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

2017 Summary Report

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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
MPLS	Males Per Lek Surveyed
NAIP	National Agricultural Imaging Program
RWMC	Radioactive Waste Management Complex
SGCA	Sage-grouse Conservation Area
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service

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 eight 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 2017 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 that includes a full description of methods, data, and discussion about results, was also prepared by ESER (Shurtliff et al. 2018) and 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 here will inform a 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 will ensure 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 chapters: Population Trigger Monitoring (Chapter 2), Habitat Trigger Monitoring (Chapter 3), and Threat Monitoring (Chapter 4). Each chapter summarizes results of pertinent monitoring tasks outlined in section 11.1 of the CCA. Chapter 5 documents how DOE and its contractors implemented the 13 conservation measures listed in the CCA during 2017. Finally, Chapter 6 brings together the main results and conclusions from all monitoring tasks and addresses them in light of the ultimate goal of the CCA, which is to conserve sage-grouse. Chapter 6 also documents substantive changes to any element of the CCA that occurred during the past year and provides a brief work plan for the upcoming year.

2. POPULATION TRIGGER MONITORING

In 2013, DOE initiated the following three monitoring tasks designed to track the number of male sage-grouse at active leks and document additional active leks on the INL Site (DOE and USFWS 2014):

1) Lek Counts and Lek Route Surveys—Surveys of all active leks on the INL Site and some inactive leks. Leks may be individually counted or may be part of a lek route survey;
2) Historical Lek Surveys—Surveys of historical leks on the INL Site to determine if sage-grouse still use those areas;
3) Systematic Lek Discovery Surveys—Surveys of poorly sampled regions of the INL Site to discover additional active leks, especially in the SGCA.

The primary purpose of Task 1 is to produce an index of peak male attendance across the 27 leks in the SGCA, which were used to establish the baseline value of the population trigger, so ESER can monitor sage-grouse abundance relative to the population trigger (DOE and USFWS 2014). Task 1 also provides information about abundance trends across the three Idaho Department of Fish and Game (IDFG) lek routes and all other active leks on the INL Site (DOE and USFWS 2014). The purpose of Tasks 2 and 3 is to identify unknown active leks on the INL Site. This information was used in 2017 to establish three new lek routes prior to the start of the field season.

2.1 Task 1—Lek Counts and Lek Route Surveys

Summary of Results: *The three-year average peak male attendance (2015-2017) across the 27 baseline leks in the SGCA was 5% higher than last year and is now 160% of the population trigger threshold. This three-year average has remained stable or increased each of the past four years. In 2017, we created three new lek routes that, in conjunction with the three IDFG routes, will become the basis for long-term sage-grouse abundance monitoring on the INL Site.*

2.1.1 Introduction

Task 1 consists of surveying all known active leks on the INL Site, including the 27 baseline leks located in the SGCA (19 of which were considered active in 2016) and all other known active leks on the INL Site (DOE and USFWS 2014). Leks on three IDFG survey routes (monitored annually since 1999; Fig. 2-1) fall into one of these two categories, but are analyzed separately as well to maintain historical context. To strengthen our ability to track sage-grouse trends in the future, we assigned 11 leks (10 were active) in 2017 to three new lek routes, as had been anticipated when the CCA was written (DOE and USFWS 2014 [pg. 36]). Results from all six lek routes are included in this year's report.

2.1.2 Results and Discussion

SGCA Baseline Leks

We surveyed each of the 27 SGCA baseline leks 3–7 times ($\bar{x}$=5.5 surveys, SD=1.8; Fig. 2-1) in 2017. The sum of peak male attendance counts across the 27 leks was 412, a 13% decrease from 2016. However, the three-year average (2015-2017) increased to 406 males. This is 5% higher than last year's (2014-2016) average (Fig. 2-2) and is 160% of the threshold (253 males) that would trigger action by DOE and the USFWS (DOE and USFWS 2014). The three-year average has been stable or has increased each of the past four years.

Following the 2017 field season, we reclassified two baseline leks as inactive, reducing the number of active baseline leks to 17. Both reclassified leks were satellites to larger, nearby leks. In each of the past five years, at least one baseline lek per year has been reclassified as inactive. However, across all baseline leks, the three-year average peak male attendance continues to increase and was higher in 2017 than it has been since the baseline was established.

Other Active Leks

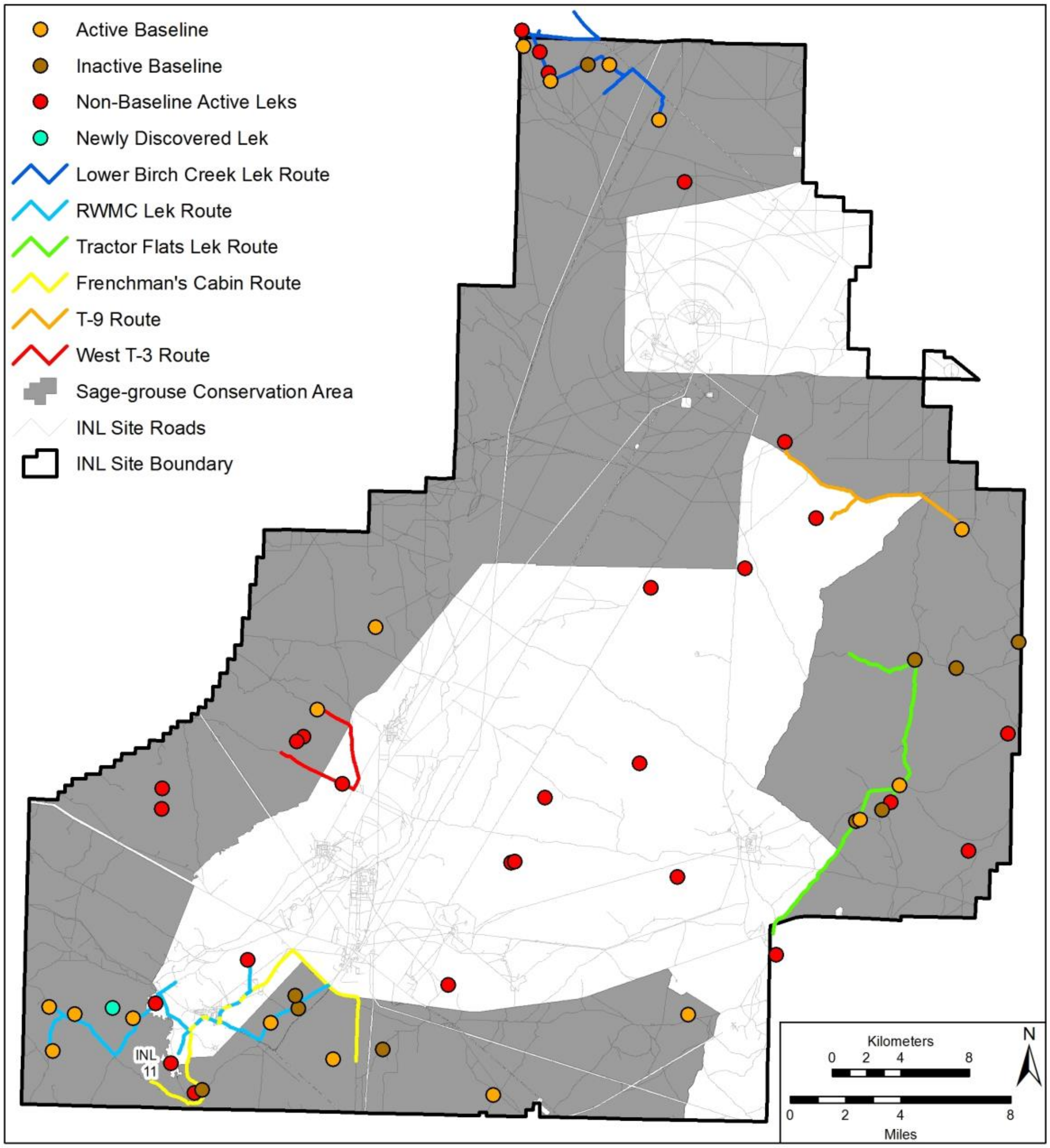

Figure 2-1. An overview of 2017 lek surveys and lek route efforts in support of Task 1. All leks surveyed by ESER are displayed, and lek activity designations are based on results from the 2016 season. Following the 2017 survey, two baseline leks were reclassified as inactive. Lek INL 11, surveyed as part of the Radioactive Waste Management Complex (RWMC) route, was elevated to active status at the end of the field season.

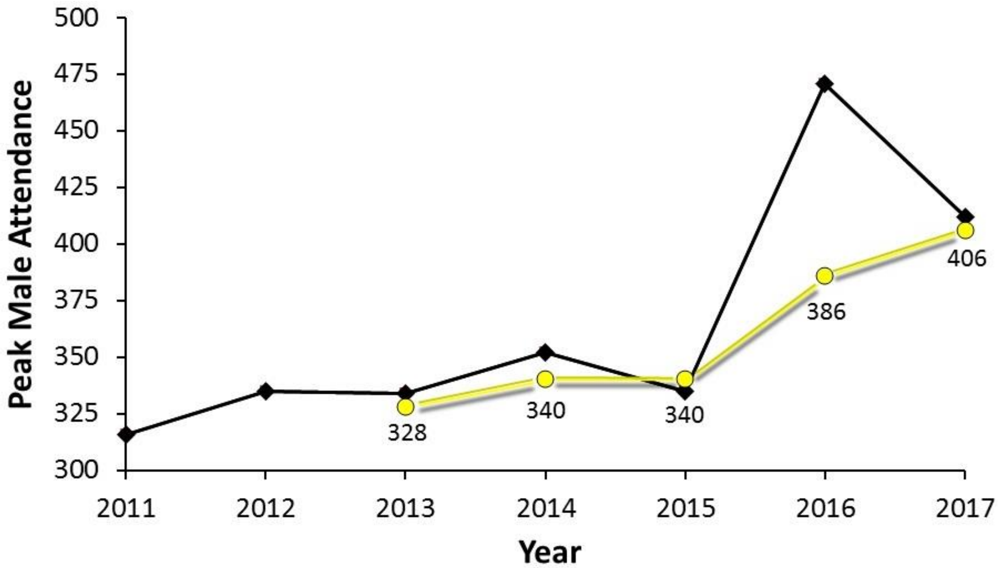

Figure 2-2. Peak male attendance on the 27 leks in the SGCA associated with the population trigger. Black diamonds are annual counts, and yellow dots represent the three-year running average.

