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Implementing the Candidate Conservation Agreement for Greater Sage-grouse on the Idaho National Laboratory Site: 2024 Summary Report

January 2025

Idaho National Laboratory

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2024 Summary Report

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

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ACRONYMS

BEA	Battelle Energy Alliance
BIL	Bipartisan Infrastructure Law
BLM	Bureau of Land Management
CCA	Candidate Conservation Agreement
CFA	Central Facilities Area
DOE-ID	U.S. Department of Energy, Idaho Operations Office
EA	Environmental Assessment
ECP	Environmental Compliance Permit
IDFG	Idaho Department of Fish and Game
INL	Idaho National Laboratory
LBC	Lower Birch Creek
MFC	Materials and Fuels Complex
NAIP	National Agriculture Imagery Program
NRG	Natural Resources Group
RWMC	Radioactive Waste Management Complex
SGCA	Sage-grouse Conservation Area
USFWS	U.S. Fish and Wildlife Service
WFMC	Wildland Fire Management Committee

1.0 INTRODUCTION

In October 2014, the U.S. Department of Energy Idaho Operations Office (DOE-ID) and the U.S. Fish and Wildlife Service (USFWS) entered into the Candidate Conservation Agreement for Greater Sage-grouse (*Centrocercus urophasianus*) on the Idaho National Laboratory Site (DOE-ID and USFWS 2014). This Candidate Conservation Agreement (CCA) stipulates that DOE-ID submits a report annually to USFWS documenting greater sage-grouse (hereafter, sage-grouse) monitoring and conservation activities that occurred within the preceding 12 months on the Idaho National Laboratory (INL) Site. The current Summary Report satisfies this reporting requirement by highlighting key findings of a comprehensive report (Williams et. al 2025) produced by the Battelle Energy Alliance (BEA) Natural Resources Group (NRG). Comprehensive reports for each year—called CCA Full Reports—can be found under the heading Candidate Conservation Agreement at https://inl.gov/environmental-publications/.

Key findings from 2024 that are summarized in the current report include: (1) a concise description of results from all CCA monitoring tasks performed by the NRG, and (2) actions taken by DOE-ID, INL contractors, and other stakeholders to meet the objectives of conservation measures designed to reduce threats to sage-grouse and its habitats (DOE-ID 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% decrease from the updated 2019 baseline of 72,300 ha (178,656 ac).

Reports of related monitoring tasks described in Section 11.1 of the CCA (DOE-ID and USFWS 2014) are grouped into three sections: Population Monitoring (Section 2), Habitat Monitoring (Section 3), and Threat Monitoring (Section 4). Section 5 summarizes how DOE-ID, contractors, and other stakeholders implemented conservation measures described 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.

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

2.0 POPULATION MONITORING

2.1 Task 1 Lek Counts and Lek Route Surveys

Summary of Results: Peak male attendance on baseline leks for 2024 was 502 males, a 65.1% increase over the 2023 count of 304 males. The three-year running average increased 35.5% to 351 males, exceeding the population trigger threshold by 38.7% (98 males). Peak male attendance on the six lek routes increased 60.3% when compared to 2023 for a total of 500 males. One lek was upgraded to active status in 2024 bringing the total number of known active leks on the INL Site to 35.

2.1.1 Introduction

Lek counts are the primary method used to monitor sage-grouse populations on the INL Site. The leks surveyed each spring include the 27 leks within the SGCA (hereafter 'baseline leks'), lek routes, active leks that are not a baseline lek or part of route, and a subset of rotational inactive leks (Figure 2-1). Counts from baseline leks are used to evaluate the population trends relative to the population trigger (Figure 2-2). The population trigger will trip if the three-year running average of peak male attendance at baseline leks falls below 253, a 20% decrease from the 2011 value of 316. Lek routes are used to evaluate long-term population trends at the INL Site and relate them to regional trends reported by the State of Idaho, while all other lek monitoring activities 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 the baseline leks in 2024 was 502 males—198 (65.1%) more than in 2023 (Figure 2-2). This value is the highest ever recorded on the INL Site since 2011, the baseline year for the population trigger.

The three-year (2022–2024) running average of peak male attendance on baseline leks increased 35.5% to 351 males, exceeding the population trigger threshold of 253 males (Figure 2-2). Surveys of baseline leks accounted for 34.6% (n = 27) of all leks surveyed and 54.3% (n = 19) of active leks in 2024. These leks accounted for 60.5% of the total sage-grouse observed on the INL Site in 2024.

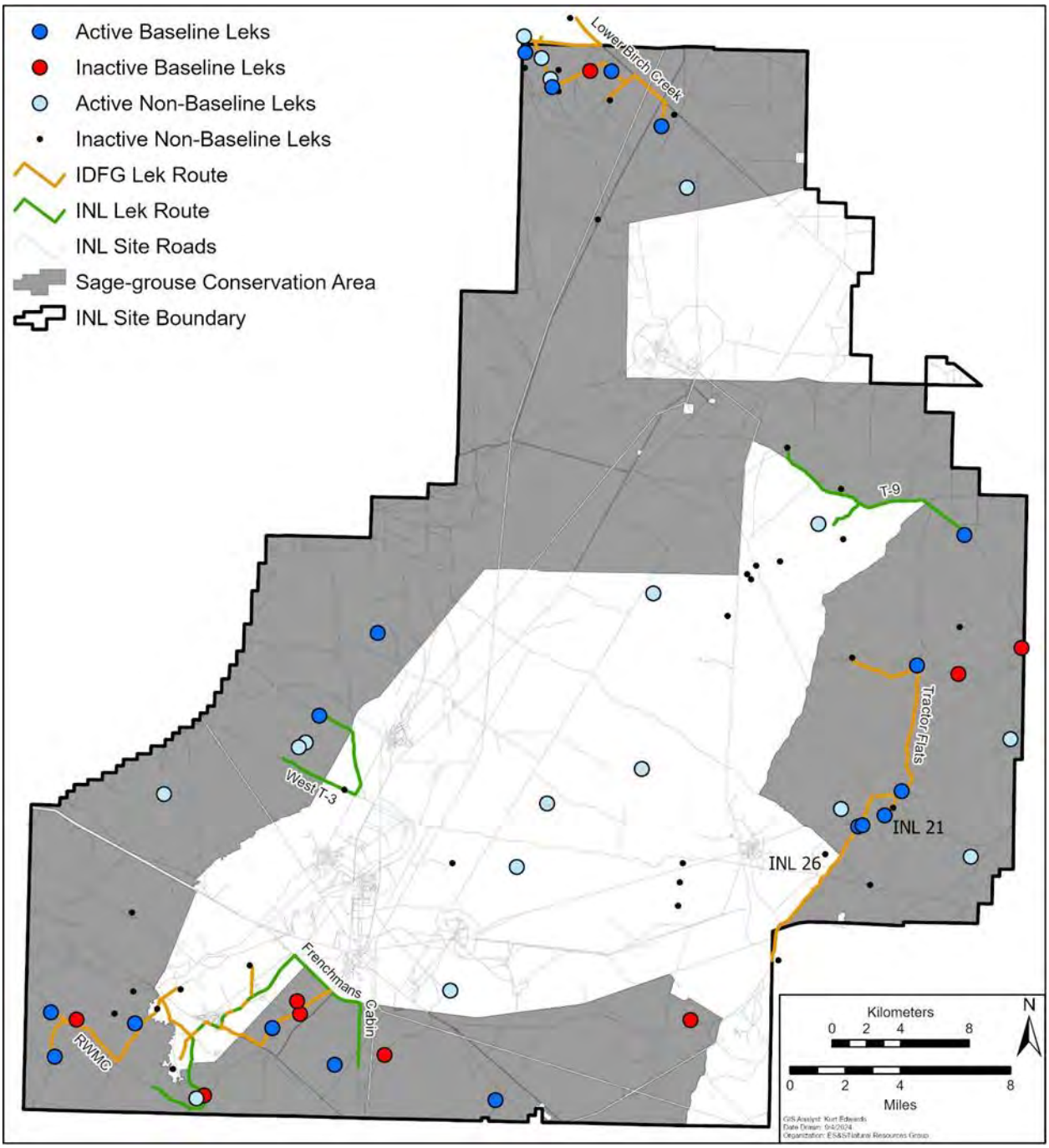

Figure 2-1. Greater sage-grouse (*Centrocercus urophasianus*) leks surveyed on or near the Idaho National Laboratory Site in 2024. Lek activity designations (active vs. inactive) refer to lek status at the end of 2024. Inactive non-baseline leks include inactive leks assigned to lek routes (visited annually) and a subset of other inactive leks visited once every five years (rotational leks).

