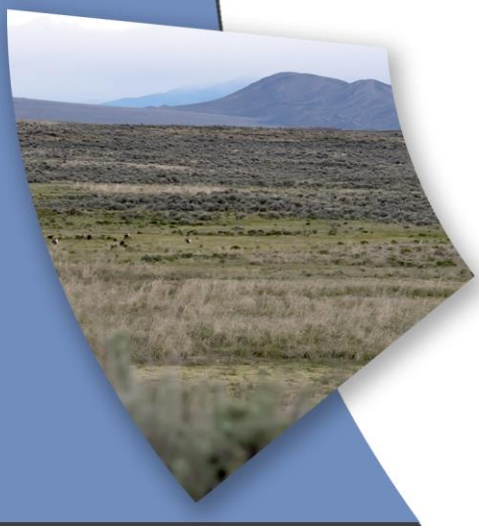
Environmental Surveillance, Education, and Research Program
January 2019
DOE/ID-11527(18)



IMPLEMENTING THE CANDIDATE CONSERVATION AGREEMENT FOR GREATER SAGE-GROUSE ON THE IDAHO NATIONAL LABORATORY SITE:

2018 SUMMARY REPORT

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Implementing the Candidate Conservation Agreement for Greater Sage-Grouse on the Idaho National Laboratory Site: 2018 Summary Report

January 2019

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Prepared for:

U.S. Department of Energy, Idaho Operations Office
Environmental Surveillance, Education, and Research Program
Contract No. DE-NE-0008477

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ACKNOWLEDGEMENTS

Front cover illustration was created by Alana Jensen, and Brande Hendricks assisted with document formatting. Bill Doering and Doug Halford reviewed a draft of this report and provided helpful suggestions for improvement. Seasonal technicians who assisted in collecting field data in 2018 were Aurora Bayless-Edwards, Emma Casselman, Mikayla Eager, Ellie Johnson, Levi Lindley, Amanda Reynolds, Matthew Sheffer, Alaysha Whitworth, and Anna Williams. We recognize how much effort and perseverance it takes to collect field data and we appreciate the crews' dedicated efforts.

RECOMMENDED CITATION

Shurtliff, Q.R., K.N. Kaser, J.R. Hafla, J.P. Shive, A.D. Forman, K.T. Edwards, and B.F. Bybee. 2019. Implementing the Candidate Conservation Agreement for Greater Sage-Grouse on the Idaho National Laboratory Site: 2018 Summary Report. Veolia Nuclear Solutions–Federal Services, Idaho Falls, ID. DOE/ID-11527(18).

ACRONYMS

BLM	Bureau of Land Management
CCA	Candidate Conservation Agreement
DOE	U.S. Department of Energy, Idaho Operations Office
ESER	Environmental Surveillance, Education, and Research
IDFG	Idaho Department of Fish and Game
INL	Idaho National Laboratory
MFC	Materials and Fuels Complex
MPLS	Males Per Lek Surveyed
NAIP	National Agricultural Imaging Program
NOAA	National Oceanic and Atmospheric Administration
OSC	Office of Species Conservation
RWMC	Radioactive Waste Management Complex
SGCA	Sage-grouse Conservation Area
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WTB	Wireless Test Bed

1. INTRODUCTION, BACKGROUND, AND PURPOSE

In October 2014, the U.S. Department of Energy, Idaho Operations Office (DOE) and the U.S. Fish and Wildlife Service (USFWS) entered into a Candidate Conservation Agreement (CCA) for Greater Sage-Grouse (*Centrocercus urophasianus*; hereafter sage-grouse) on the Idaho National Laboratory (INL) Site (DOE and USFWS 2014). The CCA stipulates that DOE submit a report annually summarizing results from monitoring tasks (Section 11), updating the USFWS on DOE's progress toward achieving stated conservation objectives (Section 10), and providing other relevant information prior to an annual meeting between the two agencies. This report briefly summarizes results from the 2018 inventory and monitoring tasks completed by DOE's Environmental Surveillance, Education, and Research (ESER) Program, and provides other information supporting sage-grouse conservation and the CCA. A companion report (Shurtliff et al. 2019) that includes a more detailed description of methods, data, and discussion of results, can be found at http://www.idahoeser.com/Publications_Wildlife.htm.

The primary purpose of this report is to summarize inventory and monitoring results and conclusions so DOE and USFWS can track population and habitat trends and make informed decisions relative to adaptive regulatory triggers outlined in the CCA. On the INL Site, the two triggers and criteria that define them, which would initiate responsive action by both agencies, are:

- Population Trigger: The three-year running average of peak male attendance, summed across 27 leks within the Sage-grouse Conservation Area (SGCA), falls below 253 males—a 20% decrease from the 2011 baseline of 316 males;
- Habitat Trigger: Total area designated as sagebrush habitat within the SGCA falls below 62,846 ha (155,296 ac)—a 20% drop from the 2013 baseline of 78,558 ha (194,120 ac).

Information provided in this report informs a continuing dialogue between DOE and USFWS as the two agencies cooperate to achieve CCA objectives for sage-grouse conservation on the INL Site. Consistent re-evaluation and analysis of new information ensures that the CCA continues to benefit sage-grouse on the INL Site, is continuously grounded in the best available science, and retains its value to both signatories.

This CCA Summary Report groups related inventory and monitoring task reports into three sections: Population Trigger Monitoring (Section 2), Habitat Trigger Monitoring (Section 3), and Threat Monitoring (Section 4). Each section summarizes results of pertinent monitoring tasks outlined in Section 11.1 of the CCA. Section 5 documents how DOE and its contractors implemented conservation measures listed in the CCA during the past year. Section 6 brings together the main results and conclusions from all activities performed during the past year in light of the ultimate goal of the CCA, which is to conserve sage-grouse. This final section also details changes and updates to the CCA that have been approved by both signatories during the past year, and it outlines the upcoming CCA annual work plan (Section 6.3).

2. POPULATION TRIGGER MONITORING

2.1 Task 1—Lek Counts and Lek Route Surveys

Summary of Key Results: The three-year running average of sage-grouse peak male attendance on SGCA baseline leks was 2.5% higher than last year and is now 164% of the population trigger threshold. The three-year average has remained stable or increased each of the past five years, but male attendance decreased 13% and 11% on baseline leks in 2017 and 2018, respectively. Consequently, the three-year average will likely begin to decrease next year.

2.1.1 Introduction

In 2013, DOE initiated a sage-grouse population monitoring task (Task 1) designed primarily to track peak male attendance on all active leks on the INL Site (DOE and USFWS 2014). Task 1 enables ESER to estimate long-term breeding population trends and to maintain accurate records of active lek locations. Annually, Task 1 includes surveys of (1) active and inactive leks on six lek routes, (2) all other active leks not assigned to a lek route, (3) inactive baseline leks (see below), and (4) a subset of inactive leks visited approximately once every five years.

Counts from 27 leks located in the SGCA (hereafter, baseline leks) were originally used as the basis for the population trigger (DOE and USFWS 2014). These leks are surveyed annually, either individually or as part of a lek route. The baseline value for the population trigger is 316 males—the summation of peak male attendance in 2011 when all baseline leks were active (Figure 2-1; DOE and USFWS 2014). The population trigger will be tripped if the three-year running average of peak male attendance at these baseline leks falls below 253 (a 20% decrease from the 2011 value) (DOE and USFWS 2014).

To evaluate long-term trends, we annually survey six lek routes and calculate each route's peak male attendance. In 2017, we established three new routes. The other three (Tractor Flats, Radioactive Waste Management Complex [RWMC], and Lower Birch Creek) were established by the Idaho Department of Fish and Game (IDFG) in the 1990s and have been surveyed annually since 1999 (Figure 2-1). Many baseline leks are assigned to these six routes, but we analyze lek route data separate from the baseline lek data. The reason is because lek route data are more useful than single-lek counts for trend analysis, as they address some of the confounding issues regarding sage-grouse movement among leks (Connelly et al. 2003). Additionally, the three lek routes established in the 1990s provide a historical perspective on current trends of sage-grouse abundance that could not be obtained simply by examining summed counts from the baseline leks (Garton et al. 2011, DOE and USFWS 2014).

2.1.2 Results and Discussion

SGCA Baseline Leks

We surveyed each of the baseline leks 2–7 times ($\bar{x}$=5.5 surveys, SD=1.7; Figure 2-1) in 2018. The sum of peak male attendance across the baseline leks was 365, an 11% decrease from 2017. Despite this decrease in peak counts, which followed a 13% decrease last year (Shurtliff et al. 2018a), the three-year (2016–2018) running average of peak male attendance on baseline leks increased 2.5% over the 2017 running average, to 416 males (Figure 2-2). The three-year average is now 164% of the trigger threshold (253 males) and has been stable or has increased in each of the past five years. That trend will likely shift downward next year as the three-year running average loses a high-count year.

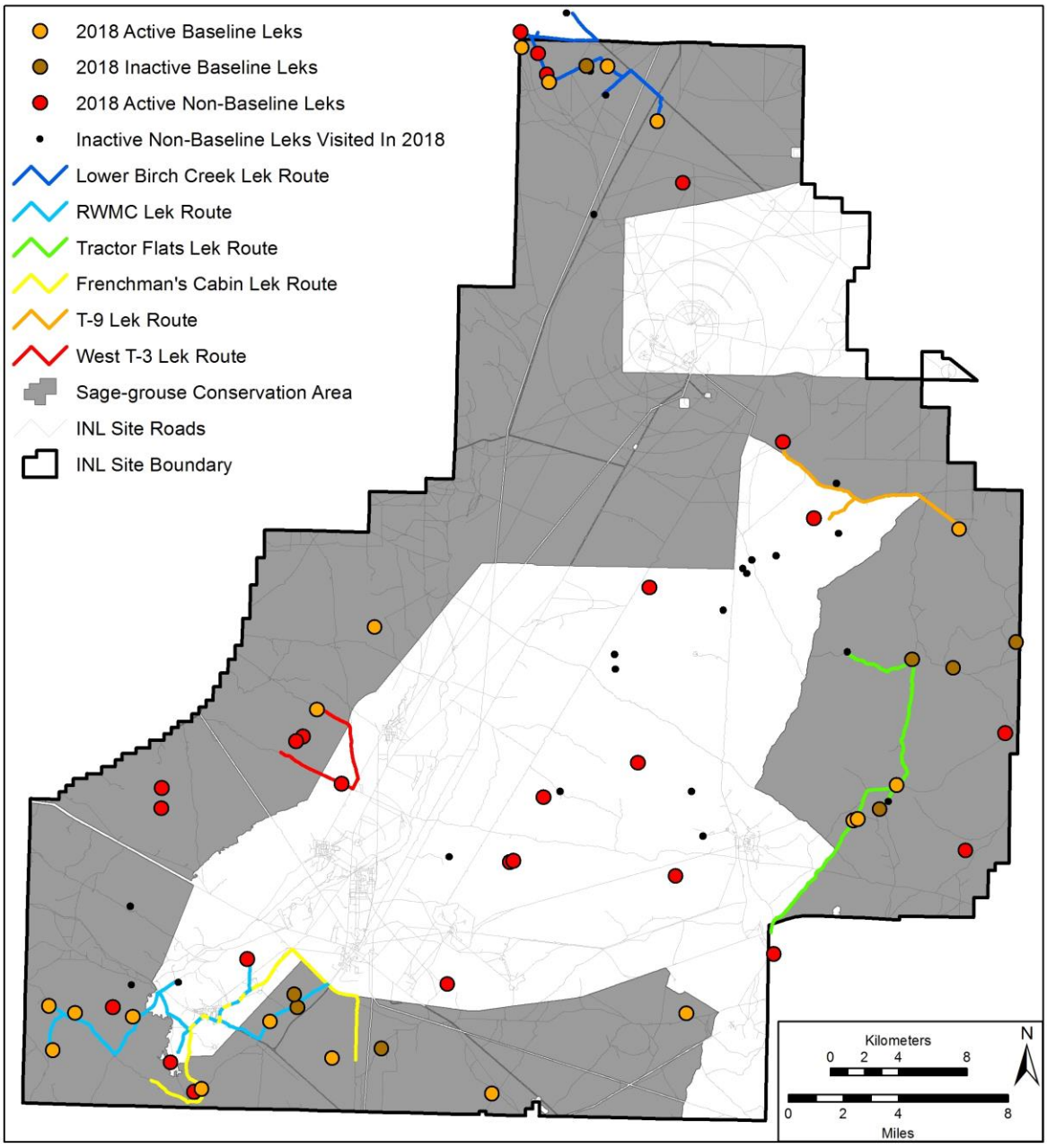

Figure 2-1. An overview of greater sage-grouse leks surveyed on the Idaho National Laboratory Site in 2018. Lek activity designations (active vs. inactive) refer to lek statuses when surveys commenced in March, 2018.