We surveyed 27 additional (i.e. non-baseline) active leks a mean of 4.8 times each (range=4–7, SD=1.3), not including a new lek identified during discovery surveys (Fig. 2-1). Average peak male attendance was 12.1 males per lek (range: 0–36, SD=10.7), up from 10.1 and 10.6 males per lek in 2016 and 2015, respectively.

Lek Routes

Leks assigned to IDFG routes (Fig. 2-1) include baseline leks, “other active leks” (previous subsection), and two leks that are outside the INL Site boundaries. In 2017, we found that the Tractor Flats route was 27% lower (2016=14.4 males per lek surveyed [MPLS]), the Radioactive Waste Management Complex (RWMC) route was 16% lower (2016=14.8 MPLS), and the Lower Birch Creek route was <1% lower (2016=13.2 MPLS) than 2016 MPLS counts (Table 2-1). High counts on the Tractor Flats route in both 2016 and 2017 remained greater than any year since 2010 (i.e. prior to the Jefferson Fire; Fig. 2-3). Likewise, the nearly identical MPLS values in the past two years on the Lower Birch Creek route represent the highest MPLS on that route since 2007.

We surveyed three additional lek routes for the first time in 2017 (Fig. 2-1). Survey effort was not as frequent for these routes as for the IDFG routes (Table 2-1) due to logistical constraints, but in future years we will survey all lek routes at least seven times. We observed sage-grouse on nine of the 11 leks assigned to these routes. The T-9 route had the lowest MPLS, but the MPLS was comparable on West T-3 and Frenchman’s Cabin routes to the IDFG routes (12.3 and 15.3 MPLS, respectively). Several more years of data collection are required before we can begin to evaluate trends using data from the new lek routes.

Taken together, lek and route counts in 2017 indicated that fewer sage-grouse were on the INL Site during the breeding season than in 2016, but the decrease was not substantial nor is it unexpected, because sage-grouse abundance tends to fluctuate annually and may exhibit natural long-term periodicity (Fedy and Aldridge 2011). Male attendance on Tractor Flats and Lower Birch Creek route leks remains among the highest third of counts during the past seven years. The RWMC count for 2017, however, was among the lowest third of counts during the same time period. Despite the increase of sage-grouse counts on the Tractor Flats route since the Jefferson Fire, sage-grouse only occupied two of seven route leks surveyed in 2017. In 2010, prior to the Jefferson Fire, sage-grouse used all six leks that comprised the route at that time.

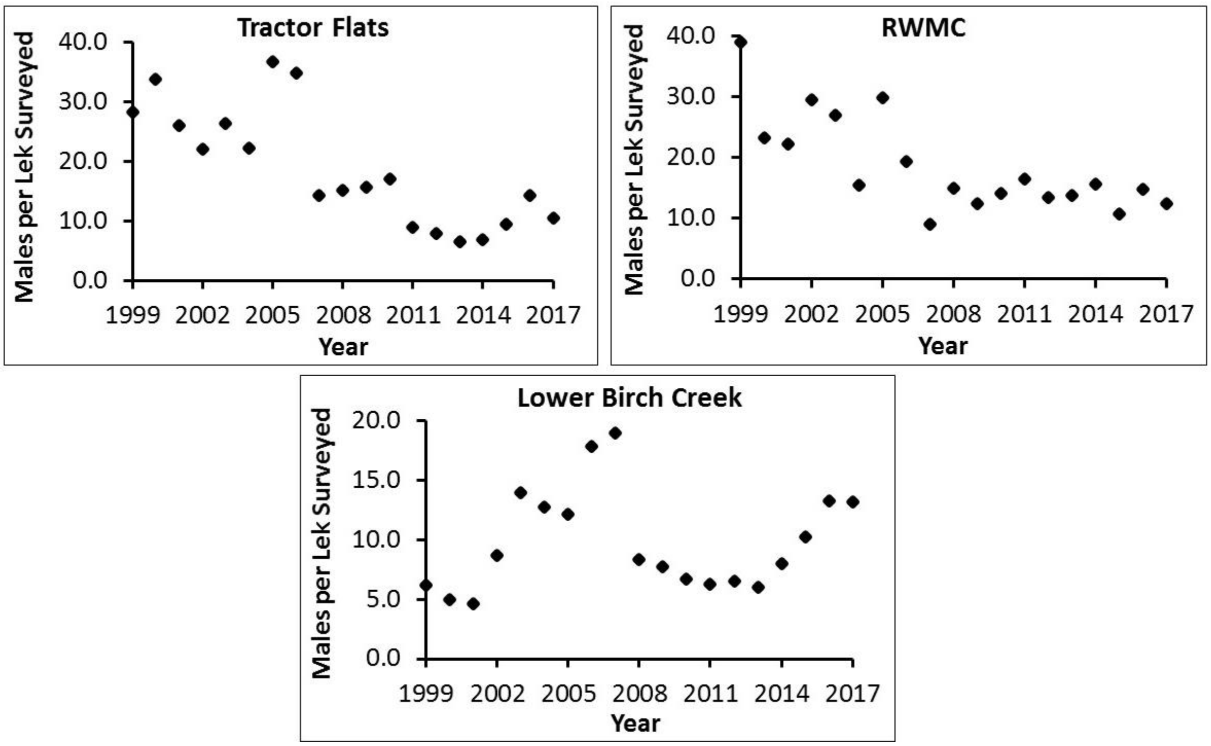

Figure 2-3. Mean number of males per lek surveyed during peak male attendance on three IDFG lek routes from 1999-2017 on the INL Site. The number of leks surveyed each year increased over the displayed time period as follows: Tractor Flats (4-8 leks), RWMC (2-9 leks), and Lower Birch Creek (6-10 leks). Note that the Y-axis is at a different scale in the Lower Birch Creek panel.

Table 2-1. 2017 data from INL Site lek routes.

Lek Route	Highest Single-Day Count	Total Leks Surveyed	Males / Lek Surveyed (MPLS)	Occupied Leks*	Males / Occupied Lek*	Surveys Conducted
Tractor Flats	84	8	10.5	2	42.0	7
RWMC	112	9	12.4	7	16.0	7
Lower Birch Creek	132	10	13.2	6	22.0	7
West T-3	49	4	12.3	4	12.3	4
T-9	34	4	8.5	3	11.3	4
Frenchman's Cabin	46	3	15.3	2	23.0	5

*For the purpose of 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.

2.2 Task 2—Historical Lek Surveys

<u>Summary of Results</u>: No sage-grouse were observed on any of the five historical lek sites surveyed in 2017. All five leks were subsequently reclassified as inactive. No leks on the INL Site remain classified as historical; thus, Task 2 is complete and will no longer be implemented.

2.2.1 Introduction

During the past several decades, many leks have been documented on the INL Site as a result of surveys and opportunistic observations of displaying sage-grouse (Whiting and Bybee 2011). Prior to 2009, many of these historical lek sites had not been surveyed for nearly 30 years. Since 2009, ESER biologists have revisited a subset of historical leks each spring to determine if the leks remain active based on current criteria (DOE and USFWS 2014). The objective of Task 2 was to determine which historical leks are active before establishing new lek routes (DOE and USFWS 2014).

2.2.2 Results and Discussion

We surveyed five historical leks two times each, but observed no sage-grouse on any of these potential lek sites (See Fig. 2-4 in Shurtliff et al. 2018). Following the 2017 surveys, we reclassified all five historical leks as inactive because they had been surveyed at least four years and there was no longer a chance of breeding activity being recorded in at least two out of five years (Whiting et al. 2014).

The end of the 2017 field season marks the completion of Task 2. No more leks on the INL Site remain classified as historical. Since ESER began to survey historical leks in 2009, 26 have been reclassified as active (Shurtliff et al. 2016, 2014; Whiting et al. 2014).

2.3 Task 3—Systematic Lek Discovery Surveys

<u>Summary of Results</u>: We discovered one new lek in 2017, bringing the total number of leks discovered by this task to seven. Three of these leks were assigned to new lek routes (Section 2.1.2). Task 3 is now complete and will not be implemented in the future.

2.3.1 Introduction

Known lek sites are few or absent across large portions of the SGCA (Fig. 2-1), even though habitat in these areas often appears to be adequate to support sage-grouse breeding and nesting activities (DOE and USFWS 2014). The objective of Task 3 is to survey suitable sage-grouse habitat within and near the SGCA where no leks are known to exist. Since 2013, ESER has systematically searched for unknown leks each spring. If a lek is discovered, it is included thereafter in ESER's annual monitoring program (Task 1).

2.3.2 Results and Discussion

Between March 27 and May 8, 2017, we completed 68 surveys (52 road, 16 remote) within the SGCA in the southern portion of the INL Site. We discovered one sage-grouse lek (INL164, Fig. 2-4) where three males were observed strutting on one of two visits to the site.

Since Task 3 began in 2013, ESER has discovered seven previously-unknown leks. All are currently classified as active, and sage-grouse have been seen every year on all leks except one (INL159). We assigned three of these leks to new lek routes this year (Section 2.1.2). In 2017, males were seen at each of the seven leks discovered by Task 3, and the mean peak male attendance was 10.9 males per lek (Range 3–19). Thus, most leks discovered under this task added to our understanding of sage-grouse breeding habitat on the INL Site and were not simply observations of males that had been flushed from larger leks (i.e. incidental observations).

All major sagebrush-dominated areas within the SGCA where leks are not known to exist have now been systematically surveyed under Task 3 (Fig. 2-4). It will no longer be necessary to implement Task 3 in the future because of the extensive coverage of the surveys and because new leks routes were created this year (the primary purpose of this task was to find leks before new lek routes were created).

