DOE/ID-11527(22)
INL/RPT-22-70606

U.S. Department of Energy
Idaho Operations Office

Implementing the Candidate Conservation Agreement for Greater Sage-Grouse on the Idaho National Laboratory Site: 2022 Summary Report

January 2023

Idaho National Laboratory

DOE/ID-11527(22)
INL/RPT-22-70606

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

2022 Summary Report

January 2023

Prepared for the
U.S. Department of Energy
DOE Idaho Operations Office

ACKNOWLEDGMENTS

This report was authored by Battelle Energy Alliance and subcontractor staff from the Natural Resources Group. Quinn R. Shurtliff served as document editor and authored the sections on greater sage-grouse (Section 2.1) and raven nest surveys (Section 4.1). Kristin N. Kaser authored the sagebrush habitat condition trend (Section 3.1) and the assessment of potential threats to sagebrush habitat (Section 4.3), conducted the corresponding quantitative data analyses of each section, and managed associated seasonal field crews. Jeremy P. Shive wrote the sections describing the changes to sagebrush habitat amount and distribution (Section 3.2) and monitoring of the infrastructure footprint for expansion (Section 4.2). Sue J. Vilord gathered updates from stakeholders and assembled a table listing progress made on CCA conservation measures (Section 5.1.1). Amy D. Forman reported on post-fire recovery planning, implementation, and monitoring (Section 5.2.1). Colby J. Kramer coordinated the sagebrush seedling planting and monitoring and authored the associated section (Section 5.2.2). Bryan F. Bybee participated in and coordinated the greater sage-grouse lek surveys. Kurt T. Edwards supported all authors and task managers by archiving data and providing quality assurance and control, generating data queries, and producing figures. Brande M. Hendricks assisted with document formatting.

The Natural Resources Group recognizes and gives special thanks to each of the interns and technicians who made this field season successful. Sarah Baccus and Angélica Beltrán-Franco conducted the spring sage-grouse lek surveys. Sarah continued into the summer with Holly Forster, Ashton Buma, Austin Housley, and Nina Keck to complete the vegetation surveys. Sarah also assisted in collecting the sagebrush seedling survivorship data.

INTENTIONALLY BLANK

CONTENTS

FIGURES

TABLES

ACRONYMS

AMT	Adaptive Management Team
AMWTP	Advanced Mixed Waste Treatment Project
BEA	Battelle Energy Alliance
BLM	Bureau of Land Management
CCA	Candidate Conservation Agreement
CFA	Central Facilities Area
DOE	U.S. Department of Energy
DOE-ID	U.S. Department of Energy–Idaho Operations Office
EA	Environmental Assessment
EBR-1	Experimental Breeder Reactor-I
HMA	Habitat Management Area
IDFG	Idaho Department of Fish and Game
INL	Idaho National Laboratory
MFC	Materials and Fuels Complex
MPLS	males per lek surveyed
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NRF	Navel Reactors Facility
NRG	Natural Resources Group
PRA	priority restoration areas
RWMC	Radioactive Waste Management Complex
SGCA	Sage-grouse Conservation Area
U.S.	United States
USFWS	U.S. Fish and Wildlife Service

INTENTIONALLY BLANK

1. INTRODUCTION

In October 2014, the United States (U.S.) Department of Energy–Idaho Operations Office (DOE-ID) and the U.S. Fish and Wildlife Service (USFWS) entered into a Candidate Conservation Agreement (CCA) for Greater Sage-Grouse (*Centrocercus urophasianus*; hereafter referred to as 'sage-grouse') on the Idaho National Laboratory (INL) Site (DOE and USFWS 2014). The CCA stipulates that the U.S. Department of Energy (DOE) submit a report annually to USFWS documenting monitoring activities that occurred within the preceding twelve months. This Summary Report highlights key findings of a comprehensive report (INL 2023) produced by the Battelle Energy Alliance (BEA) Natural Resources Group (NRG), which satisfies the CCA reporting requirement. Comprehensive reports (i.e., Full CCA Reports) for each year can be found under the heading *Sage-grouse Reports* at https://idahoeser.inl.gov/publications.html.

Key findings from 2022 that are summarized here include: (1) a concise description of results from all CCA monitoring tasks performed by the NRG; and (2) actions taken by DOE, INL contractors, and other stakeholders to meet the objectives of conservation measures designed to reduce threats to sage-grouse and its habitats (DOE and USFWS 2014). Most importantly, this Summary Report updates stakeholders regarding sage-grouse population and habitat trends as applied to adaptive regulatory triggers established in the CCA. The two triggers and criteria that define them are:

Population Trigger: The three-year running average of peak male attendance, summed across 27 leks within the Sage-grouse Conservation Area (SGCA). This trigger will trip if the average 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. This trigger will trip if total area falls below 57,840 ha (142,925 ac)—a 20% drop from the updated 2019 baseline of 72,300 ha (178,656 ac; see Section 3.2).

In 2022, the population trigger tripped for the first time, initiating an assessment process defined in the CCA. Details about lek counts and next steps prescribed by the CCA are described in Section 2.1 of this report.

Reports of related monitoring tasks described in Section 11.1 of the CCA (DOE and USFWS 2014) are grouped into three sections: Population Monitoring (Section 2), Habitat Monitoring (Section 3), and Threat Monitoring (Section 4). Section 5 reports how DOE, contractors, and other stakeholders implemented conservation measures listed in the CCA during the past year. The final section (Section 6) synthesizes results from all monitoring tasks and discusses results and their implications in the context of regional trends and future management directions. This section also documents changes and updates to the CCA that have been approved by both signatories during the past year.

INTENTIONALLY BLANK

2. POPULATION MONITORING

2.1 Task 1—Lek Counts and Lek Route Surveys

Summary of Key Results: *Total male sage-grouse counted on baseline leks was 8.4% higher than in 2021 (246 males), but the three-year running average declined 7.9%, tripping the population trigger. Counts on six lek route counts increased 23.9% over 2021. Three leks were downgraded to inactive status and one was discovered, reducing the total number of known active leks on the INL Site to 36. This is the lowest number of known active leks since 2010.*

2.1.1 Introduction

The primary purposes of the sage-grouse monitoring task are to track the status of the population trigger and monitor long-term trends of male attendance on INL Site leks. The basis of the population trigger is the three-year average male count on 27 designated leks within the SGCA (hereafter referred to as 'baseline leks;' DOE and USFWS 2014). Long-term trends are being generated as data from baseline leks and six lek routes accumulate (Figure 2-2; INL 2023). Each year, baseline leks, lek routes, and all other active leks on the INL Site are surveyed ≥3 times from mid-March to early May. Additionally, a few inactive leks are selected each year that are not included in annual surveys. These are visited ≥2 times each to verify they remain unoccupied. The latter exercise helps BEA maintain accurate records of the number and location of active leks on the INL Site.

2.1.2 Results and Discussion

SGCA Baseline Leks

Summed peak attendance across baseline leks in 2022 was 246 males—19 (8.4%) more than in 2021 (Figure 2-2). This value is higher than what was recorded in the previous two years, but remains lower than any other year since 2011—the basis year for the population trigger. All 17 active baseline leks remained classified as such at the end of the 2022 field season.

The three-year (2020–2022) running average of peak male attendance on baseline leks declined 7.9% to 233 males (SD = 11.0), falling below the population trigger threshold of 253 males. This was the fourth straight year the three-year average has declined, and it resulted in the population trigger being tripped (Figure 2-2). To return the running average to the population trigger threshold, the annual male count in 2023 would need to be at least 285 males—a 16% increase over the 2022 count.

The CCA outlined a process that DOE and USFWS agreed to follow if the population trigger threshold were crossed (DOE and USFWS 2014). The first step would be for the USFWS to "complete a thorough review" of DOE's sage-grouse management approach to help both parties determine the likelihood that DOE activities were responsible for population declines. Following the review, DOE and USFWS would meet to discuss potential conservation measures that could be newly implemented or adapted from the current set to address threats that are likely the most impactful to sage-grouse or its habitat on the INL Site. The parties may also consider renegotiating the SGCA boundary or adjusting the population trigger threshold.

Lek Routes

The sum of peak male attendance across all routes was 275 males, which was 53 more (23.9%) than in 2021. Similarly, males per lek surveyed (MPLS) was up 24.1% (7.2 MPLS) as compared to 2021. All but one lek route (Radioactive Waste Management Complex [RWMC]) had MPLS values as high as or higher than in 2021. On the RWMC route, one male less was counted than in 2021. More males were counted on the T-9 route in 2022 than in any previous year, in contrast to other routes that produced counts in the middle to lower end of their 5-year (for Frenchmans Cabin and West T-3 routes) or 10-year (for Lower Birch Creek, Tractor Flats, and RWMC routes) ranges (INL 2023).

Other Surveys and Changes of Lek Status

In addition to routine surveys of active and inactive baseline and route leks, 17 inactive leks were visited twice each to verify status (INL 2023). Twelve of these had not been visited since 2017, and the remaining five were most recently surveyed in 2020 or 2021. No sage-grouse were observed at any of these leks, so each will retain its inactive status and will be visited again in five years or less.

One lek was discovered in 2022 and three non-baseline leks were downgraded to inactive status following the field season, reducing the total count of known active leks on or near the INL Site to 36 (Figure 2-1). The number of active leks has declined nearly every year since 2016, generally mirroring lek count trends. Active leks are now at their lowest documented level since 2010 when 34 leks were classified active.

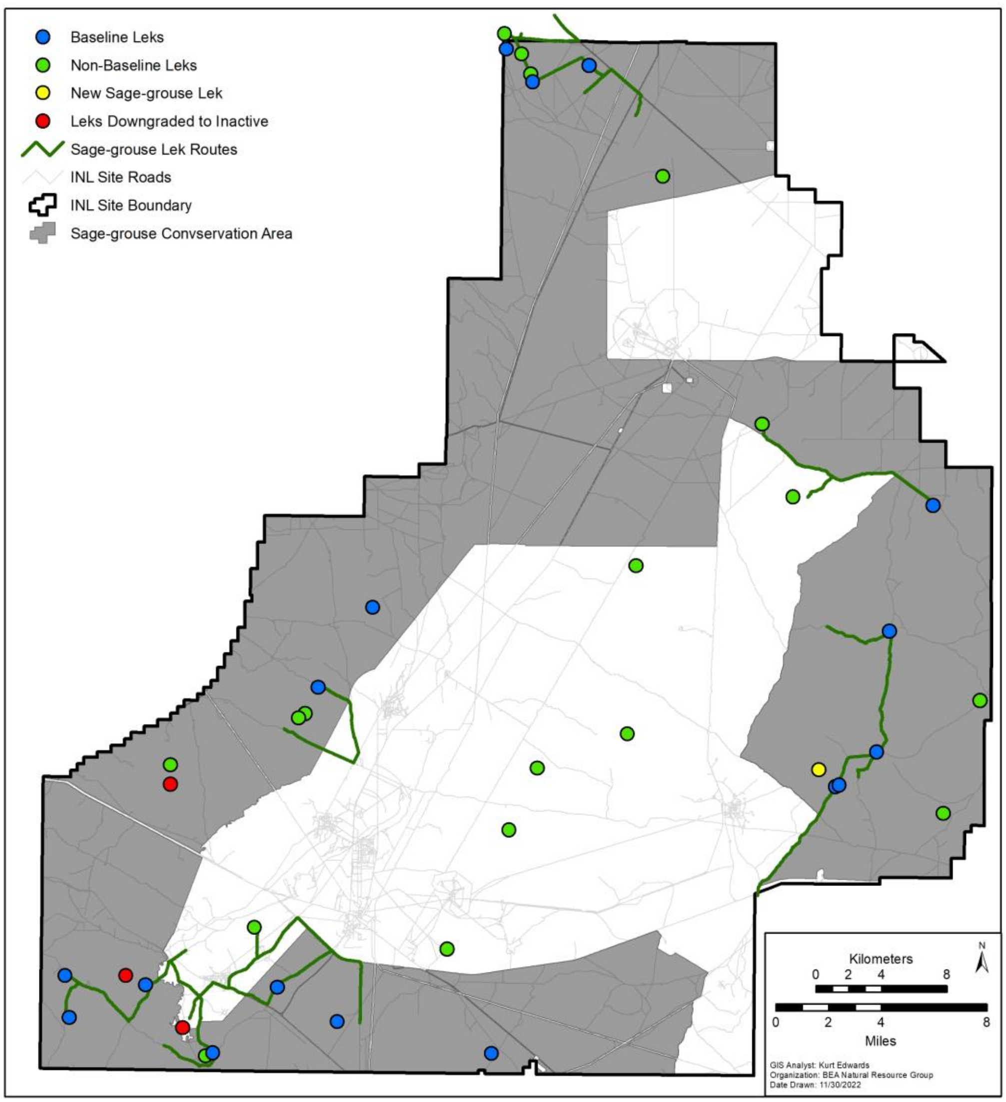

Figure 2-1. Locations of 36 leks on or near the Idaho National Laboratory Site that were classified active following the 2022 field season. A lek discovered in 2022 (yellow dot) is a non-baseline lek. Two lek routes in the southwest corner contain an overlapping section of road, making them appear as one.

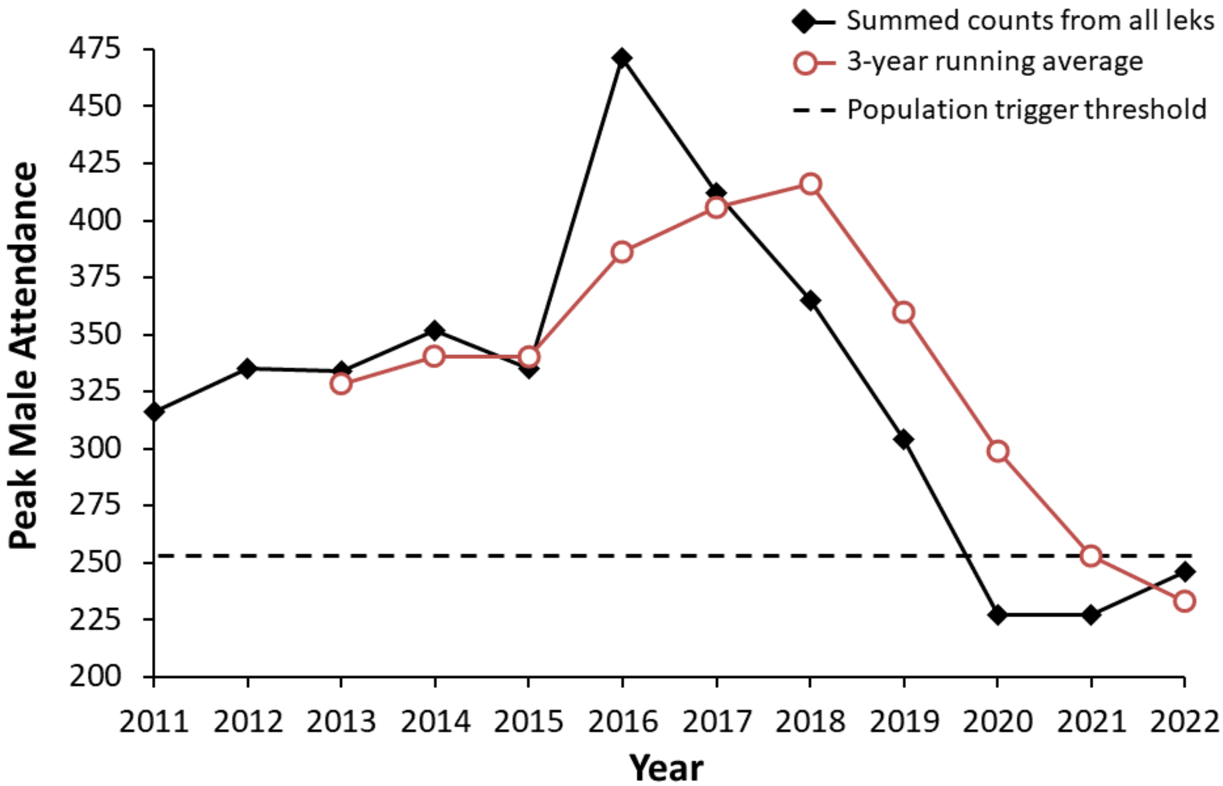

Figure 2-2. Peak male attendance of greater sage-grouse at baseline leks in the Sage-grouse Conservation Area. Black squares represent the annual sum of peak male attendance on all baseline leks.

INTENTIONALLY BLANK

3. HABITAT MONITORING

Areas designated as sagebrush habitat will change through time based on gradual changes in vegetation composition and abrupt changes caused by wildland fire. To facilitate annual evaluation of the habitat trigger, two monitoring tasks are carried out 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.