None of the baseline leks became inactive in 2018, marking the first time in six years that an active baseline lek was not reclassified. Currently, 17 of the 27 baseline leks are considered active.

Other Non-Route Leks

We surveyed 27 additional (i.e., non-baseline) active leks 3–8 times ($\bar{x}$=5.3 surveys, SD=1.5, Figure 2-1). Average peak male attendance was 9.6 males per lek (range: 0–25 males, SD=7.9), down from 12.1 males per lek in 2017. We downgraded one lek to inactive status that was within the boundaries of a 2011 wildland fire (see Shurtliff et al. 2019 for more detail).

We surveyed 15 inactive leks two times each that were neither baseline leks nor part of lek routes. These leks were included as part of the ESER effort to resurvey each inactive lek approximately once every five years (see Shurtliff et al. 2019 for more detail). We did not record observations of male sage-grouse at any of the leks, so each will retain its inactive status.

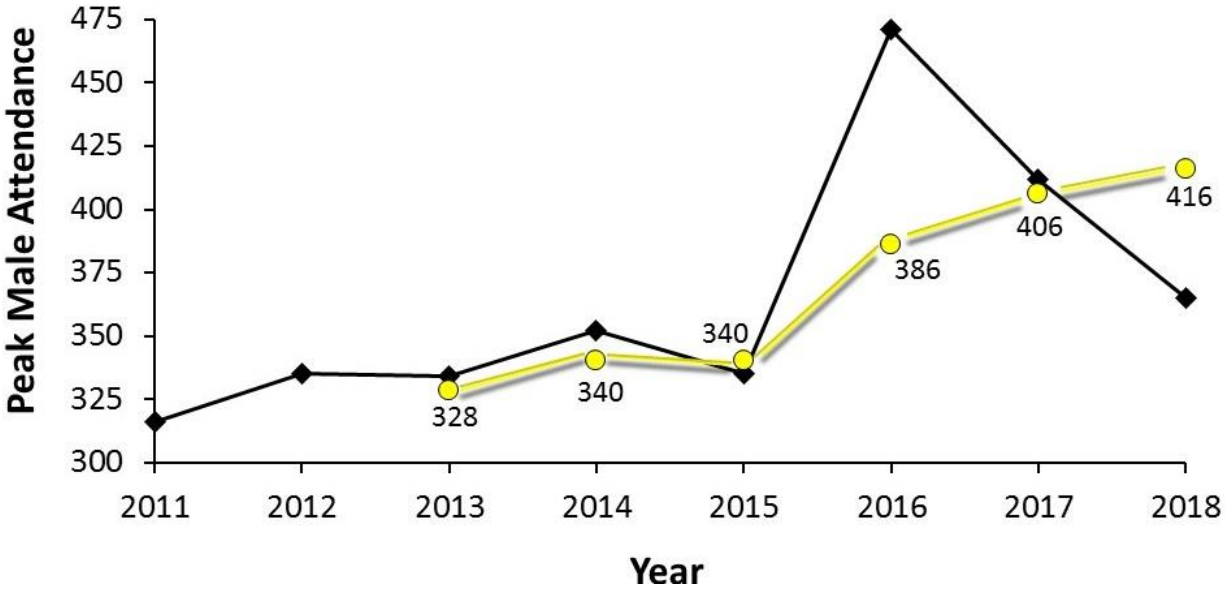

Figure 2-2. Peak male attendance of greater sage-grouse from 2011–2018 on the 27 leks in the Sage-Grouse Conservation Area associated with the population trigger. Black diamonds represent annually summed peak male attendance values for each lek, and yellow circles (values displayed) represent the three-year running average.

Lek Routes

On the IDFG routes, the number of males per lek surveyed (MPLS) were lower than the past two years (Figure 2-3). On the Tractor Flats route, the 2018 MPLS was 11% lower than 2017 and 35% lower than 2016. On the Lower Birch Creek route, the 2018 MPLS was 24% lower than 2017 and 25% lower than 2016. On the RWMC route, the 2018 MPLS was 5% lower than 2017 and 20% lower than 2016. The RWMC route experienced a 16% drop in absolute numbers of males from 2017 to 2018, but we surveyed one less lek in 2018, which lessened the MPLS decline. All three IDFG lek routes had similar or slightly higher MPLS values in 2018 compared to 2015.

The 2018 MPLS values for the three new lek routes compares to 2017 values as follows: Frenchman's Cabin route dropped 22%, West T-3 route dropped 4%, and T-9 route increased 9%. Although the number of leks surveyed on each of these routes was the same as 2017, we completed one additional survey of West T-3 and three additional surveys of T-9 in 2018, compared to last year. Logistical constraints in 2017 reduced the survey effort, as we surveyed three new lek routes while completing historical lek survey and discovery lek survey tasks (Shurtliff et al. 2018a) (Table 2-1). The greater survey effort in 2018 for West T-3 and T-9 routes may explain why the West T-3 route had the lowest documented MPLS decline and the T-9 route had only recorded MPLS increase among the six routes.

We downgraded two route leks to inactive status and upgraded two route leks to active status following the 2018 field season. One downgraded lek served as a satellite display area on the Tractor Flats route.

Another was on the RWMC route at a location where three males were observed displaying only once in 2014, but none have been recorded since. One upgraded lek is on the Tractor Flats route and has been surveyed since 1995. Historically, sage-grouse displaying on the north side of a two-track road were recorded separately from those displaying a few hundred meters away on the south side. No males were recorded on this lek from 2011–2015, but since 2015, 1–10 males have been recorded each year. The second upgraded lek was on the Frenchman's Cabin route. We recorded up to 10 males at this location in 2016 and 2018, but prior to 2016, we had not observed two or more males since 2012. For more information about each of these leks, see Shurtliff et al. (2019).

The Tractor Flats and Lower Birch Creek lek route data suggest that the breeding population of sage-grouse on the INL Site may have peaked from about 2005 to 2007, with a subsequent, albeit lower, peak approximately 10 years later. The RWMC route does not have a cyclic signature, but appears to have slowly declined over the past 20 years. It may be natural for long-term sage-grouse abundance to be cyclic (Fedy and Aldridge 2011). Thus, the recent downturn in male attendance on most of our lek routes is not unexpected. Based on the previous 20 years of data, we may expect to see sage-grouse numbers slowly decline for several years.

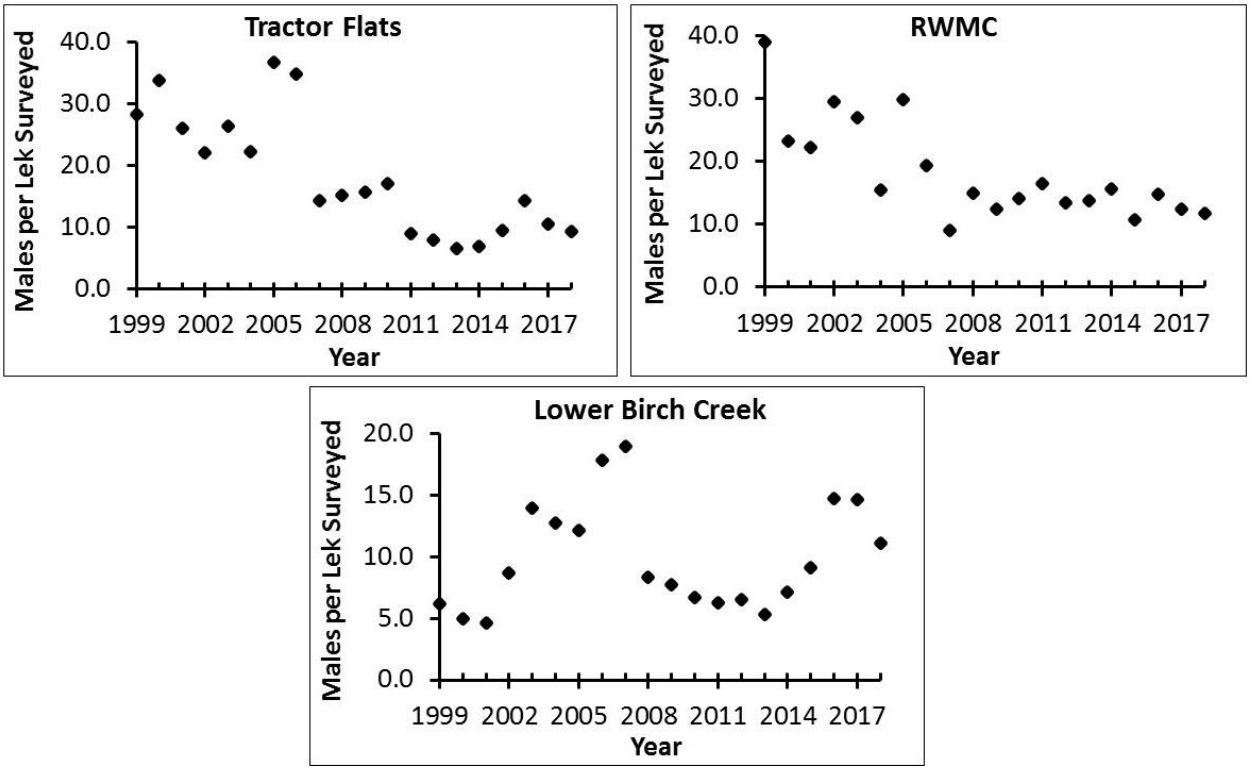

Figure 2-3. Mean number of Males Per Lek Surveyed during peak male attendance on three Idaho Department of Fish and Game lek routes from 1999–2018 on the Idaho National Laboratory Site. The number of leks surveyed each year increased over the displayed time period as follows: Tractor Flats (4–8 leks), Radioactive Waste Management Complex (RWMC; 2–9 leks), and Lower Birch Creek (6–9 leks). Values for 2016 and 2017 in the Lower Birch Creek panel are slightly different than in last year's report because we corrected an error (nine instead of 10 leks were surveyed). Note that the Y-axis is at a different scale in the Lower Birch Creek panel.

2.2 Summary of Known Active Leks and of Changes in Lek Classification

Before the 2018 field season, 45 leks were designated active on or near the INL Site, including two just outside the Site boundaries that are part of the IDFG survey routes. After the field season, three leks were downgraded from an active to inactive status, and two leks were upgraded to active status (Figure 2-4). Thus, the total number of known active leks on or near the INL Site is currently 44.

Table 2-1. Greater sage-grouse lek route data from 2018 surveys on the Idaho National Laboratory Site.

Lek Route	Highest Single-Day Count	Total Leks Surveyed	Males / Lek Surveyed (MPLS)	Occupied Leks*	Males / Occupied Lek*	Surveys Conducted
Tractor Flats	74	8	9.3	3	24.7	7
RWMC	94	8	11.8	6	15.7	7
Lower Birch Creek	100	9	11.1	6	16.7	6
West T-3	47	4	11.8	3	15.7	5
T-9	39	4	9.8	3	13.0	7
Frenchman's Cabin	36	3	12.0	3	12.0	5

*For the purpose of this analysis, leks on routes are considered occupied if two or more males were observed displaying during the current-year survey. This is different from an active lek designation that ESER uses to characterize leks on the INL Site, which is based on five years of data.

2.3 Adaptive Management

The CCA states that following the establishment of new lek routes and the first year of data collection, DOE and the USFWS would meet to discuss whether summing maximum male counts across all lek routes "represents a reasonable new baseline for the population trigger" (DOE and USFWS 2014, pg. 36). Thus, the signatories agreed to consider whether the interim population trigger that has been in place since the CCA was signed should be replaced with a more commonly accepted form of tracking sage-grouse abundance (i.e., lek route counts). During the annual CCA Stakeholder Meeting in February 2018, DOE and the USFWS discussed this issue and concluded that for now, the CCA should maintain the population trigger as the sum of peak male attendance at baseline leks. After an updated Bureau of Land Management (BLM) Land Use Plan is released, the two parties will revisit the issue.