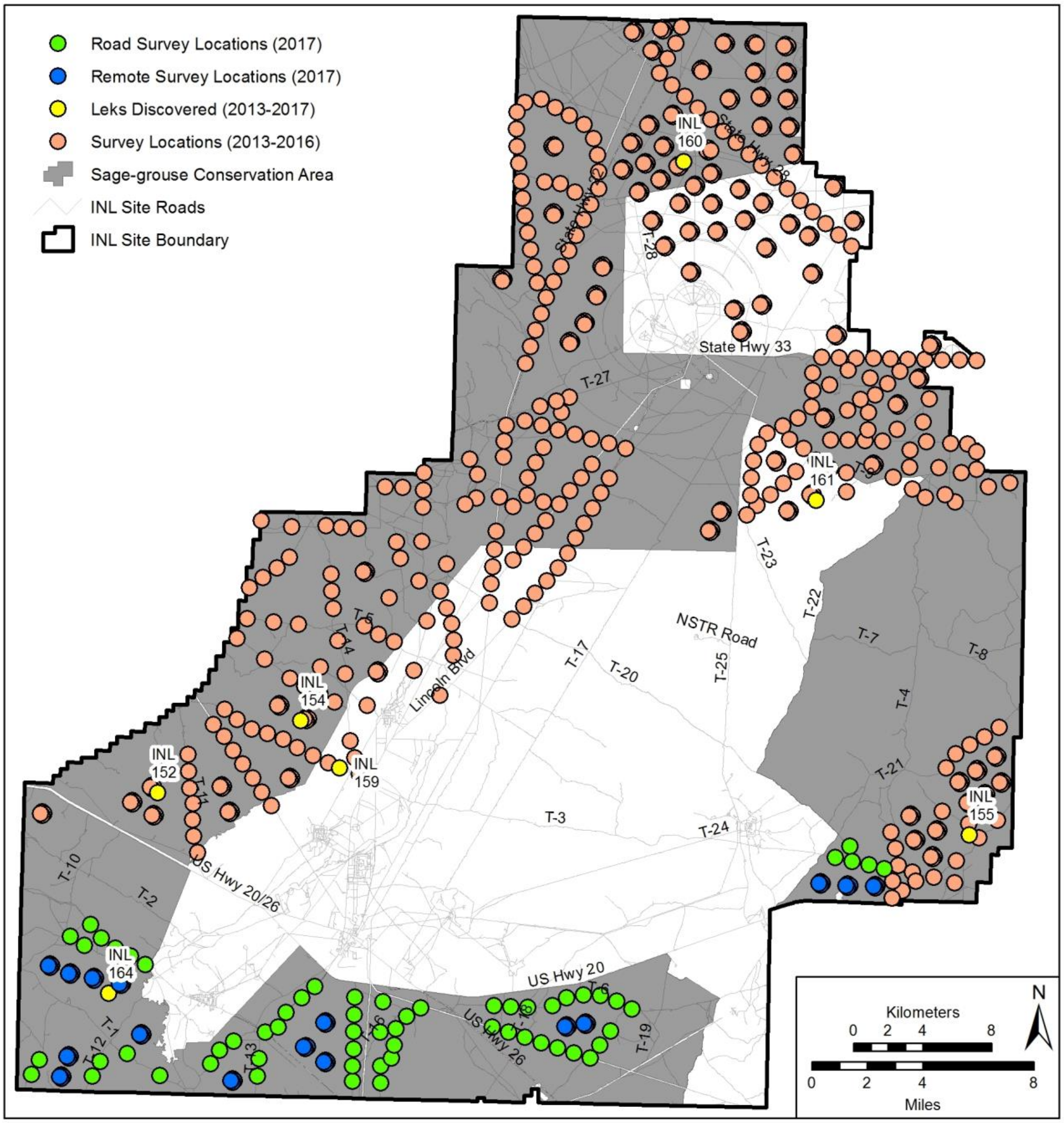

Figure 2-4. Locations of lek discovery surveys conducted since 2013. All active leks discovered as a result of these surveys are indicated by yellow dots.

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

Before the 2017 field season, 49 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, six leks (Fig. 2-5) were downgraded from an active to inactive status. With the discovery of one lek (Section 2.3.2) and the upgrade of an inactive lek to active status, the total number of known active leks on or near the INL Site is currently 45 (Fig. 2-5).

We did not empirically evaluate factors that may have influenced abandonment of these six leks over the past few years. However, in a companion report, we examine lek count records in light of the spatial distribution of active leks to develop an opinion about why these six leks are no longer active (Shurtliff et al. 2018). Briefly, we speculate that at least two of these leks have served as satellite display grounds that were used in years of high sage-grouse abundance (Dalke 1963). The other four inactive leks may have been abandoned as a result of sagebrush habitat loss from the large fires that burned in 2010 and 2011. Other factors could have contributed to lek abandonment, but we are unaware of any potential threat (e.g. infrastructure development, livestock grazing, human disturbance) that could have been a primary contributor at more than a single lek (for example, only one of the four leks occur within livestock grazing allotments). It is important to remember that the CCA population trigger is based on sage-grouse abundance in the SGCA, not the number of active leks on the INL Site. As reported above, the three-year running average of sage-grouse abundance on baseline leks has increased each year since the CCA was signed.

2.5 Adaptive Management—New Lek Routes for 2017

The end of the 2017 field season marked the completion of CCA Tasks 2 and 3. No leks remain classified as historical (Task 2) and the purpose of discovery surveys (Task 3), which was to search poorly-sampled regions within the SGCA for unknown leks before establishing new lek routes, has been achieved. Going forward, ESER will continue to implement Task 1. That is, we will survey all known leks on the INL Site multiple times each year, with extra effort directed at surveying lek routes and the 27 baseline leks. In addition, ESER proposes to annually revisit a subset of inactive lek sites each year, especially those within or near good nesting habitat. By regularly surveying a few different leks each year, we could revisit all inactive lek sites approximately every five years to determine if sage-grouse use of those sites has changed.

The CCA states that following the establishment of new lek routes and the first year of data collection, DOE and the USFWS will 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). In other words, the agencies agreed to consider whether the interim baseline for the population trigger, comprised of data from 2011 for 27 designated leks in the SGCA, should be replaced with a more commonly accepted form of tracking sage-grouse abundance (i.e. lek route counts). ESER recommends postponing consideration of changing the baseline, because we did not survey new lek routes seven times in 2017 (Section 2.1.2) and a new baseline would more accurately reflect current abundance patterns if a three-year running average was used rather than a single year of data.

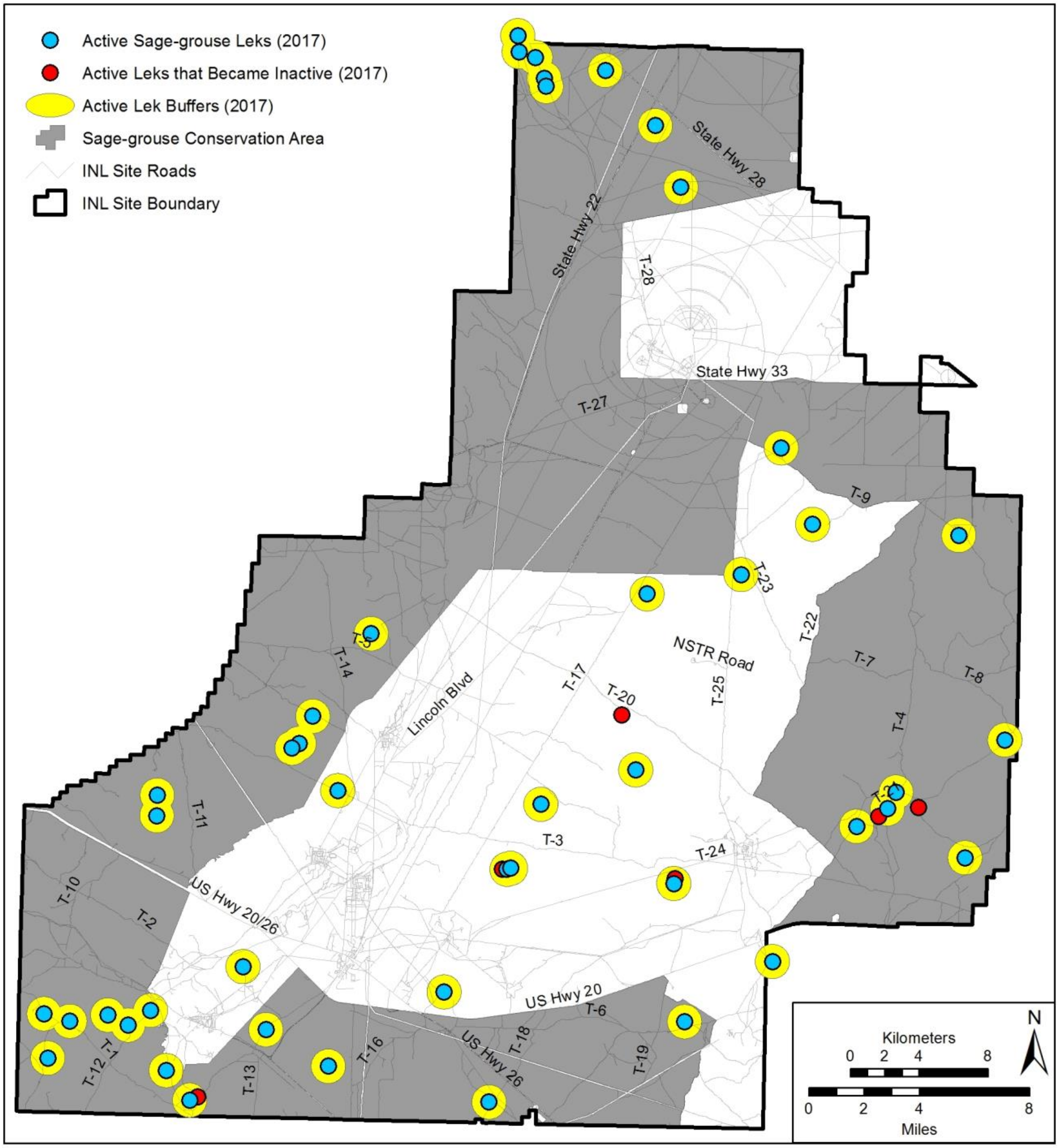

Figure 2-5. Locations of 45 active leks on or near the INL Site and six leks downgraded to inactive status following the 2017 field season. Lek Buffers that extend 0.6 mi (1 km) out from each lek site provide increased protection from human disturbance during the breeding season (DOE and USFWS 2014).