3.1 Task 5—Sagebrush Habitat Condition Trends

Summary of Results: *In 2022, sagebrush habitat condition summary metrics were within or above the normal range of variability of the five-year baseline dataset. Sagebrush habitat plot trend analyses indicate that sagebrush cover continues to increase, intact sagebrush habitat communities are resistant to invasive species dominance, and native perennial functional groups are exhibiting resilience to drought. Post-fire communities appear to have more annual fluctuation in species abundance and composition in response to precipitation amount and timing.*

3.1.1 Introduction

This section of the Summary Report addresses annual habitat condition assessments from permanent vegetation monitoring plots distributed throughout the INL Site. Sage-grouse habitat condition assessments use vegetation abundance, composition, and structure data from vegetation plots in areas designated as current sagebrush habitat. The sagebrush habitat condition characteristics evaluated annually include vegetation cover, vegetation height, and sagebrush density. Baseline values (hereafter referred to as 'baseline') were calculated from 48 vegetation monitoring plots over five consecutive years (2013–2017; Shurtliff et al. 2019). Trend analyses on vegetation cover provide longer-term context, using 10 years of vegetation cover data to examine abundance trends of native and non-native plant functional groups (i.e., shrubs, grasses, and forbs). Similar trend analyses are conducted using vegetation monitoring data from non-sagebrush plots located in areas recovering from wildland fire to determine the status of their recovery to sagebrush habitat.

3.1.2 Results and Discussion

General Habitat Condition

Overall, 2022 general summary vegetation data summaries indicated that intact sagebrush habitat was in good condition because values were generally within baseline data ranges (Table 3-1; Table 3-2). Sagebrush habitat plots remain dominated by sagebrush (*Artemisia spp.*) species (INL 2023), and sagebrush species cover was greater than baseline. Sagebrush species height measurements were below baseline values but were within the historical range of variability for this dataset. Perennial grass/forb cover (17%) was notably greater and perennial grass/forb mean height was similar to baseline values. Sagebrush density was below baseline, potentially because juvenile sagebrush frequency was relatively low in 2022.

Table 3-1. Summary of vegetation measurements used for characterization of sagebrush habitat condition on permanent monitoring plots (*n* = 43*) on the Idaho National Laboratory Site in 2022.

2022 Summary	Mean Cover (%)	Mean Height (cm)	Mean Density (individuals/m^2)
Sagebrush	24.93	45.73	2.78
Perennial Grass/Forb	16.81	19.07	

*indicates sample size is different from past sampling efforts.

Table 3-2. Five-year averages of vegetation measurements used to establish baseline values for characterization of sagebrush habitat condition on permanent plots on the Idaho National Laboratory Site. Baseline values were generated from vegetation monitoring plot data from 2013–2017. Standard Error is denoted as SE.

Baseline Summary	Mean Cover (%)	SE	Mean Height (cm)	SE	Mean Density (individuals/m^2)	SE
Sagebrush	21.27	±0.33	47.81	±0.98	5.19	±1.80
Perennial Grass/Forb	9.99	±2.53	20.70	±3.67		

Habitat Condition Trends

Vegetation monitoring plots are used to evaluate habitat condition trends by comparing vegetation cover of plant functional groups within sagebrush habitat and within non-sagebrush areas recovering from wildland fire. Sagebrush habitat plots were dominated by native functional groups, and non-native functional groups contributed little overall cover across 10 years of monitoring data (Figure 3-1; Figure 3-2). Intact sagebrush habitat plant communities appear to be resistant to dominance by non-native species because they are ubiquitous across intact habitats but rarely dominate and sagebrush species have increased significantly over the 10-year monitoring period. Native perennial functional groups are exhibiting resistance to short-term drought conditions because cover does not trend downward in concert with recent precipitation conditions (Figure 3-1; Figure 3-2; Figure 3-3). Trend patterns over the past 10 years have remained relatively constant for most functional groups; however, cover from native perennial grasses has been higher over the last few years when compared to the earlier part of the dataset (Figure 3-1). Introduced perennial grass cover has remained low, while introduced annual grass cover has been more variable but has been relatively low over the past two years. Abundance of introduced annual grasses likely increased between 2021 and 2022 because of favorable precipitation timing from late summer and early fall in 2021 (Figure 3-2; Figure 3-3). Cheatgrass (*Bromus tectorum*) is the only introduced annual grass represented in this functional group and although cheatgrass cover has increased during favorable weather conditions, its total cover values indicate that it remains a minor component of intact sagebrush habitat (Figure 3-3).

Additional annual vegetation monitoring plots located in recovering burned areas. The cover trends are evaluated separately in these non-sagebrush plots (Shurtliff et al. 2016). Burned plant communities lack sagebrush cover, but many are likely recovering to sagebrush habitat. Recovering plant communities exhibit amplified fluctuations of introduced annual functional groups and are more susceptible to non-native weedy species dominance (INL 2023). Cheatgrass cover trends likely respond to seasonal precipitation patterns (INL 2023) and cheatgrass cover increased from 2021 to 2022 (INL 2023). The threat of habitat conversion to annual grasslands applies to all habitats on the INL Site but is particularly concerning in burned areas. Because cheatgrass can increase precipitously in a single growing season (Forman and Hafla 2018, INL 2023), it is important to conserve intact sagebrush habitats and to continue monitoring recovering habitats for recovery trajectory.

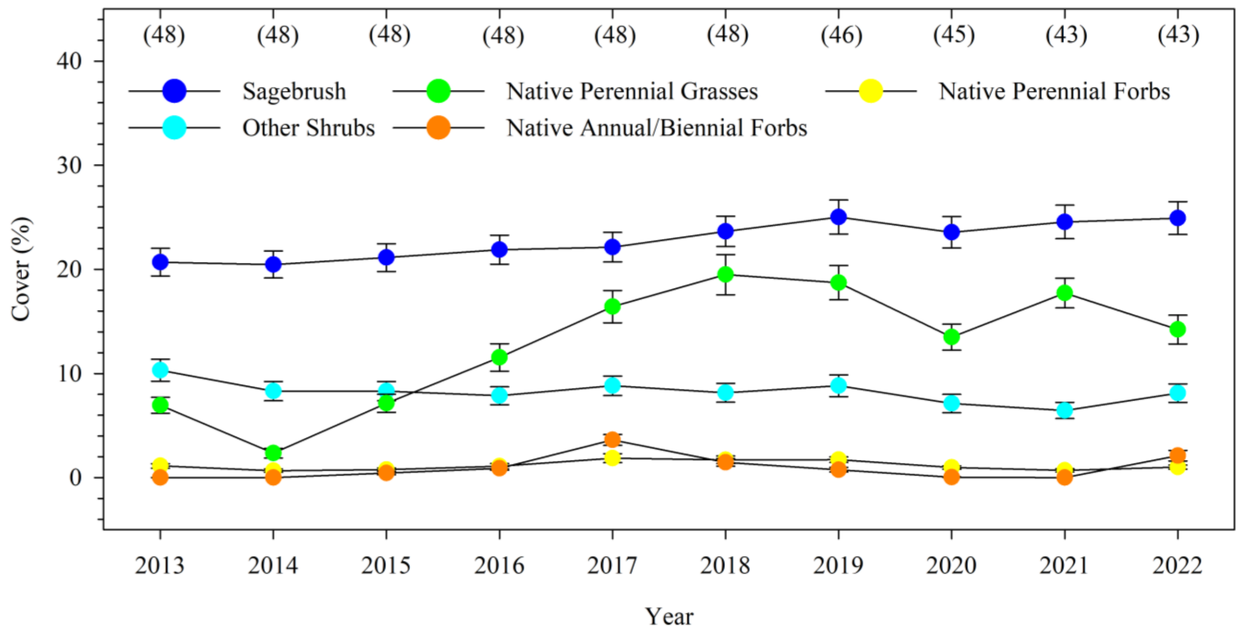

Figure 3-1. Sagebrush habitat plot cover by native functional group on the Idaho National Laboratory Site from 2013 through 2022. Error bars represent ± 1 Standard Error. Tick marks along the top denote sample size.

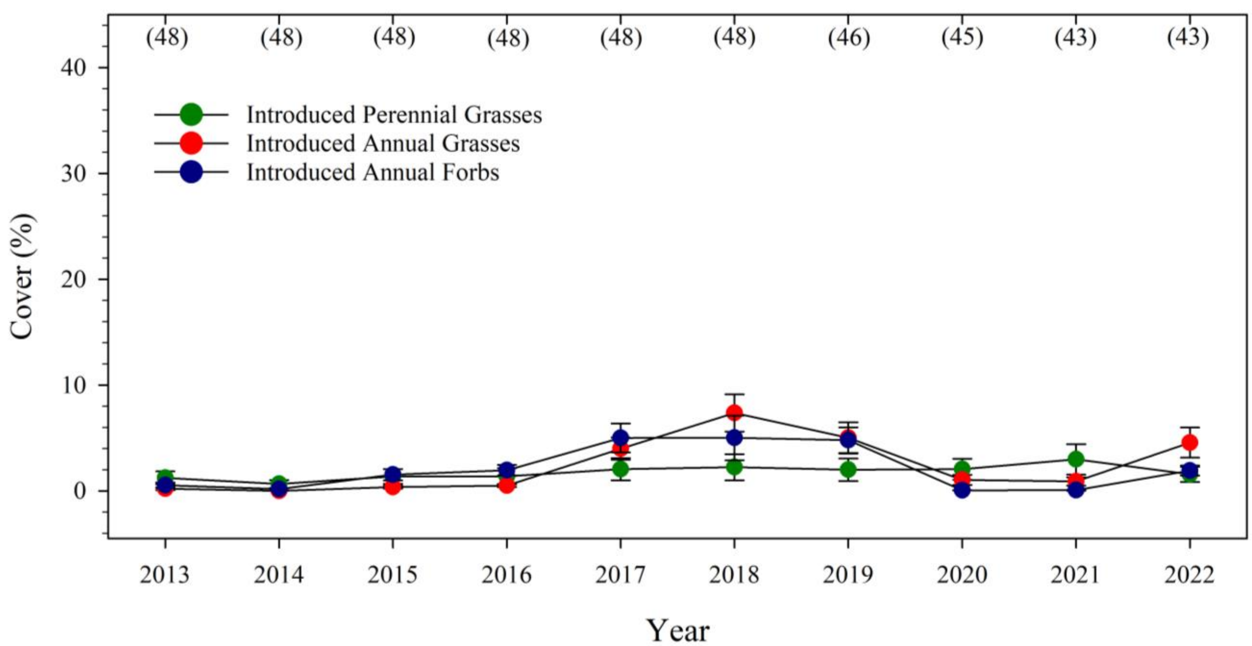

Figure 3-2. Sagebrush habitat plot cover by introduced functional groupon the Idaho National Laboratory Site from 2013 through 2022. Error bars represent ± 1 Standard Error. Tick marks along the top denote sample size.

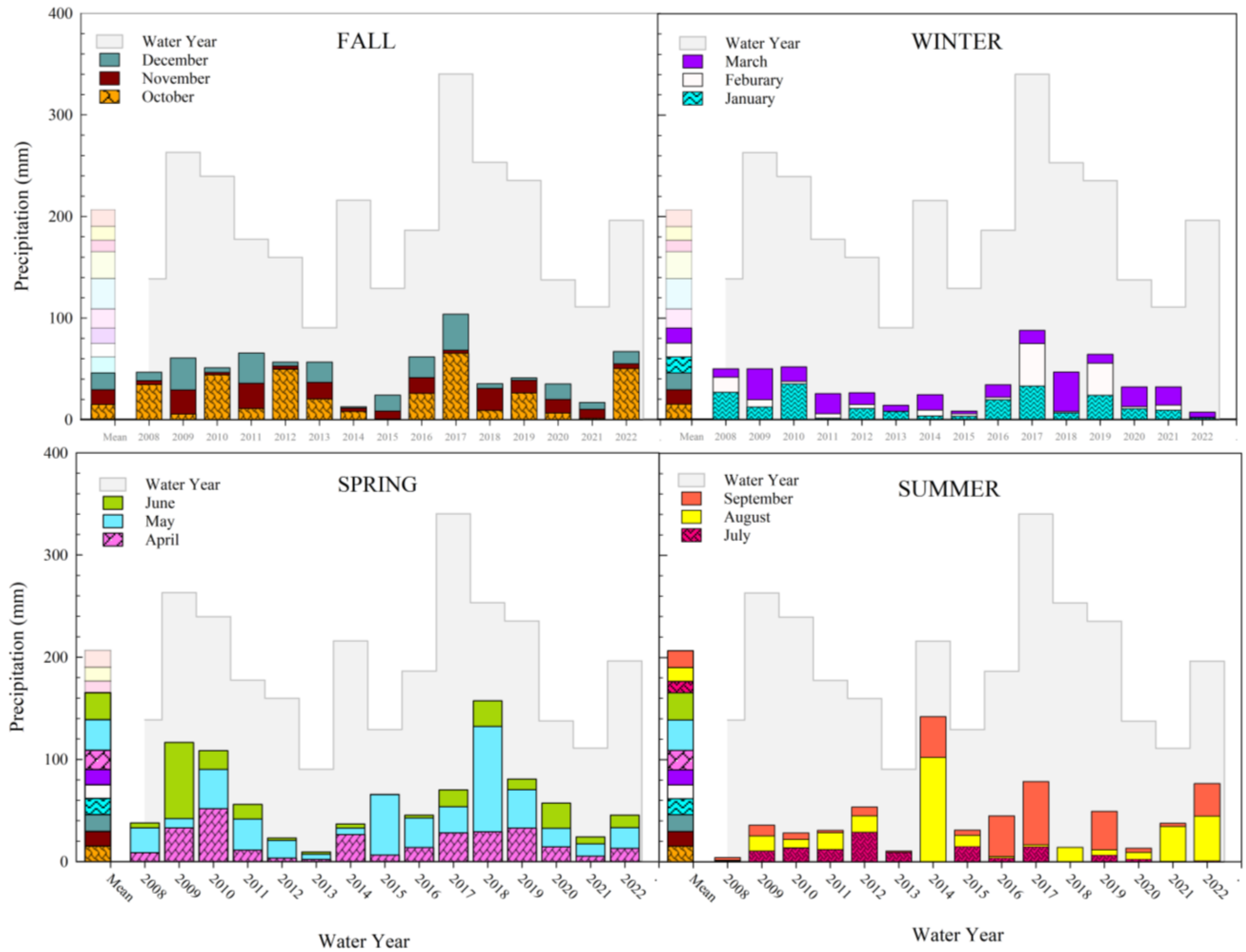

Figure 3-3. Precipitation is divided into four seasons within the water year (October 1 – September 31). In each panel, monthly precipitation means are stacked on the left to show annual precipitation mean accumulation. The Total water year precipitation is included in each seasonal panel. Data were collect by the National Oceanic and Atmospheric Administration at the Central Facilities Area on the Idaho National Laboratory Site. Means were calculated from precipitation data collected between 1951 to 2022.

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

Summary of Results: *There were no wildland fires on the INL Site in 2022. The total area of sagebrush habitat in the SGCA on the INL Site remains unchanged from 2021 at 71,358.8 ha (176,331.4 ac) representing a 1.3% decrease from the updated sagebrush habitat baseline. The current estimated area of sagebrush habitat remaining outside the SGCA is 28,306.5 ha (69,947 ac).*

3.2.1 Introduction

This task is intended to provide an update to the current sagebrush habitat distribution map, and primarily addresses losses to sagebrush habitat following events that alter vegetation communities. As updates are made to map classes (i.e., vegetation polygon boundaries are changed), the total area of sagebrush habitat mapped will be compared to the baseline value established for the habitat trigger to determine status with respect to the habitat trigger threshold.

After the CCA stakeholder meeting in February 2022, it was agreed upon that the sagebrush habitat trigger baseline would be updated using the most recent vegetation map data available (see Section 6.3). The current vegetation map was published in 2019 (Shive et al. 2019) and served as an update to the previous vegetation map, which was used to establish the original sagebrush habitat layer defined in the CCA. Sagebrush habitat losses from the 2019 Sheep Fire and the 2020 Fires were previously reported and removed from the original baseline layer. After the updated sagebrush habitat baseline was implemented in 2022, these same losses were maintained and removed to reflect current ground conditions. The area of sagebrush habitat in the SGCA prior to 2022 was 71,358.8 ha (176,331.4 ac).

3.2.2 Results and Discussion

There were no fires on the INL Site in 2022 (INL Fire Department Chief James Blair, personal communication, 2022). There were also no losses of sagebrush habitat from infrastructure expansion within the SGCA.