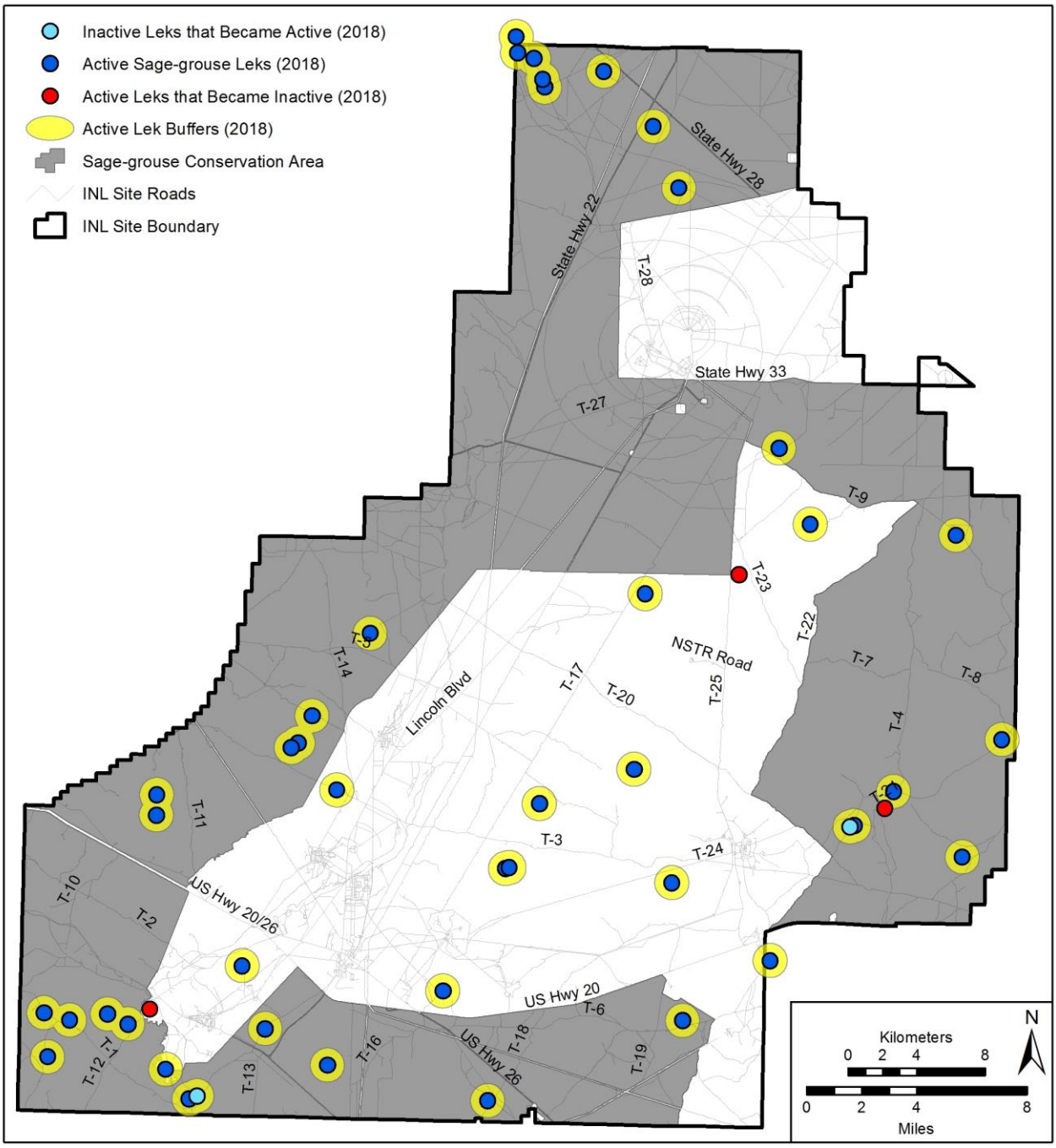

Figure 2-4. Locations of 44 active leks and three leks reclassified as inactive on or near the Idaho National Laboratory Site. The two leks reclassified as active (light blue) were within 500 m of other active leks.

3. HABITAT TRIGGER MONITORING

All vegetation-based estimates of sagebrush habitat distribution for the CCA were initially determined using a vegetation map completed in 2010 (Shive et al. 2011). Sagebrush habitat was designated by selecting all map polygons assigned to stand-alone big sagebrush or low sagebrush classes, and all map class complexes where one of the two classes was either a big sagebrush or low sagebrush class. Areas designated as sagebrush habitat will change through time based on gradual changes in vegetation composition and also from abrupt changes caused by wildland fire.

The baseline value of the habitat trigger is defined as the total area designated as sagebrush habitat within the SGCA at the beginning of 2013 (DOE and USFWS 2014). Currently, this baseline value is estimated at 78,558 ha (194,120 ac). Although no real changes in the amount of sagebrush habitat within the SGCA have been recorded since the CCA was signed, the habitat trigger baseline value was increased twice following improved fine-scale mapping of recent fires (Shurtliff et al. 2016, 2017a). Based on updated habitat estimates, the trigger will be tripped if there is a loss of >15,712 ha (38,824 ac) within the SGCA (i.e., a 20% reduction in sagebrush habitat). If the trigger is tripped, the USFWS will ask DOE to take action to mitigate the loss of habitat.

Two monitoring tasks are designed to identify vegetation changes across the landscape and assist in maintaining an accurate record of the condition and distribution of sagebrush habitat within the SGCA to facilitate annual evaluation of the habitat trigger:

Task 5: Sagebrush Habitat Condition Trends—This task provides information to support ongoing assessment of habitat condition within polygons mapped as sagebrush habitat and facilitates comparison of current-year sagebrush habitat on the INL Site with average site-specific values. Data collected to support this task may also be used to document gains in habitat as non-sagebrush map polygons transition back into sagebrush classes, or to document losses when compositional changes occur within sagebrush polygons that may require a change in the assigned map class.

Task 6: Monitoring to Determine Changes in Sagebrush Habitat Amount and Distribution—This task is intended to provide an update to the current sagebrush habitat distribution map, and primarily deals with losses to sagebrush habitat following events that alter vegetation communities. As updates are made to map classes (vegetation polygon boundaries), the total area of sagebrush habitat available will be compared to the baseline value established for the habitat trigger to determine status with respect to the habitat threshold.

Together, these two monitoring tasks provide the basis for maintaining an accurate map and estimate of condition and quantity of sagebrush habitat on the INL Site. For example, if imagery from burned areas suggests there have been changes in vegetation classes or distribution of those classes several years post-burn, sagebrush cover will be assessed using habitat condition monitoring data from plots located within a burned area. Once substantial increases in sagebrush cover have been identified from either the plot data or the imagery, field-based sampling will be conducted within affected polygons to determine whether it has enough big sagebrush cover over a substantial area to redefine the polygon as a sagebrush class or complex, or whether re-delineating smaller sagebrush-dominated polygons within the burn area is appropriate.

3.1 Task 5—Sagebrush Habitat Condition Trends

Summary of Results: In map polygons currently identified as sagebrush habitat, mean sagebrush cover and height from 2018 are within generally recommended ranges for breeding and brood-rearing habitat and are comparable to average local habitat condition values; perennial herbaceous cover and height are above general recommended minimums and are considerably above the average local habitat condition values.

3.1.1 Introduction

The habitat condition monitoring task was developed to allow biologists to characterize broad-scale trends in habitat condition over time and to link vegetation composition data to polygons that represent sagebrush habitat on the INL Site. Seventy-five annual plots are sampled for cover, height, sagebrush density, sage-grouse sign, and anthropogenic disturbance. Forty-eight of these plots are located in polygons identified as sagebrush habitat, and 27 are located in previously burned areas recovering to sagebrush habitat. Annually sampled plots are used to address current habitat condition to support general trend analyses. An additional 150 plots are sampled on a rotational basis, using the same methodology, to increase sample sizes and to address potential habitat threats, specifically fire and livestock use.

Until now, we have compared habitat characteristics measured on the INL Site to the general guidance provided by Connelly et al. (2000). However, experts recommend developing more site-specific standards for evaluating the status of local habitat condition (Connelly et al. 2000, Connelly et al. 2011). The use of local standards allows for more meaningful interpretation of habitat condition and fills site-specific knowledge gaps from which to make adaptive management decisions.

Beginning this year, we developed average local habitat condition values (referred to hereafter as local means) for several metrics used to assess sagebrush habitat condition on the INL Site. The local means were developed using INL Site habitat condition data from 2013 – 2017 on annual plots to generate reference values for vegetation cover, vegetation height, and sagebrush density. These new local means incorporate data from annual plots distributed across the INL Site, encompassing a range of spatial and temporal conditions. Precipitation patterns were highly variable during the period when local means were generated. For example, this time period includes the single driest year of the past 68 years (Shurtliff et al. 2019) and three years of above-average precipitation.

These local mean values likely provide us a better frame of reference for interpreting results than general guidelines, but they do represent a limited point in time. Compared with longer-term data sets (Forman and Hafla 2018), it is apparent that the abundance values of several functional groups were not centered within their range of variability during the five-year period from which these local means reference values were generated. Therefore, we will interpret the local means with caution when reporting departures from those values. In future reports, we will assess whether the local means generated from 2013 – 2017 data are ecologically defensible and/or meaningful, and we will continue to explore developing the most appropriate guidelines for the INL Site based on local data.

3.1.2 Results and Discussion

Data were collected on a total of 75 annual plots and 50 rotational between June and August of 2018. Results only focus on annual plots for this report. The annual plot vegetation abundance and structure data were summarized to evaluate habitat condition in 2018 compared to a newly developed local means. Trend analysis was also completed, comparing cover of plant functional groups from six sample years. Analysis of rotational plots are completed once every five years, after data have been collected on all three plot

subsets (150 total plots). The most recent analysis of rotational plots was completed in 2016 (see Shurtliff et al. 2017 for details).

Habitat Condition

Overall, the local means for sagebrush cover and height do not differ drastically from general guidelines (Connelly et al. 2000; Table 3-1; Table 3-2). When compared to Connelly et al. (2000) sagebrush cover and height are within their recommended range (10-15%, 40-80cm, respectively), and perennial grass/forb cover is lower than the recommended range (≥15%). Relative to regional habitat guidelines (Connelly et al. 2000), these site-specific departures do not appear to be a result of poor ecological condition, but rather the effect of soils and climate on the local ecosystem (Forman et al. 2013).

In 2018, total absolute shrub cover in sagebrush habitat plots was about 32% (Shurtliff et al. 2019) and was primarily from sagebrush (*Artemisia sp.*) (Table 3-1). Sagebrush cover in sagebrush habitat plots is slightly higher than the local mean (Table 3-2). However, sagebrush height was nearly identical to the local mean. Perennial grass/forbs cover and height are substantially higher than local means by 11% and 11 cm, respectively. Both values from 2018 remain at the upper end of their range of variability when compared with other long-term data sets (Forman and Hafla 2018). Sagebrush density was lower than the local mean, but within the recorded ranges from the 2013 – 2017 data (see Shurtliff et al. 2019 for details).

On recovering burned areas (i.e., non-sagebrush plots), almost half of the total absolute cover was from native species, where the most abundant species were perennial grasses (39%, Shurtliff et al. 2019). Mean cover from 2018 of native perennial grasses and forbs was approximately 25% (Table 3-1), which was an increase above the local mean of 20% (Table 3-2). Shrubs make up about 13% absolute cover and rabbitbrush (*Chrysothamnus viscidiflorus*) was the dominant species. The other half of the total absolute cover was from introduced annuals such as cheatgrass (*Bromus tectorum*). Sagebrush density remained low and was identical to the local mean.

Table 3-1. Summary of selected vegetation measurements for evaluating the condition of sagebrush habitat monitoring plots and non-sagebrush monitoring plots on the Idaho National Laboratory Site in 2018.

2018	Mean Cover (%)	Mean Height (cm)	Mean Density (individuals/m^2)
Sagebrush Habitat Plots (*n*=48)			
Sagebrush	23.65	47.59	3.55
Perennial Grass/Forbs	21.21	31.90	
Non-sagebrush Plots (*n*=27)			
Sagebrush	0.27	48.91	0.07
Perennial Grass/Forbs	24.97	38.51	

Table 3-2. Average local habitat condition values (local means) of selected vegetation measurements for evaluation the condition of sagebrush habitat monitoring plots and non-sagebrush monitoring plots on the Idaho National Laboratory Site. Local means were generated from 2013–2017 data.

Local Means	Mean Cover (%)	Mean Height (cm)	Mean Density (individuals/m²)
Sagebrush Habitat Plots			
Sagebrush	21.27	47.81	5.19
Perennial Grass/Forbs	10.26	20.70	
Non-sagebrush Plots			
Sagebrush	0.22	33.54	0.07
Perennial Grass/Forbs	19.97	29.77	

Over the six-year period during which habitat condition data have been collected, cover values have remained stable for most vegetation functional groups on sagebrush habitat plots (Figure 3-1). One exception is native perennial grasses, which have been steadily increasing since 2014. Non-native annuals have also steadily increased over the past few years, but remain much less abundant than native species (Shurtliff et al. 2019). On plots in burned and recovering habitat, non-native annuals, primarily cheatgrass, have increased markedly over the past six years (Shurtliff et al. 2019). Cover from native species have remained stable over the same time period, so it does not appear the increase in cheatgrass has been at the expense of species in other functional groups.