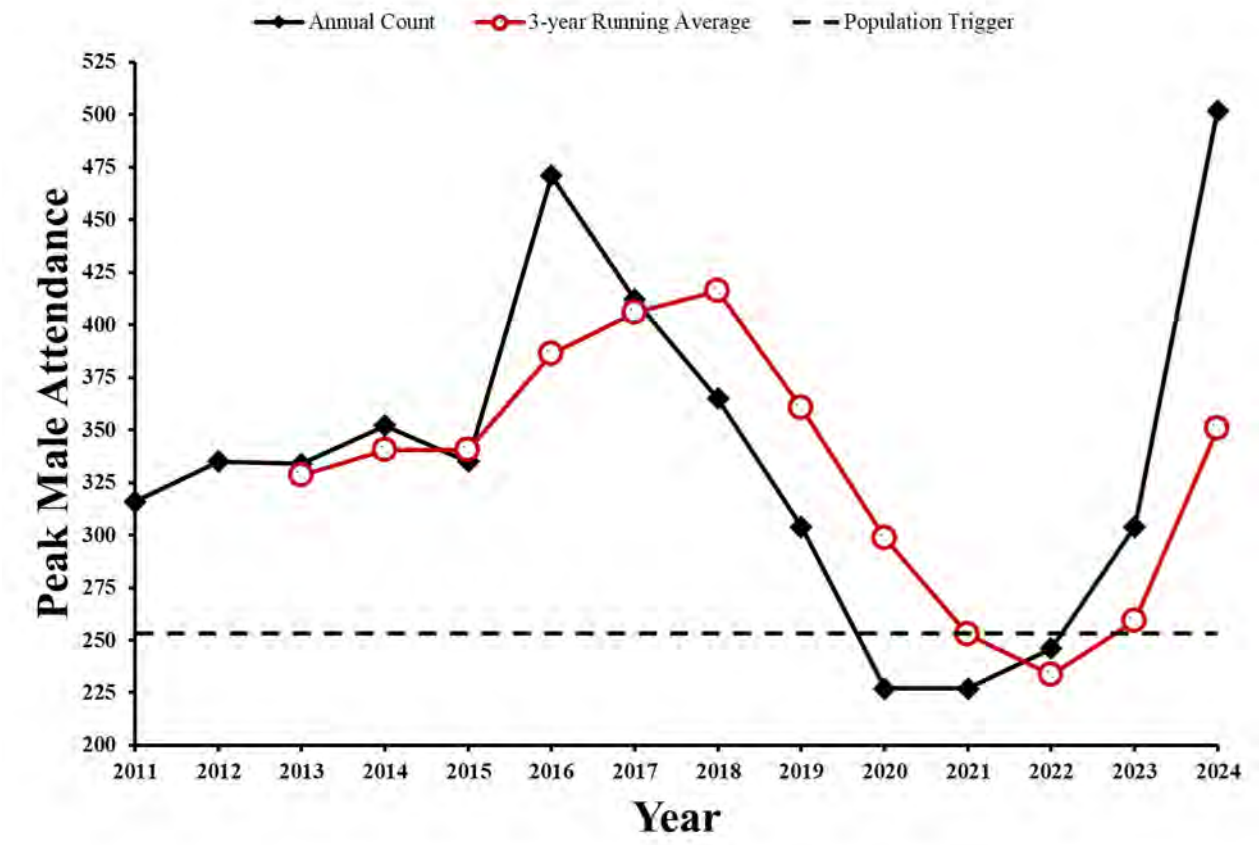

Figure 2-2. Peak male attendance of greater sage-grouse (*Centrocercus urophasianus*) at baseline leks within the Sage-grouse Conservation Area on the Idaho National Laboratory Site from 2011 to 2024.

Lek Routes

The sum of peak male attendance across all routes increased in from 312 males in 2023 to 500 males in 2024. Counts on all routes were higher compared to 2023, with the Tractor Flats, Radioactive Waste Management Complex (RWMC), and West T-3 routes exhibiting the most notable increases of 97.5%, 74.7%, and 165.6%, respectively. In 2024, maximum total male counts on the Tractor Flats and RWMC routes nearly reached or exceeded those from the last sage-grouse population peak in 2016 (Williams et al. 2025, Table 2-1).

The total male count on the Lower Birch Creek (LBC) route in 2024 was 58.6% lower than the 2016 peak and the number of active leks has decreased from seven to four during the same time period. No significant infrastructure or wildfire activity occurred near the LBC route between 2016 and 2024. The entire LBC route lies within the Mountain Valleys Priority Habitat Management Area designated by the State of Idaho in 2015. Idaho did not issue a sage-grouse population report in 2024 but the 2023 report (Kemner 2023) indicated that this management area has tripped a hard population trigger every year since 2018. Therefore, declines on the LBC route likely reflect regional trends in the sage-grouse population for the Mountain Valleys Priority Habitat Management Area and not likely direct impacts from operations on the INL Site.

Rotational Surveys and Changes in Lek Status

In addition to routine surveys of active and inactive baseline and route leks, 21 rotational inactive leks were visited in 2024. These leks were each visited twice, and no sage-grouse were observed except on lek INL 26, which has been vacant since 2006, where two male sage-grouse were observed (Figure 2-1). While this lek is still classified as inactive after the 2024 survey season, any detection of two or more males at the lek within the next four years will upgrade this lek to active status. INL 26 will be added to the 2025 inactive rotational lek list and be visited twice to assess the occupancy of the lek. Nine of the leks visited this season were last visited in 2018; the remaining 12 were visited in 2019. The nine leks that were last visited in 2018 were not visited in 2023 due to weather and time constraints and were added to the 2024 survey effort.

One lek, INL 21, a baseline lek on the Tractor Flats lek route, changed status this season (Figure 2-1). The peak male sage-grouse attendance was four in 2024 and two in 2021, making this lek active; it was last active in 2016. Of the 27 baseline leks, 18 are currently active. There are 35 total leks classified as active, one more than in 2023. However, males were counted on four leks located on the T-9, FC, and RWMC lek routes that were classified as inactive at the beginning of the 2024 season.

Site-wide Population and Survey Effort

The sum of peak male counts for all leks surveyed on the INL Site in 2024 was 829, the highest recorded since 2011. Mean survey effort between 2011 and 2024 was 78.79 leks (range 67–93) with 78 leks surveyed in 2024. The survey effort since 2011 has been sufficient to document the cyclical nature of sage-grouse populations (Figure 2-3) and this pattern mirrors the regional trends reported by the State of Idaho (Kemner 2023). Despite this consistent survey effort and a record high count in 2024, the total number of leks classified as active has steadily declined on the INL Site from a high of 49 in 2013 to a low of 34 in 2023 (Figure 2-3). This decline may be an artifact of a time-lag as inactive leks become active during population peaks or a result of leks becoming inactive after wildfire events and those birds moving to active leks in higher quality habitat.

Conclusion

The three metrics described above are used to comprehensively assess the health of sage-grouse populations present on the INL Site. The three-year running average of the total peak male count from baseline leks is used to evaluate how the current sage-grouse population within the SGCA compares to the baseline population of 2011 as established in the CCA. Using the total peak male count for all leks surveyed provides a broader picture of sage-grouse meta-populations on the INL Site, including for those leks located in less suitable habitat (i.e., habitats recovering from wildland fire events). The total peak male count for all leks surveyed can also be used to evaluate the influence of survey effort on annual counts. Counts from lek routes allow for a more direct comparison between the population on the INL Site and populations across the State of Idaho. This regional context is important when assessing tripped triggers because sage-grouse that occupy the INL Site also use habitats outside of the INL Site boundary. Even though these three metrics inform different facets of population monitoring, all three currently exhibit a similar pattern, indicating that they are tracking the cyclical nature of the sage-grouse population on the INL Site.

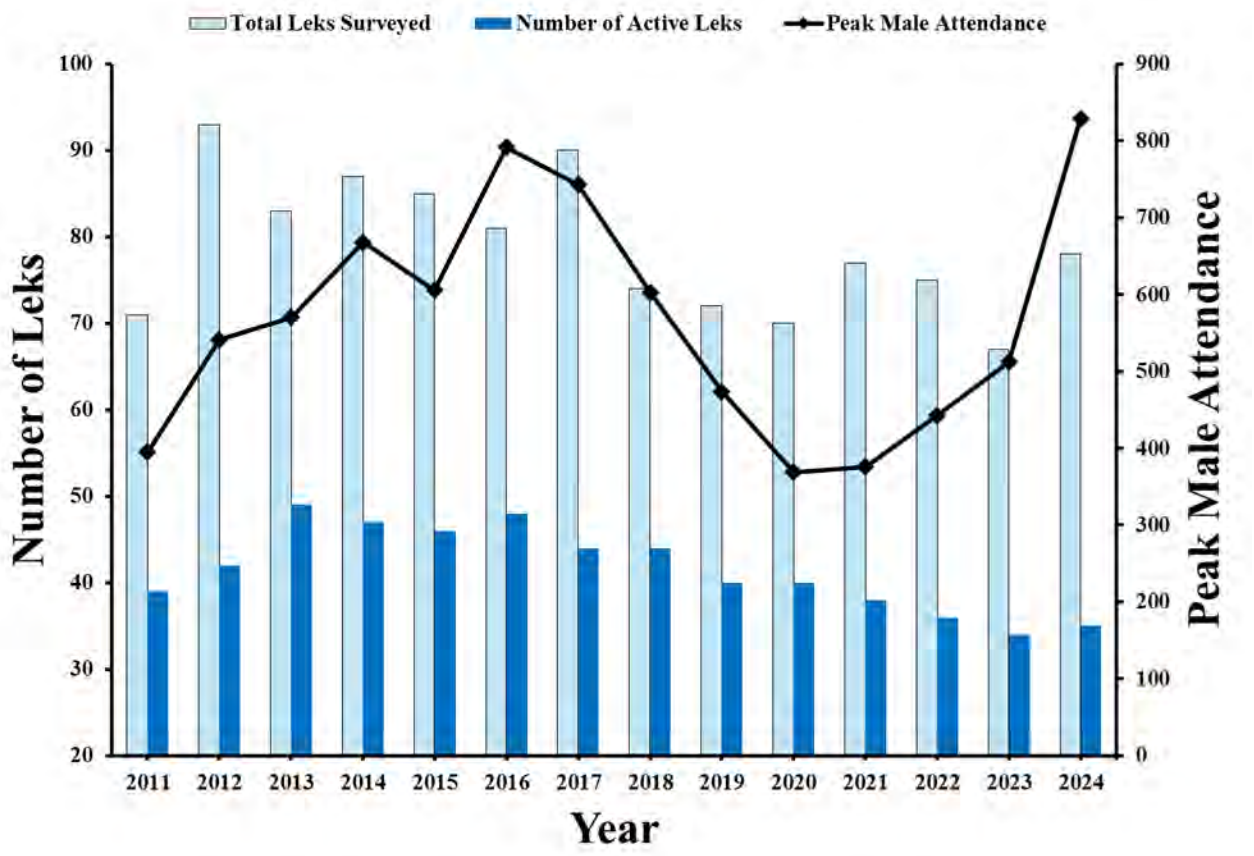

Figure 2-3. Lek survey effort, lek activity status and peak male attendance of greater sage-grouse (*Centrocercus urophasianus*) for all leks surveyed on the Idaho National Laboratory Site from 2011 to 2024. Leks are classified as active if two or more male sage-grouse were observed displaying on the lek in at least two of the previous five years.