The total area of sagebrush habitat in the SGCA on the INL Site remains unchanged from 2021 with 71,358.8 ha (176,331.4 ac) representing a 1.3% decrease from the updated sagebrush habitat baseline (Figure 3-4). The sagebrush habitat outside of the SGCA is considered a 'conservation bank' that could be incorporated into the SGCA to replace lost sagebrush habitat resulting from wildland fire or from new infrastructure development (DOE and USFWS 2014). There was 4.6 ha (11.4 ac) of sagebrush habitat loss reported in the Infrastructure Expansion task (Section 4.2) that all occurred outside the SGCA. After those losses are removed from the conservation bank, the current estimated area of sagebrush habitat remaining outside the SGCA is 28,306.5 ha (69,947 ac).

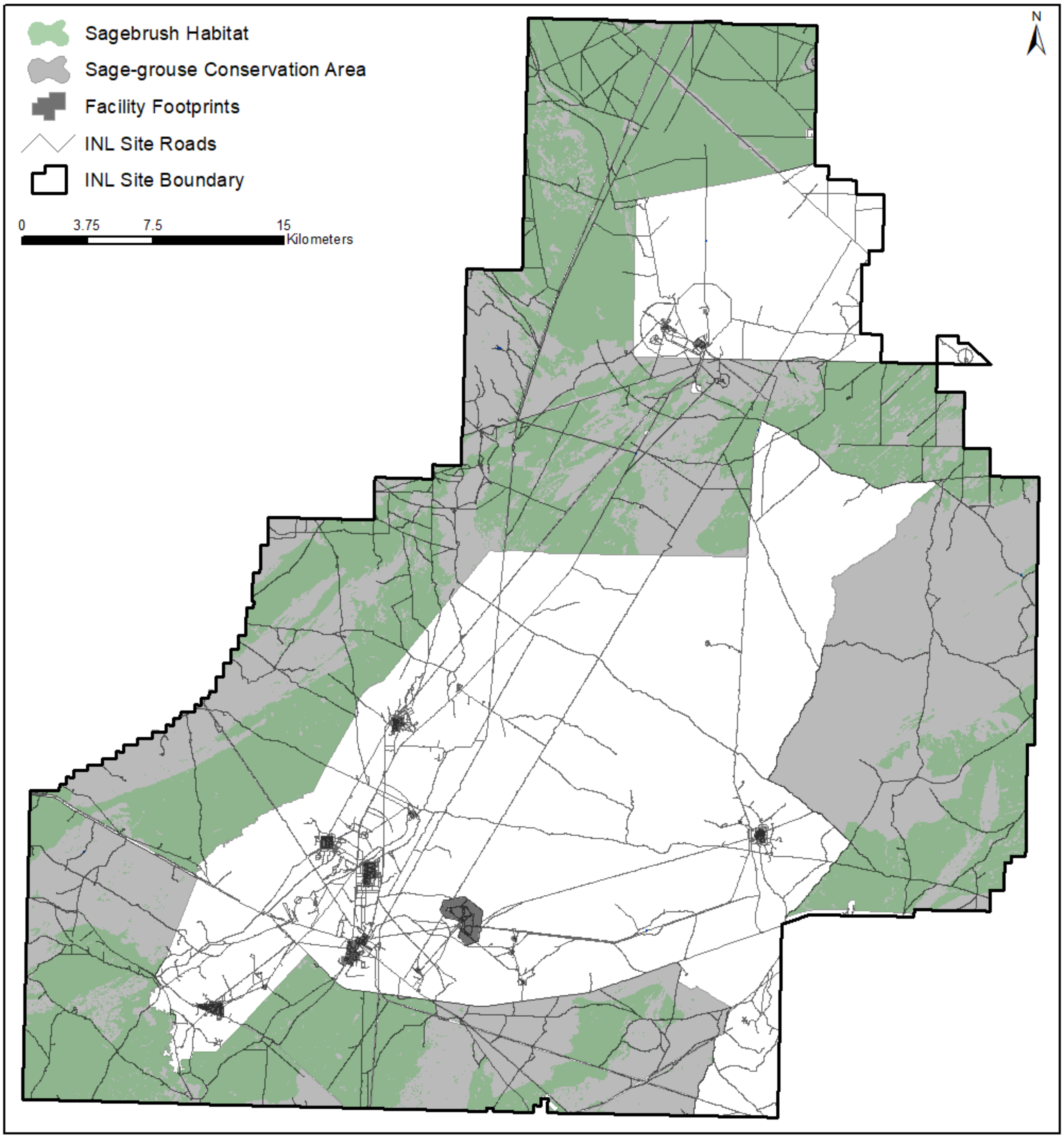

Figure 3-4. Current sagebrush habitat distribution within the Sage-grouse Conservation Area on the Idaho National Laboratory Site.

4. THREAT MONITORING

Threats that potentially impact sage-grouse and its habitats on the INL Site require regular monitoring to track the status of the threat and establish baseline evidence so success of implemented conservation actions can be evaluated. Monitored threats include raven predation (Section 4.1), infrastructure development (Section 4.2), wildland fire (and subsequent habitat recovery; Section 4.3), and livestock (Section 4.3). Annual grasslands (i.e., cheatgrass) trends are discussed above (Section 3.1), and cheatgrass control, which is a component of post-fire restoration, is addressed in Section 5.2.1.

4.1 Task 4—Raven Nest Surveys

Summary of Results: *Thirty-three raven nesting hot spots were identified on INL Site infrastructure. The highest priority hot spot to address with nest deterrents is Experimental Breeder Reactor-I (EBR-1). The next highest priorities for INL infrastructure include Navel Reactors Facility (NRF), Advanced Mixed Waste Treatment Project (AMWTP), the Central Facilities Area (CFA) main gate, two sections of transmission lines southeast of Specific Manufacturing Capability, and a power line section northeast of NRF. These priorities were based on the likelihood that ravens nesting in the hot spot would prey upon sage-grouse nests in nearby sagebrush habitat.*

4.1.1 Introduction

For the past eight years (2014–2021), locations of raven nests have been documented annually on INL Site infrastructure, with biologists finally concluding that raven nesting had not increased during the study (INL 2022). During a recent meeting among staff representing DOE, USFWS, and other CCA stakeholders, the USFWS encouraged DOE to assume ravens are likely impacting sage-grouse and to prioritize long-term, sustainable solutions to reduce raven nesting on infrastructure over continued monitoring and research.[1] Accordingly, BEA suspended raven nest surveys in spring 2022 and evaluated the 8-year dataset to identify raven nesting hot spots (hereafter referred to as 'hot spots') on power lines, towers, and at facilities. The primary objective of this analysis was to generate a prioritized list of structures and power line sections that could be retrofitted by BEA and non-INL entities to eliminate the potential for raven nesting near areas most likely to be used by sage-grouse for nesting.

Research has demonstrated that raven breeding pairs forage almost entirely within 2 km (1.2 mi) of their nest (Rösner and Selva 2005, Harju et al. 2018, Harju et al. 2021). Therefore, after identifying hot spots, we buffered them by 2 km (hereafter referred to as 'foraging buffer') and calculated the percentage of mapped sagebrush habitat (DOE and USFWS 2014; Section 3-2 this report) within each. A study on the INL Site conducted approximately 15 years ago found 61%, 35%, and 17% of nests by marked female sage-grouse were farther than 3 km (1.9 mi), 5 km (3.1 mi), and 7 km (4.3 mi), respectively, from the lek upon which the hen was captured (Howe et al. 2014; Q. Shurtliff, unpublished data). It was therefore assumed that if a lek was <5 km from the edge of a raven foraging buffer that encompassed sagebrush habitat (i.e., <7 km from the nearest raven nest in a hot spot), sage-grouse nests associated with the lek would have an elevated risk of being predated by ravens nesting within the hot spot.

4.1.2 Results and Discussion

Hot Spot Identification

Across all years, 296 raven nesting events were documented on 189 structures. A nesting event (hereafter referred to as 'nest') was defined as an active nest in a single year. Thus, a structure able to support a single stick nest could have had up to eight nests recorded on it over the eight-year study. A hot spot was

[1] Minutes recorded by BEA staff on February 24, 2022. Comment was made by Jason Pyron, Conservation Partnerships—Branch Lead, USFWS.

defined as a group of four or more nests, observed during any of the eight years of the study, whose supporting structures were no further than 650 m (711 yd) from another nest structure. Hot spots typically consisted of multiple structures; however, in some instances (e.g., on a tower), the hot spot consisted of a single nest that was active in ≥4 years. The hot spot threshold of 650 m was based on empirical data (INL 2023).

In total, 33 hot spots were identified, including 20 on power lines, nine at facilities, and four on towers outside of facilities (Figure 4-1). Hot spots on power lines consisted of 4–10 nests each (mean = 5.8), and nine of the 20 hot spots were on lines managed by INL. Facility hot spots consisted of 4–8 nests (mean = 5.7) and tower hot spots consisted of 4–6 nests (mean = 5.3). Facilities with hot spots included NRF (eight nests on three structures), Idaho Nuclear Technology and Engineering Center (eight nests on one structure), AMWTP (six nests on three structures), EBR-1 (six nests on two structures), U.S. Department of Agriculture Sheep Station (six nests on five structures), CFA main gate (five nests on one structure), ATR Complex (four nests on two structures), Specific Manufacturing Capability (four nests on two structures), and Materials and Fuels Complex (MFC) (four nests on two structures). Facilities without a hot spot were Critical Infrastructure Test Range Complex (three nests) and CFA (one nest).

On the east side of the INL Site, a National Oceanic and Atmospheric Administration (NOAA) meteorological tower and a cellular tower each supported a raven nest for six years. On the west side of the INL Site, a NOAA meteorological tower supported a nest for five years. A Federal Aviation Administration tower located approximately 420 m (459 yd) from the southeast boundary of the INL Site supported a raven nest for four years. Together, these four towers supported 21 nests over eight years.

Hot Spot Prioritization

Hot spots were categorized as ‘high priority,’ ‘medium priority,’ or ‘low priority’ for mitigation based on (1) the number of active sage-grouse leks within 7 km (4.3 mi) of a hot spot and (2) the percentage of area mapped as sagebrush habitat within the raven foraging area. Those not meeting the minimum criteria for the low priority category were not assigned to a category. Results were then ranked from high to low priority within their assigned categories based on the number of male sage-grouse that attended leks within 7 km in 2022.

A hot spot at EBR-1, centered on a pair of large aircraft engines, was categorized as high priority for deterring raven nesting to reduce the potential for predation of sage-grouse nests (Table 4-1). The 2-km raven foraging buffer surrounding these nest sites was almost entirely comprised of sagebrush habitat, it overlapped an active sage-grouse lek, and a second lek was just outside the foraging buffer. Adding overhead netting or mesh wire at the nest sites are two of several possible ways to exclude nesting.

Six hot spots on INL transmission lines and facilities and three hot spots on non-INL transmission lines were rated medium priority for mitigating action (Table 4-1). The three highest ranking hot spots in this category were near leks with similar male sage-grouse attendance, and mitigation on any would be of roughly equal value, based on the ranking criteria. Notable among these three is the hot spot at AMWTP. This facility is the most southwesternly infrastructure to provide nesting subsidies and it is adjacent to a large area of sagebrush habitat. If raven nesting were excluded here and at EBR-1, potential impacts to sage-grouse nesting as a result of INL Site infrastructure may be substantially reduced in this area. Although the hot spot associated with the CFA main gate is ranked fourth in its priority category, it may be the most feasible for excluding raven nesting. At this site, ravens build nests approximately 3 m (10 ft) above the ground under the eves of a lean-to attached to the back of the badging office. Adding mesh wire under the eves would problably render these sites unusable for ravens. The two hot spots on transmission lines encompass a total of 11 2-pole structures. Nesting on these sections of power line could be eliminated by replacing horizontal wooden crossarms bolted to either side of the poles with a single-side structure (INL 2023). In the past few years, BEA Power Mangement has retrofitted four of the 11 structures within the hot spots.

Hot spots on four INL transmission lines and facilities, and seven non-INL transmission lines and towers, are low priority for mitigation action. For a detailed description of these, see INL (2023). Twelve other hot spots did not qualify for any of the prioritization categories.

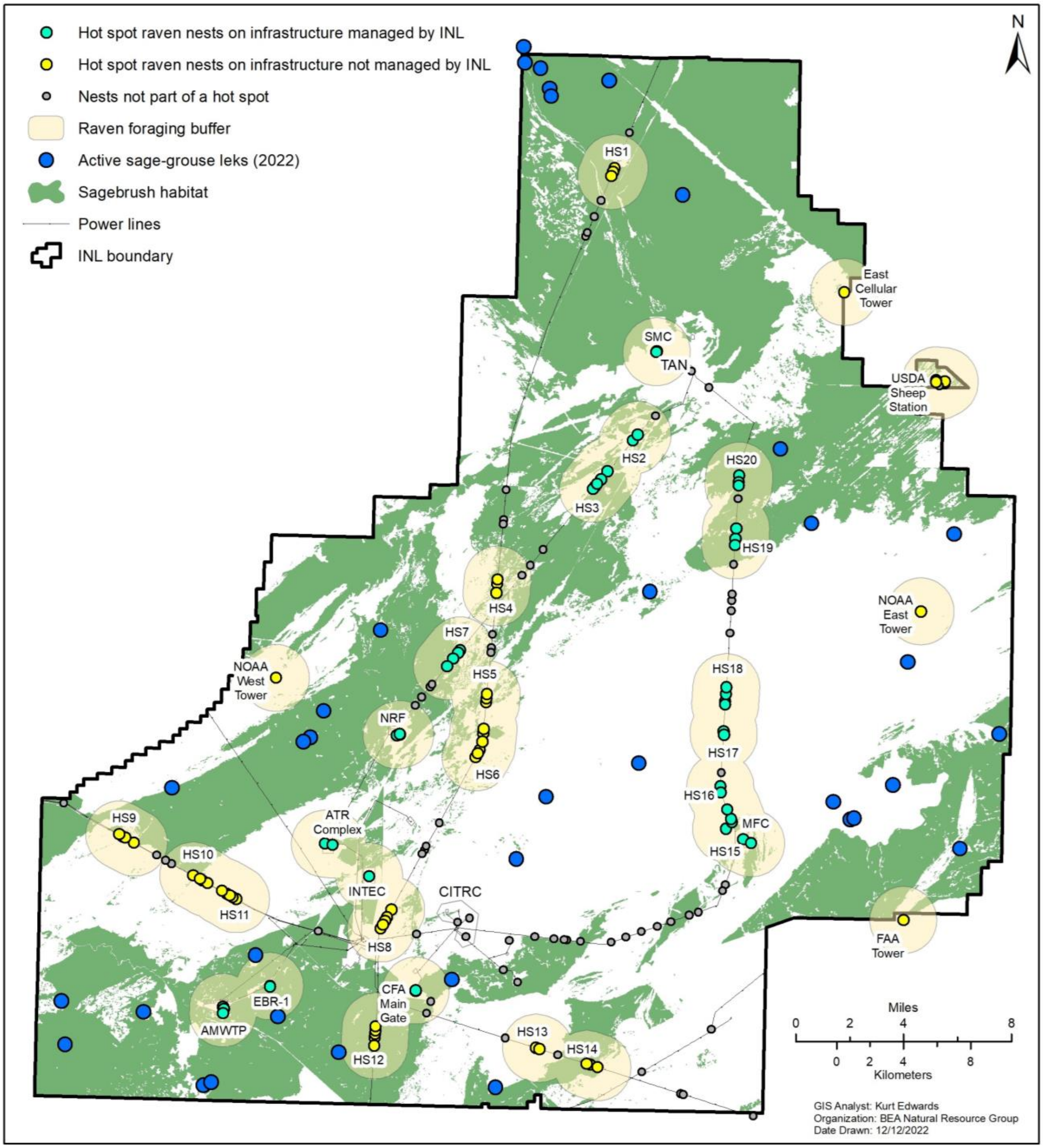

Figure 4-1. Location of raven nests documented from 2014 to 2021 relative to active sage-grouse leks and mapped sagebrush habitat. Raven nesting hot spots on power lines are identified with HS numbers and other structures are identified by facility acronyms or colloquial names. A 2-km (1.2 mi) raven nest foraging buffer was overlaid on a sagebrush habitat polygon to aid in hot spot prioritization.

Table 4-1. Prioritized raven nesting hot spots (HS) on infrastructure managed by INL and non-INL entities. "Nearby leks" refer to the number of sage-grouse leks within seven kilometers of the hot spot. Number of sage-grouse is a sum of peak male attendance at all nearby leks in 2022. "Sagebrush habitat" refers to percentage of the area within the 2-km raven foraging buffer mapped as sagebrush habitat. Within each priority level, hot spots are ranked by number of sage-grouse. Hot spots not meeting the minimum criteria of Low Priority are not presented here.