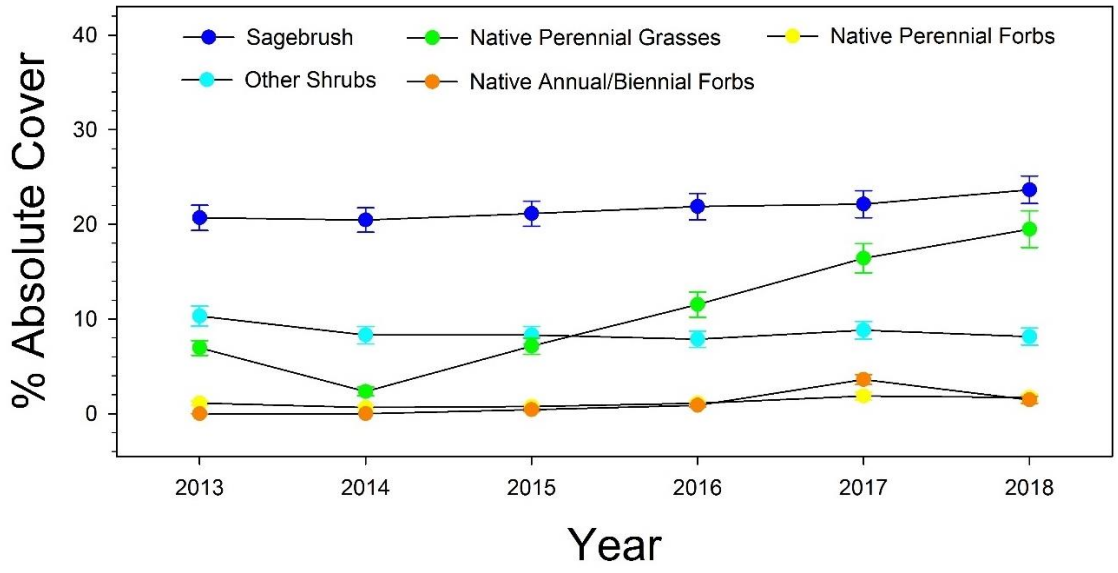

Figure 3-1. Mean cover from functional groups of native species in sagebrush habitat plots (*n*=48) on the Idaho National Laboratory Site from 2013 through 2018. Error bars represent ± 1 SE.

Similar fluctuations in the abundance of herbaceous functional groups have been noted in the Long Term Vegetation dataset (Forman and Hafla 2018). Although the recent increase in cheatgrass on monitoring plots for this task is concerning, especially on the burned plots, the Long Term Vegetation dataset shows both upward and downward trends in cheatgrass abundance from one time period to another. The threat of cheatgrass to sagebrush habitat (or recovering habitat) should not be underestimated, but six years of trend data from this monitoring effort are likely not enough to fully understand the trajectory of cheatgrass abundance.

Precipitation

Vegetation abundance and composition is strongly influenced by precipitation. Total annual precipitation for 2018 was above average and May precipitation was much higher than average (Figure 3-2). Annual precipitation was above average in four of the past six years and short-term precipitation patterns have deviated from historical patterns of seasonality over the same time period. During this time period, unique seasonal precipitation patterns include the single driest year of the past 68 years (Shurtliff et al. 2019), and extreme precipitation events in the late summer and fall. Deviations from historical precipitation patterns favor some plant functional groups over others (see Shurtliff et al. 2019 for details). Cover from perennial herbaceous species, mean cheatgrass cover, and cover from all annual forbs was uncharacteristically low in 2013 and 2014, probably due to drought conditions (Shurtliff et al. 2015) and was much higher than normal in 2015 through 2018 due to the precipitation patterns that characterized those years.

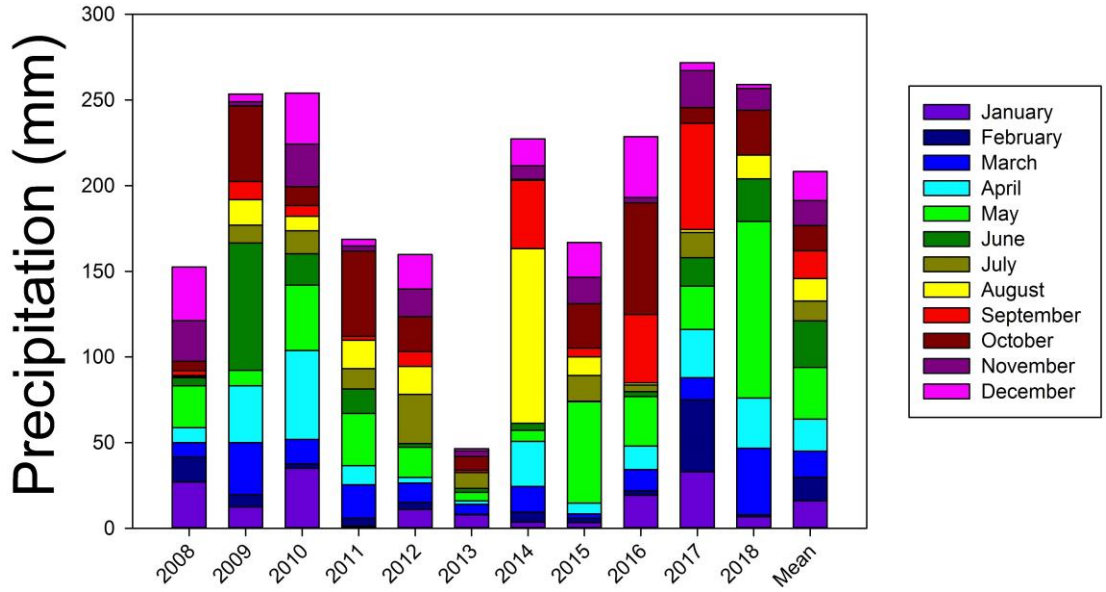

Figure 3-2. Annual precipitation by month from the Central Facilities Area, Idaho National Laboratory Site. Mean monthly precipitation includes data from 1950 through 2018.

3.2 Task 6—Monitoring to Determine Changes in Sagebrush Habitat Amount and Distribution

Summary of Results: There were five small wildland fires documented near or on the INL Site in 2018, which resulted in the estimated loss of a few acres of sagebrush habitat. The losses in sagebrush habitat will be more accurately mapped when new high resolution imagery becomes available. Consequently, the amount of sagebrush habitat on the INL Site remained basically unchanged in 2018 except for minor losses reported in Task 8 (see Section 6.2). Infrastructure expansion removed 2.3 ha (5.6 ac) of sagebrush habitat resulting in a current estimated amount of 78,555.2 ha (194,114.2 ac), which is less than 0.01% change from the baseline.

3.2.1 Introduction

A 20% loss of sagebrush habitat from the 2013 baseline has been identified as a conservation trigger in the CCA (DOE-ID and USFWS 2014). The goal of Task 6 is to maintain an updated INL Site vegetation map to accurately document changes in sagebrush habitat area and distribution. Task 6 is designed to document changes in sagebrush habitat following losses due to wildland fire or other disturbances that remove or significantly alter vegetation across the landscape. In addition to documenting losses of sagebrush habitat, Task 6 will also add additional sagebrush habitat by providing updates to the vegetation map when sagebrush cover increases and warrants a new map class designation, or to refine existing boundaries of vegetation classes when changes in species cover and composition are documented through Task 5. Lastly, this task will conduct post-fire mapping when the fire extent is unknown and will also allow for modifying existing wildland fire boundaries and unburned patches when errors on the ground are observed.

3.2.2 Results and Discussion

There were 5 small wildland fires documented near or on the INL Site in 2018 (Unpublished wildland fire statistics summary for 2018; Eric Gosswiller, INL Fire Chief). The “Highway 33 Fire” was a collection of 19 small roadside fires that burned off Site to the west and likely didn’t impact any sagebrush habitat. The “Portland Fire” was a roadside fire that burned near a borrow source in sagebrush habitat, but was estimated at only 0.2 ha (0.5 ac) in size. The “Highway 20 Fire” was a small roadside fire (< 0.2 ha [0.5 ac]) that burned outside of sagebrush habitat. The “Birch Fire” was a lightning-caused fire and burned about 1.2 ha (3 ac) in sagebrush habitat near Birch Creek. The “Clark County Fire” burned less than 0.1 ha (0.25 ac) and no location information was available to determine if it was in sagebrush habitat. The losses of sagebrush habitat were minimal and once new National Agricultural Imaging Program (NAIP) imagery is collected in 2019, we will update any sagebrush habitat polygons where sagebrush was lost because of fire.

Currently, the sagebrush habitat baseline value is estimated at 78,558 ha (194,120 ac). Although no significant changes in the amount of sagebrush habitat within the SGCA have been recorded since the CCA was signed, the habitat trigger baseline value was increased twice following improved fine-scale mapping of recent fires (Shurtliff et al. 2016, 2017a). The amount of sagebrush habitat on the INL Site remained basically unchanged in 2018 except for the very minor losses reported in the Task 8 Infrastructure Expansion section below (see Section 6.2). Infrastructure expansion removed 2.3 ha (5.6 ac) of sagebrush habitat resulting in a current estimate of 78,555.2 ha (194,114.2 ac), which is less than 0.01% change from baseline.

4. THREAT MONITORING

The CCA identifies and rates eight threats that potentially impact sage-grouse and its habitats on the INL Site, either directly or indirectly. All threats are addressed to some extent by conservation measures DOE is striving to implement (Section 5). The potential impacts of wildland fire and livestock on sage-grouse habitat are assessed by Task 5 (Section 3.1). Other threats are addressed by tasks designed specifically to develop a baseline and provide continuing information about a threat, because associated conservation measures cannot be implemented without this *a priori* information. The following sections report on Tasks 4 and 8, which were developed to address the threats of raven predation (Task 4) and infrastructure development (Task 8). Over time, these tasks will provide crucial information needed by DOE to make decisions about how to implement threat reduction measures.

In previous years, we also reported in this section results from Monitoring Task 7, which was designed to identify a prioritized list of potential cheatgrass treatment areas on wildland fire containment lines. The intent was that DOE would then be able to take action (via Conservation Measure 4) to reduce the extent and density of cheatgrass. In consultation with ESER, DOE has concluded there is currently no cost-effective way to directly reduce cheatgrass dominance at a meaningful scale within sagebrush habitat on the INL Site. We will continue, however, to monitor the abundance and spatial distribution of cheatgrass on the INL Site through Monitoring Tasks 5 and 6 (see Section 6.2.4). This information, when coupled with other ecological data collected regularly on the INL Site, will allow DOE and USFWS to continue to evaluate changes to the cheatgrass threat and to respond appropriately where feasible. Furthermore, although no task will be aimed directly at reducing cheatgrass abundance, the potential impact of cheatgrass will be reduced to the extent that DOE successfully implements measures restricting the occurrence or impact of wildland fire and infrastructure development.

4.1 Task 4—Raven Nest Surveys

Summary of Results: Raven nesting on INL Site infrastructure and in ornamental trees was approximately 5% higher in 2018 than in 2017, and a trend is beginning to emerge that suggests raven nesting on these structures is stable. Most facilities and an increasing number of towers supported raven nests, and as a result, DOE broadened the scope of Conservation Measure 10 to encourage contractors and agencies to take steps to deter raven nesting wherever it is reasonably feasible, and not just to focus on deterring nesting on power lines.

4.1.1 Introduction

In the CCA, DOE committed to support research aimed at developing methods to deter raven nesting on utility structures (*Conservation Measure 10*; DOE and USFWS 2014). Later, this scope broadened into a commitment from DOE to work with INL contractors and others to opportunistically reduce raven nesting on any anthropogenic structure, including power lines, towers and structures at facilities (Sec. 6.2.7). The DOE continues to recognize the value of research that would improve its ability to deter nesting on power lines, but it also recognizes that some raven nesting on towers and at facilities could be deterred by simple methods employed at appropriate times. Hence, it now encourages ESER and contractors to seek opportunities, and where appropriate to collaborate together or with the National Oceanic and Atmospheric Administration (NOAA), to reduce the suitability of any structure that has been previously used for nesting to support a nest in the future.

To accomplish the original design of Conservation Measure 10 (i.e., to support research on nest deterrents), and to support the broadened scope, ESER established and continues to implement a raven nest monitoring task (Task 4) by which nearly all infrastructure on the INL Site are monitored throughout much of the raven nesting period. The purpose of the task is three-fold: (1) to determine how many raven nests are supported each year by anthropogenic structures on the INL Site so that we may evaluate inter-annual trends; (2) to identify structures or stretches of power line favored by ravens for nesting year after year, which may be candidates for retrofitting; and (3) to allow us to evaluate the effectiveness of deterrents after they are installed.

