomes."

— ***Compensatory Mitigation Actions***

Compensatory mitigation actions are measures that create, restore and/or protect functional habitat or habitat corridors to offset the impacts of unavoidable permanent disturbance to sage-grouse habitat. Permanent disturbance is further defined in Utah Administrative Rule R634-3, as amended.

Management Protocol

To avoid or minimize the potential impact of proposed disturbance activities in SGMAs, agencies should voluntarily implement the Management Protocol upon federal and state lands, as described in Appendix 8.

Compensatory Mitigation Ratio

The compensatory mitigation ratio is the ratio of credits needed to offset permanent

Landownership Mitigation Practices

As described above, compensatory mitigation offsets the impacts of permanent disturbance to sage-grouse habitat anywhere in Utah's SGMAs, regardless of land ownership. The regulatory agencies responsible for providing compensatory mitigation are as follows:

— ***Federal Lands***

On federally owned and managed lands, the federal land-management agency and the State of Utah will coordinate with the federal agency to recommend when compensatory mitigation should be utilized to offset disturbance on federal lands. They will seek to develop an annual work-plan and MOU that prioritize where compensa-

tory mitigation should be used for the greatest conservation benefit to sage-grouse habitats in Utah subject to their respective legal authorities.

— ***State Lands***

For disturbance on lands owned and managed by state agencies—other than the State Institutional Trust Lands Administration (SITLA)—the agency that owns, manages or regulates the land will ensure compensatory mitigation is completed to offset permanent disturbance to sage-grouse habitat on those lands, pursuant to EO/002/2015, as amended.

— ***SITLA Lands***

Lands owned or administered by SITLA have a special status under the Utah Constitution. As such, compensatory mitigation for permanent disturbance on SITLA land is not regulated by this Plan. However, the State of Utah will restore and/or protect sufficient acres of habitat annually to serve as compensatory mitigation to offset permanent disturbance on SITLA lands. The State of Utah will coordinate with SITLA to voluntarily and cooperatively fund the state's compensatory mitigation efforts.

— ***Private, County and Municipal Lands***

This category of land ownership includes all sage-grouse habitat that is not included in one of the preceding categories. Compensatory mitigation for permanent disturbance on these lands will operate similar to the method described for SITLA lands. The State of Utah will work with private landowners, counties and municipalities to develop a strategy to complete the voluntary compensatory mitigation, and will request voluntary and cooperative funding or mitigation credits from the landowner or entity carrying out the disturbance-causing activity.

Tracking Compensatory Mitigation

The State of Utah will track each acre of permanent disturbance to sage-grouse habitat, regardless of land-ownership type, using the term "debit." Further, for each acre of sage-grouse habitat within SGMAs that is created, restored or preserved to offset debits, the State will track "credits" for compensatory mitigation purposes. Credits and debits will be tracked annually by the DNR through its Credit Exchange Service.

Any person can generate credits to be utilized as compensatory mitigation by creating or protecting sage-grouse habitat in any of the following ways:

- Creating functional sage-grouse habitat

  adjacent to existing occupied habitat that has a live sagebrush canopy of at least 10%, and has no more than 1% canopy cover of conifer trees over 0.5 meters in height.

- Creating corridors that link two occupied habitat areas that facilitates safe movement between habitats, particularly by broods. A corridor must be at least 100 acres in size, have a width of at least 2,000 feet, contain less than 1% canopy cover by conifers, and

have at least 15% ground cover in perennial grasses, in addition to the presence of shrubs and forbs.

- Protecting existing occupied habitat through a conservation bank, easement or other mechanism.

— *Monitoring and Verification*

The DNR will verify that projects conducted to create, restore or protect habitat result in the creation or protection of functional habitat or corridors.

— *Pre-disturbance Mitigation*

In most cases, compensatory mitigation projects should be completed before a permanent disturbance occurs. Compensatory mitigation for a disturbance must be demonstrably effective in the timeframe of the activity and not at some future date. This does not mean that sage-grouse immediately use the area, but only that the criteria for functional habitat is met.

Compensatory mitigation actions should occur in areas that have the highest likelihood of occupation by the species. Areas within any SGMAs may receive compensatory mitigation action based on a calculation of the positive habitat effects generated inside. Once sage-grouse occupy the site of a mitigation action, the SGMA boundaries may be adjusted to include the area.