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, 2017). Based on updated habitat estimates, the trigger will trip if there is a 20% reduction in sagebrush habitat (i.e. a loss of >15,712 ha [38,824 ac]) within the SGCA. If the trigger is tripped, the USFWS will ask DOE to take action to compensate for 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 sagebrush habitat on the INL Site with sage-grouse habitat guidelines (e.g. Connelly et al. 2000). 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 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 big 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 big 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 polygons currently identified as sagebrush habitat, mean sagebrush cover and height are within suggested optimal ranges for breeding and brood-rearing habitat; perennial herbaceous cover and height also meet habitat recommendations in 2017.

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 plots, 48 of which are located in polygons currently identified as sagebrush habitat and 27 of which are located in previously burned areas recovering to sagebrush habitat, are sampled annually for cover, height, sagebrush density, sage-grouse sign, and anthropogenic disturbance. The annually-sampled plots are used to address current habitat condition and 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.

3.1.2 Results and Discussion

Data were collected on a total of 75 annual plots between June and August of 2017. These vegetation abundance and structure data were summarized to evaluate current habitat condition and compared to previous years' values to visualize changes over the five-year sample period. 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 2017 (see Shurtliff et al. 2017a for details).

Habitat Condition

Mean sagebrush cover from annual sagebrush habitat plots, and for the sagebrush habitat polygons they represent, is near the upper end of the range suggested for optimal breeding (15-25%) and brood-rearing habitat (10-25%) in arid sites (Connelly et al. 2000). Mean sagebrush height is also within the optimal range (40-80 cm [16-32 in.]; Table 3-1). Perennial grass/forb mean height values were above the minimum value recommended (18 cm) in current sage-grouse habitat guidelines (Connelly et al. 2000). Average perennial grass/forb cover on sagebrush habitat plots was about 18% in 2017, which is above the minimum specified for breeding and brood-rearing habitat (15%), but it was higher in 2017 than in any of the four previous years (Fig. 3-1) and was likely at the upper end of the range of variability for this functional group on the INL Site.

On the plots from recovering burned areas, about 17% absolute cover was from shrubs in 2017 and green rabbitbrush (*Chrysothamnus viscidiflorus*) provided nearly all of that cover. Perennial grasses and forbs were responsible for much of the cover from native species on these plots in 2017 with about 24% absolute cover (Table 3-1). Cover from non-native herbaceous species was higher (36%) than that of native herbaceous species and cover from non-natives was primarily from cheatgrass. Average cover and height of perennial grasses and forbs were greater on recovering habitat plots than on current sagebrush habitat plots (Table 3-1), but herbaceous cover was also much more annually variable in recovering habitat plots from 2013 through 2017, which had a greater impact on year-to-year stability of total vegetation cover in areas of recovering habitat.

Table 3-1. Summary of selected vegetation measurements for characterization of condition of sagebrush habitat monitoring plots and non-sagebrush monitoring plots on the INL Site in 2017. The number marked by an asterisk (*) includes five plots with notable sagebrush seedling germination events. Most seedlings in these plots will fail due to self-thinning; the adjusted mean sagebrush density (without the five high-germination plots) is 4.21 individuals/m^2.

	Mean Cover (%)	Mean Height (cm)	Mean Density (individuals/m^2)
Sagebrush Habitat Plots (n = 48)			
Sagebrush	22.14	50.38	7.02*
Perennial Grass/Forbs	18.29	32.55	
Non-sagebrush Plots (n = 27)			
Sagebrush	0.32	35.43	0.12
Perennial Grass/Forbs	23.88	38.57	

Over the five-year period during which habitat condition data have been collected, cover values have remained stable for most vegetation functional groups (Fig. 3-1) on habitat plots. One exception is perennial grasses, which have been increasing since 2014. On sagebrush habitat plots, non-native annuals have increased slightly over the past few years, but remain much less abundant than native species. On plots in burned and recovering habitat, non-native annuals, primarily cheatgrass (*Bromus tectorum*), have increased markedly over the past five years. Cover from herbaceous species has increased over the same time period as well, so it does not appear the increase in cheatgrass has been at the expense of species in other functional groups. See Shurtliff et al. (2018) for results and discussion of cover trends from all functional groups on both current sagebrush habitat and burned/recovering plots.

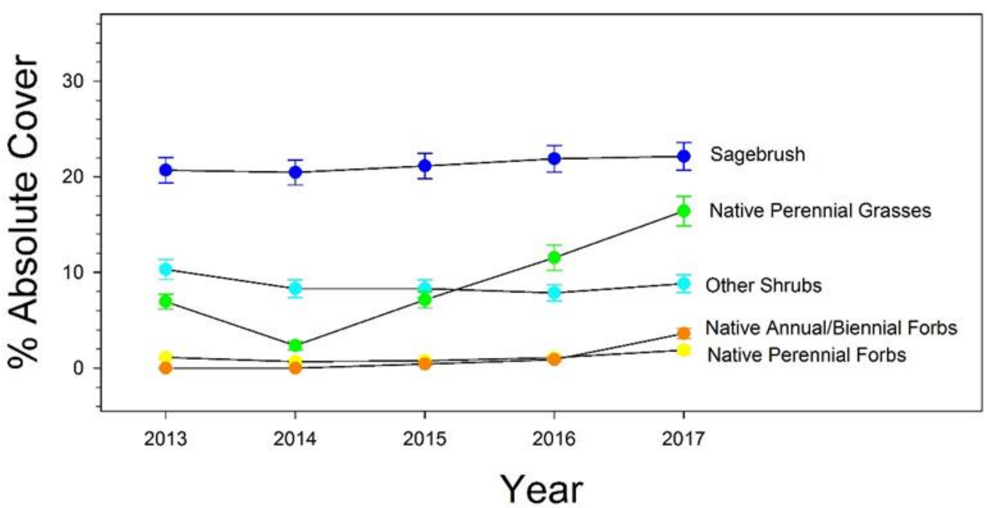

Figure 3-1. Mean cover from functional groups of native species in sagebrush habitat plots (*n*=48) on the INL Site from 2013 through 2017. Error bars represent ± 1 SE.

Similar fluctuations in the abundance of herbaceous functional groups have been noted in the Long Term Vegetation (LTV) dataset (Forman et al. 2013). Although the recent increase in cheatgrass on monitoring plots for this task is concerning, especially on the burned plots, longer-term data from INL's LTV data set show both upward and downward trends in cheatgrass abundance from one time period to another. The LTV data also indicate that the five years of trend data from this monitoring effort are likely not enough to fully understand the nuances of invasion dynamics. Nonetheless, the threat of cheatgrass to sagebrush habitat (and recovering habitat) should not be underestimated and cheatgrass abundance will continue to be monitored in the future.

Precipitation

Total annual precipitation for 2017 was above average (Fig. 3-2). As with several recent years, the timing of precipitation in 2017 deviated markedly from historical patterns (Fig. 3-2). The first year of data collection for this monitoring task, 2013, was the driest year on record with only about ¼ of average annual precipitation. Much of the sampling in 2014 was completed prior to August, when almost half of the total precipitation for 2014 fell. Mean August precipitation is about 13 mm (0.5 in.); total August precipitation from 2014 was 102 mm (4.0 in.). In 2015, May was abnormally wet, with a total of nearly 60 mm (2.4 in.), which is twice the historical monthly average. September and October of 2016 had more than three times average historical precipitation for the same time period and more than half of the annual precipitation fell after the summer growing season. Snowpack through the winter of 2016/2017 was much higher than average and is reflected in the December 2016 through February 2017 precipitation data.

These short-term precipitation patterns, which deviate from historical patterns of seasonality, would certainly favor some plant species and functional groups over others. Cover from perennial herbaceous species, mean cheatgrass cover, and cover from all annual forbs was probably uncharacteristically low in 2013 and 2014 (Shurtliff et al. 2015) and was probably much higher than normal in 2015 through 2017 due to the anomalous precipitation patterns in those years.

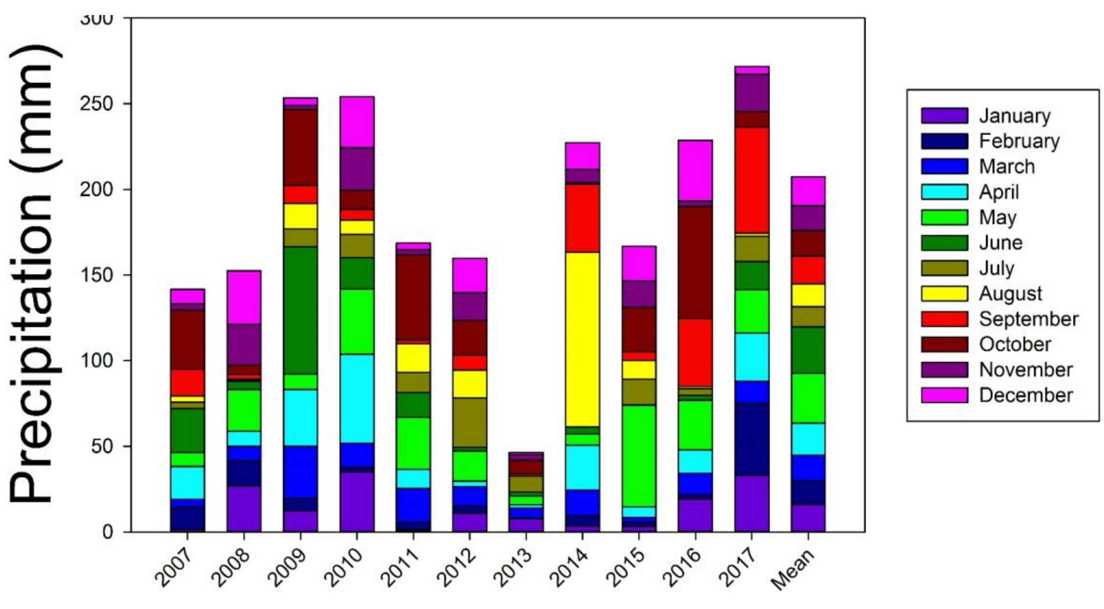

Figure 3-2. Annual precipitation by month from the Central Facilities Area, INL Site. Mean monthly precipitation includes data from 1950 through 2017.