	INL Infrastructure				**Non-INL Infrastructure**			
	Hot spot	Nearby leks	# sage-grouse	Sagebrush habitat (%)	Hot spot	Nearby leks	# sage-grouse	Sagebrush habitat (%)
High Priority	EBR-1	4 (1 in buffer)*	42	91	–	–	–	–
Medium Priority	NRF	4	49	61	HS 1	4	43	92
	AMWTP	5	43	84	HS 12	3	25	99
	HS 19	3	40	75	HS 14	1	10	52
	CFA main gate	2*	21	54	–	–	–	–
	HS 20	2	19	89	–	–	–	–
	HS 7	1	14	62	–	–	–	–
Low Priority	MFC	3	47	15	FAA tower	3	50	28
	HS 3	1	21	48	NOAA west tower	4	49	7
	HS 13	2	16	16	HS 6	2	14	21
	ATR Complex	2	14	16	HS 9	1	8	35
	–	–	–	–	HS 10	2	8	26
	–	–	–	–	HS 8	1	6	19
	–	–	–	–	HS 5	1	3	28

*A lek was outside the foraging buffer, but was within 250 m (273 yd).

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

Summary of Results: *There were 10 polygons mapped where infrastructure expansion removed sagebrush habitat and resulted in a loss. All the expansions were minor with a total combined area of 4.6 ha (11.4 ac) of sagebrush loss. All losses occurred outside the SGCA and do not impact the sagebrush habitat trigger. There was a total of 32.6 km (20.3 mi) of new linear features mapped within the SGCA or existing sagebrush habitat. An additional 0.8 km (0.5 mi) of linear features were mapped this year within the SGCA or existing sagebrush habitat that were present but not captured during the last review process.*

4.2.1 Introduction

Infrastructure development is considered a medium-ranked threat to sage-grouse on the INL Site. 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 this monitoring task 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. Losses in sagebrush habitat documented under this monitoring task are included in habitat distribution task totals to evaluate the status of the habitat trigger.

This monitoring task is conducted whenever new high-resolution imagery that encompasses the entire INL Site becomes available. Currently, this is reliant on the U.S. Department of Agriculture National Agricultural Imagery Program, which typically collects aerial digital imagery in Idaho every two years and is made publicly available at no cost. As other high-resolution imagery becomes available (e.g., INL Site image acquisition following a large wildland fire), those data are also incorporated into the analysis to monitor infrastructure changes.

4.2.2 Results and Discussion

There were 10 polygons mapped where infrastructure expansion removed sagebrush habitat and resulted in a loss. All the expansions were minor with a total combined area of 4.6 ha (11.4 ac) of sagebrush loss. All losses occurred outside the SGCA and do not impact the sagebrush habitat regulatory trigger. Two of the mapped polygons were associated with gravel pit expansions (one that has expanded beyond administrative boundaries), one was an area adjacent to a gravel pit where sagebrush appears to be mostly removed, one was from mowing along the eastern perimeter of MFC, and the remaining six polygons were located at the NRF facility where one new pad was expanded, a perimeter road was widened, and a new parking lot was constructed. The largest polygon mapped removed 1.8 ha (4.3 ac) of sagebrush habitat where the Idaho Transportation Department gravel pit, located off U.S. Highway 20/26, was expanded.

There was a total of 32.6 km (20.3 mi) of new linear features mapped within the SGCA and/or existing sagebrush habitat (Figure 4-2). The majority of new linear features consisted of spurs that dead-end or short cuts created between two existing roads. The longest linear feature mapped was a segment of the new Raghorn power line that was 3.7 km (2.3 mi), and it only partially overlapped with existing sagebrush habitat outside the SGCA. There was an additional 0.8 km (0.5 mi) of linear features mapped this year within the SGCA and/or existing sagebrush habitat, but after cross-referencing these features with the previous 2019 National Agricultural Imagery Program dataset, we recognized these features were present but were missed during the last review process.

The mapped distance of new linear features was substantially less than 2020, the last time this monitoring was conducted, when 238.3 km (148.1 mi) of new features were reported (Shurtliff et al. 2021). The majority of new linear features reported in 2021 were associated with the 2020 wildland fire season and were created during firefighting or post-fire clean-up activities. There was only a slight increase in the total distance of linear features mapped from 2021 compared to what was found in 2016 and 2018 where 7.4 km (4.6 mi) and 9.6 km (6 mi) were mapped, respectively (Shurtliff et al. 2017, Shurtliff et al. 2019).

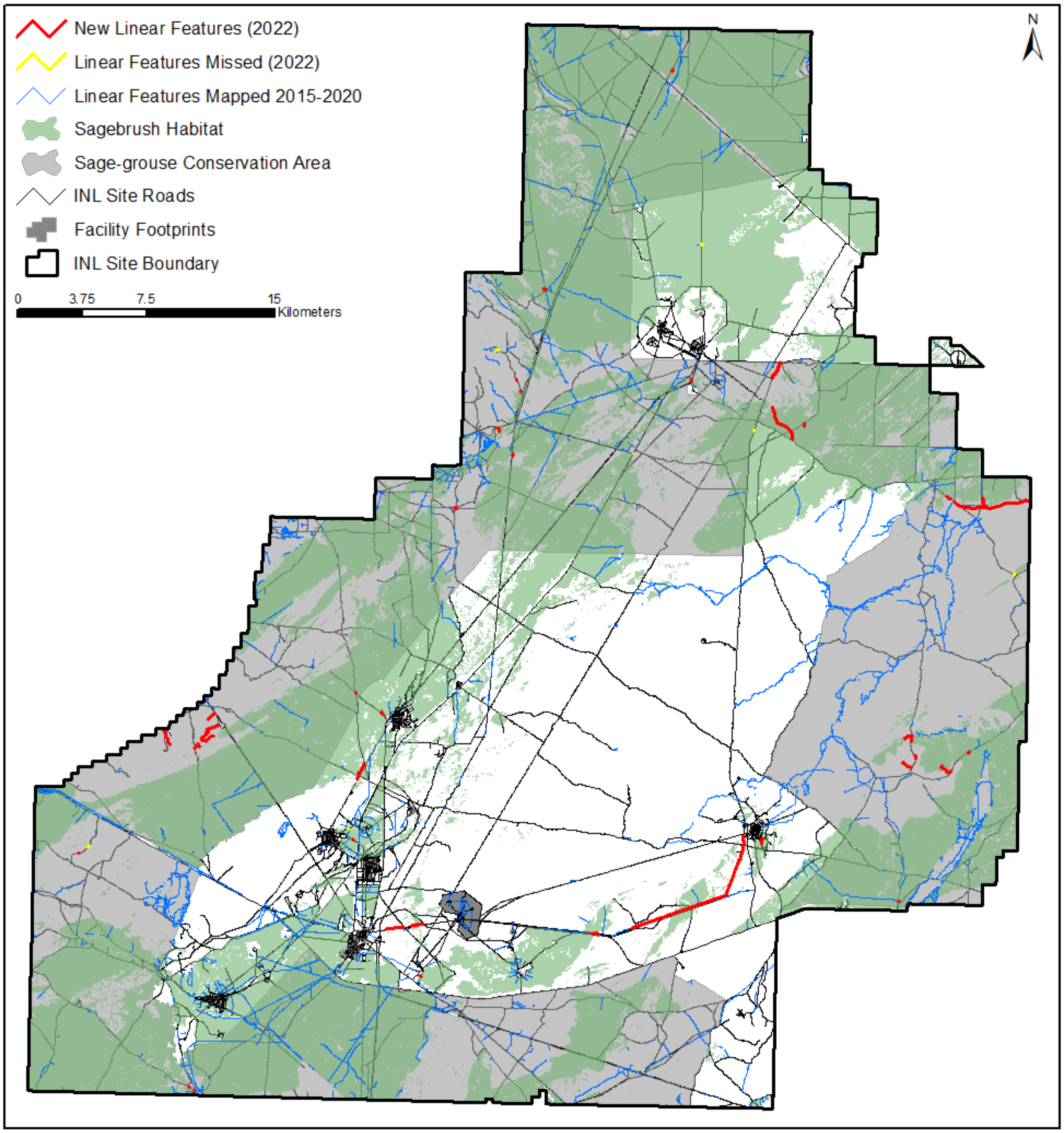

Figure 4-2. Two-track linear expansion mapped within the Sage-grouse Conservation Area or overlap with existing sagebrush habitat on the Idaho National Laboratory Site. The slightly darker green areas are where sagebrush habitat is coincident with the Sage-grouse Conservation Area.

4.3 Task 5—Assessment of Potential Threats to Sagebrush Habitat

<u>Summary of Results</u>: *Wildland fire footprints exhibited a range of habitat condition; most are recovering to healthy native plant communities; however, some have a substantial weedy component. Vegetation composition generally did not differ between livestock grazing allotments and similar adjacent areas. Introduced species were more abundant in recovering burned habitats compared to intact sagebrush habitats regardless of grazing use, indicating lower resistance to dominance by non-natives.*

4.3.1 Introduction

This section of the Summary Report addresses the assessment of effects from two potential threats to sagebrush habitat identified as threats to sage-grouse populations. Threats to sagebrush habitat are assessed every five years, but initial results from 2021 (INL 2022) suggested more detailed analyses would be useful for interpreting the potential effects of threats on sagebrush habitat condition and recovery (INL 2023).

Permanent vegetation monitoring plot data on the INL Site are used to assess of potential effects of threats to sagebrush habitat by comparing ecological condition among fire footprints, among grazing allotments, and between sampling periods for both factors. Ecological condition can be assessed by comparing plant functional group abundance, composition, variability, species diversity, and abundance. Habitat monitoring data from two sample periods were compared to assess potential changes in condition. Statistical comparisons were made among threat groups (e.g., allotments or fire footprints) and between sample periods using Two-way Repeated Measure Analysis of Variance and Holm-Šidák (Šidák 1967) tests for all pairwise multiple comparisons.

4.3.2 Results and Discussion

Wildland Fire Threat Analysis

Abundance for all functional groups appeared to be spatially and temporally dynamic, indicating a range of ecological condition across fire footprints (Figure 4-3). Post-fire plant communities were dominated by resprouting native shrubs (i.e., 'other shrub' functional group) and native perennial grasses. Introduced annual grasses were abundant, but not necessarily dominant, in some fire footprints. Native perennial grasses significantly increased from sample period one to sample period two, across most fire footprints, and within unburned areas. Introduced annual grasses group significantly increased from the first to the second sample periods and across four of the seven fire footprints but not within unburned sagebrush habitat. Substantial increases in native perennial grasses across all monitoring plots suggest differences in weather conditions between the sample periods is likely influencing their abundance. Cover from the introduced annual grasses functional group has a large range of annual variability, and while this group is a concern, increases between sample periods do not appear to be at the expense of native functional group abundance (INL 2023).

Results from these analyses indicate that changes in the amount and timing of precipitation over the past decade appear to affect the ecological condition of recovering burned areas (Figure 4-3, Figure 3-3). In particular, the data continue to suggest that non-native annual production increases with late summer and early fall precipitation in burned areas. Blew and Forman (2010) found that seasonal changes in precipitation timing may also reduce sagebrush recruitment in burned areas. A combination of increased non-native annual cover and reduced sagebrush recruitment would likely impact the time required for burned areas to develop sagebrush cover sufficient to support sage-grouse. If unusual precipitation events over the ten-year monitoring effort are related to climate change, then climate change could negatively impact post-fire habitat recovery. For this reason, it will be important to continue to monitor post-fire recovery and to continue to explore strategies for facilitating habitat recovery on the INL Site.

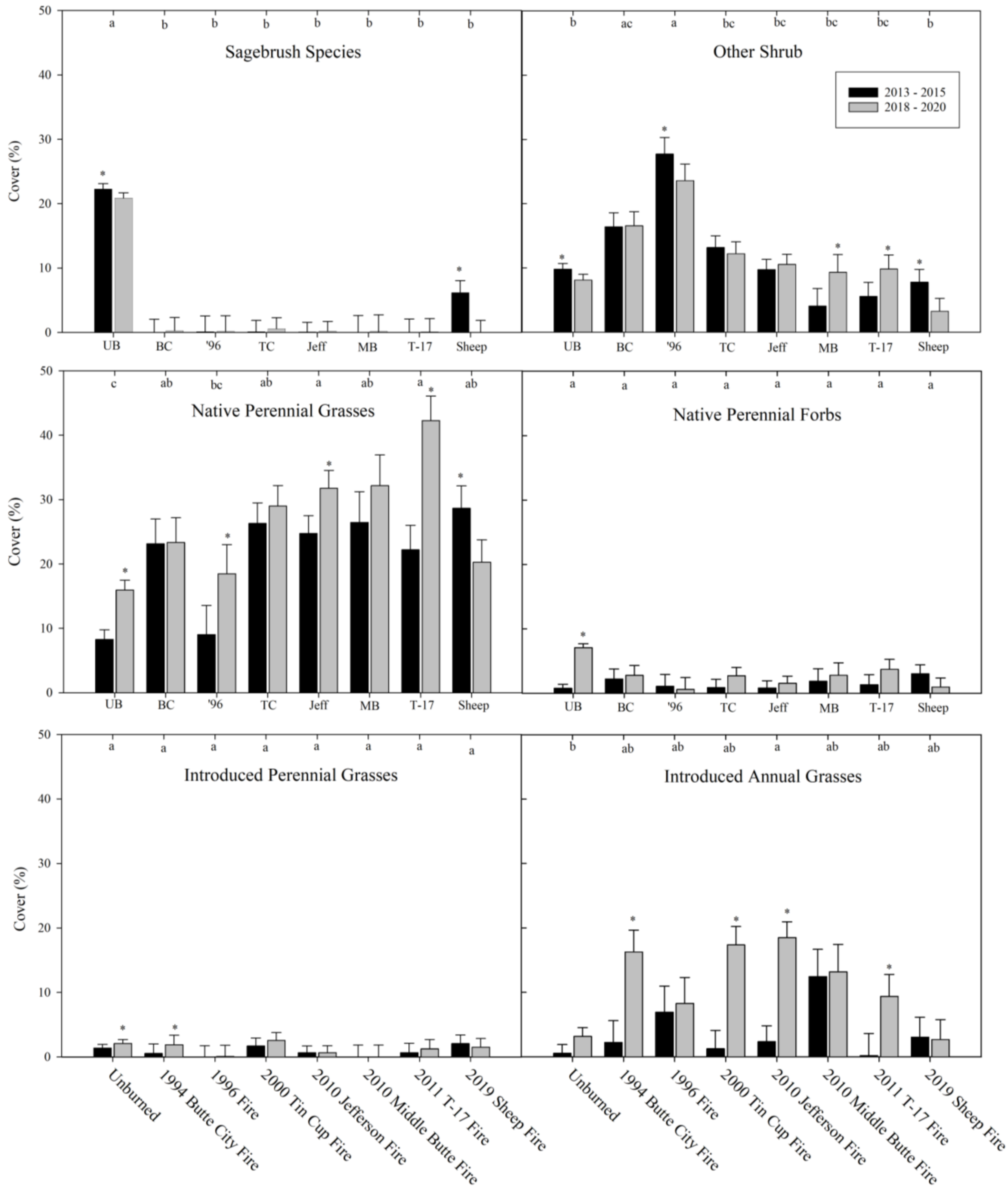

Figure 4-3. Cover by functional group for monitoring plots comparing unburned sagebrush habitat plots to plots in seven wildland fire footprints on the Idaho National Laboratory Site. The significance of pairwise multiple comparison results are indicated among wildland fires at $\alpha \leq 0.05$ by letters (a,b, etc.) and between sample periods at $\alpha \leq 0.05$ by an asterisk. Sample sizes are n = 89, 14, 10, 20, 27, 9, 14, and 17, respectively.

Livestock Use Threat Analysis

Vegetation composition data from several livestock grazing allotments (hereafter referred to as 'allotments') and from analogous areas outside of allotments (hereafter referred to as 'ungrazed') were used to assess spatial and temporal differences in ecological conditions among allotments and ungrazed and between two sample periods. Vegetation monitoring plots were subdivided into two categories for analyses based on their wildland fire status because fire changes vegetation composition so markedly. Vegetation monitoring plots within sagebrush habitat polygons are defined as current sagebrush habitat. Plots that are located outside of sagebrush habitat polygons are defined as non-sagebrush habitat and they generally coincide with fire footprints.