3.0 HABITAT MONITORING

Areas designated as sagebrush habitat will change over time based on gradual changes in vegetation composition and abrupt changes caused by disturbances like wildfire. To facilitate annual evaluation of the habitat trigger, two monitoring tasks are used to identify vegetation changes across the landscape and to 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 2024, cover and height of sagebrush and of perennial grasses and forbs were within or above baseline ranges in both sagebrush habitat plots and plots representing recovering habitat. Sagebrush habitat plots were in good ecological condition as evidenced by high native cover values and low cover from introduced functional groups. Recovering habitat plots continued to exhibit increases in sagebrush cover, and although cheatgrass fluctuations are greater in these plots, the abundance of native species appears to be unaffected by cheatgrass.

3.1.1 Introduction

Habitat condition monitoring is an integral component of the CCA because it provides data about the quality of habitat available and informs the adaptive management actions used to conserve habitat important to sage-grouse on the INL Site. This monitoring effort also guides the process used to determine the distribution of sagebrush habitat. Habitat condition monitoring data are collected annually. Habitat quality is determined by 1) an annual habitat condition assessment, 2) the habitat condition trend analyses, and 3) an evaluation of the effects of precipitation on habitat condition. The annual habitat condition assessment compares current habitat condition metrics against INL Site habitat condition baseline ranges (hereafter 'baseline') to determine if current habitat condition metrics are within acceptable ranges of variability. Habitat condition trend analyses are used to evaluate changes in vegetation abundance and composition since 2013. Because precipitation patterns are one of the major drivers of change in semi-arid systems (Anderson and Inouye 2001), precipitation data are summarized and are used to contextualize departures from baseline values and changes in habitat conditions over time.

There are a total of 75 permanent annual monitoring plots distributed across the INL Site (Williams et al. 2025, Figure 5-1), and they are allocated between two habitat types. Vegetation monitoring plots in plant communities dominated by sagebrush species (hereafter, sagebrush habitat plots) represent the existing sagebrush habitat type. Because it is also important to evaluate the condition of recovering habitats in areas where sagebrush species have been lost to wildfire, an additional set of vegetation monitoring plots were established within wildfire footprints (hereafter, recovering habitat plots). Monitoring habitat affected by wildfire helps to better inform land stewardship strategies that facilitate recovery to healthy and productive sagebrush habitat. In previous reports, recovering habitat plots have been referred to as non-sagebrush plots, but this terminology has been updated to more accurately reflect their importance within the larger sagebrush steppe landscape at the INL Site.

The vegetation metrics measured at each plot are absolute cover and height of all vascular plant species, and sagebrush density. Foliar cover is used to estimate plant species abundance, composition, and to facilitate plant functional group trend analysis for habitat quality. Height of plant species is summarized by plant functional group and is used to infer changes in habitat canopies available to sage-grouse. Sagebrush density is used to understand the stability of sagebrush populations.

3.1.2 Results and Discussion

Sagebrush habitat plots are characterized by a dominant woody sagebrush overstory and an herbaceous grass/forb understory (Table 3-1). In 2024, cover for the sagebrush and perennial grass/forb functional groups was above the baseline range, while sagebrush density was well below the baseline range. Dry conditions in late spring and early summer were unfavorable for sagebrush seedling germination events (Figure 3-1), which likely contributed to low sagebrush density values. Native perennial species dominated the understory, and native herbaceous species were six times more abundant than introduced species. Habitat condition trend analyses indicate that the dominance of native plant functional groups and minimal cover from cheatgrass (*Bromus tectorum*) and other non-native species has been consistent throughout the monitoring program (Figure 3-2, Figure 3-3). Cover from native perennial grasses remained above average in 2024 but appears to be returning to within normal ranges of variation. Though total cover has been relatively low throughout the monitoring period, habitat diversity is enhanced by native forbs, which fluctuate and are more abundant during years with average to above average precipitation. These abundance patterns of plant functional groups suggest a healthy plant community that is resistant to dominance by introduced species.

Table 3-1. Average cover, height, and sagebrush density values for sagebrush (n = 43) and recovering (n = 32) habitat plots on the Idaho National Laboratory Site during 2024. Baseline ranges represent five years of vegetation monitoring data (2013–2017) from sagebrush (n = 48) and recovering (n = 27) habitat plots. Colors indicate when the 2024 summary value is greater than (green), less than (red), or within (black) the baseline range of ± 1 Standard Error (SE) around the baseline mean ($\bar{x}$).

	Cover (%)		**Height (cm)**		**Density (individuals/m^2)**	
Sagebrush Habitat	Baseline ($\bar{x}$ ±1 SE)	2024	Baseline ($\bar{x}$ ±1 SE)	2024	Baseline ($\bar{x}$ ±1 SE)	2024
Sagebrush	20.94 – 21.60	25.45	46.83 – 48.79	47.91	3.39 – 6.99	2.96
Perennial Grass/Forb	7.73 – 12.79	14.45	17.03 – 24.37	20.88	— - —	—
Recovering Habitat						
Sagebrush	0.17 – 0.27	1.32	31.60 – 35.48	49.95	0.06 – 0.08	0.16
Perennial Grass/Forb	17.80 – 22.14	20.22	25.96 – 33.58	27.88	— - —	—

Recovering habitats vary in ecological condition due to differences in fire frequency and microsite characteristics. In general, the 2024 annual habitat condition assessment results indicated that recovering habitats were dominated by the herbaceous perennial grass/forb functional group; sagebrush species were a minor component of the plant community, but were well above the baseline ranges for cover, height, and density (Table 3-1). In addition to sagebrush, recovering habitats had a diverse shrub canopy dominated by green rabbitbrush (Williams et al. 2025, Table 3-5). Non-native annuals, especially cheatgrass, are more abundant in recovering plots (Williams et al. 2025, Figure 3-5) than in sagebrush habitat plots (Figure 3-3). However, the vegetative cover from native functional groups remains higher and more stable than introduced functional groups in both habitat types. The dominance by native perennial species and the increases in sagebrush abundance suggest that habitats affected by wildfire continue along a trajectory toward recovery. Introduced annual grasses, like cheatgrass, continue to be a concern in recovering habitats due to substantial fluctuations in their abundance.

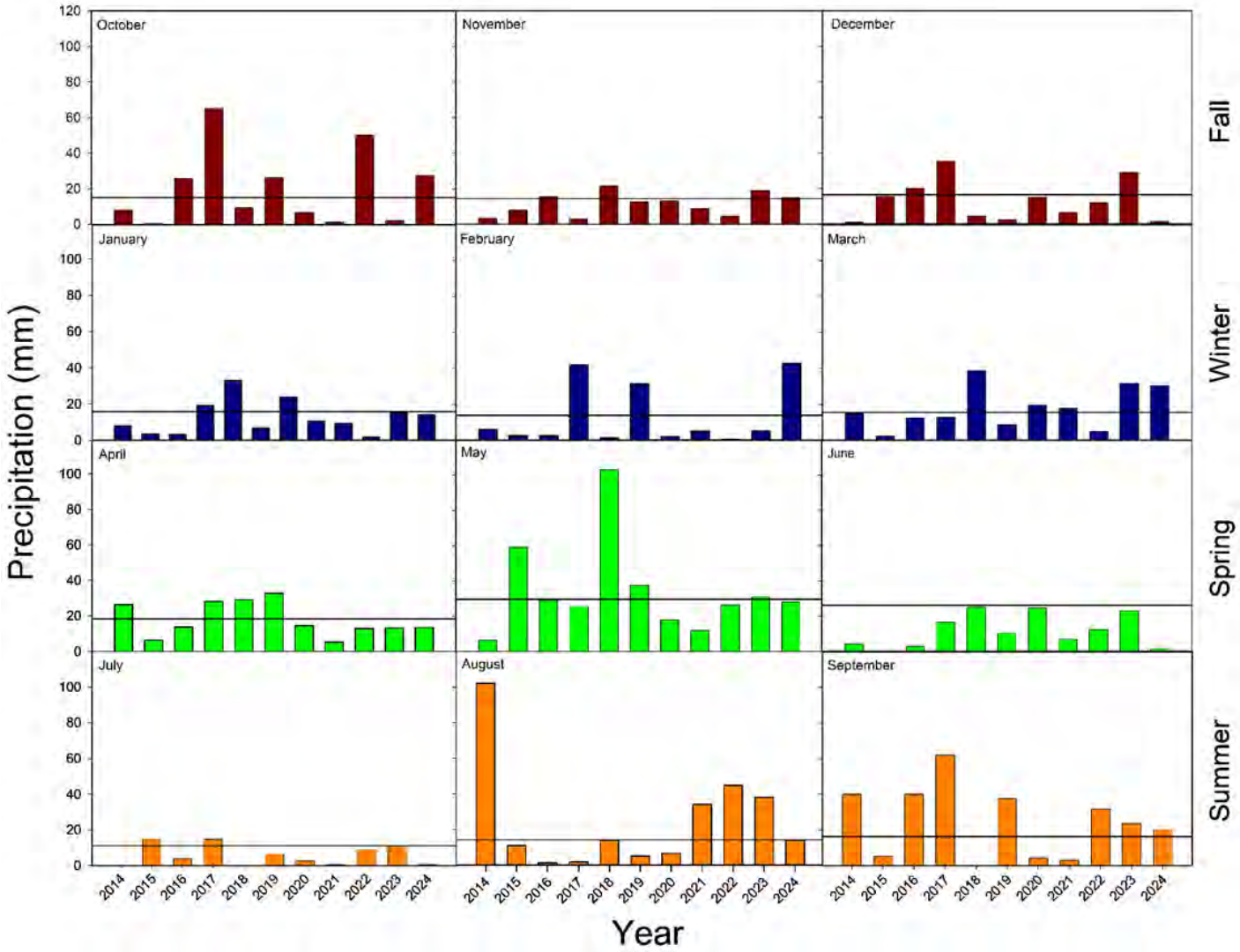

Figure 3-1. Monthly precipitation totals, organized by water-year (October 1–September 30), from 2013 to 2024. Means are depicted with a solid line and were calculated from precipitation data collected between 1951 to 2024. Data are from the Central Facilities Area on the Idaho National Laboratory Site and were provided by the National Oceanic and Atmospheric Administration.