— *Duration for Maintaining Credits*

Each mitigation credit should be managed as functional habitat or corridor for the duration prescribed in Utah Administrative Rule R634-3 (Compensatory Mitigation Program), as amended. Those terms are intended to ensure that credits are managed or protected as functional habitat or corridor for the lifetime of the debit it is intended to offset. In other words, if a permanent disturbance will last 20-years before functional habitat exists or is restored, then the credit that was meant to offset the permanent disturbance should be managed as functional habitat or corridor for a period of at least 20-years to offset the disturbance. Similarly, if a disturbance will last in perpetuity, or if the credits are generated by protecting functional habitats or corridors through a Conservation Bank, then the credit to offset the disturbance should be managed in perpetuity.

— *Managing Uncertainty*

To manage uncertainty and to offset any potential loss of credits due to unforeseen circumstances, the State of Utah will manage a reserve pool of credits to offset any catastrophic loss of generated credits from unforeseen circumstances.

These rules are subject to change. For the latest information about the State's program, visit Utah Administrative Rule R634-3 or wildlife.utah.gov/sagegrouse. *If there are differences between this Plan and R634-3, as amended, then R634-3 shall be the authoritative resource.*

— *Alternative Strategies to Compensatory Mitigation*

In 2016, the Western Governor's Association's Sage-Grouse Task Force finalized a position paper on compensatory mitigation for sage-grouse (WGA 2016). That paper outlined the key principles and approaches that all western states should adhere to when developing and implementing mitigation measures. Those principles and approaches are accounted for in the mitigation program described herein, and are essential for avoiding a future listing of the sage-grouse under the Endangered Species Act. However, some project proponents may wish to voluntarily propose alternative mitigation strategies to offset the impacts of permanent disturbance. In those rare instances, the alternative strategies should adequately address the following elements of compensatory mitigation that are described in that report and in the mitigation program described herein, including the following:

- Implementation of the mitigation hierarchy of avoid, minimize and mitigate and the Management Protocol outlined in Appendix 8.
- Adherence to a no-net loss mitigation stan-

dard by providing habitat or conservation values, services and functions that are at least equal to the lost or degraded values, services and functions caused by the disturbance.

- Identify, quantify and offset the impacts of direct and indirect effects.
- Reliance on best-available science and accepted industry standards and practices.
- Identifies and addresses the uncertainty associated with catastrophic losses or unforeseen failure to achieve its stated objectives.
- Maintenance, monitoring and reporting that ensures mitigation actions fully offset the effects to sage-grouse for a duration that is equal to the duration of the disturbance.
- Assurance that the proposed compensatory mitigation actions will be completed before the proposed disturbance occurs.
- Measurable and quantifiable outcomes for seasonal habitat functionality, quality and quantity.

Project proponents who wish to voluntarily propose alternative mitigation strategies are encouraged to coordinate closely with the UDWR and DNR prior to submitting formal proposals. If UDWR, DOGM, DNR and PLPCO concur in writing that the voluntarily proposed alternative strategies adhere to and fully address the key principles described herein, such projects may proceed without recourse to the provisions of this plan.

The considerations outlined above apply only to agency considerations by the State of Utah, and do not apply to federal agencies or actions. Those project proponents that are proposing alternative mitigation strategies on federal lands

are encouraged to coordinate closely with the relevant federal agencies. In addition, proposals which are near completion of environmental reviews at the time of this plans adoption, and which have independently considered the effects of the project on sage-grouse, may continue the pending evaluation without recourse to the provisions of this plan.

Disturbance Cap Monitoring

Implementing a disturbance cap has been cited as an important component of a state-led conservation plan (USFWS 2015). The BLM and USFS have adopted a 3% disturbance cap, while Utah's 2013 Plan adopted a 5% disturbance cap. The data that was used to calculate both disturbance caps varied widely, so the interpretation of the outputs of such calculations may also vary widely. As a result of these differences, stakeholders are often confused by the varying methodologies that are used across multiple land-ownership jurisdictions. That confusion has led to widespread uncertainty for many stakeholders. Therefore, a more consistent approach to calculating and monitoring a disturbance cap would be more beneficial to stakeholders and sage-grouse conservation efforts. As described in 1(b) on page 32 herein, it is the intent of this Plan to work with the BLM, USFS and effected stakeholders to determine the most appropriate methods to monitor and implement a disturbance cap of 3%, above the 2013 baseline identified by Gifford et al. 2014, within SGMAs (Appendix 9).