Within current sagebrush habitat, the abundance of the sagebrush functional group was comparable across all areas except for the Twin Buttes Allotment, which had significantly greater cover when compared to ungrazed areas (Figure 4-4a). Abundance of the sagebrush functional group decreased significantly in ungrazed areas from the first sample period to the second. Native perennial grasses significantly increased across all areas from the first sample period to the second and abundance was comparable between all areas. Introduced annual grasses functional group was generally more abundant in the second sample period than the first, and the difference was significant in the Twin Buttes Allotment. The introduced annual grasses functional group contributed very little to overall vegetative cover within sagebrush habitat across allotments and in ungrazed areas.

Within non-sagebrush habitat, the abundance of each functional group was not significantly different among allotments and ungrazed areas (Figure 4-4b). There was less than 1% cover from the sagebrush functional group in areas affected by fire but some areas had statistically significant increases from sample period one to two. The functional group containing non-sagebrush shrubs, native perennial grasses, and introduced annual grasses were the most abundant functional groups across all areas. Native perennial grasses significantly increased in abundance across all areas from the first sample period to the second; specifically, within the ungrazed and the Twin Buttes Allotment areas. The introduced annual grasses functional group increased in abundance from the first sample period to the second within the ungrazed and allotment areas and the increase was significant for all areas except the Deadman Allotment. The substantial increase in cheatgrass abundance between the two sample periods may reflect more precipitation during seasons that favor cheatgrass germination and establishment in the second time period (INL 2023).

Results from these analyses did indicate changes in habitat condition in some of the allotments, but similar changes were detected in ungrazed areas. In general, intact sagebrush plant communities are in good ecological condition because they continue to be dominated by a diversity of native species and they appear to be resistant to invasion of weedy species. Non-sagebrush plant communities appear to be more variable in species abundance and composition and as a result ecological condition is more likely to vary, especially because the dominant functional groups are highly responsive to precipitation event timing and amount (INL 2023). Large areas within several of the allotments on the INL Site are not used by livestock, likely because the demands are prohibitive to sustain available resources to livestock in areas that are difficult to access. Therefore, the ecological condition of sagebrush habitat and recovering habitats is equally a consequence of abiotic conditions and a lack of use, as it is from specific grazing practices prescribed in allotments on the INL Site. Overall, fire appears to have had a greater immediate impact on sagebrush habitat than livestock use but concentrated livestock use of recovering habitats may facilitate patches of invasive species in habitats with lower invasion resilience.

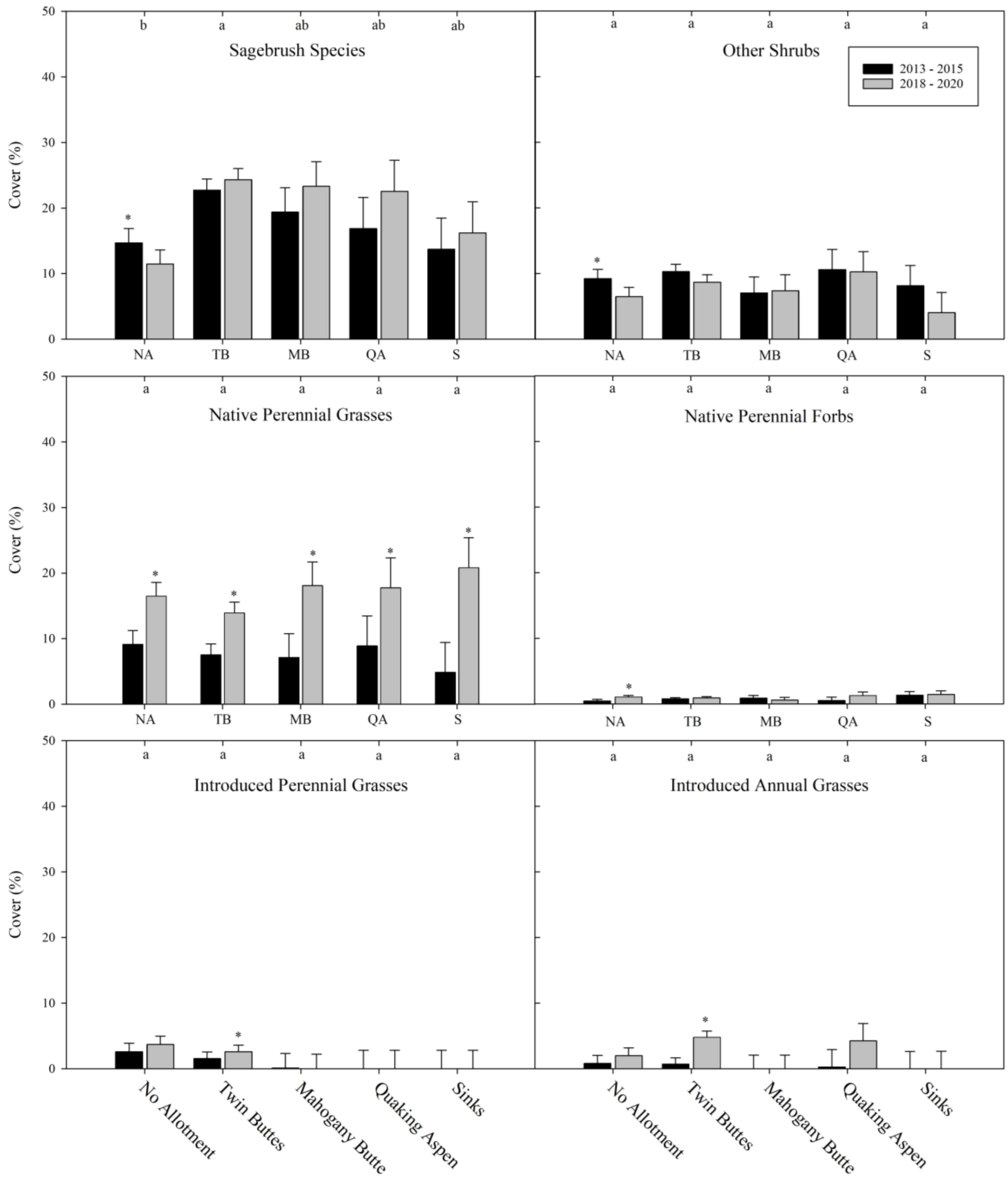

Figure 4-4a. Cover values are from sagebrush habitat monitoring plots. Each panels compares the abundance of a plant functional group among four allotments, with plots outside of allotments in unburned sagebrush habitat, and between sample periods on the Idaho National Laboratory Site. Pairwise multiple comparison procedures indicate significant differences between allotments by letters (a, b, etc.) at $\alpha \leq 0.05$ and an asterisk indicates significant differences between sample periods at $\alpha \leq 0.05$. Sample sizes are n = 24, 38, 8, 5, and 5, respectively.

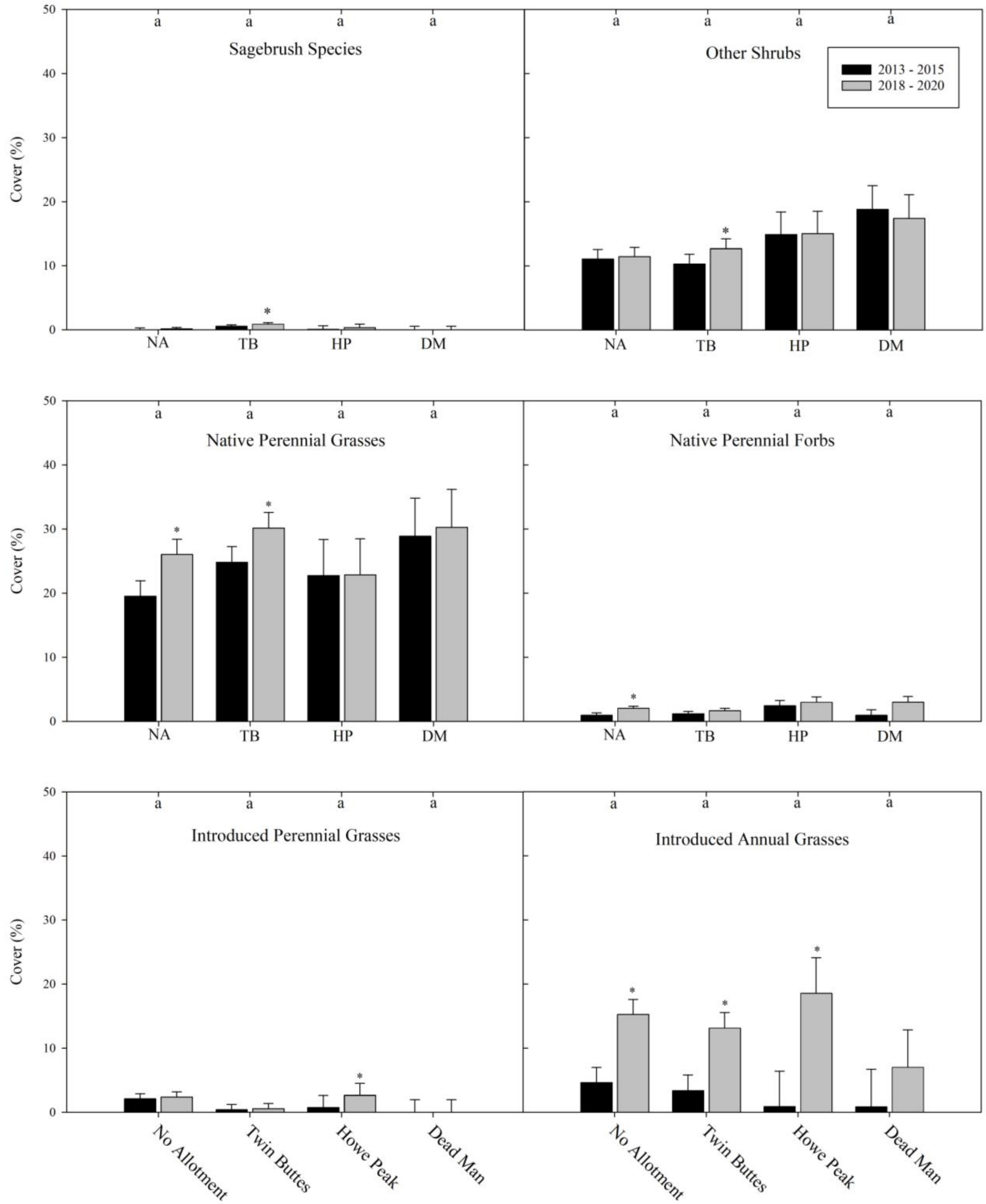

Figure 4-4b. Cover values are from non-sagebrush monitoring plots. Each panels compares the abundance of a plant functional group among three allotments, with plots outside of allotments in burned areas, and between sample periods on the Idaho National Laboratory Site. Pairwise multiple comparison procedures indicate significant differences between allotments by letters (a, b, etc.) at $\alpha \leq 0.05$ and an asterisk indicates significant differences between sample periods at $\alpha \leq 0.05$. Sample sizes are n = 56, 52, 10, and 9, respectively.

5. IMPLEMENTATION OF CONSERVATION MEASURES

5.1 Summary of 2022 Implementation Progress

The CCA describes 13 conservation measures designed to mitigate and reduce threats to sage-grouse and its habitats on the INL Site. It also articulates DOE's requirement that infrastructure development results in no net loss of sagebrush. The following list highlights activities and accomplishments associated with conservation measures that DOE, contractors, and stakeholders participated in and achieved in 2022 to reduce threats. Minor activities and conservation measures that have been discontinued or were not actively implemented during the past year are not listed. For a full description of all activities cited below, see Appendix A.

5.1.1 Threat: Wildland Fire

Conservation Measure 1—Prepare an assessment for the need to restore the burned area. Based on the assessment, DOE would evaluate and prioritize treatment options to meet habitat recovery objectives in burned areas and reduce the impact of wildland fires >40 ha (99 acres). Primary habitat recovery objectives include soil stabilization, cheatgrass and noxious weed control, maintaining a healthy herbaceous understory, and sagebrush restoration.

- No fires occurred on the INL in 2022.

Associated activities to reduce the wildland fire threat:

- The INL Fire Department and NRG are updating or developing plans to increase the efficacy of fuels management, fire suppression, and recovery actions. The National Environmental Policy Act (NEPA) group is preparing to complete an Environmental Assessment (EA) evaluating the potential impacts of these plans.
- BEA mowed six- to 12-m (20- to 40-ft) firebreaks along 190 km (118 mi) of roads.
- NRG facilitated the planting of 86,300 sagebrush seedlings in two recent burns to speed up sagebrush reestablishment. An additional 13,700 seedlings were planted in an old fire scar as compensatory mitigation for infrastructure development.

5.1.2 Threat: Infrastructure Development

Conservation Measure 2—Adopt Best Management Practices outside facility footprints for new infrastructure.

- Seven infrastructure projects reported that they minimized the total distance of habitat edge caused by construction and project activities in 2022.
- Seven projects co-located new infrastructure with existing infrastructure footprints to avoid the impacts to both current and recovering habitats on the INL Site.
- The Carbon Free Power Project installed perch deterrents on a meteorological tower.

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.

- Two infrastructure projects were initiated within the SGCA. DOE consulted with the USFWS on both about how to minimize impacts to sage-grouse.

5.1.3 Threat: Livestock

Conservation Measure 5—Encourage BLM to take steps to keep livestock off leks; provide updated lek locations.

- During the 2022 sage-grouse lek counts, biologists did not observe livestock on any of the leks between March 20 and May 15.

Conservation Measure 6—Communicate and collaborate with BLM to maintain the herbaceous understory for the benefit of sage-grouse and to ensure rangeland improvements follow guidelines.

- DOE and INL collaborated to initiate restoration of a section of Birch Creek, repair a section of road that has widened due to hauling water for livestock, and spray noxious weeds.
- DOE supported installation of an underground pipe to maintain water troughs, which will result in less road traffic in remote areas. DOE ensured a fencing project included high visibility markers and is wildlife friendly.

5.1.4 Threat: Seeded Perennial Grasses

Conservation Measure 7—Rehabilitate disturbed areas using only native seed mixes that are verified free of crested wheatgrass contamination.

- Project-specific native perennial seed mixes that exclude crested wheatgrass are being recommended by BEA's NRG for all revegetation work.
- It is mandatory that all seed mixes exclude crested wheatgrass seed, and all seed mixes were verified free of crested wheatgrass contamination.

5.1.5 Threat: Landfills and Borrow Sources

Conservation Measures 8 and 9—Do not disturb lekking sage-grouse at borrow sources, ensure sagebrush habitat is not lost outside administrative boundaries due to borrow pit or landfill development, and control noxious and other invasive weed species.

- INL complied with seasonal and time-of-day restrictions.
- No new borrow pits or landfills were opened.
- INL added requirements to programmatic documents to ensure that adequate weed control measures are implemented throughout the life of an active borrow source or landfill.

5.1.6 Threat: Raven Predation

Conservation Measure 10—Opportunistically reduce raven nesting on infrastructure.

- INL Power Management installed avian protection devices on 18 transmission structures. The devices are narrow and preclude raven nesting on the devices.
- The NRG used empirical evidence to identify raven nesting hot spots on power lines, towers, and at facilities and to prioritize infrastructure for the installation of nest deterrents (Section 4.1).

5.1.7 Threat: Human Disturbance

Conservation Measures 12 and 13—During the lekking and nesting periods, minimize human disturbance of sage-grouse on leks across the INL Site and nesting hens within the SGCA.

- All unmanned aerial vehicle flights complied with CCA requirements regarding timing and distance from leks during early mornings and late evenings within the sage-grouse breeding period.
- Detonations of explosives greater than 1,225 kg (2,700 lb) did not occur at National Security Test Range between 9 p.m. and 9 a.m. from March 15 to May 15.
- No meteorological, sound detection and ranging, or other cell towers were erected within 1 km (0.6 mi) of a sage-grouse lek or within the SGCA.

5.2 Reports on Projects Associated with Conservation Measures

Since the CCA was signed, DOE and contractors have implemented activities on an as-needed or recurring basis to reduce impacts to sage-grouse habitats and to support the objectives of all Conservation Measures.