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

Summary of Results: *The distribution and area of sagebrush habitat remains unchanged in 2017 with no losses occurring within the SGCA or elsewhere on the INL Site. Only one small roadside fire (<0.1 ha [0.25 ac]) was documented on the INL Site in 2017, and it did not occur within sagebrush habitat.*

3.2.1 Introduction

A 20% loss of sagebrush habitat from the 2012 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 which 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

The distribution and area of sagebrush habitat remained unchanged in 2017 with no losses occurring within the SGCA or elsewhere on the INL Site. Only one small roadside fire (<0.10 ha [0.25 ac]) was documented on the INL Site in 2017, and it did not occur within sagebrush habitat. No additional field sampling was conducted within recently burned areas because a new vegetation community classification is currently pending, and all recently burned areas will be updated and published when the new vegetation map for the INL Site is completed in 2019.

4. THREAT MONITORING

The CCA identifies and rates eight threats that impact sage-grouse and its habitats on the INL Site, either directly or indirectly. All threats are addressed to some extent by the 13 conservation measures that DOE is striving to implement (Chapter 5). Task 5, which was reported above (Section 3-1), provides information on the status of sagebrush habitat, but it also monitors potential impacts of wildland fire and livestock threats. Some tasks, however, were designed specifically to gather baseline and continuing information about a threat because associated conservation measures could not be implemented without this *a priori* information. The following sections report on Tasks 4, 7, and 8, which were developed to address the threats of raven predation (Task 4), annual grasslands (Task 7), 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.

4.1 Task 4—Raven Nest Surveys

Summary of Results: *Raven nesting on INL Site infrastructure and in ornamental trees decreased 7% from 2016, but the number of active nests in 2017 remains 41% higher than in 2014 when surveys commenced. The number of nests on power lines was fewer in 2017 than in either 2015 or 2016, and this decrease is the primary reason total raven nest counts were lower in 2017. More nests were recorded at facilities than in any other year, and all but one facility either supported a raven nest or was within a few hundred meters of a raven nest.*

4.1.1 Introduction

In the CCA, DOE committed to support research aimed at developing methods for deterring raven nesting on utility structures (*Conservation Measure 10*; DOE and USFWS 2014). The objective of Task 4 is to annually survey all man-made structures on the INL Site that could potentially be used by ravens as nesting substrates and document the number and location of active nest sites. These data will allow DOE to determine the trend of raven nesting and decide how and when to begin testing nest deterrent designs.

4.1.2 Results

Survey Results

We observed 43 active raven nests on man-made structures or in trees associated with facilities, 29 of which were on power line structures (all were transmission structures, including a lattice structure next to a transmission line that is used for power grid tests). Before final analysis, we removed two nests from the dataset because they had fallen to the ground early in the breeding season, and nearby nests (440 m [481 yd] and 1,900 m [2,078 yd]) became active later in the season (Shurtliff et al. 2018). When one nest falls to the ground and another nest within 6 km becomes active later, we assume it is the same breeding pair (Shurtliff et al. 2017a). Thus, the adjusted raven nest results for 2017 are 41 total nests with 27 (66%) on power lines. Twelve power line nests (43%) were inside or bordering the SGCA.

We surveyed 13 facilities and recorded 11 nests at nine of them. The U.S. Sheep Experiment Station, located on the edge of the INL Site near Mud Lake (Fig. 4-1), supported three raven nests simultaneously. In addition to facilities, ravens maintained nests on the same three towers they occupied last year (Shurtliff et al. 2017a), two of which are in remote locations within the SGCA (Fig. 4-1).

The number of active raven nests (adjusted) on the INL Site was 7% lower in 2017 than in 2016, the first time since surveys began that fewer raven nests were recorded than the previous year (Fig. 4-2). The greatest decreases were on power lines (-18% from 2016, -9% from 2015). Although slightly lower than in 2016, the adjusted raven nest count in 2017 remains 41% higher than in 2014, and nests on power lines are 30% higher than 2014.

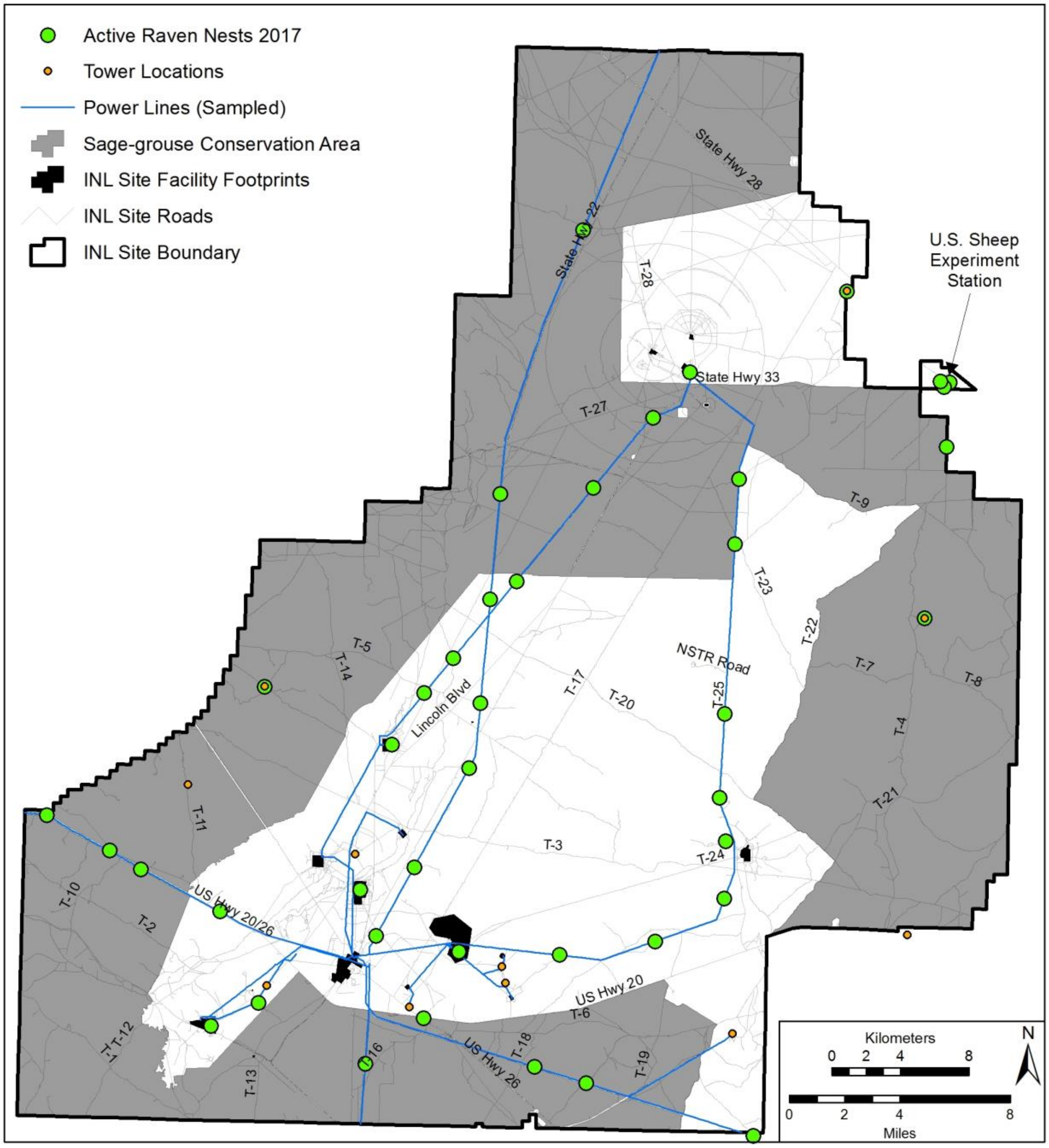

Figure 4-1. Results of 2017 raven nest surveys. Raven nests displayed represent adjusted nest locations (*n*=41).

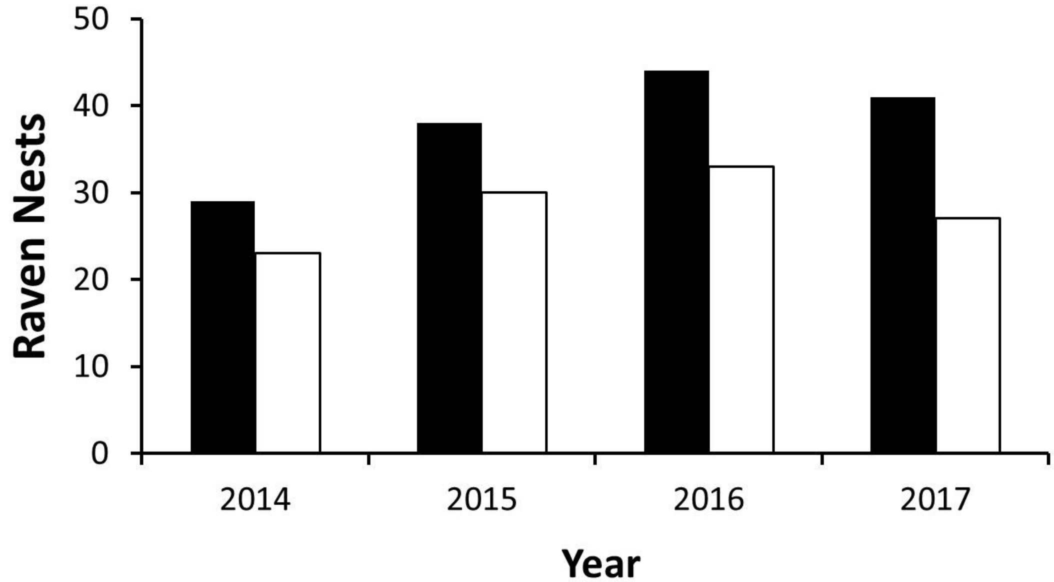

Figure 4-2. Adjusted number of raven nests observed on INL Site infrastructure. Black bars represent total nest counts and white bars represent nests on power lines.