Adaptive Management

The statewide population trend, as well as the population trend within each SGMA, will be evaluated annually to determine if each population is generally stable, increasing or decreasing. Population trends will be evaluated over a 20-year period—which incorporates two population cycles into the evaluation—and minimizes bias in light of natural fluctuations. A trend line (i.e., a regression line) will be fit to the most recent 20 years of data, with the slope of the line representing the long-term population rate of change. If the long-term population rate of chanage (i.e., slope) is approximately equal to or greater than zero, it is an indicator the population is stable or growing. If the population is stable or growing, no additional management action is needed be-

yond that which is already taking place.

If the population growth rate is less than zero, it is an indicator the population is declining, and new management actions are needed in order to reverse that decline. If a population is determined to be in decline using these methods—or if other information indicates that the population could soon be in decline—resource experts from state agencies, federal land-management agencies and other affected stakeholders will convene in LWG meetings to determine the causal factors for the decline. Then, they will decide on the appropriate responses and strategies to address those causal factors (e.g., population translocations, predator control, habitat improvements). The conservation plan for the affected LWG will be updated to adaptively respond to those findings.

The appropriate management responses (e.g., translocations) will be implemented in a manner and for a duration deemed appropriate by resource experts and the relevant LWG. If, in the course of that implementation, an SGMA is no longer occupied after 10 years, then PLPCO—in careful coordination with UDWR—may revise SGMA boundaries and designations to re-prioritize statewide conservation actions.

A description of the methodology used to monitor statewide populations, as well as current population trends, can be found in Appendices 3 and 4, respectively.

Utah's Watershed Restoration Initiative

The WRI is a partnership-based program to improve high-priority watersheds throughout Utah. The program is sponsored by the Utah Partners for Conservation and Development (UPCD) and is in its eleventh year of implementation. The program focuses on three ecosystem values:

- Watershed health and biological diversity
- Water quality and yield
- Opportunities for sustainable uses of natural resources

The program is a bottom-up initiative, where project planning, review and ranking all occur at a local level. Five regional teams elect their own leadership; establish focus areas; review, score and rank project proposals using a comprehensive project-prioritization process; and assist their members in implementing projects. The program and its partners provide a number of project services, including: funding; assistance with project planning and implementation; contracting and accounting; seed purchases, storage, mixing and delivery; free use of restoration equipment; project monitoring and reporting; project management; and an online project database.

The core funding for WRI comes from an appropriation to the DNR by the Utah Legislature, which is then matched by funds from various state, federal, non-governmental and private conservation partners. In State Fiscal Year 2015 alone, 122 agencies, organizations and individuals participated in projects in the WRI database through funding, project management, technical assistance or in-kind services. This program and its locally led regional teams make it possible to improve habitats on a landscape-scale and across ownership and jurisdictional boundaries.

Utah has demonstrated a unique capability to restore and enhance habitat on a large scale through the UPCD and the WRI. Protection of remaining habitat is the primary focus of conservation efforts, but many locations can be reclaimed or restored by active vegetation-management actions.