4.1.2 Results

Survey Results

We observed 45 active raven nests on man-made structures or in trees associated with facilities along survey routes. Thirty-three of the 45 nests were on power line structures, all of which were transmission or lattice structures. We merged two pairs of power line-based nests because they met our criteria of having been likely occupied by the same nesting pair (Shurtliff et al. 2017b). Thus, the total number of active raven nests (i.e., adjusted total) was 43, with 31 (72%) of those on power lines (See Shurtliff et al. 2019 for more details). Fourteen power line nests (45%) were inside or bordering the SGCA.

We surveyed 13 facilities and recorded eight nests at seven of them. The two nests located at a single facility included one nest inside the fence of the Materials and Fuels Complex and one nest on the nearby Transient Reactor Test Facility. In addition to facilities, ravens maintained nests on two cellular phone towers located near the INL Site boundary and on two meteorological towers operated by NOAA (Figure 4-1).

4.1.3 Discussion

The adjusted number of raven nests recorded on the INL Site was 5% higher in 2018, compared to 2017, and is nearly identical to the peak number observed in 2016. One caveat is that the number of raven nests reported last year may have been slightly overestimated. In 2017, we reported three raven nests at the U.S. Sheep Experiment Station (Sheep Station; Shurtliff et al. 2018b); however, we now speculate that some if not all three of those nests were occupied by American crows (*Corvus brachyrhynchos*; see Shurtliff et al. 2019). If all three nests were mistakenly attributed to ravens, the 2017 total would have been 38 raven nests (Figure 4-2). Thus, the 2018 raven nest count would be 13% higher than in 2017. Regardless of whether the Sheep Station nests were occupied by American crows or ravens, our results suggest that the number of raven nests on anthropogenic substrates has been stable on the INL Site for at least the past three years. If ravens indeed occupied fewer nests in 2017 than were reported, our current conclusion of a stable trend would extend to the past four years.

During 2018, ravens nested at the same facilities as in 2017, with three exceptions. No raven nests were observed at the Critical Infrastructure Test Range Complex this year, nor at the Sheep Station, as already noted. However, for the first time since surveys began, we documented a raven nest at the Materials and Fuels Complex (Shurtliff et al., 2018b, 2019).

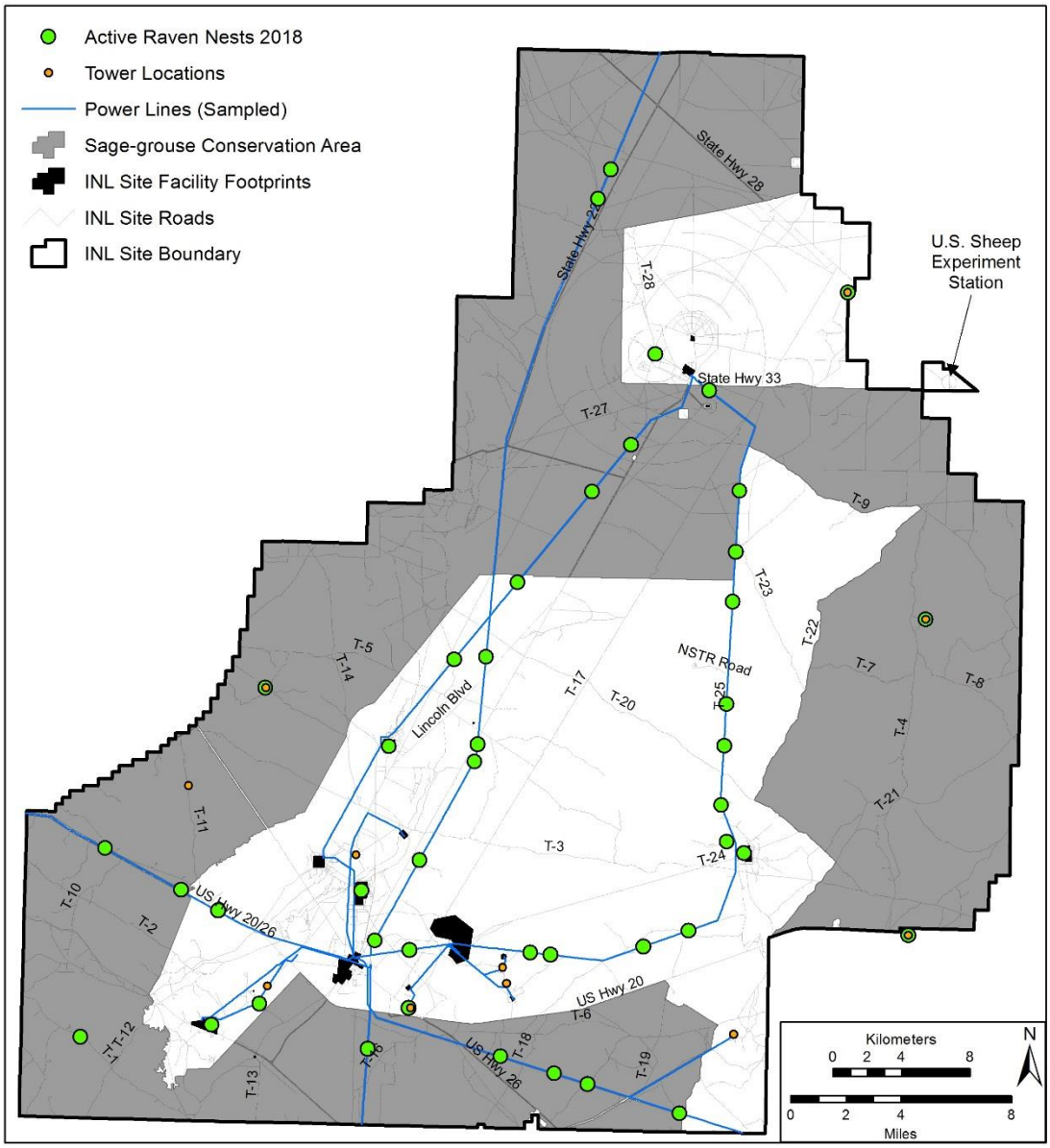

Figure 4-1. Results of 2018 raven nest survey. Raven nests displayed represent adjusted nest locations (*n*=43).

DOE does not own any of the weather monitoring or cellular service towers occupied by ravens in 2018, and therefore it cannot make a unilateral decision to install nest deterrents. ESER continues to work with NOAA to improve the placement of hardware cloth on two towers which have been used for nesting for several years. Hardware cloth installed by NOAA technicians last year did not adequately cover the most likely nesting sites on the towers, but NOAA intends to add more hardware cloth at the end of 2018.

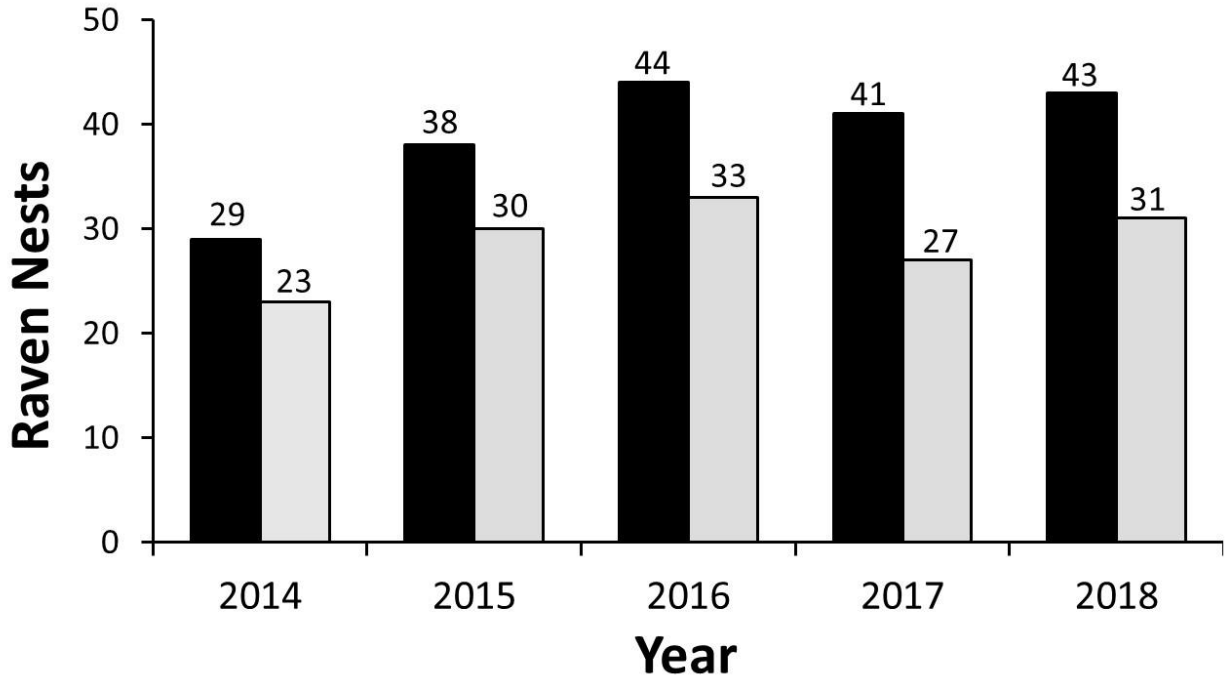

Figure 4-2. Adjusted number of common raven nests observed on Idaho National Laboratory Site infrastructure. Black bars represent total nest counts and gray bars represent nests on power lines. Total nest count in 2017 may have been overestimated by two or three nests (see Discussion).

Conservation Measure 10 in the CCA specifically identifies utility structures as the target for nest deterrent experiments because most raven nests on anthropogenic structures are on power transmission structures. Since the CCA was signed however, a number of factors have reduced the priority of this conservation measure relative to other ongoing or potential actions that can or could be taken to address threats to sage-grouse. For example, during the January 2017 meeting between the USFWS and DOE, the USFWS emphasized that addressing wildland fire and invasive weeds is the highest priority for the USFWS region-wide. Another contributing factor is that most power line sections that support raven nests are outside the SGCA. We know of no studies in similar sagebrush steppe habitat that have determined the territory size of breeding ravens, neither are we aware of any study in similar habitat that documents how far nesting ravens will travel to forage. Thus, we do not know whether the majority of ravens on power lines forage in the SGCA. Understanding raven foraging behavior may be a more important priority than installing nest deterrents because the latter would be a much greater cost and could potentially be unnecessary, if most nest-tending ravens don't forage in the SGCA.

4.2 Task 8—Monitor Expansion of the Infrastructure Footprint within the SGCA and Other Areas Dominated by Big Sagebrush

Summary of Results: We mapped eight polygons where infrastructure expansion removed a total of 2.3 ha (5.6 ac) of sagebrush habitat. We also mapped a total of 9.6 km (6 mi) of new linear features located within the SGCA and/or existing sagebrush habitat.

4.2.1 Introduction

Infrastructure development is now considered a medium-ranked threat to sage-grouse on the INL Site (see Section 6.2). Infrastructure expansion on the INL Site occurs when facility or project footprints encroach into adjacent patches of sagebrush habitat or when new two-track linear features are created in otherwise undisturbed areas. The goal of Task 8 is to identify where expansion of infrastructure has occurred and document and map all two-track linear features within the SGCA and other areas dominated by big sagebrush. This task serves as the mechanism to identify and report on new infrastructure and two-track linear features being developed and to update the sagebrush habitat distribution data layer due to changes across the landscape not associated with wildland fires.

This monitoring task is conducted whenever new high resolution imagery that encompasses the entire INL Site becomes available. Currently, this task is reliant on the U.S. Department of Agriculture NAIP, which typically collects aerial digital imagery in Idaho every two years and is made publically available for no cost. As high resolution imagery becomes available (e.g., INL Site image acquisition following a large wildland fire), we will also incorporate those data to monitor infrastructure changes.

4.2.2 Results and Discussion

There were eight polygons mapped where infrastructure expansion removed sagebrush habitat. All of the expansions were minor with a total combined area of 2.3 ha (5.6 ac) of sagebrush loss. Three of the polygons mapped were new project footprints (i.e., cleared pads), two were small roadside expansions of disturbed areas near vehicle pullouts, and three polygons (including two of the largest) were associated with livestock management where new water troughs were installed within the Quaking Aspen grazing allotment.

We mapped 9.6 km (6 mi) of new linear features located within the SGCA and/or existing sagebrush habitat (Figure 4-3). The longest single linear feature mapped was 1.6 km (1 mi) and represents an extension to an existing road just north of the Jefferson Fire near the eastern side of the Site. Coincidentally the second longest linear feature was 1.3 km (0.8 mi) and serves as a shortcut between two existing roads right next to the longest linear feature previously described. There was also an additional 2.7 km (1.7 mi) of linear features mapped this year, but after cross-referencing these features with the previous 2015 NAIP dataset, we recognized that these features were present but were missed during the last review process (Figure 4-3). It is important to consider that while some of the newly observed two-track linear features are actually new, some of the other linear features mapped previously (Shurtliff et al. 2016, Shurtliff et al. 2017a) may be historic two-track roads that have only recently become recognizable in imagery.