4.1.3 Discussion

The number of active raven nests recorded on INL Site infrastructure was lower in 2017 than in 2016, but the current-year nest numbers remain substantially higher than when surveys began in 2014. Although the number of raven nests on power lines was lower in 2017 than in 2016, the number of nests on structures and trees at facilities has increased each year of the surveys. In 2014, five raven nests were recorded at facilities. This number increased to six in 2015, eight in 2016, and 11 in 2017. Part of the increase since 2014 may be attributable to slightly better search effort (e.g. we did not survey AMWTP nor the main guard shack in 2014), new infrastructure (an open-air shelter was recently built near the main gate, and it supported a raven nest in 2017), and increased raven nesting density (three nests at the U.S. Sheep Experiment Station in 2017). However, some facilities that have been well-surveyed each year had raven nests in 2017 but not in some of the past years (e.g. EBR-1, SMC/TAN). Only two facilities on the INL Site (Central Facilities Area and Advanced Test Reactor Complex) did not support a breeding pair of ravens or have a pair of ravens nesting in a nearby facility (i.e. within 1,500 m) in 2017 (Shurtliff et al. 2018).

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 7—Identifying Non-Native Annual Grass Priority Restoration Areas

<u>Summary of Results:</u> *A subset of previously delineated wildfire containment lines located south of Highway 20/26 were surveyed to assess relative cheatgrass abundance in 2017. Survey results were used to develop a prioritized list of potential cheatgrass treatment areas. Activities within these defined potential cheatgrass treatment areas will be determined by DOE when effective and reliable treatments are identified for testing.*

4.2.1 Introduction

Habitat loss due to dominance by non-native grasses, primarily cheatgrass, is a threat to sage-grouse across its range and on the INL Site (DOE and USFWS 2014). Cheatgrass domination generally follows the loss of native herbaceous species, resulting in an altered landscape in poor ecological condition and function for indefinite periods of time. Task 7 was developed to support and inform implementation of Conservation Measure 4, which has a goal to "maintain and restore healthy, native sagebrush plant communities" thereby reducing the threat of annual grasslands (DOE and USFWS 2014, pg. 57). This task is currently outlined in three phases (Shurtliff et al. 2017a) that ultimately address the goal of restoring healthy sagebrush communities in areas known to have been impacted by soil disturbance and cheatgrass invasion. The phases are to 1) delineate wildfire containment lines, 2) survey and prioritize potential cheatgrass treatment areas, and 3) propose a treatment plan to DOE to reduce the abundance of non-native annual grasses.

In Phase 1 (completed in 2016), we delineated a total of 847.4 km (526.5 mi) of bladed wildfire containment lines across the INL Site. Phase 2 was finished in 2017. For Phase 2, we surveyed non-native annual grass occurrence and relative abundance within a subset of delineated wildfire containment lines and developed a prioritized list of potential cheatgrass treatment areas. Potential cheatgrass treatment areas were selected based on several criteria related to implementation logistics and likelihood of success. Ideally, plant communities selected for treatment would have abundant cheatgrass cover with a co-dominant native assemblage that could provide some residual native seed bank. Logistical characteristics important to the proposed restoration areas included travel time, road condition, and accessibility.

4.2.2 Results and Discussion

We surveyed 74 point locations across the southern portion of the INL Site. Of those locations, 34 (46%) were visually estimated to have abundant cheatgrass cover. From point locations that had abundant cheatgrass cover, 23 (68%) had an associated native assemblage. The sites with abundant cheatgrass and a co-dominant native plant community were organized into two potential cheatgrass treatment areas (Fig. 4-3) and these two potential treatment areas were prioritized based on access and logistics.

Now that some potential cheatgrass treatment areas have been identified, ESER will begin exploring treatment options (Phase 3) that would reduce cheatgrass and improve native perennial cover. A proposed cheatgrass treatment(s) should be effective at decreasing cheatgrass cover, pose little risk to native plant communities, and be economical so that the project can be scaled to a meaningful level. No tools meeting all these criteria have yet been developed, and there is currently no accepted standard restoration approach. A recent review of several cheatgrass control methods concludes that meaningful long-term reductions in cheatgrass have only been achieved by a combination of applying chemical herbicides and planting desirable perennial species (Monaco et al. 2017). However, new, relatively untested tools are beginning to be applied regionally and across the West, and we are hopeful that viable options will emerge in the next few years.

Application of microbial herbicide is one tool that is gaining interest as a possible cheatgrass control mechanism. In particular, *Pseudomonas florenscens* (strains D7 and MB-906), which advantageously targets a select few non-native annual grasses, including cheatgrass, may provide a viable restoration approach in the future. Laboratory growth chamber tests confirmed that D7 significantly reduced root growth of cheatgrass (Kennedy et al. 2001). However, we are unaware of any literature that reports on the effectiveness of either D7 or MB-906 in long-term suppression of cheatgrass in sagebrush ecosystems.

The Bureau of Land Management (BLM) in Idaho and IDFG have recently and independently set up rangeland experimental plots in which *Pseudomonas florenscens* was applied to test its effectiveness at reducing cheatgrass. Results from these field tests will certainly inform any recommended approach to cheatgrass control on the INL Site in the future. Microbial herbicides are not currently a viable cheatgrass treatment option on the INL Site because the availability of D7 is limited and MB-906 in not currently a licensed herbicide.

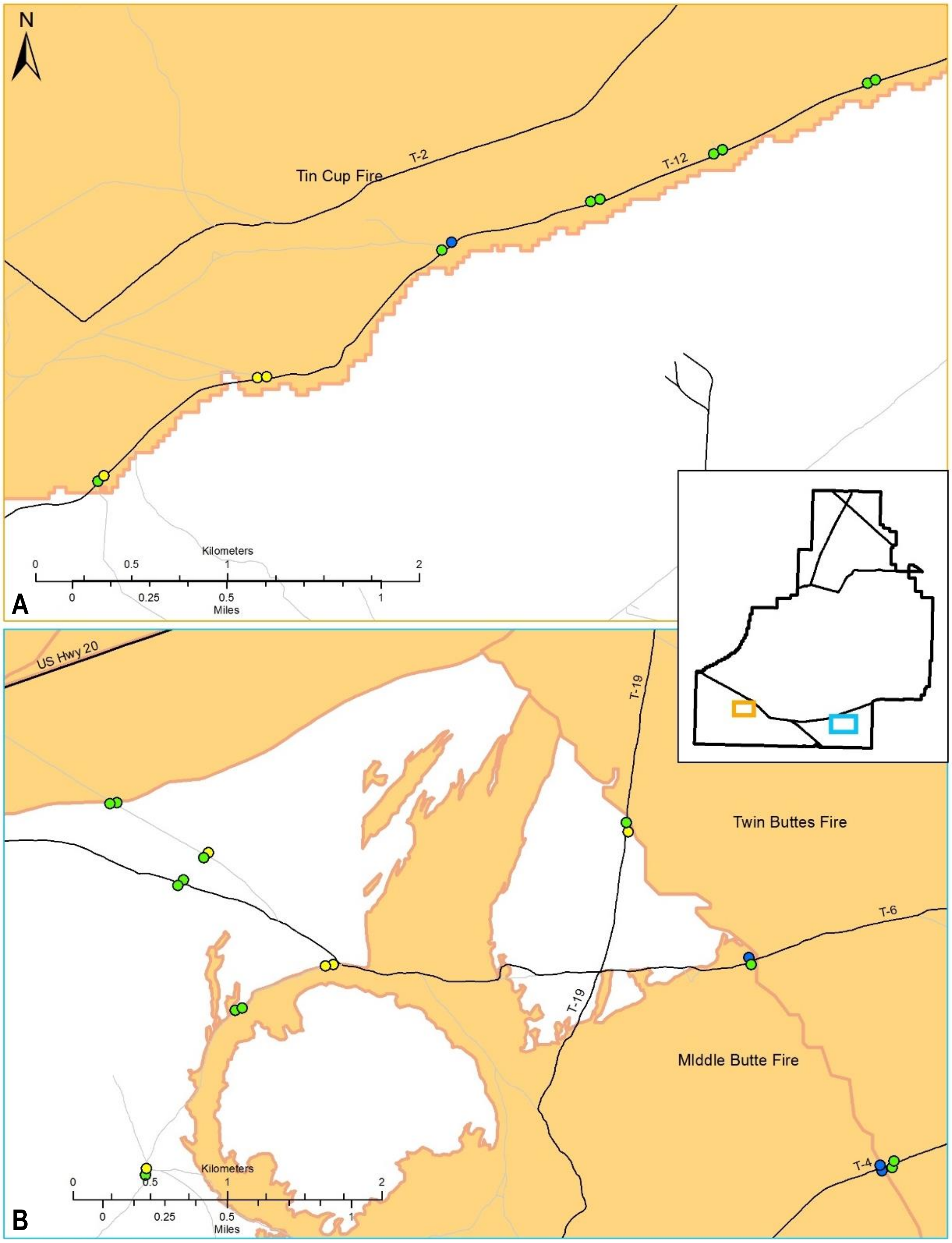

Figure 4-3. Two potential cheatgrass treatment areas are displayed south of Highway 20/26 on INL Site with wildfire boundaries shown in light orange. A is the primary potential treatment area. B is the secondary potential treatment area. The green symbols reflect that three criteria, cheatgrass abundance, native species assemblage, and accessibility, have been met. The yellow symbols have two out of three criteria met and blue has one or none of the criteria met.

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

Summary of Results: *There was no work conducted on this task in 2017 because no new high resolution imagery was collected for the INL Site since the last results were reported in 2016.*

4.3.1 Introduction

Infrastructure development is one of the two top threats to sage-grouse on the INL Site (see Table 3, DOE and USFWS 2014). 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 (USDA) National Agricultural Imaging Program (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.

4.3.2 Results and Discussion

There was no work conducted on this task in 2017 because no new high resolution imagery was collected for the INL Site. The USDA NAIP collected high resolution imagery across the State of Idaho during the summer of 2017 and those data are typically made available the following spring. Once we download and process the new NAIP imagery, we will systematically review the INL Site for expansion of linear features and losses of sagebrush habitat due to facility or project footprint expansions, and those results will be presented in 2018.