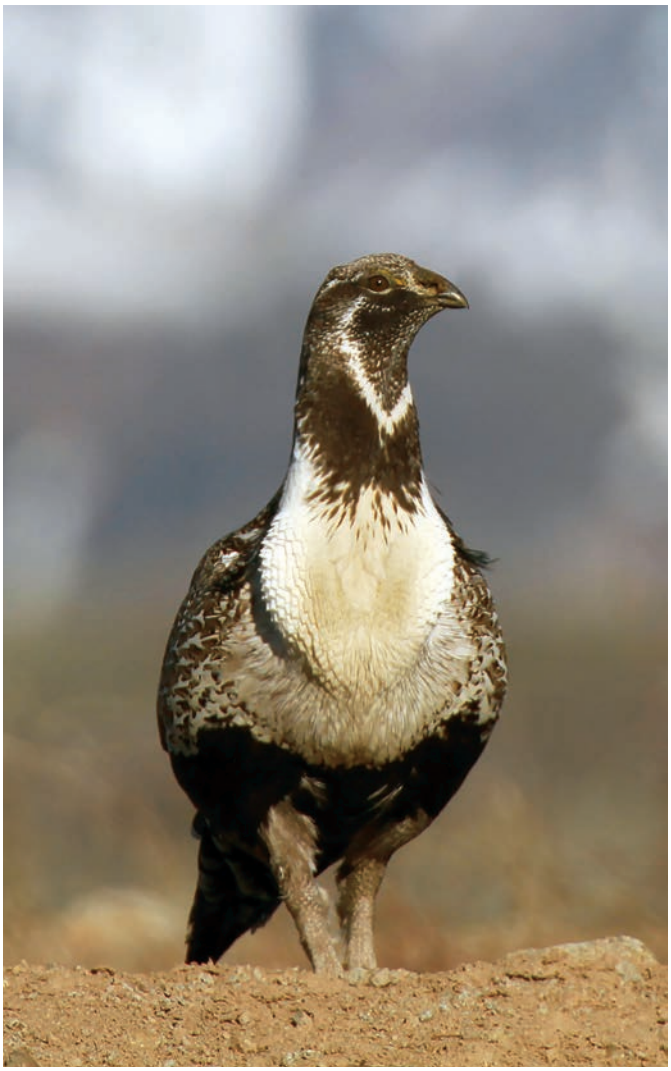
Additional information about this program can be found at *www.wri.utah.gov*.

Utah's Catastrophic Wildfire Reduction Strategy

Following Utah's record-breaking wildfire season in 2012, Governor Gary R. Herbert tasked state land managers with developing "a comprehensive and systematic strategy to reduce the size, intensity and frequency of catastrophic wildland fires in Utah." That mandate, followed by a year-long inter-agency planning effort, led to the creation of the Governor's Catastrophic Wildfire Reduction Strategy (Strategy) and associated

Statewide Steering Committee (Committee). The Governor accepted the Strategy in December 2013 and FFSL was tasked with its implementation. During the 2014 Utah Legislative General Session, the Legislature unanimously passed SCR7, expressing support for the Strategy and urging its implementation.

The Committee is convened by the Utah State Forester to advise and support FFSL's implementation of the Strategy, and to facilitate the inter-agency coordination and implementation of the National Cohesive Wildland Fire Management Strategy (NCS). The Committee coordinates with local, state and federal government agencies, NGOs and private-sector stakeholders in a cooperative, unified effort to successfully achieve the Strategy's recommendations, including:



- Coordinate statewide mitigation resources
- Create a Catastrophic Fire Reduction Fund
- Create and coordinate Regional Collaborative Working Groups to prioritize wildland fire management needs across Utah
- Create and coordinate technical committees to respond to specific concerns of statewide importance
- Adopt key recommendations from the NCS
- Increase public understanding and participation in wildland fire reduction strategies
- Report on actions taken and planned to the Governor and Legislature annually

The following NCS goals inform every decision made by the Committee and FFSL:

- Landscapes across all jurisdictions are resilient to fire-related disturbances in accordance with management objectives.
- Human populations and infrastructure can withstand a wildfire without loss of life and property.
- All jurisdictions participate in making and implementing safe, effective, efficient risk-based wildfire management decisions.

The goals of the statewide catastrophic wildfire reduction policy, which includes "reducing risks to wildlife such as greater sage-grouse," and the three NCS goals are now incorporated into Utah State Code 65A-8-103.5.

Utah's Invasive Species Mitigation Program

Invasive plant infestations in Utah have reached critical levels, with estimates of yearly invasive-species treatments at more than 37,000 acres of public and private lands. The UDAF—in cooperation with Utah's 29 county governments—manages and implements Utah's noxious weed laws.

As weed infestations increase and spread across the landscape, the funding appropriated and allocated each year in government programs is often barely enough to cover base salaries.

There's little room for program advancement to address the growing threat from invasive plant infestations.

In 2012, the Utah Legislature authorized an annual dedicated appropriation of $1 million toward on-the-ground treatments of invasive species, as directed by UDAF. In 2013, these funds were increased to $2 million annually, to be managed by UDAF through cooperative contracts with CWMAs, private landowners, and federal, state, county and local governments. From 2012 through 2018, these funds have resulted in yearly increases in treatments and restoration statewide. In State Fiscal Year 2018 alone, more than 88,000 acres of treatment and restoration was requested through the ISM program. This incorporates activities on federal, state and private lands with matching funds of more than $3.5 million.