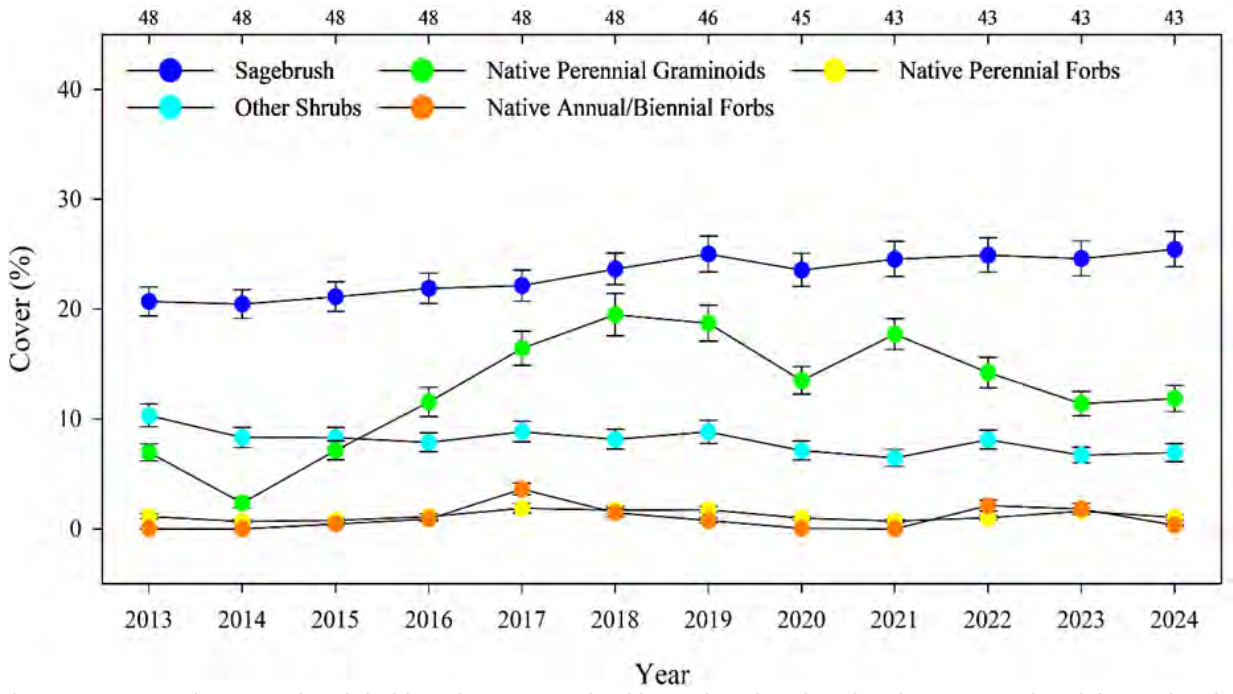

Figure 3-2. Cover from sagebrush habitat plots summarized by native plant functional groups on the Idaho National Laboratory Site from 2013 through 2024. Cover is the absolute mean ($\bar{x}$). Error bars represent ±1 Standard Error (SE). Sample size is denoted along the top at corresponding tick marks.

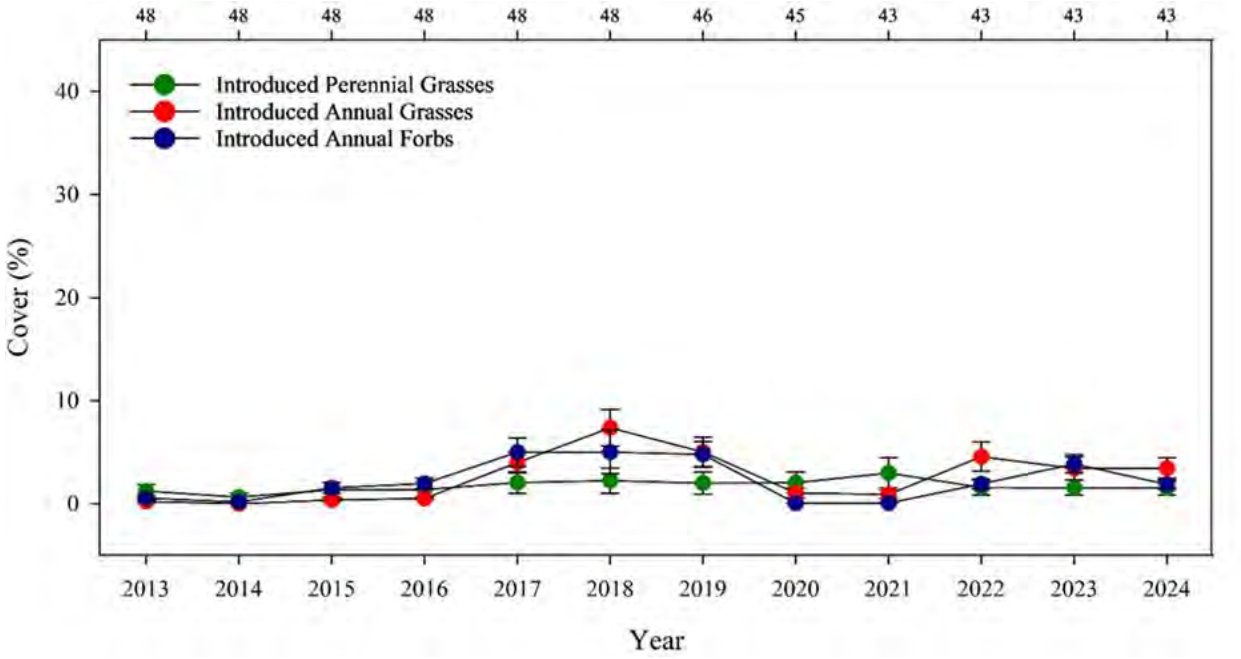

Figure 3-3. Cover from sagebrush habitat plots summarized by introduced plant functional groups on the Idaho National Laboratory Site from 2013 through 2024. Cover is the absolute mean ($\bar{x}$). Error bars represent ±1 Standard Error (SE). Sample size is denoted along the top at corresponding tick marks.

The higher cover values and the amplified fluctuations of cheatgrass in the recovering plots imply that they are less resistant to cheatgrass pressure than the intact sagebrush plots. However, native plant functional group abundance is stable in the recovering plots (Williams et al. 2025, Figure 3-4), suggesting native species abundance is unaffected by fluctuating annual cheatgrass cover. Long-term stability and

seasonal fluctuations of plant functional groups are strongly affected by the amount and timing of precipitation. If late summer and early fall continue to be wetter than spring and early summer, then functional groups that favor late season precipitation, such as non-natives, will continue to gain an advantage. Shifting weather patterns could have potential implications on recovering habitat that are susceptible to weedy species dominance. For these reasons, it is important to monitor long-term trend patterns in both sagebrush and recovering habitats to implement conservation management strategies at the opportune moment and suitable intensity to maintain their ecological integrity (Boyd et al. 2024).

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

Summary of Results: There were five wildland fires that burned on the INL Site in 2024, however, the Dry Channel Fire was the only fire to meet the size criteria for mapping. The Dry Channel Fire and fire suppression activities removed 35.1 ha (86.8 ac) of sagebrush habitat in SGCA. The current estimated area of sagebrush habitat in the SGCA is 71,322.2 ha (176,240.9 ac) representing a 1.4% decrease from the habitat baseline. There was no sagebrush habitat loss from wildland fire outside the SGCA in 2024, although infrastructure expansion (see Section 4.2) was responsible for the removal of 29.4 ha (72.6 ac). The current area of sagebrush habitat outside the SGCA is 28,056.7 ha (69,329.6 ac).

3.2.1 Introduction

This task is intended to provide updates 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 current habitat distribution status with respect to the trigger threshold.

There were two different mapping updates made in 2024 to support this task. First, the existing vegetation map (Shive et al. 2019) was updated to reestablish vegetation map classes in the areas recovering from wildland fires that occurred in 2019-2023. Secondly, sagebrush habitat distribution was updated to identify annual losses incurred from the 2024 Dry Channel Fire. In addition to documenting losses from fire, there was additional sagebrush habitat removed this year from infrastructure expansion.

Prior to 2024, the most recent vegetation classification and mapping product was completed in 2019 (Shive et al. 2019). Wildland fires in 2019–2020 burned about 18% of the Site, and those regions of the vegetation map were outdated and no longer representative of current ground conditions. In 2024, the INL Site vegetation map was updated to add new map class boundaries in the regions affected by wildfires 2019-2020 (Shive 2024). The recovery time since the fires is too short for areas to be remapped as sagebrush habitat, but there were mapping adjustments made to some of the unburned patches of sagebrush habitat that were delineated immediately after the fires but continued to change in the years since.

There were five wildland fires that occurred on the INL Site in 2024. On May 25, the Highway 33 Fire started on the north side of the highway. The fire was found smoldering in light grass and quickly extinguished burning about 0.1 ha (0.25 ac). On June 26, the Dry Channel Fire started east of State Highway 22 from a reported lightning strike. A water tender and Bureau of Land Management (BLM) resources were used to aid in suppression while dozers bladed a containment line around the perimeter of the fire which burned an estimated 57.5 ha (142 ac). The Kyle Canyon Fire started on July 27 where grass was found smoldering around a single juniper tree. A line was dug around the hot spot and direct suppression with water and foam was employed limiting the burned area to less than 0.4 ha (1 ac). On August 8, the Portland Ave Fire was caused by a downed power line near the Antelope Substation. The

fire was initially stomped out by INL Protective Force and burned less than 0.1 ha (0.25 ac). On October 3, the Highway 33 Mile Post 29 Fire was found burning roadside in a small patch of light fuels. The fire was quickly extinguished and only burned about 0.1 ha (0.25 ac).

3.2.2 Results and Discussion

Following the vegetation map updates (Shive 2024), sagebrush habitat in the SGCA prior to the 2024 losses remained basically unchanged (i.e., there was an increase of 0.2 ha following the vegetation map update) and resulting in a total of 71,359 ha (176,332 ac). The redefined area of sagebrush habitat outside the SGCA is now 28,086.1 ha (69,402.2 ac) which is a slight reduction (i.e., < 1%) from the 2023 total, prior to the mapping update. It is important to note that the reduction to the 2023 total area is not from new losses in sagebrush habitat, but rather a more accurate mapping of the unburned patches.