5. IMPLEMENTATION OF CONSERVATION MEASURES

5.1 Summary of 2017 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. Below, we summarize action that DOE took in 2017 to ameliorate threats to sage-grouse and its habitats. For a more complete description of DOE's actions, see Shurtliff et al. (2018).

THREAT: WILDLAND FIRE

Objective**:** Minimize the impact of habitat loss due to wildland fire and firefighting activities.

Conservation Measure 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 ac).

Accomplishments and Noteworthy Events:

- A single human-caused wildfire burned <0.1 ha (0.25 ac) next to a highway on the INL Site. (Unpublished wildland fire statistics summary for 2017; Eric Gosswiller, INL Fire Chief). No post-fire assessment or sagebrush reestablishment was required because the fire was small.

  Note: An estimated 4.5 ha (11 ac) burned on the INL Site during the past five years in eight separate incidents. Fewer acres have burned during the current five-year period than in any other five-year period since at least 1989 (the current annual INL wildfire report contains data back to 1994).

Associated Conservation Actions that Address the Wildland Fire Threat:

- DOE purchased 2,200 sagebrush seedlings, and ESER planted them in a priority restoration area (See below and Section 5.2).

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 Measure 2: Adopt Best Management Practices outside facility footprints for new infrastructure development.

Accomplishments and Noteworthy Events:

- In addition to listing Best Management Practices, Conservation Measure 2 introduces DOE's goal of having no net loss of sagebrush anywhere on the INL Site. In 2017, contractors disturbed 1.8 ha (4.5 ac) of sagebrush-dominated land on the INL Site (Pers. Comm., Jenifer Nordstrom; September 26, 2017) and paid a per-acre mitigation fee for 1.5 ha (3.74 ac). The fee allowed 3,800 sagebrush seedlings to be grown and planted in a priority restoration area in fall 2017 (Section 5-2).
- Power Management installed nest deterrents (tent structures) on the lower cross arm of a double cross arm distribution structure near Critical Infrastructure Test Range Complex. This type of corner structure is one of the few places ravens or raptors could build a nest on a distribution line

(Pers. Comm., Kenneth Barnes, Maintenance Manager, Power Management; September 25, 2017).

Conservation Measure 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.

Accomplishments and Noteworthy Events:

The U.S. Geological Survey installed two new monitoring wells within the SGCA in 2017. Neither well site was within 1 km (0.6 mi) of a lek (Pers. Comm., Roy Bartholomay, U.S. Geological Survey INL Project Chief, Idaho Falls; November 22, 2017).

THREAT: ANNUAL GRASSLANDS

Objective**:** Maintain and restore healthy, native sagebrush plant communities.

Conservation Measure 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.

Accomplishments and Noteworthy Events:

- See Section 4.2 of this report.

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 Measure 5: Encourage 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.

Accomplishments and Noteworthy Events:

- As a technician approached an active lek on April 27, 2017, she saw a large water truck and a sheepherder's trailer stationed off road somewhat near the lek. No sage-grouse were present that day and we don't know if the sheepherder's outfit was the cause. For reference, no sage-grouse were seen at this lek three days earlier during a survey, but in mid-April, peak male attendance was 13 (the highest number recorded during the two years the survey was conducted).
- ESER provided updated lek maps to the DOE on January 26, 2017 so they could be forwarded to the BLM.

Conservation Measure 6**:** Communicate and collaborate with BLM to adequately maintain the herbaceous understory on the INL Site to promote sage-grouse reproductive success and rangeland improvements follow guidelines in the 2006 State Plan and the current agreement.

Accomplishments and Noteworthy Events:

DOE and ESER staff met with BLM staff on April 3, 2017 in what we hope to be an annual meeting for the purpose of coordinating and communicating. Some of the issues we learned about and discussed were as follows:

- BLM has applied *Psuedomonas florescens* D7 to treat cheatgrass on its lands. ESER will be interested to keep updated on what is found.

- Spraying weeds on the INL Site is a low priority for the BLM, given the large area they are tasked to treat.
- BLM staff shared their experience planting sagebrush seedlings and seeding sagebrush. The information was useful as they have been involved in a great deal of sagebrush restoration.
- BLM updated ESER on its sage-grouse telemetry study and informed us that most of their marked birds moved to the southeastern portion of the INL Site to winter.

THREAT: SEEDED PERENNIAL GRASSES

Objective**:** Maintain the integrity of native plant communities by limiting the spread of crested wheatgrass.

Conservation Measure 7**:** Cultivate partnerships with other agencies to investigate the mechanisms of crested wheatgrass invasion so that effective control strategies can be developed**.**

Accomplishments and Noteworthy Events:
No measurable progress has been made on this conservation measure.

THREAT: LANDFILLS AND BORROW SOURCES

Objective**:** Minimize the impact of borrow source and landfill activities and development on sage-grouse and sagebrush habitat.

Conservation Measure 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).

Accomplishments and Noteworthy Events:

- Fluor Idaho prepared an Environmental Checklist for a Borrow Source Study Field Sampling [EC No. ICP-16-002] in which they cited CCA time-of-day restrictions as one of the necessary requirements for personnel to follow.

Conservation Measure 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.

Accomplishments and Noteworthy Events:

- No new borrow pits were developed or existing pits expanded at Fluor Idaho facilities in 2017 (Pers. Comm., Shawn Rosenberger, Environmental Engineer [Fluor Idaho], September 26, 2017).

THREAT: RAVEN PREDATION

Objective**:** Reduce food and nesting subsidies for ravens on the INL Site.

Conservation Measure 10**:** Support research to develop methods for deterring raven nesting on utility structures.

Accomplishments and Noteworthy Events:

- Staff with the USDA were vigilant to keep ravens from building a nest on grain bins at the U.S. Sheep Experiment Station in the northeast portion of the INL Site near Mud Lake (Pers. Comm., Bret Taylor, Research Leader and Supervisory Scientist [U.S. Department of Agriculture], September 22, 2017). However, three raven pairs nested in ornamental trees at the station.

- INL Power Management installed three metal cross arms on power transmission structures west of the Materials & Fuels Complex. Unlike the typical wooden structures they replaced, it is unlikely ravens could build a nest on these metal cross arms (Pers. Comm., Kenneth Barnes, Maintenance Manager, Power Management; September 25, 2017).
- In October 2017, National Oceanic and Atmospheric Administration staff installed wire mesh on two of their towers in an effort to discourage raven nesting. These towers are in remote locations on the INL Site. Previous wire installation on these towers forced ravens to nest lower on the tower. The hope is that the latest improvements will force ravens to seek other places to nest.

Conservation Measure 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.

This Conservation Measure is complete.

THREAT: HUMAN DISTURANCE

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 Measure 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 of the CCA):

- 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 of a 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.

Accomplishments and Noteworthy Events:

- The Environmental Checklist prohibits portable or permanent towers to be erected within the SGCA or within 1 km (0.6 mi) of active leks March 15–May 15, 2017 (Pers. Comm., Jenifer Nordstrom; September 26, 2017).
- No explosives >1,225 kg (2,700 lbs) were detonated outside the seasonal guidelines in 2017 (Pers. Comm., Desiree Saupe, Materials and Physical Security Department Engineer, National and Homeland Security, September 25, 2017).

Conservation Measure 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.

Accomplishments and Noteworthy Events:

- The Environmental Checklist prohibits portable or permanent towers to be erected within the SGCA April 1–June 30 (Pers. Comm., Jenifer Nordstrom; September 26, 2017).

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 approximately 6,000 sagebrush seedlings in fall of 2017 in an area prioritized for restoration. Survivorship of seedlings planted in 2016 was at least 61%.*

Introduction

The objective of Conservation Measure 1 is to minimize the impact of habitat loss due to wildland fire and firefighting 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.

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 6,000 seedlings on 18.5 ha (46 ac)(~324 seedlings per ha [130 seedlings per ac]) from October 10 to October 14, 2017 in the east central part of the INL Site (Fig. 5-1) and marked the locations of 977 (~16%) seedlings for future monitoring. About 3,800 of those seedlings were purchased by Battelle Energy Alliance to offset the disturbance of 1.5 ha (3.74 ac) across two project areas. These project areas included expansion at the Central Facilities Area Main Range and the Smartgrid project at the Critical Infrastructure Test Range Complex.

To assess 2016 seedling survivorship and condition, we revisited 497 sagebrush seedlings in September 2017. We relocated 332 seedlings, of which 240 (48%) were healthy, 66 (13%) were stressed, and 26 (5%) were dead. Assuming that the 165 (33%) plants that we were unable to locate did not survive, a total of 62% of the seedlings survived the first year.

Precipitation patterns from fall 2016 to fall 2017 were fairly characteristic of a good recruitment year. From the fall of 2016 through the spring of 2017, most months had above average precipitation. The summer growing season was above average (Fig. 3-2). Lack of moisture during summer can stress young plants, and is probably responsible for the high numbers of stressed plants we observed in 2015, while the abundant monthly moisture of 2016 is responsible for a greater number of healthy individuals. Young sagebrush plants experience the highest mortality during the first year (Dettweiler-Robinson et al. 2013). In a review of 24 projects where containerized sagebrush seedlings were planted and survivorship was measured after one year, researchers reported first year survival of stock ranged from 14% to 94% (median = 59%, weighted average=57%). Thus, sagebrush establishment following the 2016 planting on the INL Site was higher than average even when the missing plants are calculated as part of the equation.