> "Because wildlife migrations often span long distances and cross many jurisdictions, the WMI is building strong partnerships with state and federal agencies, cities, counties, private landowners and conservation groups and then working with those partners to document and preserve wildlife movement."

Utah's Wildlife Migration Initiative

The UDWR founded the Wildlife Migration Initiative (WMI) in 2017 to document, preserve and enhance movement corridors for wildlife throughout Utah. The WMI uses state-of-the-art GPS tracking technology to monitor species' movements in near real-time. Information generated by tracking collars is used to define critical habitats for species, including migration corridors that provide essential linkages between seasonal ranges. The WMI also generates maps of stopover sites, bottlenecks and movement barriers, and it works to identify mitigation needs—such as wildlife crossings—that safely move species under or over busy highways.

Because wildlife migrations often span long distances and cross many jurisdictions, the WMI is building strong partnerships with state and federal agencies, cities, counties, private landowners and conservation groups and then working with those partners to document and preserve wildlife movement. The mission is critical because Utah is the fastest-growing state in the country and its infrastructure—which can block or disrupt wildlife movements—is expanding at a rapid pace.

The WMI also complements and supports the efforts of the WRI. Information generated by monitoring the movements of wildlife can be used to strategically complete habitat treatments so they provide maximum benefits for target species. Additionally, wildlife-tracking data can be used to evaluate the effectiveness of habitat treatments, helping land managers justify resources used on habitat treatments. Together, Utah's conservation initiatives are building a legacy of high-quality habitat, information, partnerships and technology to ensure the state's fish and wildlife populations remain healthy and productive for generations to come.

Local Working Groups

In 1996, USU began a long-term partnership with the UDWR to develop an LWG process to conserve sage-grouse populations throughout Utah. Since that time, the Utah CBCP has facilitated stakeholder meetings in communities within occupied sage-grouse habitats to devel-

op local sage-grouse conservation plans. The CBCP updates stakeholders regularly, informing them about emerging issues and new research through quarterly LWG meetings, field tours, quarterly newsletters (distributed to more than 2,000 stakeholders) and e-mail alerts. The CBCP has also hosted several statewide summits—and national and international forums—where they have engaged thousands of stakeholders range-wide in an open and ongoing discussion about how best to conserve sage-grouse, the sagebrush ecosystem and working landscapes.

Support for the CBCP comes from ongoing Utah legislative funding and from federal, state and private partners. The CBCP process has translated conservation planning and research into management—and management into population change—further validating the role of community-based conservation strategies in sage-grouse conservation. The CBCP process gives local communities a voice in shaping state and national policies that directly affect them.

Plan Authorization

This Plan shall become effective when approved by the governor, and it shall remain in effect for five years thereafter, unless revised or extended by the governor. The Plan shall be reviewed at times and by such public processes as the governor shall direct, for effectiveness and continued need. Notwithstanding the provisions of this section, if the USFWS should finalize a regulation that lists the sage-grouse as threatened or endangered under the provisions of the Endangered Species Act, this Plan may be revoked and rendered ineffective by action of the governor.

Annual Reporting

PLPCO, in close coordination with DNR and UDWR, shall complete an annual report that summarizes the State of Utah's progress toward implementation of this Plan. The annual report shall be presented to the PIC upon its finalization.

Appendices

All appendices to this Plan—as amended, referenced and incorporated herein—can be found at *wildlife.utah.gov/sagegrouse*, including:

- Appendix 1. Governor's Executive Order and Agency MOUs
- Appendix 2. Science Summary
- Appendix 3. Population Monitoring
- Appendix 4. Adaptive Management
- Appendix 5. Seasonal Habitats
- Appendix 6. SGMAs and Boundary Adjustments
- Appendix 7. Compensatory Mitigation
- Appendix 8. Management Protocol
- Appendix 9. Disturbance Cap Monitoring
- Appendix 10. Definitions
- Appendix 11. Literature Cited

Online appendices may be revised at any time to incorporate new information, ensuring that this Plan remains adaptive in its content and effectiveness. Readers are encouraged to check for updates online when relying upon these materials.