The Dry Channel Fire resulted in a patchy burn across the fire footprint with numerous unburned patches of vegetation left following the fire. The total mapped burned area was 46 ha (113.7 ac) and there was a smaller area outside the fire where 708 m^2 (0.2 ac) was bladed and removed vegetation. The combined area impacted from the fire and fire suppression activities resulted in a loss of 35.1 ha (86.8 ac) of sagebrush habitat.

At the start of the 2024 fire season there was 71,359 ha (176,332 ac) of sagebrush habitat in the SGCA. The Dry Channel Fire removed 35.1 ha (86.8 ac), and results from the Infrastructure Expansion task documented an additional 1.7 ha (4.3 ac) of sagebrush habitat loss in the SGCA (See Section 4.2). The current estimated area of sagebrush habitat in the SGCA is 71,322.2 ha (176,240.9 ac) representing a 1.4% decrease from the updated habitat baseline (Figure 3-4; INL 2023).

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 new infrastructure development (DOE-ID and USFWS 2014). There was no sagebrush habitat loss due to wildland fire outside the SGCA in 2024, although infrastructure expansion (see Section 4.2) was responsible for the removal of 29.4 ha (72.6 ac). At the start of 2024, the estimated area of sagebrush habitat remaining outside the SGCA was 28,086.1 ha (69,402.2 ac). After the new losses are removed, the current area of sagebrush habitat outside the SGCA is 28,056.7 ha (69,329.6 ac).

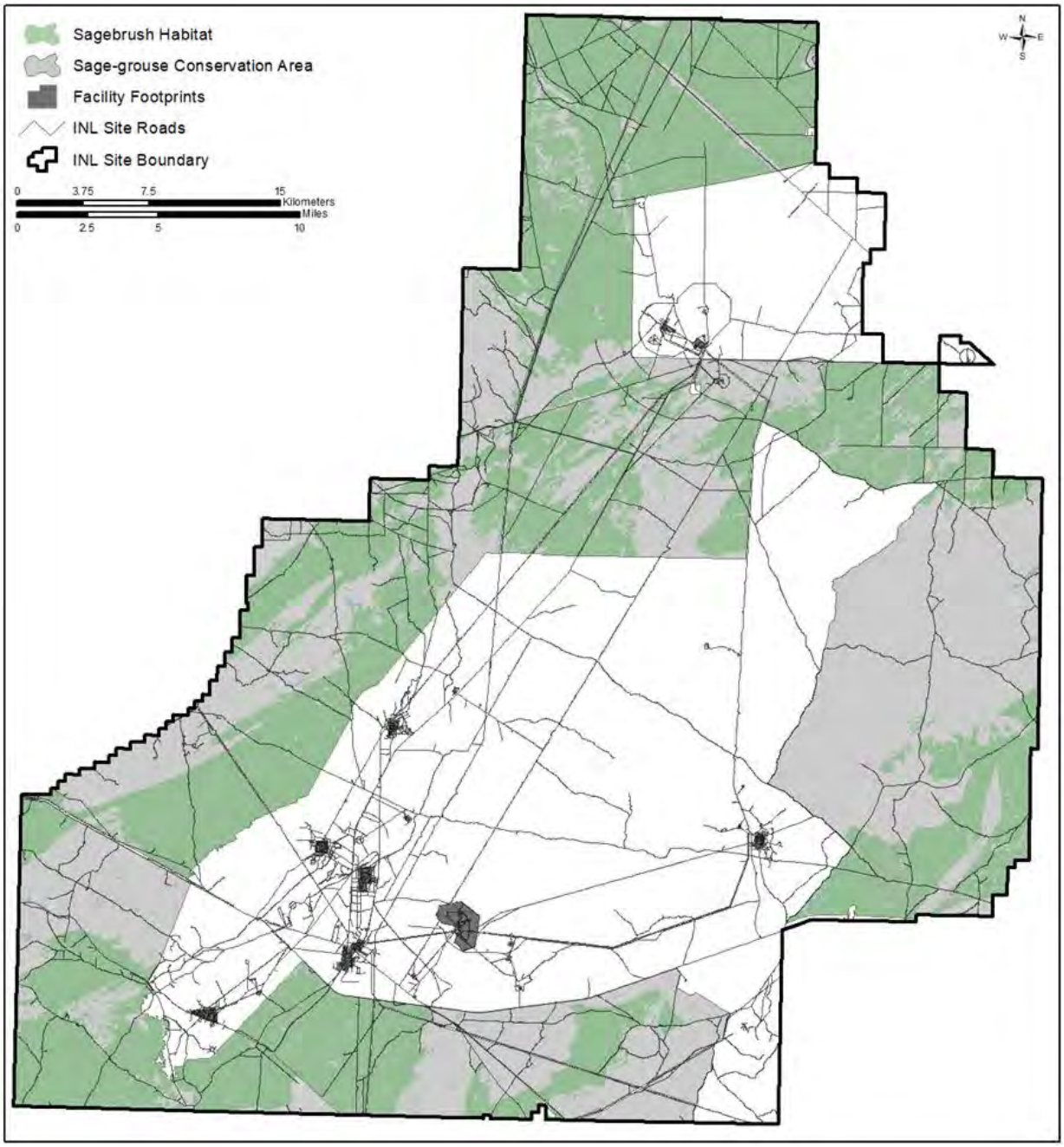

Figure 3-4. Current sagebrush habitat distribution within the Sage-grouse Conservation Area on the Idaho National Laboratory Site.

4.0 THREAT MONITORING

4.1 Task 4—Address Raven Predation

Summary of Results: Three transmission structures were retrofitted with single crossarms in 2024 bringing the total number of retrofitted transmission structures to 66. Two raven nests were removed in 2024, one in May due to power outages caused by nesting material and another in September from the shelter structure at Gate 1 near the Central Facilities Area.

4.1.1 Introduction

Common ravens (*Corvus corax*; hereafter, raven) are effective nest predators of sage-grouse (Coates et al. 2008, Coates and Delehanty 2010, Lockyer et al. 2013). Raven predation is considered a medium-ranked threat to sage-grouse on the INL Site because raven abundance has been linked to declines in sage-grouse lek counts (Peebles et al. 2017) and nest survival (Gibson et al. 2018, Kohl et al. 2019, Coates et al. 2020, Owens et al. In Review). Due to concentrated foraging around nests, breeding ravens likely have a larger impact on nest survival of sensitive species like sage-grouse than non-breeding or transient ravens (Brussee and Coates 2018, Sanchez et al. 2021). Therefore, the management of raven nests is a possible tool for conserving local sage-grouse populations.

Ravens nest on multiple anthropogenic structures on the INL Site including buildings, equipment, and power infrastructure (Coates et al. 2014, Howe et al. 2014, Shurtliff and Whiting 2021, INL 2024). Nests on buildings and infrastructure are removed in compliance with the Migratory Bird Treaty Act when they pose health or safety risks. Nests may also be removed after the conclusion of breeding season to deter future nesting attempts. To prevent nesting on power poles, three types of nest deterrent devices are used on the INL Site – inverted 'V' structures that are placed along the double crossarms of distribution line poles (Figure 4-1[A]), a pyramid cap which is placed on the top of the pole when crossarms are not available (Figure 4-1[B]), or replacing double crossarms of transmission or distribution line poles with a single crossarm made of either wood or fiberglass (Figure 4-1[C]). Retrofitting of existing power infrastructure is directed by INL Power Management and generally occurs when maintenance is required for specific poles. Approximately 32% of transmission structures (n = 282) do not support nesting because they are either a single vertical structure (Figure 4-1[D]) or are a multi-pole structure that lacks crossarms.

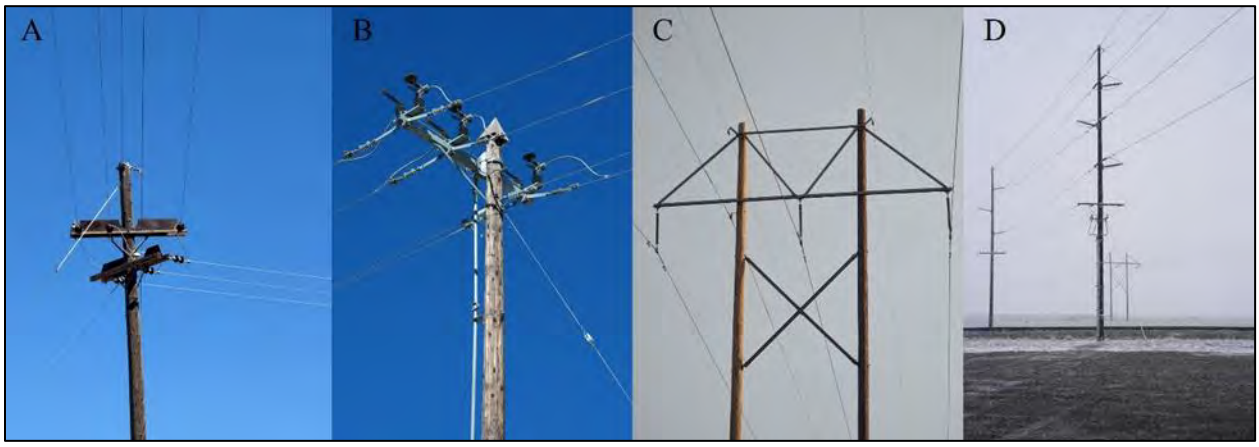

Figure 4-1. Nest deterrents used on power infrastructure on the Idaho National Laboratory Site including inverted 'V' structures (A) and pyramid caps on distribution poles (B), single crossarms on H-frame transmission structures (C) and vertical transmission structures that do no support nesting (D).

4.1.2 Activities to Reduce or Deter Raven Nesting

Retrofits of Electrical Power Transmission Lines

H-frame transmission structures are comprised of 2–3 poles which are individually tracked by INL Power Management. Three H-frame transmission structures were retrofitted with single crossarms in 2024. The total number of H-frame transmission structures now retrofitted on site is 66. The number of structures varies annually on Site as they are removed from or added to the landscape.