5.2.1 Post-fire Recovery Planning, Implementation, and Monitoring—Conservation Measure 1

<u>Summary of Results</u>: *There were no wildland fires on the INL Site in 2022. Post-fire recovery plans developed for four of the 2020 fires and for the 2019 Sheep Fire continue to be implemented. Post-fire ecological recovery actions include noxious weed control, cheatgrass monitoring and treatment, and sagebrush restoration.*

Introduction

The threat level of wildland fire was ranked as high in the CCA (DOE and USFWS 2014) and wildland fire is one of the top threats to sage-grouse (Federal Register 2010), especially in the western portion of their range (Brooks et al. 2015). Based on the analysis of the threat of wildland fire to sage-grouse, a conservation measure was developed for inclusion in the CCA that stated an assessment evaluating the need for post-fire restoration would be prepared and DOE would guide an approach for hastening sagebrush reestablishment on fires larger than 40 ha (99 ac). This conservation measure was recently updated to emphasize a more holistic approach to wildland fire recovery (see Section 6.3). In addition to sagebrush restoration, post-fire recovery objectives now include soil stabilization, cheatgrass and noxious weed control, and maintaining a healthy herbaceous understory.

After the CCA was signed, the INL Site did not experience any wildland fires meeting the conservation measure criteria for nearly five years, but several larger fires burned in 2019 and 2020. Post-fire recovery plans were developed for four of the wildland fires that burned in 2020 and for the 2019 Sheep Fire. This section of the report contains a summary of the active fire recovery plans, ongoing restoration actions, and initial monitoring results for the past five years and a summary of activity for older wildland fires with any ongoing recovery treatments.

2020 Fires

In 2020, there were two small wildland fires (<1,000 m^2 or 0.25 ac) and five wildland fires ranging in size from 11 ha (27 ac) to 678 ha (1,675 ac) on the INL Site. The Wildland Fire Management Committee requested an ecological assessment and fire recovery plan for four of the fires: the Howe Peak Fire, the Telegraph Fire, the Cinder Butte Fire, and the Lost River Fire. An ecological resources post-fire recovery plan was completed for the four fires (Forman et al. 2021), which included an assessment of the ecological resources impacted by the fires and addressed four primary recovery objects. The plan also included several options for meeting recovery objectives and a phased implementation approach based on restoration priorities and available funding.

Under approved emergency stabilization actions listed in the existing Wildland Fire EA (DOE 2003), the INL completed several activities during the fall of 2020, including recontouring containment lines on the fires where they were used, reseeding containment lines with native grass seed, and spraying noxious weeds, especially in disturbed soils on and around containment lines. Upon completion and review of the ecological resource recovery plan, additional recovery actions that were prioritized by INL's Wildland Fire Management Committee included: monitoring temporary fire suppression access roads for natural recovery, signing and replanting those roads if necessary, ongoing noxious weed inventory and treatment, and sagebrush restoration. Specifically, rush skeletonweed (*Chondrilla juncea*), musk thistle (*Carduus nutans*), Canada thistle (*Cirsium arvense*), black henbane (*Hyoscyamus niger*), Russian knapweed

(*Acroptilon repens*), and spotted knapweed (*Centaurea stoebe*) were treated on the Howe Peak Fire, Telegraph Fire, and Lost River Fire via vehicle-mounted tank and backpack sprayers by certified applicators using appropriate chemicals according to label instructions. Additionally, sagebrush restoration was recommended on the Telegraph Fire because the area was used extensively by collared sage-grouse pre-fire (BLM unpublished data), restoration would improve habitat value in proximity to an active lek, and it would provide some habitat connectivity across the burned area. A total of 41,300 sagebrush seedlings were planted in the Telegraph Fire in October 2022.

2019 Fires

In 2019, the Sheep Fire burned more than 40,000 ha (98,842 ac) on the INL Site and the Sheep Fire Ecological Resources Post-Fire Recovery Plan (Forman et al. 2020) was completed to facilitate restoration planning. Soil stabilization activities were completed on the Sheep Fire containment lines in 2020 and the Wildland Fire Management Committee prioritized restoration/treatment actions within two post-fire recovery objectives: noxious weed/cheatgrass control and big sagebrush habitat restoration.

Noxious weed treatment continued throughout the Sheep Fire footprint in 2022 and will remain a focus over the next several years. In 2022, rush skeletonweed and musk thistle were the two most frequently encountered noxious weeds. They were sprayed along roadsides with a vehicle-mounted tank and in the backcountry using backpack sprayers. Though restrictions on off-road travel prevented applying chemical throughout the entire prioritized cheatgrass treatment area with a vehicle, Facilities and Site Services sprayed Indaziflam (Esplanade SC©) to high priority cheatgrass treatment areas in September 2021 using a truck-mounted tank and boom. The application was completed along sections of two-track roads in a swath extending 20 feet on each side of the road for a total of 8 km (5 mi), resulting in 9.7 ha (24.0 ac) treated. Sufficient area was treated to test the use of the chemical and application methodology and evaluate their efficacy in coming years.

In the winter of 2019/2020, DOE worked with stakeholders to aerially seed 10,100 ha (25,000 ac) of the Sheep Fire within and adjacent to the SGCA. Unfortunately, monitoring efforts in 2020 and 2021 found no seedlings that could be attributed to aerial seeding. The Sheep Fire Ecological Resources Post-Fire Recovery Plan suggested replanting areas where seed did not establish with sagebrush seedlings and that seedlings should be placed strategically where they can provide the greatest benefit toward hastening the return of sagebrush habitat. Six areas were identified as a high priority for sagebrush seedling planting in the Sheep Fire. The proposed planting sites were selected based on CCA priority restoration areas, logistics and access, ecological condition of the recovering herbaceous plant community, and agency stakeholder input (Kramer et al. 2021). Local sagebrush seed was collected in the fall of 2020 and in 2021 and it was delivered to a greenhouse to grow seedlings. A total of 45,000 seedlings were planted in the Sheep Fire burned area in October 2021 and another 45,000 were planted in October 2022 (see Section 5.2.2).

Pre-2018 – Older Fires

There is ongoing treatment activity on several older wildland fires for which recovery plans were not written or have expired. Noxious weeds continue to be treated and monitored across the INL Site, and previously burned areas are prioritized because areas lacking sagebrush tend to be less resilient to weed invasion. Occasionally, sagebrush is planted in areas that burned more than five years ago to continue reducing recovery time in those areas. For example, in 2021, sagebrush was planted in the 2010 Jefferson Fire as part of a collaborative partnership with Idaho Department of Fish and Game (IDFG) and Pheasants Forever to improve sage-grouse wintering habitat. In 2022, approximately 12,000 sagebrush seedlings were purchased as compensatory mitigation for construction of the Raghorn powerline. These seedlings were planted in October of 2022 in an area between East Butte and Middle Butte that burned in the 2007 Twin Buttes Fire and partially burned again in the 2010 Middle Butte Fire. This area was selected for compensatory mitigation because it is in the SGCA and there were active sage-grouse leks nearby prior to these wildland fires.

Programmatic Changes to Improve Fire Suppression and Ecological Recovery

Emergency wildland fire response and associated soil stabilization actions are addressed in the INL Wildland Fire EA (DOE 2003). Because of changes in fire frequency and land cover over the past twenty years, many of the fuels management and post-fire recovery actions currently under consideration for the INL Site were not evaluated in the 2003 EA. Therefore, the INL has identified the need to update their fuels management, fire suppression, and wildland fire recovery approach and associated NEPA evaluation. The INL Fire Department is updating the current fuels management and fire suppression plan and the NRG is drafting a new post-fire recovery framework. Combined, these documents will facilitate a more comprehensive and efficient planning and response effort for fuels management, fire suppression, and post-fire restoration in the future. With respect to wildland fire recovery specifically, a comprehensive ecological recovery framework that has been evaluated through the NEPA process will substantially improve the restoration treatment options available and the timeliness of implementing them.

5.2.2 Sagebrush Seedling Planting for Habitat Restoration—Conservation Measure 1 and 2

Summary of Results: *INL managed the planting of 100,000 sagebrush seedlings in fall of 2022 in areas prioritized for restoration. Survivorship of seedlings planted in 2021 was approximately 13 percent. Survivorship of seedlings planted in 2017 was approximately 56 percent.*

Introduction

The objective of Conservation Measure 1 is to minimize the impact of habitat loss due to wildland fire and firefighting activities and the objective for Conservation Measure 2 is to minimize the impact of habitat loss due to infrastructure development and disturbance (Section 5.1). DOE began planting sagebrush seedlings in 2015. Since then, sagebrush plantings have gotten larger as more stakeholders have turned their attention and funding toward sagebrush habitat restoration. Sagebrush planting efforts include strategically planting within older burned areas, planting to address wildland fire recovery objectives, and planting for compensatory mitigation. The intent of these sagebrush planting efforts is not to plant sagebrush at densities that typify sage-grouse habitat, but rather to establish sagebrush seed sources over larger priority areas to shorten the time interval between a fire and the reestablishment of sagebrush habitat.

Results and Discussion

During the fall of 2022, 100,000 sagebrush seedlings were planted across three different areas initiating sagebrush restoration of approximately 391.6 ha (967.7 ac; Figure 5-1). Of the sagebrush seedlings planted in 2022, 45,000 seedlings were planted to address the 2019 Sheep Fire sagebrush habitat restoration objectives, 41,300 seedlings were planted in the Telegraph Fire to address the 2020 wildland fires habitat restoration objectives, and 13,700 seedlings were planted in footprint of the 2007 and 2010 Twin and Middle Butte Fires. These seedlings were planted to address compensatory mitigation due to infrastructure development on the INL Site. The locations of at least 500 seedlings were marked at each area for future monitoring of survival.

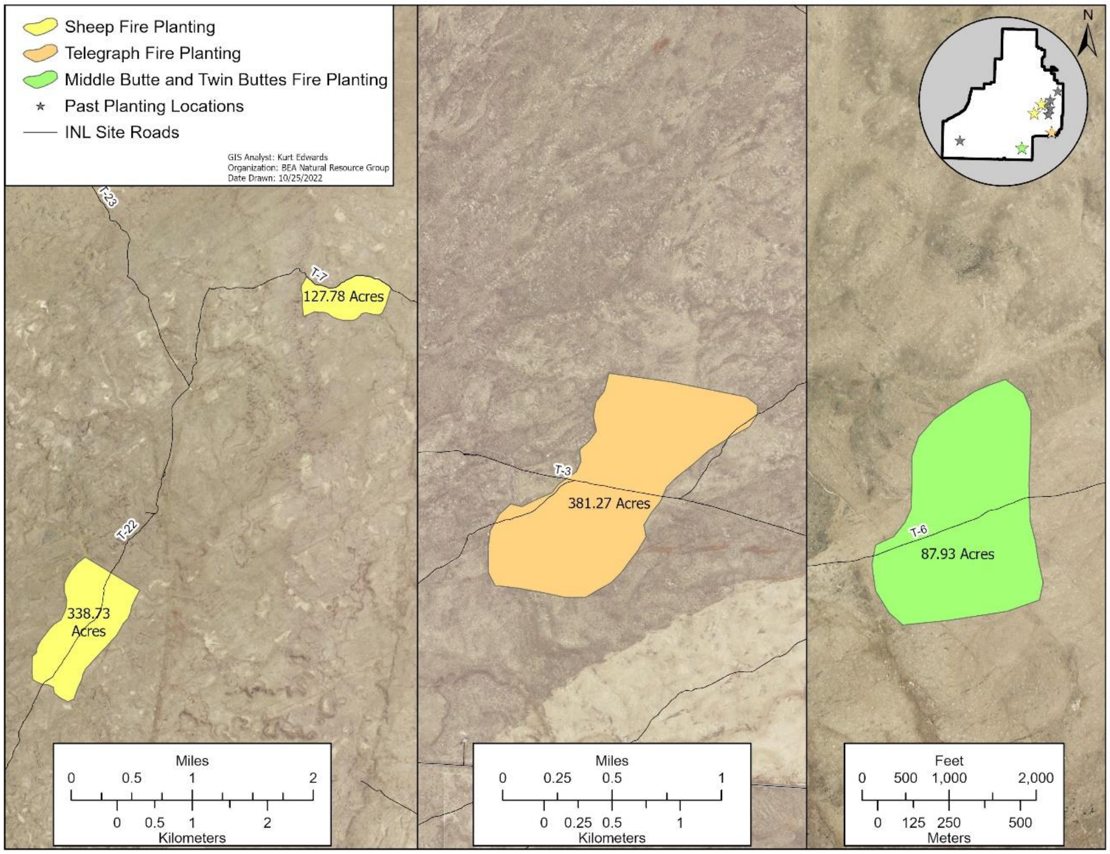

Figure 5-1. Areas planted with big sagebrush (*Artemisia tridentata)* seedlings in 2022 with reference to previous years plantings on the Idaho National Laboratory Site.

Survivorship surveys of the INL-funded seedlings planted in 2021 found 25 seedlings to be healthy, 4 stressed, 10 dead, and 461 were missing. Survivorship surveys of the IDFG-funded seedlings planted in 2021 found 123 seedlings to be healthy, 8 stressed, 2 dead, and 354 were missing. Assuming the missing seedlings were dead, approximately 13.3% of all seedlings planted in 2021 survived the first year. This result is higher than the 2019 and 2020 plantings, but remains much lower than plantings between 2015 and 2018 (Figure 5-2).

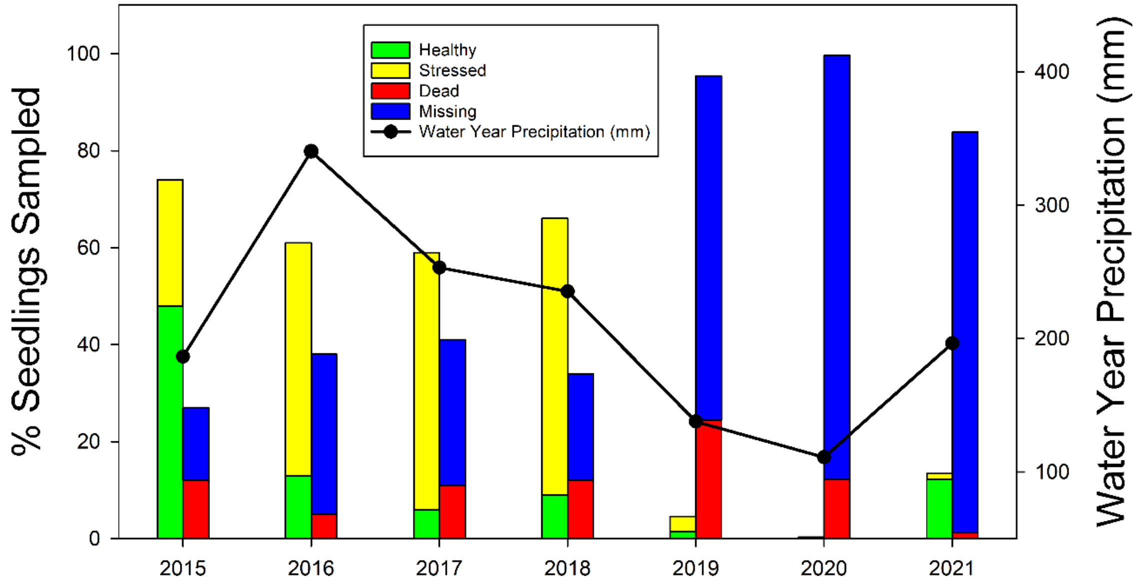

Figure 5-2. Sagebrush seedling survivorship one year after planting on the Idaho National Laboratory Site. Seedlings planted in 2015 and 2016 were within the Tin Cup Fire boundary, seedlings planted in 2017 through 2020 were planted within the Jefferson Fire boundary, and seedlings planted in 2021 were within the Jefferson Fire and the Sheep Fire boundaries. The yellow and green bar represents the observed living seedlings. The blue and red bar represents seedlings presumed to be dead. The black dots indicate the total water year precipitation. Water year is calculated as precipitation received in October of the planting year to September of the following year.

Low seedling survivorship could be due to many variables, but it appears that sustained deviations in both precipitation timing and lower-than-average accumulation are likely contributing factors to the past three years of low seedling survivorship. It is unfortunate that the 2019, 2020, and 2021 plantings have deviated from a trend of successful plantings, but it can provide an opportunity to better inform the planting process and allow us to explore new techniques or approaches to increase the success of future planting efforts.

To evaluate 5-year survivorship, 500 seedlings planted in the fall of 2017 were revisited in the fall of 2022. Two hundred eighty seedlings were found. Of these, 268 were healthy and 12 were stressed. This means 56% of the marked seedlings have survived. The one year results of the 2017 planting found that 59% (n=597) of the seedlings had survived to the fall of 2018 (Shurtliff et al. 2018), so most of the seedlings that survived one year survived five years.

Since 2015, sagebrush seedling planting on the INL has now been completed on 988.7 ha (2,443.1 ac). Over the past eight years, a total of 255,750 seedlings have been planted from multiple funding sources, including DOE, BEA, the Idaho Governor's Office of Species Conservation, and IDFG.