The large number of two-track linear features mapped as the baseline in 2015 (Shurtliff et al. 2016) likely represented many years of accumulated unauthorized expansion rather than activities that have occurred in the last few years since the signing of the CCA. The much smaller linear distances of two-track features mapped during this analysis in 2016 and 2018 shows that the rate of increase within a two-year window

remains fairly low. However, the total distance of linear features mapped in 2018 is a 2.2 km (1.4 mi) increase compared to the mapping results reported in 2016. And in some cases there are new two-track spurs being created that branch from other two-track roads which were likely unauthorized to begin with. This ever growing network of linear features may pose a threat to long-term sagebrush habitat condition as the likelihood of non-native species introduction into more pristine habitat, and the probability of wildfire from increase vehicle use in the backcountry becomes a legitimate concern. While these disturbances may seem insignificant compared to the total area of the INL Site, continuous cumulative impacts over time should be considered a bigger concern and monitored closely.

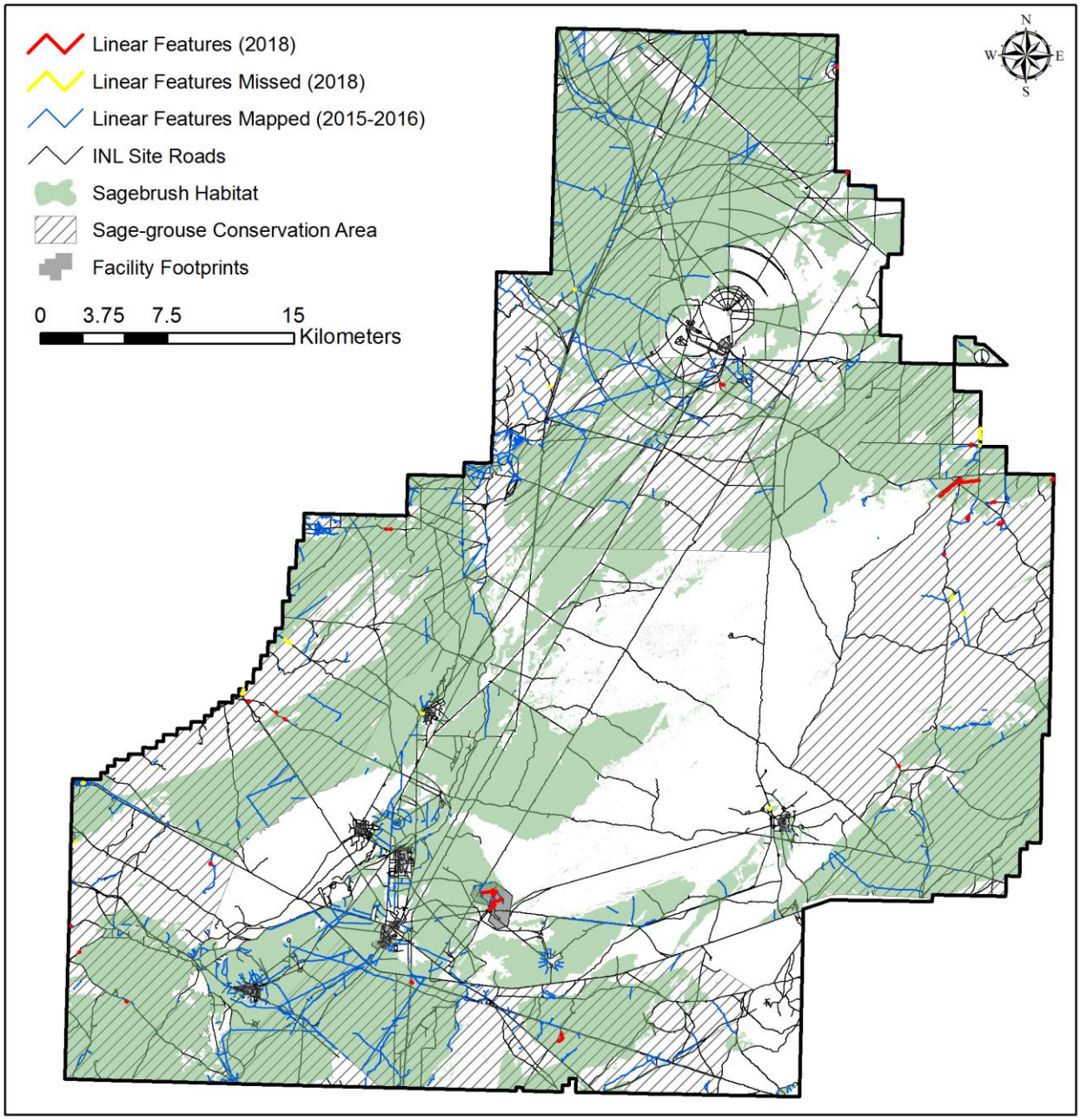

Figure 4-3. Two-track linear feature expansion mapped in 2018 at the Idaho National Laboratory Site within the Sage-Grouse Conservation Area or existing sagebrush habitat.

5. IMPLEMENTATION OF CONSERVATION MEASURES

5.1 Summary of 2018 Implementation Progress

Section 10 of the CCA describes eight threats to sage-grouse and its habitats on the INL Site. DOE committed to implement 13 conservation measures to mitigate and reduce these threats. Table 5-1 summarizes DOE's actions during the past year to ameliorate threats to sage-grouse and its habitats.

Table 5-1. Accomplishments and other noteworthy events that DOE, contractors, and other stakeholders achieved in 2018 while implementing conservation measures outlined in the Candidate Conservation Agreement (CCA).

Threat:	Wildland Fire
Objective:	Minimize the impact of habitat loss due to wildland fire and firefighting activities.
Conservation Measures:	1. Prepare an assessment for the need to restore the burned area. Based on that assessment, DOE would prepare an approach for hastening sagebrush reestablishment in burned areas and reduce the impact of wildland fires > 40 ha (99 acres).

Conservation Measure 1—Accomplishments and Noteworthy Events:

- Approximately 8 ha (20 ac) were reported burned on the INL Site in five wildland fire incidents during 2018 (Unpublished wildland fire statistics summary for 2018; Eric Gosswiller, INL Fire Chief). This number is based on estimates made at incident sites. However, our cursory examination of fire locations using updated INL Site boundaries in a GIS suggests one fire estimated at 6.7 ha (16.5 ac) may not have burned onto the INL Site. In 2020, we will confirm the actual area burned using NAIP imagery. Because the reported fires were small, no post-fire assessment or sagebrush reestablishment was required.

  Note: An estimated 12.5 ha (31 ac) have burned on the INL Site during the past six years in 13 separate incidents. Fewer acres have burned in the last six years than during any other six-year period dating back to at least 1988 (the current annual INL wildfire report contains data back to 1994).

Associated Conservation Actions that Addressed the Wildland Fire Threat:

- ESER planted ~25,000 sagebrush seedlings in the Jefferson Fire scar (See below and Section 5.2).
- About three miles of containment lines were constructed in 2018, all of which were re-contoured following the fire. At an October 29, 2018 Post-Season meeting of the INL Site Wildland Fire Management Committee, the committee agreed that Facility and Site Services will implement the following actions to minimize the impacts of fires in 2018:
  - Post signs to prohibit vehicle travel on the rehabilitated containment lines;
  - Add the three miles of containment lines to the annual noxious weed and invasive species management control areas to control noxious weeds and map the locations.

Threat:	Infrastructure Development
Objective:	Avoid new infrastructure development within the SGCA and 1 km (0.6 mi) of active leks, and minimize the impact of infrastructure development on all other seasonal and potential habitats on the INL Site.
Conservation Measures:	2. Adopt Best Management Practices outside facility footprints for new infrastructure development. 3. Infrastructure development within the SGCA or within 1 km (0.6 mi) of an active lek will be avoided unless there are no feasible alternatives.

Conservation Measure 2—Accomplishments and Noteworthy Events:

- National and Homeland Security constructed a power grid test pad (Obsidian Test Pad) adjacent to an existing 138kV overhead power line near the Bode Test Site. The Obsidian Test Pad is about 122 m x 122 m (400 ft x 400 ft). To reduce the potential for noxious weeds, the test pad was cleared, grubbed, and backfilled with gravel. The test pad is co-located with infrastructure.
- The U.S. Geological Survey (USGS) constructed a monitoring well (USGS-147) within the Sage Grouse Conservation Area (SGCA). The USGS made use of existing roads and sited the well adjacent to established roads. The area disturbed for borehole coring and drilling was about 76 m x 76 m (250 ft x 250 ft). The Environmental Checklist for the project stated that the project must avoid destroying sagebrush habitat and must re-establish sagebrush in acreages equal to or greater than acreages lost by project activities. Drilling did not occur prior to June 30th. After drilling, disturbance at the site is limited to the area needed to drive a truck and generator for sampling.
- To protect Wireless Test Bed (WTB) equipment from livestock at Crater Butte, a removable electric fence was installed around the Crater Butte WTB site. The project installed T-posts around the top of Crater Butte to support the fence. T-posts remain in place to reduce disturbance that would occur if T-posts were placed for every test, while the fence wire is removed when testing is not in being performed. The T-posts will be removed when the location is no longer required for testing. Marking the fence was not required.
- National and Homeland Security installs nest deterrents on dead-end and corner power poles during maintenance activities as funds allowed.

Conservation Measure 3—Accomplishments and Noteworthy Events:

- During construction of the Obsidian Test Pad cited described above, the Circuit 56 13.8kV overhead power line was extended from the end of the Bode Test Pad to the new Obsidian Test Pad approximately 0.4 km (0.25 mi) to the north, but this line was not within a 1 km (0.6 mi) lek buffer area.
- A livestock grazing permittee proposed to install a fence within the SGCA in the southwestern part of the INL Site. The proposed fence line would parallel a highway and be within an Idaho Department of Transportation right of way. The installation process would require mowing the vegetation, including sagebrush. DOE discussed the issue with the USFWS in May, 2018, and the parties agreed that the vegetation community adjacent to a highway is poor-quality sage-grouse habitat, so active restoration to compensate for the lost sagebrush would be unnecessary (especially because sagebrush would likely return naturally within a few years). Furthermore, the USFWS agreed that this was a reasonable approach because the project is covered under a grazing permit issued by BLM for work to be performed in the state right of way, and the state had already issued a permit for the fence to be installed. The shared conclusion of DOE and USFWS is that DOE does not have responsibility in the action.

Threat:	Annual Grasslands
Objective:	Maintain and restore healthy, native sagebrush plant communities.
Conservation Measures:	4. Inventory areas dominated or co-dominated by non-native annual grasses, work cooperatively with other agencies as necessary to identify the actions or stressors that facilitate annual grass domination, and develop options for eliminating or minimizing those actions or stressors.

Conservation Measure 4—Accomplishments and Noteworthy Events:

See Section 6.2.4.

Threat:	Livestock
Objective:	Limit direct disturbance of sage-grouse on leks by livestock operations and promote healthy sagebrush and native perennial grass and forb communities within grazing allotments.

Conservation Measures:	5. Encourage the Bureau of Land Management (BLM) to seek voluntary commitments from allotment permittees and to add stipulations during the permit renewal process to keep livestock at least 1 km (0.6 mi) away from active leks until after May 15 of each year. Regularly provide updated information to BLM on lek locations and status to assist in this effort. 6. Communicate and collaborate with BLM to ensure that the herbaceous understory on the INL Site is adequately maintained to promote sage-grouse reproductive success and that rangeland improvements follow guidelines in the BLM Land Use Plan and the CCA.

Conservation Measure 5— Accomplishments and Noteworthy Events:

- ESER provided updated lek maps to the DOE in January 2018 so they could be forwarded to the BLM. However, in a May 2018 meeting including BLM, DOE, and ESER staff, the BLM said that the maps ESER prepared in January were probably not useful for permittees because they were zoomed in too much and had inadequate reference points. Next year, ESER will change the format of the maps and allow BLM staff to view early drafts and provide suggestions.

Conservation Measure 6— Accomplishments and Noteworthy Events:

- BLM, DOE, and ESER met in their annual meeting in May 2018. No allotment assessments were scheduled for 2018, but the meeting allowed for a regular forum for communication and sharing.
- During summer 2018, ESER discovered that wildlife escape ramps had not been installed in a relatively new multi-trough watering system located a few hundred meters from a large lek on the RWMC lek route. A BLM employee verified that ramps were missing and promised that they would be installed before livestock are turned out in spring 2019. The Big Lost River flooded this area throughout most of the 2018 lekking season, so the troughs were probably never filled (email communication between Quinn Shurtliff and Jordan Hennefer, August 13, 2018).
- A livestock grazing permittee proposed to install a fence in the southwestern part of the INL Site. Details provided under Conservation Measure 3.