Removal of Raven Nests

Two raven nests were removed in 2024. One nest was removed from a transmission structure in May because debris from the nest was causing power outages. This removal was completed after consultation with USFWS and was agreed upon take under DOE-ID's Migratory Bird Treaty Act permit. A second nest was removed in September after the conclusion of breeding season from the shelter structure located at the Central Facilities Area (CFA) Gate 1. This nest was in the crossbeams of a corner underneath the structure.

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 30 polygons mapped where infrastructure expansion removed sagebrush habitat resulting in a loss. The total mapped sagebrush loss was 31.1 ha (76.9 ac). Three of the mapped polygons fell within the SGCA accounting for 1.7 ha (4.3 ac) of loss from the current habitat trigger area. There was a total of 18.8 km (11.7 mi) of new linear features mapped within the SGCA or existing sagebrush habitat. In addition to the new two-track linear features, 3 km (1.8 mi) of older two-tracks were mapped, because when cross-referenced to previously collected National Agriculture Imagery Program imagery, these features were found to be present in older imagery but not mapped during the last review.

4.2.1 Introduction

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. 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. 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 (NAIP), 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 30 polygons mapped where infrastructure expansion removed sagebrush habitat resulting in a loss. The total mapped sagebrush loss was 31.1 ha (76.9 ac). Three of the mapped polygons fell within the SGCA accounting for 1.7 ha (4.3 ac) of loss from the current habitat trigger area.

The location that had the largest amount of sagebrush habitat loss was the expansion of the T-12 gravel pit where 9.6 ha (23.7 ac) was removed following an authorized pit boundary expansion. The second largest mapped loss was associated with a new water line installed underground between CFA and the main gun range, which also included a mowed area adjacent to the existing parking area, that removed 7.1 ha (17.5 ac) of sagebrush habitat. Ten of the mapped polygons were all associated with the underground fiber optic line installed along U.S. Highway 20/26.

There was a total of 18.8 km (11.7 mi) of new linear features mapped within the SGCA or existing sagebrush habitat. New linear features consisted of spurs and side loops from existing roads (Figure 4-2), access roads for site characterization at the Carbon Free Power Plant project area, an access road between RWMC and the Adams Blvd gravel pit, and some shortcuts between existing two-track roads. The longest single linear feature mapped was 2.9 km (1.8 mi) and is a recently mowed corridor connecting the RWMC facility with the Adams Blvd gravel pit.

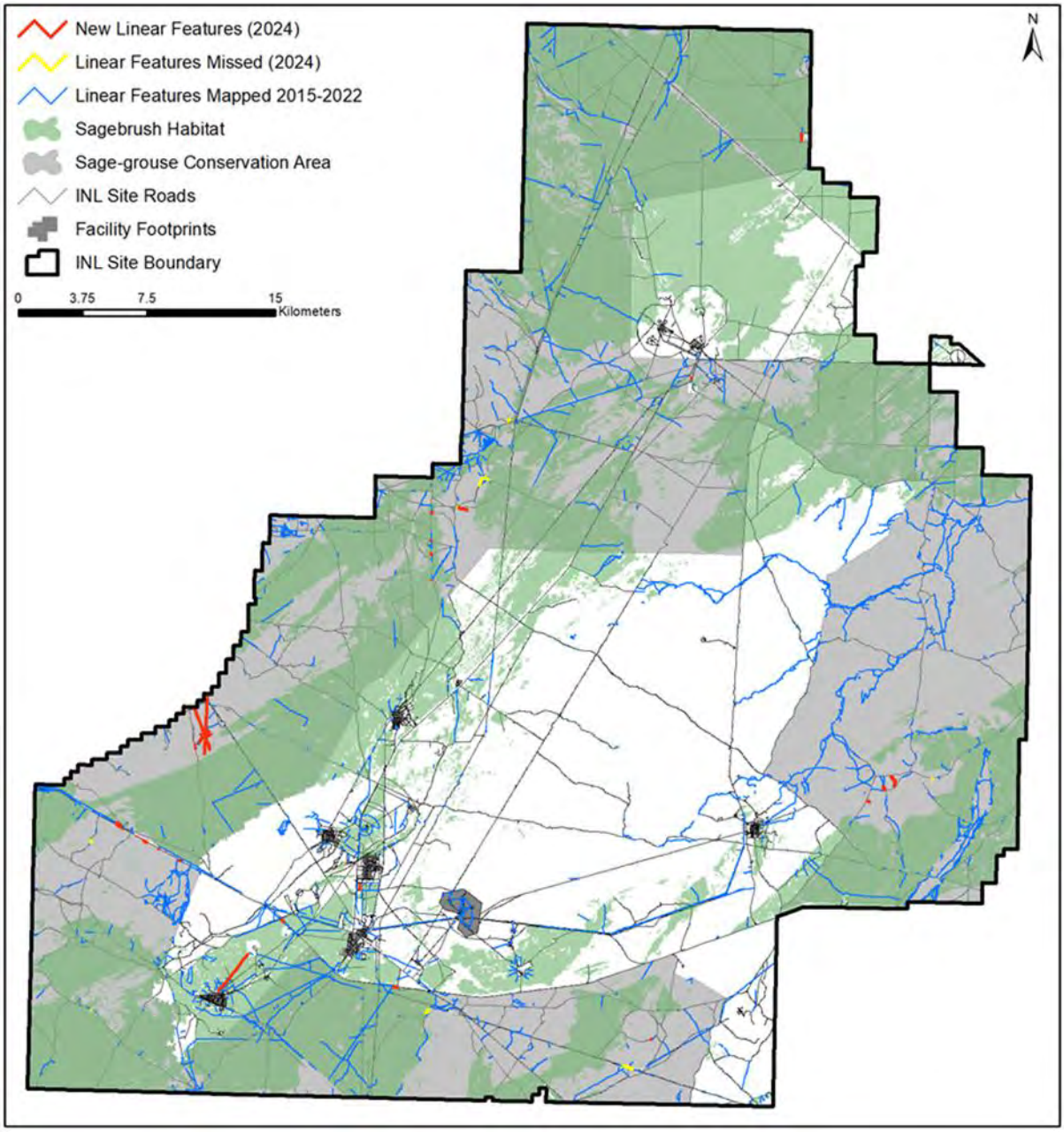

Figure 4-2. Two-track linear feature expansion mapped within the Sage-grouse Conservation Area or overlap with existing sagebrush habitat at the Idaho National Laboratory Site. The slightly darker green areas are where sagebrush habitat is coincident with the Sage-grouse Conservation Area.

In addition to the new two-track linear features, 3 km (1.8 mi) of older two-tracks were mapped, because when cross-referenced to previously collected NAIP imagery, these features were found to be present in older imagery but not mapped during the last review. The NAIP imagery is collected across numerous days throughout the summer with the goal of producing cloud free imagery. Subsequently, the sun elevation angle will sometimes differ between image tiles and the shadows cast by lower sun angles sometimes help illuminate linear features, improving our ability to detect them. In some cases, faint two-tracks were previously visible but were assumed to be legacy tracks in the process of natural recovery.

However, when the same tracks are still visible in multiple sets of high-resolution imagery, those linear features are added and noted as missed during the previous mapping efforts (Figure 4-2).

High-resolution drone imagery of the 2024 Dry Channel Fire was collected on November 6. Due to the late timing of the image acquisition, all two-track linear features associated with fire suppression or post-fire mop-up activities were not mapped in time to be included in this report. Those results will be presented in the 2025 annual report.

The mapping results from this year showed an increase in losses of sagebrush habitat due to infrastructure expansion compared to the last time this monitoring task was completed in 2022 (INL 2023), but still less than the peak losses reported in 2020 (Shurtliff et al. 2020). There was a decrease in the distance of new two-track linear features reported this year compared to 2022 (INL 2023), and the majority of new features are from known INL Site projects, which means they are assessed during the National Environmental Policy Act process and Best Management Practices are applied to minimize the potential effects of habitat loss (see Section 5).

4.3 Task 5—Assessment of Potential Threats to Sagebrush Habitat

Summary of Results: Data were collected on 50 habitat monitoring plots in 2024. Results of analyses evaluating the potential impacts of wildland fire and livestock operations on habitat condition will be presented in the 2027 CCA Implementation Reports.

4.3.1 Introduction

The primary goal of this task is to assess habitat condition in response to the potential threats of wildland fire and livestock operations on habitat. Wildland fire is ranked as a high-level threat and livestock operations threat ranking was reduced from its initial medium-level rank to its current low-level ranking to sage-grouse and their habitats on the INL Site (DOE-ID and USFWS 2014, Shurtliff et al. 2019). To evaluate these threats, vegetation abundance is compared among fire footprints, grazing allotments, and areas where both activities have occurred. The analysis uses vegetation monitoring plot data from the 75 annual and 150 rotational plots.

Vegetation monitoring plots are distributed such that the number of plots in each burned area, allotment, or combination thereof are roughly proportional to the amount of area they occupy. Rotational plots are used to increase sample sizes within wildland fire footprints and livestock allotments where sample sizes from annual plots are not sufficient. Each rotational plot is sample once per five-year sample period. The rotational plots are divided into three subsets of 50 plots and a sampling period includes the span of three years to complete data collection on all rotational plots and an additional two years for data, summary analyses, and reporting. The current rotational sample period will be completed in 2025, and results will be reported in 2027 (Table 4-1).

Generalized linear models, like ANOVAs, are used to compare vegetation abundance, distribution, and structure among individual wildland fire footprints and unburned areas and between livestock grazing allotments and areas outside of grazing allotments, as well as changes in functional group composition over time.

Table 4-1. Habitat condition monitoring schedule to conduct vegetation sampling and report results for the third sample period at the Idaho National Laboratory Site.