INTENTIONALLY BLANK

6. SYNTHESIS AND ADAPTIVE MANAGEMENT

6.1 Trends and Threats in a Regional Context

Trends in annual sage-grouse counts on INL baseline leks and lek routes have loosely mirrored results from state-wide lek counts since 2013. Both State and INL counts increased to a peak in 2016, then declined annually for several consecutive years. State-wide counts reached a low point in 2019, but in the past two years (2020-2022) they increased 27% (Kemner 2022). Similarly, INL counts declined through 2020, but in 2022 they increased (baseline leks were up 8% and lek routes were up 24% compared to 2021). Despite the recent increase, the three-year running average on the INL Site continued its multi-year decline, tripping the population trigger. This outcome was not surprising because three of four BLM Habitat Management Areas (HMAs) for sage-grouse that overlap the INL Site (Mountain Valleys Priority, Desert Priority and Desert Important areas [Figure 6-1]) tripped IDFG hard triggers in 2018 or 2019 (Governor's Sage-grouse Task Force 2012, Kemner 2022).

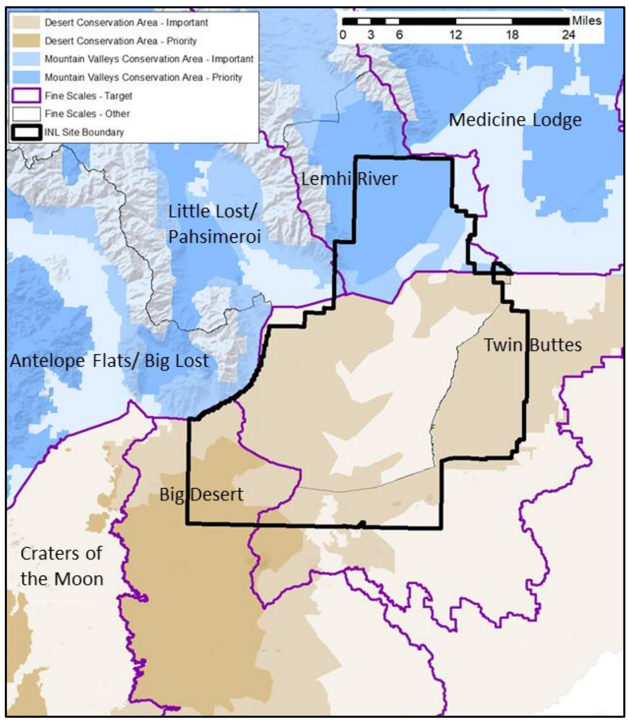

Figure 6-1. Regional BLM Habitat Management Areas (HMA) for Sage-grouse. Fine-scale areas within each HMA are identified, and those that were experiencing substantial population declines when a causal factor analysis was performed are outlined in purple. Figure was adapted from Ellsworth et al. (2019) using data provided by Bonnie Claridge, Idaho BLM, in January 2021.

An inter-agency Idaho Adaptive Management Team (AMT) completed a preliminary causal factor analysis for HMAs that tripped adaptive management triggers in 2018 and 2019 (Ellsworth et al. 2019). The analysis was a multi-step process wherein the AMT analyzed vegetation transect data, fire history, and raven occurrence probability for fine-scale areas within each HMA (Figure 6-1). They also held multi-agency meetings with local biologists to explore possible causes of sage-grouse population declines. In the Twin Buttes fine-scale area, which encompasses much of the INL Site and stretches from the western edge of the Sand Creek area north of Rexburg to the Big Desert area, the AMT determined that repeated wildfires were the most significant issue for sage-grouse. In the adjacent Big Desert fine-scale area, sagebrush cover was lower than in all other fine-scale areas examined, and the AMT concluded that this lack of cover was "certainly" due to the impacts of wildfire. For the Lemhi River fine-scale area, which includes the Lower Birch Creek lek route on the INL Site (Figure 2-1), the ATM was unable to identify specific issues related to population decline. They noted, however, that population declines in the fine-scale area were limited to northern lek routes, which are or are not on or near the INL Site.

Monitoring results from the INL Site presented in this and previous CCA reports largely support the findings of the AMT. Large tracts of sagebrush-dominant plant communities have been lost to wildfire over the past 30 years in the portion of the INL Site that falls within the Twin Buttes fine-scale area, and in none has sagebrush recovered sufficiently to reclassify the burned area as sage-grouse habitat. Cheatgrass increasingly exacerbates the wildfire threat in much of the western portion of the sage-grouse range (Balch et al. 2013); however, on the INL Site, only 4% of the landscape is dominated by cheatgrass. Fortunately, a cheatgrass-driven fire cycle is not yet prevalent, but the need is urgent to reduce the spread of cheatgrass as much as possible, especially following a fire. This understanding has prompted DOE to pursue options for treating cheatgrass and other weeds within recent fire scars and to continue to work with partners to restore sagebrush habitat in areas strategically selected to maximize benefits to sage-grouse.

No fires have been documented in the northern portion of the INL Site since record keeping began in 1994, and like the AMT, we lack evidence to explain why the Lower Birch Creek route in that area has declined. When the causal factor report was produced, males per lek surveyed on the Lower Birch Creek route was above the 22-year median (2019 = 9.4 MPLS; median = 8.6 MPLS). Since then, MPLS has dropped to 5.0 and was lower in 2021 and 2022 than in all but two of the past 25 years. Meaningful analysis is limited because there is only one lek route in the area, but it is unlikely that livestock grazing on the INL Site is having a substantial effect (Shurtliff et al. 2017, INL 2023) and the availability of infrastructure for raven nesting near sage-grouse breeding areas is limited in the northern part of the INL Site (Figure 4-3). Furthermore, there have been no new DOE projects or activities in the area in recent years.

When DOE and USFWS begin discussions about how to proceed now that the population trigger has tripped, it may be useful to consider that monitoring of likely threats to sage-grouse and its habitats over the past 10 years has produced no evidence suggesting that a specific threat has disproportionately affected sage-grouse abundance on the INL Site. Collectively, these threats could be suppressing survivorship or reproductive success, but if they are, the effects on abundance are likely similar to those at the regional and state level. In addition, portions of the INL Site provide important wintering, breeding, and early brood-rearing habitat, but most sage-grouse leave the INL Site during the summer (Whiting et al. 2014) where they may be affected by influences outside the control of DOE.

The CCA and resulting relationship between DOE and USFWS have helped DOE and its contractors take proactive, focused measures to conserve sage-grouse while still pursuing its mission. The agreement and conservation measures therein have also been the impetus for strengthening relationships with natural resource partners to collaborate on projects relevant to sage-grouse. For example, during the past eight years, DOE has worked regularly with partners to restore sagebrush and treat weeds. DOE regularly shares habitat data with BLM when allotments are reassessed, and BLM invites NRG ecologists to participate in grazing allotment assessments on the INL Site. Procedures have been implemented to prohibit human disturbance at leks from people and equipment. A mechanism has been created that allows projects to pay a compensatory mitigation fee when they remove sagebrush so seedlings can be planted in strategic locations to maximize benefits to sage-grouse. There are, of course, weaknesses and shortcomings in the CCA, but improvements have been adopted (for example, see Section 6.3) as local monitoring results, evolving scientific understanding, and changing circumstances necessitate. One emerging challenge is that the CCA does not adequately address potential impacts of some of the projects being considered because these projects are substantially different from those envisioned when the CCA was being developed nearly a decade ago.

6.2 Proposed Changes to the CCA

The USFWS recently recommended that DOE consider revising the CCA to maintain its alignment with an upcoming BLM Land Use Plan amendment. A revision would be timely because projects and circumstances on the INL Site are expanding beyond the initial considerations of the CCA. Furthermore, the CCA has been in effect over eight years, during which time numerous changes have been adopted. These changes are documented in Section 6 of each annual CCA report, but there is no mechanism for updating the CCA document that is available to contractors, and therefore it is difficult for them to maintain awareness of all amendments.

6.3 Adopted Changes

During the annual CCA stakeholders meeting held February 24, 2022, in Idaho Falls, DOE proposed and the USFWS agreed to make the following changes to the CCA.

1. Update the Habitat Trigger Baseline—the original baseline area for the sage-grouse habitat trigger was generated from a vegetation map completed in 2011 (Shive et al. 2011). There were a few reasons that justified updating the 2011 INL Site vegetation map; consequently, a new vegetation classification and map was published in 2019 (Shive et al. 2019). The new map eliminated two-class map complexes by increasing the mapping scale which resulted in a more accurate distribution of sagebrush-dominated map classes. Therefore, beginning with the current report, the habitat trigger and analysis of sagebrush loss due to wildfire and infrastructure development is based on the most accurate and current vegetation data available (see Section 3.2.2).

2. Update Conservation Measure 1—Conservation Measure 1 was developed to address the wildland fire threat. In the CCA, it reads,

    > "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)."

    The original language of this measure specifies treatments to hasten *sagebrush* reestablishment. However, recent INL fire recovery plans (Forman et al. 2020, 2021) and comparable stakeholder agency fire recovery plans describe a more holistic approach to wildland fire recovery. Recent plans and a new fire recovery framework identify four objectives that include soil stabilization, cheatgrass and noxious weed control, and maintaining a healthy herbaceous understory in addition to sagebrush restoration. Therefore, DOE and USFWS revised Conservation Measure 1 as follows (new language in bold font):

    > "Prepare an assessment for the need to restore the burned area. Based on that assessment, DOE would **evaluate and prioritize treatment options to meet habitat recovery objectives** in burned areas and reduce the impact of wildland fires >40 ha (99 acres). **Primary habitat recovery objectives include soil stabilization, cheatgrass and noxious weed control, maintaining a healthy herbaceous understory, and sagebrush restoration.**"

3. Identify Priority Areas for Sagebrush Habitat Restoration Using Updated Criteria—Priority restoration areas (PRAs) were recalculated to expand the potential area for planting sagebrush. When PRAs were originally identified, only active sage-grouse leks were incorporated into the analysis. However, the distribution of active leks changes over time and some of the leks active in 2011 are currently inactive. Assuming lek status will continue to change and inactive leks

could once again become active, especially if sagebrush returns to the area, we used all 124 lek locations regardless of current activity status. We also used vegetation data from the most recent vegetation map (Shive et al. 2019) to identify areas that could return to sagebrush habitat in the future (i.e., green rabbitbrush shrublands and native perennial grasslands). The new set of PRAs expands the total area and distribution of potential sagebrush planting area, but it is also important to note that additional criteria will be considered during the restoration area site selection process (e.g., lek persistence and density, likelihood of success, and accessibility).

4. <u>Update Conservation Measure 9</u>—Conservation Measure 9 was designed to reduce threats to sage-grouse habitat from landfills and borrow sources. The measure currently reads:

   > "Ensure that no net loss of sagebrush habitat occurs due to new borrow pit or landfill development."

   To achieve this measure, the CCA outlined three actions DOE would take, the third of which is: "ensure adequate weed control measures are implemented throughout the life of an active borrow source or landfill."

   As currently written, any expansion of a borrow source or landfill that removes sagebrush would result in a measurable loss, which would affect the habitat trigger if the expansion occurred in the SGCA. If outside the SGCA, the CCA requires that DOE senior management approve the expansion because it would affect the no net loss goal for sagebrush.

   DOE proposed that the language of Conservation Measure 9 and the third supporting action quoted above be changed because neither reflect the current reality on the INL Site. An administrative boundary is maintained around each borrow pit and landfill that pre-dates the CCA. Therefore, if sagebrush is removed within this boundary, the loss would not be counted against the habitat trigger. Although noxious and invasive weed control is listed as a supporting action, DOE desired to emphasize this action by including it in the conservation measure description. Further, a correction is necessary because currently BEA controls weeds in both active and inactive borrow sources. The adapted Conservation Measure and supporting action will now read as follows (new language in bold font):

   > "Ensure that no net loss of sagebrush habitat occurs due to new borrow pit or landfill development **beyond the administrative boundaries. Current and new borrow sources are managed to control noxious and other invasive weed species.**
   >
   > "To achieve Conservation Measure 9, DOE will:"
   >
   > - [bullet 1 remains the same]
   > - [bullet 2 remains the same]
   > - "Ensure adequate weed control measures are implemented throughout the life of **a** ~~an active~~ borrow source or landfill."

7. LITERATURE CITED

Balch, J. K., B. A. Bradley, C. M. D'Antonio, and J. Gómez-Dans. 2013. "Introduced annual grass increases regional fire activity across the arid western USA (1980–2009)." *Global Change Biology* 19:173-183.

Blew, R. D., and A. D. Forman. 2010. "Tin Cup Fire Recovery Report." STOLLER-ESER-143, Environmental Surveillance, Education, and Research Program, Gonzales-Stoller Surveillance, LLC, Idaho Falls, ID. GSS-ESER-143.

Brooks, M. L., J. R. Matchett, D. J. Shinneman, and P. S. Coates. 2015. Fire patterns in the range of greater sage-grouse, 1984–2013—Implications for conservation and management: U.S. Geological Survey Open-File Report 2015-1167, 66 p. http://dx.doi.org/10.3133/ofr20151167.

DOE. 2003. "Idaho National Engineering and Environmental Laboratory Wildland Fire Management Environmental Assessment." DOE-EA-1372. Idaho National Laboratory, Idaho Falls, ID

DOE and USFWS. 2014. "Candidate conservation agreement for greater sage-grouse (*Centrocercus urophasianus*) on the Idaho National Laboratory Site." DOE/ID-11514, U.S. Department of Energy Idaho Operations Office, Idaho Falls, Idaho. https://idahoeser.inl.gov/Wildlife/PDF/CCA_2014.pdf.

Ellsworth, E., A. Moser, and K. Lubetkin. 2019. Preliminary causal factor analysis of 2018 greater sage-grouse adaptive management triggers. Unpublished report.

Federal Register. 2010. Endangered and threatened wildlife and plants; 12-month findings for petitions to list the greater sage-grouse (*Centrocercus urophasianus)* as threatened or endangered (proposed rule). 23 March.

Forman, A. D. and J. R. Hafla. 2018. "The Idaho National Laboratory Site Long-Term Vegetation Transects: Updates through 2016." Environmental Surveillance, Education, and Research Program, Idaho Falls, ID, VSF-ID-ESER-LAND-003. https://idahoeser.inl.gov/Vegetation/PDF/2016LTVReport.pdf.

Forman, A. D., J. P. Shive, and K. N. Kaser. 2020. "Sheep Fire Ecological Resources Post-Fire Monitoring Report 2020." Environmental Surveillance, Education, and Research Program, Idaho Falls, ID, VSF-ID-ESER-LAND-076. https://idahoeser.inl.gov/Vegetation/PDF/Sheep_Fire_Post_Fire_Plan2020.pdf.

Forman, A. D., C. J. Kramer, S. J. Vilord, and J. P. Shive. 2021. "INL Site 2020 Wildfires Ecological Resources Recovery Plan." Environmental Surveillance, Education, and Research Program, Idaho Falls, ID, VSF-ID-ESER-LAND-092. https://idahoeser.inl.gov/Vegetation/PDF/2020_Fires_Ecological_Resources_Recovery_Plan_Final.pdf.

Governor's Sage-grouse Task Force. 2012. "Federal Alternative of Governor C.L. "Butch" Otter for Greater Sage-grouse Management in Idaho." September 5, 2012, Version.

Harju, S. M., C. V. Olson, J. E. Hess, and B. Bedrosian. 2018. "Common raven movement and space use: influence of anthropogenic subsidies within greater sage-grouse nesting habitat." *Ecosphere* 9:e02348.

Harju, S., C. V. Olson, J. Hess, and S. L. Webb. 2021. "Isotopic analysis reveals landscape patterns in the diet of a subsidized predator, the common raven." *Ecological Solutions and Evidence* 2:e12100.

Howe, K. B., P. S. Coates, and D. J. Delehanty. 2014. "Selection of anthropogenic features and vegetation characteristics by nesting common ravens in the sagebrush ecosystem." *The Condor* 116:35-49.

INL. 2022. "Implementing the Candidate Conservation Agreement for Greater Sage-grouse on the Idaho National Laboratory Site: 2021 Full Report." Idaho National Laboratory, Idaho Falls, ID. INL/RPT-22-65559.

INL. 2023. "Implementing the Candidate Conservation Agreement for Greater Sage-grouse on the Idaho National Laboratory Site: 2022 Full Report." Idaho National Laboratory Environmental, Safety, Health & Quality Organization, Idaho Falls, ID. INL/RPT-23-70807.

Kemner, M. 2022. "2022 Sage-grouse Population Triggers Analysis." Idaho Department of Fish and Game, August 15. https://species.idaho.gov/wp-content/uploads/2022/09/SageGrouse_2022TriggersAnalysis_Final.pdf.