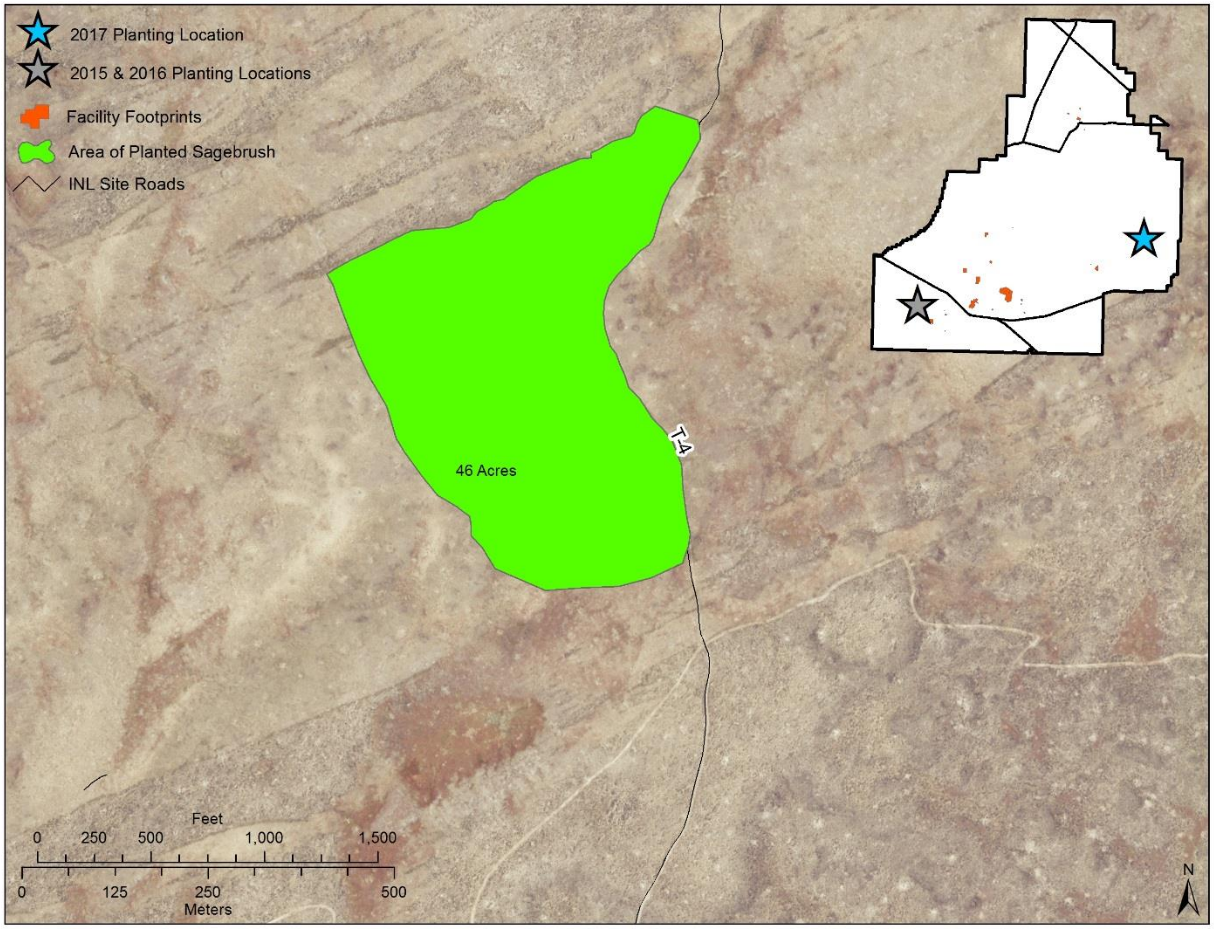

Figure 5-1. Area planted with big sagebrush seedlings in 2017.

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 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.

6. SYNTHESIS AND ADAPTIVE MANAGEMENT

6.1 Sage-Grouse and Sagebrush Habitat Trends

Population and habitat data from the INL Site suggest that sage-grouse abundance has increased in recent years and that sagebrush habitats are in relatively good condition. These results are probably due to favorable amounts and timing of precipitation (Section 3.1.2). Three of the past four years produced above-average precipitation on the INL Site. Not only were the total amounts high, unusually high amounts of rain fell during spring and fall in 2014–2016, and snow levels were high during the winter of 2016–2017. High sage-grouse chick survival has been correlated with cool, wet springs (e.g. Blomberg et al. 2014), and recently a study in Wyoming showed a positive correlation between cool, wet springs and male attendance at leks the following spring (Peebles et al. 2017).

The information presented in this and previous reports suggest that it is unlikely that any threats to sage-grouse and its habitats on the INL Site will push population or total habitat area below their pre-defined trigger thresholds in the near future. However, we recognize that conditions can shift rapidly. Wildfire has burned almost no sagebrush habitat on the INL Site in over five years, but drier conditions could reverse this trend. Cheatgrass cover was relatively high during 2017, but we do not know if the increase represents a real shift in habitat conditions or if it simply reflects short-term precipitation patterns that are favorable. More than six decades of LTV transect data show that cheatgrass cover has fluctuated over time (Forman et al. 2013), so it may be that current conditions represent a high point in long-term oscillations. Regarding the livestock threat, last year (Shurtliff et al. 2017b) we found no evidence of a difference in habitat conditions between grazed and ungrazed sampling plots. Raven nesting on infrastructure has increased over 40% since 2014, but most nests are outside of the SGCA. Because we do not know how far ravens travel from their nests to forage, we do not know whether predation risk to sage-grouse in the SGCA is high. Regardless of the actual predation rate, sage-grouse abundance (based on a three-year running average) has continued to increase nearly every year since the CCA report was begun.

6.2 Changes made to the CCA

During the 2017 annual CCA meeting between the USFWS, DOE, and other stakeholders (held February 16), the USFWS suggested that the best way to acknowledge and track minor changes to the CCA would be to include them in a section of the annual CCA report. Hence, we have added this section (Section 6.2) to document all changes to the CCA approved by both DOE and the USFWS. Last year we reported the only change that has been made thus far to the CCA—a change to the objective of Monitoring Task 7 (hereafter Task 7)(Shurtliff et al. 2017b). To enable a future reader to easily find all changes made to the CCA, we include below a summary of the change made last year to Monitoring Task 7.

2016

Monitoring Task 7—When CCA Task 7 was developed, the primary goals were to (1) delineate areas both affected by anthropogenic disturbance and dominated by cheatgrass within the SGCA, and (2) identify the source of disturbance that made it possible for cheatgrass to dominate. The premise was that if DOE knew what caused the disturbance, it could reduce or eliminate the stressor, or work with partners to do so. In 2016, DOE recognized that Task 7 was not achieving its desired outcome, so DOE redefined the objective to read "inventory and delineate cheatgrass-dominated areas on wildfire containment lines on the INL Site" (Shurtliff et al. 2017b, pp. 20–21).

2017

Monitoring Task 2—Historical lek surveys will be discontinued in 2018 and this Task will no longer be implemented (Section 2.2.2).

Monitoring Task 3—Lek discovery surveys will be discontinued in 2018 and this Task will no longer be implemented (Section 2.3.2).

7.8 Spent Fuel Handling Project (SFHP) at the Naval Reactors Facility - The purpose of the SFHP is to provide the infrastructure necessary to support the naval nuclear reactor defueling and refueling schedules required to meet the operational needs of the U.S. Navy. Based on the life-cycle of current and new designs and planned construction of aircraft carriers and submarines, the ability to perform naval spent nuclear fuel handling will be required into the foreseeable future. Next-generation aircraft carriers have a ship life of approximately 50 years, while new nuclear submarines will have operational lives of approximately 30 years. The first next-generation nuclear-powered U.S. Navy aircraft carrier, GERALD R. FORD (CVN 78) was commissioned in 2017; new nuclear-powered submarines are also under construction. The Final Environmental Impact Statement for the Recapitalization of Infrastructure Supporting Naval Spent Nuclear Fuel Handling at the INL (DOE/EIS-0453-F) was issued on September 23, 2016 and the Record of Decision (ROD) was issued on November 15, 2016. The selected alternative, as outlined in the ROD, would acquire capital assets to recapitalize naval spent nuclear fuel handling capabilities. The Naval Nuclear Propulsion Program will recapitalize the infrastructure supporting naval spent nuclear fuel handling at the INL Site by constructing a new facility in the northeast section of the NRF site. This decision includes recapitalization of the naval spent nuclear fuel handling capabilities described in DOE/EIS-0453-F including: the capability to unload M-140 and M-290 shipping containers; temporary wet storage of naval spent nuclear fuel; initial examination of naval spent nuclear fuel; resizing and securing nuclear poison in naval spent nuclear fuel modules; capability to support transfer of naval spent nuclear fuel for more detailed examination at the examination location; loading naval spent nuclear fuel into naval spent nuclear fuel canisters; the capability to support transfer of naval spent nuclear fuel into or out of temporary dry storage; and capability to load waste shipping containers. Environmental impacts associated with the SFHP are negligible or small with the exception of the electrical energy consumption impacts which would be moderate. The project is bounded by the original analysis of large-scale infrastructure performed for the CCA. The location of the project is outside the SGCA and partially overlaps the existing facility footprint where there is no high-quality sagebrush habitat. However, there is potential to disturb several acres of sagebrush habitat during construction due to support areas that will be needed. These areas will be restored when no longer in use. The nearest lek is several miles from the location for the new infrastructure. When construction is complete, ongoing operations will not impact sage-grouse or sagebrush habitat.

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	• In 2018, we will commence an annual effort to resurvey a subset of inactive leks, with the intent to resurvey all inactive leks within potential sage-grouse habitat approximately every five years.
2. Historical Lek Surveys	• Completed.
3. Systematic Lek Discovery Surveys	• Completed.
4. Raven Nest Surveys	• No changes to the surveys are anticipated, although we will evaluate whether efforts to deter ravens from nesting on towers was successful.
5. Sagebrush Habitat Condition Trends	• Sample all annual monitoring plots (n=75) and set 1 of the rotational plots (*n*=50). • Update annual habitat condition analyses and continue to explore trend analyses.
6. Monitoring to Determine Changes in Sagebrush Habitat Amount and Distribution	• No work will be conducted on this task inside recently burned areas until a new vegetation community classification and map is completed in 2019. New wildland fires will be mapped to document sagebrush habitat loss as needed.
7. Identifying Non-Native Annual Grass Priority Restoration Areas.	• ESER will begin to explore treatment options for reducing cheatgrass and improving native perennial cover.
8. Monitoring Expansion of the Infrastructure Footprint within the SGCA and Other Areas Dominated by Big Sagebrush	• Updated Idaho NAIP imagery will be available in 2018, and we will systematically review the INL Site to document evidence of expansion of linear features and losses of sagebrush habitat from project footprint expansions.

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