Assessment of Potential Threats to Sagebrush Habitats Schedule		
Year	**Vegetation Sampling Efforts**	**Reporting Efforts**
2023	Annual + Rotational Set I	Sagebrush Habitat Condition Trends
2024	Annual + Rotational Set II	Sagebrush Habitat Condition Trends
2025	Annual + Rotational Set III	Sagebrush Habitat Condition Trends
2026	Annual	Sagebrush Habitat Condition Trends
2027	Annual	Sagebrush Habitat Condition Trends Assessment of Potential Threats to Habitats

4.3.2 Results and Discussion

To support this task, 50 rotational plots were sampled in 2024. Once the vegetation monitoring data is completed for the third sample period from 2023 to 2025, we will conduct the assessment on potential threats to habitat condition and those results will be presented in 2027 (Table 4-1).

5.0 IMPLEMENTATION OF CONSERVATION MEASURES

5.1 Summary of 2024 Implementation Progress

The CCA describes eight threats, and 13 conservation measures designed to mitigate and reduce those threats to sage-grouse and their habitats on the INL Site. It also articulates DOE-ID'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-ID, contractors, and stakeholders participated in and achieved in 2024 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-ID 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.

- Five fires occurred on the INL Site that burned a total of approximately 57.8 ha (143.8 ac). Only one fire exceeded 40 ha (99 ac). The total mapped burned area of the Dry Channel Fire was 46 ha (113.7 ac) and there was a smaller area outside the fire where 708 m^2 (0.2 ac) was bladed and vegetation was removed. The NRG will prepare an assessment of the Dry Channel Fire and make a draft plan with recommendations for recovery that will be presented to the Wildland Fire Management Committee (WFMC) in spring 2025.

Associated activities to reduce the wildland fire threat:

- The INL Fire Department is updating and developing plans to increase the efficacy of fuels management and fire suppression. The NRG has completed a fire recovery framework describing post-fire recovery actions. The National Environmental Policy Act group is considering an Environmental Assessment for evaluating the potential impacts of these plans.

- BEA mowed 6- to 12-m (20- to 40-ft) firebreaks along 190 km (118 mi) of roads.

- INL mechanically planted sagebrush seed across approximately 283.3 ha (700 ac) using locally collected seed.

- NRG facilitated the planting of 19,050 sagebrush seedlings within the 2010 Middle Butte Fire and 2007 Twin Butte Fire to support habitat restoration efforts.

5.1.2 Threat: Infrastructure Development

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

- Four infrastructure projects minimized the total distance of habitat edge caused by construction and project activities in 2024.

- Three projects co-located new infrastructure with existing infrastructure footprints to avoid the impacts to both current and recovering habitats on the INL Site.

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.

- Three polygons associated with two infrastructure projects were observed within the SGCA while completing Task 8 in 2024.
    - One polygon was mapped at the USGS Geotechnical Drilling for USGS 153 (ECP INL-22-025) project location. This project was initiated and approved in 2022. As required by the CCA, DOE consulted with the USFWS on how to minimize impacts to sage-grouse prior to ground disturbing activities.
    - Two polygons were mapped resulting from disturbance associated with the installation of an underground fiber optic line within the right-of-way managed and maintained by the Idaho Transportation Department along U.S. Highway 20/26.

5.1.3 Threat: Livestock

Conservation Measure 5—Encourage Bureau of Land Management to take steps to keep livestock off leks and provide them with updated lek locations.

- During the 2024 sage-grouse lek counts, biologists did not observe any livestock on leks.

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 intentional use of crested wheatgrass seed. Because crested wheatgrass is not native, it is never included as acceptable plant materials in INL Site revegetation plans.

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.
- All noxious weeds are treated when encountered and other invasive species are treated or removed when defensible space is required around infrastructure and equipment within landfills and borrow sources in accordance with INL's Sitewide Noxious Weed Management Plan, PLN-611. In 2024, Noxious weeds were observed and treated at the CFA landfill in five instances. The weeds treated include, rush skeletonweed (*Chondrilla juncea*), spotted knapweed (*Centaurea stoebe*), Russian knapweed (*Acroptilon repens*), and musk thistle (*Carduus nutans*). Additionally, sterilant was applied to prevent the establishment and spread of noxious and invasive species and provide necessary defensible space at the T-28 gravel pit.

- The T-12 pit was expanded to support increased use. To achieve no net loss of sagebrush because of this expansion the project will follow the INL compensatory mitigation strategy.

- The Monroe Blvd pit and Adams Blvd pit experienced expansion within the previous two years, 0.02 ha (0.06 ac) and 2.3 ha (6 ac) respectively, and will be required to participate in compensatory mitigation.

5.1.6 Threat: Raven Predation

Conservation Measure 10—Opportunistically reduce raven nesting on infrastructure.

- Three INL-controlled transmission structures were retrofitted with single crossarms, permanently excluding future raven nesting at these sites.

- In total, 66 INL-controlled transmission structures have been retrofitted.

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 the National Security Test Range between 6 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-ID 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 specific Conservation Measures. The following sections highlight activities associated with specific Conservation Measures that were carried out in 2024.

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

Summary of Results: There was one wildfire > 40 ha (99 ac) on the INL Site in 2024. A fire recovery plan will be drafted using INL's recently completed wildland fire recovery framework. A post-fire recovery plan developed for four of the 2020 fires continues to be implemented and treatments are ongoing within the footprints of several older fires. 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 for fires larger than 40 ha (99 ac) and an approach or plan for restoration would be developed.

To standardize and streamline the process of developing fire-specific natural resource recovery plans, the NRG recently developed a wildland fire recovery framework for the INL Site (Forman et al. 2024). This framework identifies INL's fire recovery goals, defines the fire recovery planning process, describes a post-fire ecological resource assessment process for quantifying fire impacts, presents all potential post-fire treatments that may be considered for improving natural resource recovery, establishes the basis for an annual post-fire monitoring program, and provides a template for future fire recovery plans.

This section of the report contains a summary of active fire recovery plans, ongoing restoration actions associated with those plans, and a summary of treatments for older wildland fires with any ongoing recovery activity. There is one active INL Site wildland fire recovery plan that addresses four wildland fires that burned in 2020, and there is one draft wildland fire recovery plan for the 2024 Dry Channel Fire to be submitted for review by the WFMC. This draft plan is the first to utilize the tools provided by the recovery framework. The Sheep Fire Recovery Plan (Forman et al. 2020) expired at the end of FY 2024, and it resulted in the largest sagebrush restoration effort within the footprint of any wildfire on the INL Site to-date.

2024 – Dry Channel Fire

The Dry Channel Fire burned on June 26, 2024, and was likely caused by a lightning strike. Although the recovery plan for this fire will not be finalized until the WFMC has approved it during the spring 2025 meeting, there are several actions that can and should be taken prior to completion of the plan. Some actions, like acquiring imagery of the fire, are necessary for completing the ecological resource assessment that informs the recovery plan. Others are considered emergency stabilization actions and are outlined by the INL Wildland Fire EA (DOE-ID 2003).

Emergency stabilization actions that can be implemented prior to finalization of the fire recovery plan include containment line restoration and noxious weed control. Recontouring containment lines and returning topsoil to the surface is the first step toward restoring those disturbed soils. The Dry Channel Fire containment lines were recontoured on October 29 and 30, 2024. Because disturbed soils associated with fire suppression activities are vulnerable to weed invasion and linear features can become vectors for spread, the area impacted by the Dry Channel Fire and fire suppression activities was added to Facilities and Site Services noxious weed treatment list. Inventory and treatment efforts were conducted periodically throughout the summer and fall of 2024.

2020 – Four Fires

In 2020, an ecological resources post-fire recovery plan was completed for four of the fires that burned that year, the Howe Peak Fire, the Telegraph Fire, the Cinder Butte Fire, and the Lost River Fire (Forman et al. 2021). The recovery plan 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-ID 2003), the INL completed containment line recontouring during the fall of 2020. Upon completion and review of the ecological resource recovery plan, additional recovery actions that were prioritized by the INL WFMC included: monitoring temporary fire suppression access roads and containment lines for natural recovery, ongoing noxious weed inventory and treatment, and sagebrush restoration.

Evaluations of access roads and containment lines on the Telegraph Fire were completed during the 2024 field season and noxious weed treatments continued to be implemented on all four fires through INL's

noxious weed program. Temporary access roads were generally very difficult to see and there was no indication that they had continued to be used or were more prone to weed establishment than the surrounding areas, so no further action was recommended. Cheatgrass was more abundant in the Telegraph Fire containment lines than in either the unburned adjacent areas or within the fire footprint where soil had not been disturbed and there was evidence of some sections of containment line being used by vehicles as a road. NRG recommended to the WFMC that containment lines be signed and replanted anywhere they intersect an established two-track road. Because the area was used extensively by collared sage-grouse, it is in proximity to an active lek, and restoration 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.

Pre-2020 – 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 resistant to weed invasion. Occasionally, sagebrush is planted in areas that burned more than five years ago to continue reducing recovery time in those areas. Since 2021, nearly 150,000 seedlings have been planted within fire footprints of pre-2020 fires through agency partnerships and INL's compensatory sagebrush mitigation program.

In 2022, DOE, INL, USFWS, and BLM partnered to pursue Bipartisan Infrastructure Law (BIL) funding to support sagebrush habitat restoration in the Tractor Flats area of the INL Site and adjacent BLM land, some of which burned most recently in the 2010 Jefferson Fire. This area is recognized as a high-priority habitat restoration location because long-term lek count data and more recent movement data from radio collared sage-grouse indicate that despite declines in habitat condition, Tractor Flats continue to be used for breeding, nesting, and overwintering. Funding was awarded to the multiagency partnership beginning in 2023. A commercial seed collection vendor collected sagebrush seed within the unburned areas of the southern and eastern portion of the INL Site (Figure 5-1) and on adjacent BLM land in November 2023. In 2024, seed was applied to approximately one-third, or about 280 ha (700 ac) of the area scheduled to be planted on the INL Site (Figure 5-1). Seed was planted using a broadcast spreader followed by an imprinter. Rice hulls were used as a carrier, and seed was applied at a rate of approximately 0.7 kg (1.5 lb) of pure live seed (PLS) per 0.4 ha (1 ac). Sagebrush seed was applied in 7.3 m (24 ft) wide strips, with a spacing of 14.6 m (48 ft) between planted strips.