Kramer, C. J., A. D. Forman, J. P. Shive, and S. J. Vilord. 2021. "Sheep Fire: Sagebrush Seedling Planting Plan." Environmental Surveillance, Education, and Research Program, Idaho Falls, ID, VSF-ID-ESER-LAND-090.

Rösner, S. and N. Selva. 2005. "Use of the bait-marking method to estimate the territory size of scavenging birds: a case study on ravens *Corvus corax."* *Wildlife Biology* 11:183-191.

Shive, J. P., A. D. Forman, K. Aho, J. R. Hafla, R. D. Blew, and K. T. Edwards. 2011. "Vegetation Community Classification and Mapping of the Idaho National Laboratory Site." Environmental Surveillance, Education, and Research Program Report, Gonzales-Stoller Surveillance LLC, Idaho Falls, ID, GSS-ESER-144. https://idahoeser.inl.gov/Vegetation/PDF/VegMap2011.pdf.

Shive, J. P., A. D. Forman, A. Bayless-Edwards, K. Aho, K. N. Kaser, J. R. Hafla, and K. T. Edwards. 2019. "Vegetation community classification and mapping of the Idaho National Laboratory Site 2019." Environmental Surveillance, Education, and Research Program, Idaho Falls, ID, VFS-ID-ESER-LAND-064. https://idahoeser.inl.gov/Vegetation/PDF/Sheep_Fire_Post_Fire_Plan2020.pdf.

Shurtliff, Q. R., A. D. Forman, J. P. Shive, J. R. Hafla, K. T. Edwards, and R. D. Blew. 2016. "Implementing the Candidate Conservation Agreement for Greater Sage-Grouse on the Idaho National Laboratory Site: 2015 Full Report." Environmental Surveillance, Education, and Research Program, Gonzales-Stoller Surveillance, LLC, Idaho Falls, ID, GSS-ESER-199. https://idahoeser.inl.gov/Wildlife/PDF/2015%20CCA%20Report_Full_Final_Feb2016.pdf.

Shurtliff, Q. R., J. P. Shive, A. D. Forman, J. R. Hafla, K. T. Edwards, and B. F. Bybee. 2017. "Implementing the Candidate Conservation Agreement for Greater Sage-Grouse on the Idaho National Laboratory Site: 2016 Full Report." Environmental Surveillance, Education, and Research Program, Wastren Advantage, Inc., Idaho Falls, ID. WAI-ESER-206. https://idahoeser.inl.gov/Wildlife/PDF/2016%20CCA%20Report-Full_Final_02-06-2017.pdf.

Shurtliff, Q. R., A. D. Forman, J. R. Hafla, K. N. Kaser, J. P. Shive, K. T. Edwards, and B. F. Bybee. 2018. "Implementing the Candidate Conservation Agreement for Greater Sage-Grouse on the Idaho National Laboratory Site: 2017 Full Report." Environmental Surveillance, Education, and Research Program, Wastren Advantage, Inc., Idaho Falls, ID, WAI-ESER-213. https://idahoeser.inl.gov/Wildlife/PDF/CCAFullReport2017.pdf.

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 Full Report." Environmental Surveillance, Education, and Research Program; Veolia Nuclear Solutions – Federal Services, Idaho Falls, ID,VFS-ID-ESER-

CCA-051. https://idahoeser.inl.gov/Wildlife/PDF/2018%20CCA%20Full%20Report_Final_01-30-2019.pdf.

Shurtliff, Q. R., K. N. Kaser, J. P. Shive, C. J. Kramer, K. T. Edwards, B. F. Bybee, A. D. Forman, and S. J. Vilord. 2021. "Implementing the Candidate Conservation Agreement for greater sage-grouse on the Idaho National Laboratory Site: 2020 Full Report." Environmental Surveillance, Education, and Research Program; Veolia Nuclear Solutions – Federal Services, Idaho Falls, ID, VFS-ID-ESER-CCA-085. https://idahoeser.inl.gov/Wildlife/PDF/2020%20CCA%20Full%20Report_FINAL.pdf.

Šidák, Z. 1967. Rectangular confidence regions for the means of multivariate normal distributions. Journal of the American Statistical Association 62:626-633.

Whiting, J. C., Q. R. Shurtliff, K. B. Howe, and B. F. Bybee. 2014. "Greater sage-grouse monitoring and management on the Idaho National Laboratory Site." Environmental Surveillance, Education, and Research Program Report, Gonzales-Stoller Surveillance, LLC., Idaho Falls, ID,. Stoller-ESER-161. Link

INTENTIONALLY BLANK

APPENDIX A. ACCOMPLISHMENTS IN 2022 FOR EACH CONSERVATION MEASURE

Table A-1. Accomplishments in 2022 for each CCA conservation measure.

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 in 2022: BURN ASSESSMENT—No fires occurred on the INL Site in 2022 (Personal Communication with James Blair, INL Fire Chief 10/03/2022). **Associated Actions that Addressed the Wildland Fire Threat:** WILDLAND FIRE PREPAREDNESS—In order to slow wildland fire and provide for a better defense area, fire breaks/buffers have been created and are routinely maintained around facilities and along the major roadways. In 2022, BEA Facilities and Site Services (F&SS) mowed 6-12 m (20-40 ft) firebreaks along 190 km (118 mi) of roadways and around 27 facilities and other infrastructure. UPDATE THE INL APPROACH TO FULES MANAGEMENT, FIRE SUPRESSION, AND FIRE REOCOVERY—To better address preparedness, response, and recovery from wildland fires, the INL Fire Department is updating an existing plan for fuels management and fire suppression and the NRG is drafting a fire recovery framework for the INL Site. A new EA will evaluate the proposed actions contained in both plans. POST-FIRE ADAPTIVE MANAGEMENT—Areas within the Twin Buttes and Deadman grazing allotments that were burned by the 2019 Sheep Fire, and the 2020 Telegraph and Lost River Fires, were reopened to grazing during the 2022 spring and fall grazing seasons (Personal Communication with Jordan Hennefer, Rangeland Management Specialist, BLM, 11/02/2021). SAGEBRUSH REESTABLISHMENT—INL planted 45,000 seedlings within the 2019 Sheep Fire area and 41,300 seedlings in the 2020 Telegraph Fire to support habitat restoration efforts. Weed control efforts continue in recently burned areas. A subset of sagebrush seedlings planted in 2021 and 2017 were revisited in 2022, and 1-year and 5-year survivorship was assessed (Section 5.2.2).	
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 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.

Table A-1. (continued).

Conservation Measure 2—Implementation of Best Management Practices in 2022: Multiple projects in FY 2022 adopted and implemented best management practices outside facility footprints to minimize the impacts to both seasonal and potential habitats on the INL Site. The following infrastructure projects were designed so that the total distance of habitat edge caused by construction activities was minimized. • Test Area North (TAN)-691 maintenance and vehicle-storage building (Environmental Compliance Permit [ECP] INL-20-035 R3) was sited immediately adjacent to the Specific Manufacturing Capability fence. • The new Power Management Building (ECP INL-21-053) was sited within CFA's administrative boundary adjacent to existing roads and power infrastructure. • The new TAN Utility Corridor (ECP INL-22-009 R1) was sited adjacent to linear disturbances such as power line infrastructure and fences. • The ATR Complex Parking Lot Refurbishment and Expansion project (ECP INL-22-045) was sited within and around the existing ATR parking lot. • The TAN Fire Station Training Pad (ECP INL-22-062) was sited in areas disturbed by the construction of the TAN fire station. • The Consolidated Training Facility at the Live Fire Range Complex (ECP INL-22-078) was sited immediately adjacent to the existing range, roads, and power infrastructure. • The Transient Reactor Test (TREAT) Operation and Maintenance Modular Office Building (ECP INL-22-093) was sited adjacent to existing TREAT infrastructure. The following infrastructure projects were co-located with existing infrastructure and/or were sited in areas dominated by non-native grasses and other exotic species. • The Electric Vehicle Charging Station Installation at CFA (ECP INL-20-018 R1) was placed in previously disturbed areas within the CFA administrative boundary. • Infrastructure associated with the Cyprus Yeti project (ECP INL-21-087 R1) was sited within the previously developed Bode test bed. • The Radiological Response Training Range - New City Landscape Training Pad (ECP INL-21-139) was sited within the previously defined administrative area of the T-28 south borrow pit. • Areas Associated with USG #121 Test (ECP INL-22-022) were sited only in previously disturbed footprints. • The GANNETT project (ECP INL-18-059 R3) was sited in areas dominated by crested wheatgrass. • The PBF-622 and PBF-623 Fiber Optic Cable Installation (ECP INL-18-113 R3) took place in areas already covered by asphalt. • The TREAT upgrade of 721, 721A, and 724 Electrical Distribution System Power Feed project (ECP INL-22-092) sited new infrastructure within existing power infrastructure corridors. Best Management Practices employed by INL Power Management Activities 2022 (ECP INL-21-067 R1) included the installation of avian protection devices where possible. Additionally, the Carbon Free Power Project (CFPP) Site Characterization revision 4 (ECP INL-19-067 R4) installed perch deterrents on their meteorological tower. Nine projects conducted activities during FY 2022 that had the potential to impact sagebrush habitat. Following project activities, an assessment to determine total area impacted will be required, and results will be reported in a future CCA Annual Report, Compensatory Mitigation Section.

Table A-1. (continued).

Conservation Measure 3—Accomplishments in 2022: Two projects initiated infrastructure development within the SGCA in 2022. DOE was consulted on the preferred siting for each location. As required by the CCA, DOE consulted with the USFWS on how to minimize impacts to sage-grouse. The two projects were the USGS Geotechnical Drilling for USGS 153 (ECP INL-22-025) and Water Reactor Researcher Test Facility Test Pad Improvements (ECP INL-21-143).	
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.~~ DISCONTINUED (See Section 6.2.4, Shurtliff et al. [2019]).
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 BLM to seek voluntary commitments from allotment permittees and to add stipulations during the permit renewal process to keep livestock at least 1 km 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 Disturbances in 2022: LEK DISTURBANCE—During the 2022 sage-grouse lek counts, biologists did not observe livestock on any of the leks between March 20 and May 15. **Conservation Measure 6—Accomplishments in 2022:** COMMUNICATION & COLLABORATION—DOE and BLM continued to collaborate on updating their Memorandum of Understanding for management of land currently occupied by the INL Site. DOE and INL supported BLM in initiating restoration of a section of Birch Creek where herbaceous understory has been lost and erosion is a concern, as well as repairing a section of road that has experienced widening by off-road travel. INL and BLM have also collaborated on spraying noxious weeds in infested areas of the INL Site. RANGELAND IMPROVEMENTS—DOE supported a 2019 decision made by BLM to permit installation of an underground pipe to maintain water troughs in the Deadman and Quaking Aspen allotments, and to construct a fence in the Deadman Allotment. An Environmental Assessment (DOI-BLM-ID-I010-2021-0008-EA) for the project has been completed and the legal appeal dismissed by the court. The water distribution portion of the project will allow for a more reliable water source resulting in better livestock distribution and less road traffic. The fencing portion of the project will restrict cattle from entering the Big Lost River channel and culturally sensitive areas (Personal Communication with Jordan Hennefer, Rangeland Management Specialist, BLM, 10/10/2022). Fencing will include high visibility markers and be wildlife friendly.	

Table A-1. (continued).

<table>
<tr><td>Threat:</td><td>Seeded Perennial Grasses</td></tr>
<tr><td>Objective:</td><td>Maintain the integrity of native plant communities by limiting the spread of crested wheatgrass.</td></tr>
<tr><td>Conservation Measure:</td><td>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.</td></tr>
<tr><td colspan="2">Conservation Measure 7—Accomplishments in 2022:
BEA’s NRG assisted projects by recommending a project-specific native perennial seed mix list for revegetation work. It is mandatory that all seed mixes exclude crested wheatgrass seed.</td></tr>
<tr><td>Threat:</td><td>Landfills and Borrow Sources</td></tr>
<tr><td>Objective:</td><td>Minimize the impact of borrow source and landfill activities and development on sage-grouse and sagebrush habitat.</td></tr>
<tr><td>Conservation Measures:</td><td>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:
• avoiding new borrow pit and landfill development in undisturbed sagebrush habitat, especially within the SGCA
• ensuring reclamation plans incorporate appropriate seed mix and seeding technology
• implementing adequate weed control measures throughout the life of an active borrow source or landfill.</td></tr>
<tr><td colspan="2">Conservation Measure 8—Accomplishments in 2022:
INL complied with seasonal and time-of-day restrictions associated with sage-grouse. Per “Idaho National Laboratory Gravel/Borrow Pits (Overarching) Environmental Checklist” (ECP INL-19-155), projects must complete Form 450.AP01, “Gravel/Borrow Source Request Form,” before removing gravel. This form reminds gravel pit users of restrictions in place to protect sage-grouse. Projects must also submit, in writing to Environmental Support and Services personnel, that they complied with the directives in this EC. The borrow sources at Adams Boulevard, Lincoln Boulevard, Monroe Boulevard, Ryegrass Flats, T-12, and T-28 South are covered by this EC.

Conservation Measure 9—Accomplishments in 2022:
No new borrow pits or landfills were opened in 2022. Historically, sage-grouse leks have been observed in three borrow pits: T-12, Adams Blvd., and Ryegrass Flats. The T-12 and Adams Blvd Pits were closed during the spring of 2022; however, source material was removed from the Ryegrass Flats borrow pit after 9 a.m. and before 6 p.m., complying with seasonal restrictions.
Expansion of existing 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 Environmental Assessment (EA) for Silt/Clay Development and Use (DOE-EA-1083). Although no borrow pits were expanded beyond the defined boundary in 2022, an expansion beyond the defined boundary of T-12 pit was proposed by the Subsurface Disposal Area Borrow Source Actions (EC ICP-22-004) located at T-12 pit and Adams Blvd. pit. Any expansion of gravel or borrow pits that would disturb surface soil or vegetation also requires a Cultural Resource Review by the Cultural Resource Management Office and Biological Resources Review by the NRG. INL F&SS personnel assist in the identification of approved footprints.</td></tr>
</table>

Table A-1. (continued).

<table>
<tr><td colspan="2">INL added requirements to programmatic documents to ensure that adequate weed control measures are implemented throughout the life of an active borrow source or landfill.</td></tr>
<tr><td>Threat:</td><td>Raven Predation</td></tr>
<tr><td>Objective:</td><td>Reduce food and nesting subsidies for ravens on the INL Site.</td></tr>
<tr><td>Conservation Measures:</td><td>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.</td></tr>
<tr><td colspan="2">Conservation Measure 10—Accomplishments in 2022:
During 2022, 18 transmission structures on the west loop between CFA and TAN were retrofitted with avian protection devices that preclude nesting. In total avian protection devices, all of which are not relevant to deter raven nesting, has been installed on 28.5% of distribution structures and 9.9% on transmission structures (email communication with Amy Wasia, Power Maintenance, 10/20/2022).
The NRG used empirical evidence to identify raven nesting hot spots on power lines, towers, and at facilities and to prioritize infrastructure for the installation of nest deterrents (Section 4.1). These results will be shared with Power Management and Facilities and Site Services.
Conservation Measure 11: Completed</td></tr>
<tr><td>Threat:</td><td>Human Disturbance</td></tr>
<tr><td>Objective:</td><td>Minimize human disturbance of sage-grouse courtship behavior on leks and nesting females within the SGCA and 1 km (0.6 mi) Lek Buffers.</td></tr>
<tr><td>Conservation Measures:</td><td>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 lb) 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.</td></tr>
<tr><td colspan="2">Conservation Measures 12 and 13—Accomplishments in 2022:
The Carbon Free Power Project site is located within the SGCA. Multiple site characterization activities took place between April 1 and June 30. All activities were approved by DOE following consultation with USFWS on how to mitigate risks to sage-grouse.</td></tr>
</table>

Table A-1. (continued).

All unmanned aerial vehicle flights conducted at the Unmanned Aerial System runway or at the National Security Test Range (NSTR) met all CCA requirements by conducting flights above 305 m (1,000 ft), after 9 a.m. and before 6 p.m., or beyond the 1 km (0.6 mi) sage-grouse active lek buffer distance. All other overflights planned their flight paths to avoid sage-grouse leks and lek buffers.

Detonations of explosives greater than 1,225 kg did not occur at NSTR between 9 p.m. and 9 a.m. from March 15 to May 15.

No meteorological, sound detection and ranging, or other cell towers were erected within 1 km (0.6 mi) of a sage-grouse lek or within the SGCA during 2022.