Threat:	Seeded Perennial Grasses
Objective:	Maintain the integrity of native plant communities by limiting the spread of crested wheatgrass.
Conservation Measures:	7. Inform INL contractors about negative ecological consequences resulting from crested wheatgrass, and persuade them to rehabilitate disturbed land using only native seed mixes that are verified to be free of crested wheatgrass contamination.

Conservation Measure 7– Accomplishments and Noteworthy Events:

- DOE, ESER, and BEA met to discuss revising current revegetation guidelines to ensure they accurately reflect this conservation measure. Specific recommendation included removing crested wheatgrass from seed planting rate examples and making the language in reference to avoiding the planting of non-natives more specific. An additional recommendation about ensuring crested wheatgrass seed is not included as a seed mix contaminant was also discussed.
- All NEPA reviews that included a recommendation for revegetation specified the use of native seeds only and all seed mix recommendations provided by ESER were native seed mixes.

Threat:	Landfills and Borrow Sources
Objective:	Minimize the impact of borrow source and landfill activities and development on sage-grouse and sagebrush habitat.
Conservation Measures:	8. Eliminate human disturbance of sage-grouse that use borrow sources as leks (measure applies only to activities from 6 p.m. to 9 a.m., March 15–May 15, within 1 km [0.6 mi] of active leks).

	9. Ensure that no net loss of sagebrush habitat occurs due to new borrow pit or landfill development. DOE accomplishes this measure by (1) avoiding new borrow pit and landfill development in undisturbed sagebrush habitat, especially within the SGCA; (2) ensuring reclamation plans incorporate appropriate seed mix and seeding technology, and (3) implementing adequate weed control measures throughout the life of an active borrow source or landfill.

Conservation Measure 8— Accomplishments and Noteworthy Events:

- All borrow source users were informed of the seasonal time-of-day restrictions through the Environmental Checklist, email, and Form 450.AP01 (Gravel/Borrow Source Request), which must be completed prior to using gravel or borrow sources. Time-of-day restrictions are also listed in INL's Road Maintenance Procedure (LST-822) and (if necessary) during spring snow removal activities covered in PLN-592. Facility and Site Services also has the ability to barricade the entrances to the Adams and T-12 pits to prevent human disturbance during seasonal restrictions.

Conservation Measure 9— Accomplishments and Noteworthy Events:

- Expansion of onsite borrow sources and landfills is limited to footprints approved in Appendix C of the Spent Nuclear Fuel Environmental Impact Statement (EIS) (DOE/EIS-0203) or the EA for Silt/Clay Development and Use (DOE-EA-1083). INL Facilities and Site Services personnel assist in the identification of approved footprints.

Threat:	Raven Predation
Objective:	Reduce food and nesting subsidies for ravens on the INL Site.
Conservation Measures:	10. DOE will work with INL contractors and the National Oceanic and Atmospheric Administration to opportunistically reduce raven nesting on power lines and towers and at facilities. 11. Instruct the INL to include an informational component in its annual Environment, Safety, and Health training module by January 2015 that teaches the importance of eliminating food subsidies to ravens and other wildlife near facilities.

Conservation Measure 10— Accomplishments and Noteworthy Events:

- In 2015, the USFWS reviewed and agreed with a cooperative agreement between the ESER contractor, INL, and National and Homeland Security to install nest deterrents only on dead-end and corner poles and not install any nest or perch deterrents on other poles. These deterrents are installed during the performance of maintenance activities as funds allow.
- NOAA staff planned to add an additional layer of hardware cloth in summer 2018 to two of its towers on the INL Site that ravens have occupied for the past several years (Pers. Comm., Adam Haggerty, NOAA Electronics Technician; May 2018). Wire mesh has been installed previously, but it did not cover the entire top eight to ten feet of the tower where ravens tend to nest. ESER will monitor the towers in 2019 to learn if these latest efforts are effective.

Associated Conservation Actions that Addressed the Raven Predation Threat:

- ESER sought out researchers interested in working on the INL Site to study raven movements and the effects of nest deterrents on those movements. During the autumn of 2018, the team of researchers worked with ESER to submit a grant proposal to the Office of Species Conservation. This effort is fully supported by DOE.

Conservation Measure 11: Complete

Threat:	Human Disturbance
Objective:	Minimize human disturbance of sage-grouse courtship behavior on leks and nesting females within the SGCA and 1 km (0.6 mi) Lek Buffers.
Conservation Measures:	12. Seasonal guidelines (March 15–May 15) for human-related activities within 1 km (0.6 mi) Lek Buffers both in and out of the SGCA (exemptions apply—see Section 10.9.3): • Avoid erecting portable or temporary towers, including Meteorological, SODAR, and cellular towers.

	• Unmanned aerial vehicle flights conducted before 9 a.m. and after 6 p.m. will be programmed so that flights conducted at altitudes < 305 m (1,000 ft) will not pass over land within 1 km (0.6 mi) of an active lek. • Detonation of explosives > 1,225 kg (2,700 lbs) will only occur at the National Security Test Range from 9 a.m.–9 p.m. • No non-emergency disruptive activities allowed within Lek Buffers March 15–May 15. 13. Seasonal guidelines (April 1–June 30) for human-related activities within the SGCA (exemptions apply—see Section 10.9.3): • Avoid non-emergency disruptive activities within the SGCA. • Avoid erecting mobile cell towers in the SGCA, especially within sagebrush-dominated plant communities.

Conservation Measures 12 and 13— Accomplishments and Noteworthy Events:

- No meteorological, Sonic Detection and Ranging, or cellular towers were erected in the SGCA or within 1 km of leks. Temporary towers associated with WTB activities were erected on previously disturbed areas (roads, pullouts, parking areas, etc.) and were not erected within any lek buffer area.
- No explosives >1,225 kg (2,700 lbs) were detonated outside seasonal guidelines in 2018.
- Seasonal restrictions on vertical distances above leks for unmanned aerial vehicle operations are found in EC INL-16-149 “Unmanned Aerial Vehicle Operations.”
- INL ES&S personnel are not aware of any non-exempt disruptive activities within lek buffers during 2018. As noted in Sections 2 and 3 above, the U.S. Geological Survey (USGS) proposed to construct a monitoring well (USGS-147) in the Sage Grouse Conservation Area (SGCA), but it was not within 1 km of a lek. Drilling began after June 30 to minimize impacts to nesting sage-grouse hens within the area.
- DOE postponed conducting an inspection of a bridge over the Big Lost River in early May 2018 because this action would have required diverting river flows into the Spreading Areas, possibly inundating an active lek.

5.2 Reports on Projects Associated with Conservation Measures

5.2.1 Conservation Measure 1—Sagebrush Seedling Planting for Habitat Restoration

Summary of Results: *ESER managed the planting of an estimated 24,625 sagebrush seedlings in fall of 2018 in an area prioritized for restoration. Survivorship of seedlings planted in 2017 was at least 58%.*

Introduction

The objective of Conservation Measure 1 is to minimize the impact of habitat loss due to wildland fire and fire-fighting activities (Section 5.1). Although no wildfires >40 ha (99 acres) have burned on the INL Site since 2012, DOE began implementing an annually recurring task in 2015 that would facilitate planting at least 5,000 sagebrush seedlings each fall in priority restoration areas on the INL Site (DOE and USFWS 2014, Section 9.4.4). Planting sagebrush seedlings annually is a proactive measure that will hasten the reestablishment of sage-grouse habitat lost during past fires.

In 2018, ESER received a grant through the Idaho Governor's Office of Species Conservation (OSC) to increase the number of seedlings planted in burned habitat. The grant provided a one-time opportunity to substantially increase DOE's level of habitat restoration effort. It was awarded based on an in-kind match from DOE, which was met by an increase in DOE's planting effort and providing ESER labor to facilitate growing and planting the seedlings funded by OSC.

The ESER program oversees the planting of sagebrush seedling and monitors survivorship to evaluate the effectiveness of the task. Each year, seeds collected on the INL Site are germinated and grown in greenhouses in 10-in^3 containers, and each fall the crop is planted in pre-determined areas. Our aim is to plant at least 80 sagebrush seedlings per acre, resulting in a coverage of ≥25 ha (63 ac) per year (Shurtliff et al. 2016), although the acreage planted can be highly variable due to weather conditions, topography, planting conditions, travel, and planter abilities.

Results and Discussion

We planted approximately 9,000 seedlings on 20.2 ha (49.8 ac) or ~446 seedlings per ha (181 seedlings per ac) from October 8 to October 13, 2018, in the east central part of the INL Site (Figure 5-1). We marked the locations of 1,530 (~17%) seedlings for future monitoring. In addition to the 9,000 seedlings planted with DOE funding, the OSC grant allowed ESER to plant an additional 15,625 seedlings on 39.1 ha (96.7 ac) or ~400 seedlings per ha (162 seedlings per ac) from October 15-16, 2018. These seedlings were also planted in the Jefferson Fire, just north and east of the DOE planting (Figure 5-1).

To assess 2017 seedling survivorship and condition, we revisited 597 sagebrush seedlings in August 2018. Of the original 597 marked seedlings, 316 (53%) were healthy, 33 (6%) were stressed, 67 (11%) were dead, and 181 (30%) were unable to be located. Assuming the missing seedlings were dead, a total of 58% of the seedlings survived the first year.

Precipitation patterns from fall 2017 to fall 2018 were characteristic of a good recruitment year. Although the winter was fairly dry, March through May were uncharacteristically wet, which would have been ideal for early spring growth for the seedlings. The summer growing season was slightly below average (Figure 3-2). Despite the lack of moisture during summer, the majority of the plants relocated were labeled as being healthy (76%) and very few were stressed or dead (8% and 16% respectively).

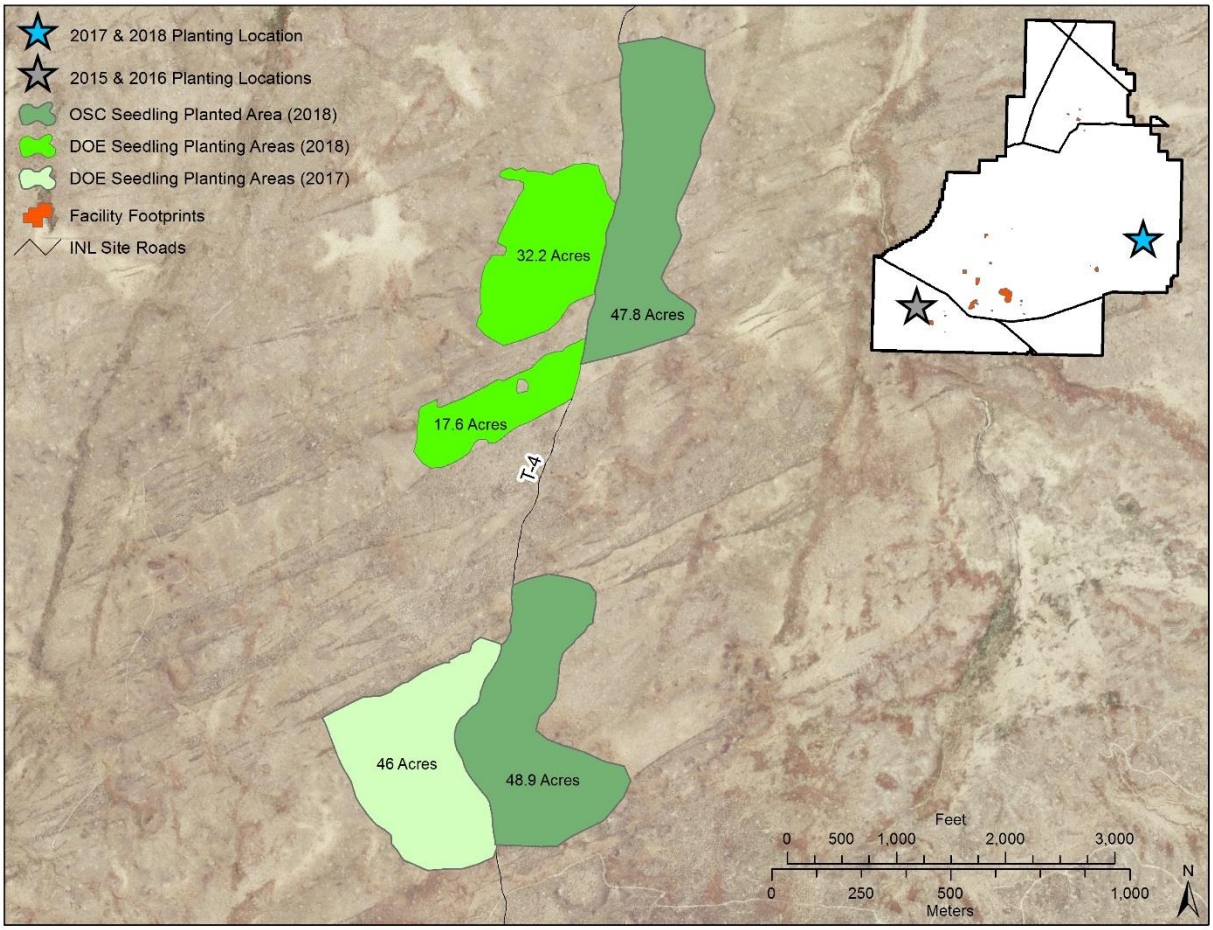

Figure 5-1. Areas within the Jefferson Fire scar on the Idaho National Laboratory Site that were planted with big sagebrush seedlings in 2017 and 2018. The 2017 planting was revisited to assess one-year survivorship in 2018.

One of the reasons DOE chose to plant seedlings over a relatively small area each year rather than to drill or broadcast sagebrush seeds over a much larger area is because successful seed germination and establishment is affected by several climatic factors, including timing and amount of precipitation (Young et al. 1990, Boudell et al. 2002). The suite of factors that facilitate successful germination of seed and establishment of new plants fluctuates from year to year (Colket 2003; Forman et al. 2013), and in many years, few or no seeds may germinate and survive the summer (Brabec et al. 2015). DOE's decision to plant containerized seedlings in old burns instead of broadcasting or drill-planting seeds will continue to be justified as long as high survivorship of seedlings is consistently achieved, particularly during years in which establishment following seeding would be low. When the INL Site experiences another wildland fire of tens or hundreds of acres, DOE may experiment with planting sagebrush seeds in the newly burned area using mechanical methods. The seeding project would help DOE determine if such methods can be successful supplements and/or alternatives to annual sagebrush seedling planting efforts immediately following a fire.

6. SYNTHESIS AND ADAPTIVE MANAGEMENT

6.1 Sage-Grouse and Sagebrush Habitat Trends

Sage-grouse abundance across Idaho was approximately 18% lower in 2018 compared to 2017, and has declined for the past two years. Prior to these declines, state-wide lek counts had increased for three consecutive years (Unpublished data; personal communication with Ann Moser, Wildlife Staff Biologist, IDFG; Dec. 4–5, 2018). Lek route observations on the INL Site are generally consistent with these results (Figure 2-3). It is well established that sage-grouse populations typically oscillate on 6- to 10-year cycles (Rich 1985, Fedy and Aldridge 2011, Coates et al. 2018), and both INL Site and state-wide data over the past ten years approximate this cyclic pattern. If future monitoring reveals that sage-grouse abundance on the INL Site continues to track regional trends, we could conclude that region-wide factors (e.g., broad-scale wildland fires or precipitation patterns) are likely driving sage-grouse trends (Coates et al. 2017). Alternatively, INL Site lek count trends could begin to deviate from regional trends, in which case we would assume local conditions are predominately affecting sage-grouse trends.

The CCA monitoring program does not include an experimental component, nor does it employ population modeling analyses that would identify factors likely to be governing observed patterns of lek count fluctuations. Consequently, only obvious negative associations between lek counts and one or more threats would potentially qualify as support of a hypothesis that threats identified in the CCA are currently impacting sage-grouse on the INL Site. As we consider results from the past six years of lek, habitat and threats monitoring, we do not find such obvious associations. Loss of sagebrush due to wildland fire or infrastructure development has been virtually zero (although new two-track roads have been increasing), and raven nesting (at least on infrastructure) may be stable. Cheatgrass cover is continuing to increase, but not at the expense of native herbaceous cover, which has been relatively high during the past few years of above-average precipitation. We believe other threats, including livestock grazing (Shurtliff et al. 2017a), human disturbance, and landfills/borrow sources have negligible effects on current sage-grouse trends. We recognize that when factors negatively impact sage-grouse reproductive success, effects on lek counts are often not immediate, sometimes requiring several sage-grouse generations to manifest (Holloran et al. 2010). We also recognize that additive effects from threats, both direct and indirect, can reduce sage-grouse abundance even when no single factor is culpable. For these reasons, DOE continues to monitor leks, habitat plots, and threats, and to take action where it is feasible to reduce impacts of the latter.

6.2 Changes made to the CCA

The following changes to the CCA were discussed by DOE and USFWS during the 2018 CCA stakeholders meeting, held in Idaho Falls in February. All changes described below were later approved by DOE in 2018.

6.2.1 Adjust Threat Ratings

For the first time since the CCA was signed, we revisited the ratings we assigned to threats that potentially affect sage-grouse and its habitats on the INL Site (see pp. 44-46 of the CCA). During this reevaluation, ESER adjusted what we perceive as the current level of threats. We now consider *Livestock* to be a low threat, *Raven Predation* to be a low threat, and *Infrastructure Development* to be a medium threat (Table 6-1).

Table 6-1. Updated threat ratings as they apply to Greater Sage-Grouse and its habitats (i.e., sagebrush communities) on the Idaho National Laboratory Site. Compare to Table 3 in the original Candidate Conservation Agreement (DOE and USFWS 2014).

Threat	Current INL Site Rating	2014 INL Site Rating	Justification for Rating Change
Wildland Fire	High	High	N/A
Annual Grasslands	Medium	Medium	N/A
Human Disturbance	Medium	Medium	N/A
Infrastructure Development	Medium	High	It no longer makes sense for infrastructure to be rated as high as wildland fire. Upon signing the CCA, DOE pledged to minimize the effects of infrastructure development on sage-grouse and its habitats, especially in the SGCA. Contractors now require project leaders to complete an Environmental Checklist before a project may proceed. This process ensures best management practices and other relevant conservation measures from the CCA have been taken into account during project planning.
Seeded Perennial Grasses	Medium	Medium	N/A
Landfills and Borrow Sources	Low	Low	N/A
Livestock	Low	Medium	Data from habitat monitoring plots showed no significant difference in primary indicators of habitat quality between plots inside and outside grazing allotments. Therefore, we have no evidence that livestock grazing is negatively affecting sagebrush habitat on the INL Site (Shurtliff et al. 2018a).
Raven Predation	Low	Medium	We have learned through the raven nest monitoring task that most raven nests are outside the Sage-grouse Conservation Area (SGCA). One assumption we made is that ravens do not travel regularly into the SGCA to forage. If future studies find that ravens travel far enough to regularly forage within the SGCA and that they are negatively influencing sage-grouse, the threat rating may need to be adjusted again.

6.2.2 Change Wording to Allow Greater Flexibility When Planting Sagebrush Seedlings

The CCA states, "If it becomes necessary for DOE to actively restore sagebrush to a vegetation community (e.g., mitigation following wildland fire), DOE will select restoration sites from within the Priority Restoration Areas" (pg. 40). The weather in October when sagebrush seedlings are planted is variable, and ESER has found that if precipitation falls during the week that plantings are scheduled, it can be extremely difficult to access previously-identified planting sites within Priority Restoration Areas. Therefore, the language on page 40 of the CCA shall be changed to:

> **"If it becomes necessary for DOE to actively restore sagebrush to a vegetation community (e.g., mitigation following wildland fire), DOE will first seek restoration sites from within the Priority Restoration Areas; however, this may not always be practical due to logistical constraints."**

6.2.3 Add a Best Management Practice to Conservation Measure 2 (Addresses Infrastructure Development

Since 2015, DOE has provided annual funds to ESER to plant sagebrush seedlings in areas prioritized for restoration and to monitor seedling survivorship. To acknowledge this process, the following will be added to the list of best management practices that comprise Conservation Measure 2 (CCA, pp. 54–55):

"Establish a centralized, all-inclusive sagebrush restoration capability to support restoration of areas where sagebrush removal or destruction is unavoidable."

6.2.4 Defer Activities on Conservation Measure 4 and Focus Resources on Conservation Measures 1 and 2 to Address Cheatgrass

Annual grasslands, especially those comprised of cheatgrass, continue to threaten sage-grouse habitat on the INL Site. After the CCA was signed, ESER inventoried areas dominated by cheatgrass (primarily in the SGCA) and attempted to identify stressors that facilitated cheatgrass domination. When it became apparent that stressors were impossible to identify in most cases, DOE shifted its focus to a known vector of cheatgrass spread—wildland fire containment lines. For two years, ESER identified and mapped containment lines visible through remotely-sensed imagery and prioritized a list of candidate restoration areas. Concurrent with these efforts, cheatgrass cover expanded greatly across many parts of the INL Site, aided by favorable precipitation patterns. Although DOE remains committed to the objective of Conservation Measure 4 (CCA pg. 57), which is to "maintain and restore healthy, native sagebrush plant communities," DOE recognizes there is currently no cost-effective way to directly reduce cheatgrass spread and dominance at a meaningful scale within sagebrush habitat on the INL Site. Therefore, DOE will no longer pursue Conservation Measure 4 nor the associated Task 7. Instead, it will redirect resources toward achieving Conservation Measures 1 and 2, which are designed to address the wildland fire and infrastructure development threats. These threats exacerbate the annual grassland problem, so to the extent they are moderated, the annual grassland threat will be reduced. The ESER Program will continue to monitor cheatgrass abundance through CCA Task 5 (pg. 79) and will regularly evaluate if the threat of annual grasslands is increasing. Additionally, DOE is aware of ongoing experiments in Idaho to control cheatgrass using bacterial soil amendments. If researchers report positive results, DOE may consider testing soil amendments on the INL Site.

6.2.5 Update Conservation Measure 6 (Addresses Livestock)

Currently, Conservation Measure 6 (CCA, pg. 59) states that DOE should "communicate and collaborate with BLM to ensure…that rangeland improvements follow guidelines in the 2006 State Plan and this CCA." The 2006 State Plan is no longer a guiding document for the BLM. Therefore, the phrase "2006 State Plan" shall be replaced with **"BLM Land Use Plan."**

6.2.6 Change Conservation Measure 7 (Addresses Seeded Perennial Grasses)

Conservation Measure 7 (CCA, pg. 61) currently reads, "cultivate partnerships with other agencies to investigate the mechanisms of crested wheatgrass invasion so that effective control strategies can be developed." This measure shall be changed to:

> **"Inform entities performing work at the INL Site about negative ecological consequences resulting from crested wheatgrass, and encourage them to rehabilitate disturbed land using only native seed mixes that are verified to be free of crested wheatgrass contamination."**

The paragraph supporting Conservation Measure 7 shall be replaced with the following:

> **"When consulted about a revegetation project, ESER and/or DOE will explain the negative consequences of planting crested wheatgrass. Even if contractors commit to use only native seed, DOE recognizes that it is possible seed mixes could be contaminated with crested wheatgrass seed. Therefore, DOE will request that contractors take steps to verify that crested wheatgrass is not a contaminant in any native seed mix."**

6.2.7 Change Conservation Measure 10 (Addresses Raven Predation)

The objective of Conservation Measure 10 (CCA, pg. 65) is to reduce nesting subsidies for ravens. The measure states that DOE will "support research that aims to develop methods for deterring raven nesting on utility structures." When first drafted, the measure was focused primarily on developing means to keep ravens from nesting on power lines. While power lines remain the favored anthropogenic substrate for nesting by ravens, ESER documents many raven nests each year at INL Site facilities and on towers (especially those owned by the National Oceanic and Atmospheric Administration). Going forward, DOE intends to opportunistically deter nesting on any anthropogenic substrate. Therefore, the Conservation Measure shall be changed to:

> **"DOE will work with INL contractors and the National Oceanic and Atmospheric Administration to opportunistically reduce raven nesting on power lines and towers and at facilities."**

6.3 Work Plan for Upcoming Year

The following table describes activities or changes that are planned for the upcoming year. The purpose of this table is to highlight upcoming activities and analyses that will be different than the regular annual activities associated with each task.

Task	Schedule and Changes for 2018
1. Lek Counts and Lek Route Surveys	• We will continue to monitor all active leks and a rotational subset of inactive leks.
4. Raven Nest Surveys	• No changes to the surveys are anticipated.
5. Sagebrush Habitat Condition Trends	• Sample all annual monitoring plots (*n*=75) and set 2 of the rotational plots (*n*=50). • Update annual habitat condition analyses and continue to explore trend analyses. • Continue to explore and develop new local means using locally-collected data to step away from regional recommendation values from Connelly et al. (2000).
6. Monitoring to Determine Changes in Sagebrush Habitat Amount and Distribution	• No work to be conducted on this task inside recently burned areas until the new vegetation community classification and map is completed in 2019. New wildland fires will be mapped when imagery becomes available to document sagebrush habitat loss as needed.
8. Monitoring Expansion of the Infrastructure Footprint within the SGCA and Other Areas Dominated by Big Sagebrush	• No planned activities for 2019. This task will be updated again after the 2019 Idaho NAIP imagery becomes available in 2020.

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