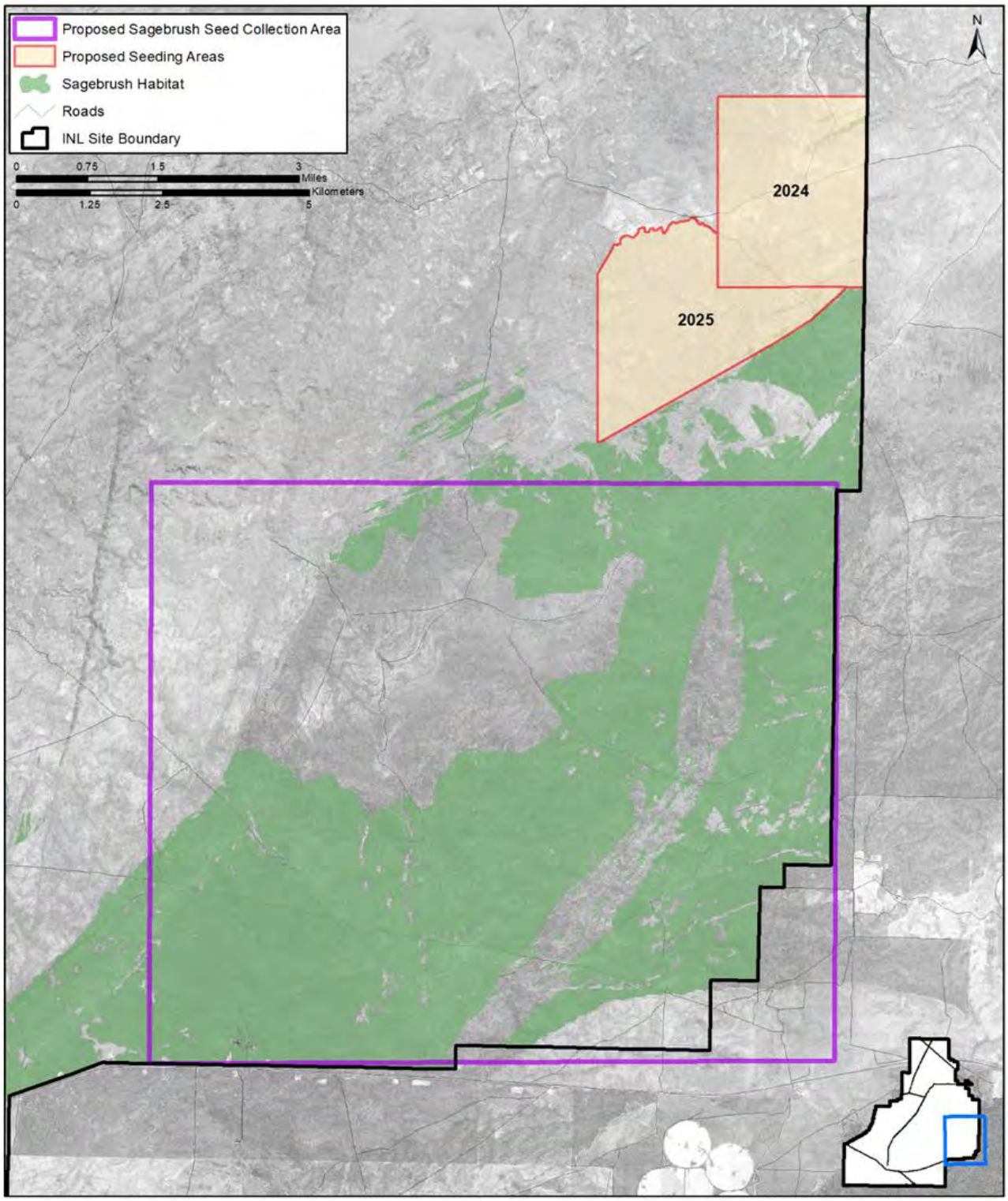

Figure 5-1. Sagebrush seed collection and proposed mechanical seeding locations for sagebrush habitat restoration efforts within the Tractor Flats area of the Idaho National Laboratory Site.

In addition to the sagebrush restoration efforts at Tractor Flats, DOE-ID and INL requested BIL funding for Rejuvra© (liquid) Indaziflam herbicide for cheatgrass control in cheatgrass-dominated areas in the Sheep Fire. INL received sufficient herbicide to treat the highest-priority 810 ha (2,000-ac) polygon. Pre-treatment, baseline vegetation abundance data were collected for the proposed treatment area in 2024, and herbicide will be applied in 2025 after National Enivornmental Policy Act review has been completed.

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

Summary of Results: INL managed the planting of 19,050 sagebrush seedlings in fall of 2024 in areas prioritized for restoration. All seedlings were planted in burned areas of the 2007 and 2010 Twin and Middle Butte Fires. Monitoring revealed that approximately 17.6% of seedlings planted in 2023 survived. Approximately 12% of seedlings planted in 2019 were still alive after five years.

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-ID 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 and as INL has formalized and implemented a compensatory mitigation program. Sagebrush planting efforts include strategically planting within older burned areas, planting to address objectives in wildland fire recovery plans, and planting to address 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 wildfire and the re-establishment of sagebrush habitat

Results and Discussion

During the fall of 2024, 19,050 sagebrush seedlings were planted on approximately 43.6 ha (107.7 ac; Figure 5-2). Seedlings were funded by and acquired for compensatory mitigation in response to one INL waterline infrastructure project that was completed in 2023. The 2024 planting was located within portions of the 2007 and 2010 Twin and Middle Butte Fires. For future monitoring, 500 seedling locations were marked following installation.

Survivorship survey results of the subset of seedlings planted in 2023 in the Middle Butte Fire and Twin Buttes Fire can be seen in Table 5-1. Seedlings were grown and planted using different growth media and planting techniques to establish four treatments and a control, which are intended to inform and improve future plantings. When compared to the control, the caged treatment and vermiculite treatment resulted in noticeably higher survivorship. Although installing cages around seedlings appeared to increase survivorship, this treatment comes with logistical challenges and increased cost, making it less appealing to use in future plantings. The addition of vermiculite as a treatment is much more feasible to implement and will be considered for all future plantings.

Figure 5-2. Area planted with big sagebrush (*Artemisia tridentata*) seedlings in 2024 with reference to previous years plantings on the Idaho National Laboratory Site.

Table 5-1. Survivorship results for big sagebrush (*Artemisia tridentata*) seedlings planted in 2023 on the Idaho National Laboratory Site. Results are shown for seedlings in the control subset and for four different treatments.

Treatment (n)		Healthy Seedlings	Stressed Seedlings	Dead Seedlings	Missing Seedlings	% of Seedlings Survived
Control	(500)	42	25	40	393	13.4
Caged	(480)	64	66	165	185	27.1
Vermiculite	(500)	78	19	5	398	19.4
HydroGel	(500)	66	15	17	402	16.2
Mycorrhizal	(500)	43	19	23	415	12.4
Total	**(2480)**	**293**	**144**	**250**	**1793**	**17.6**

Assuming the missing seedlings were dead, approximately 17.6% of all seedlings planted in 2023 survived the first year. This result is higher than the 2019 and 2020 plantings, and were similar to the 2021 and 2022 plantings, but remains much lower than the plantings between 2015 and 2018 (Figure 5-3).

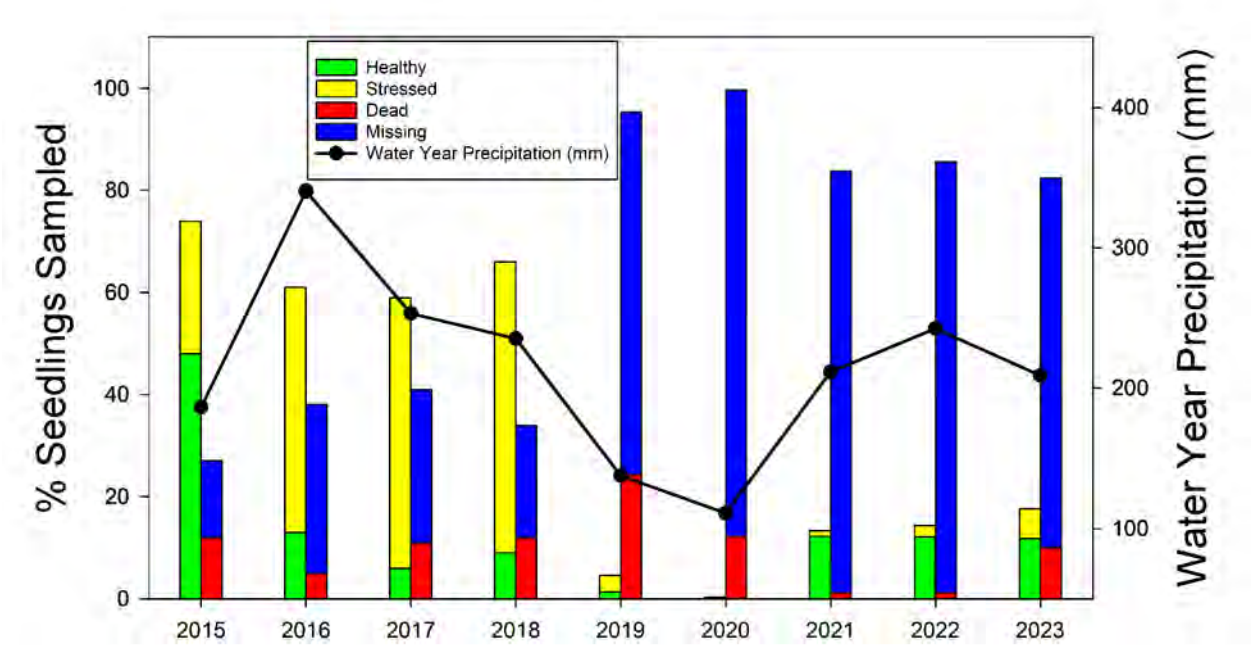

Figure 5-3. Sagebrush seedling survivorship one year after planting on the Idaho National Laboratory Site. The yellow and green bar represents the observed living seedlings. The blue and red bar represents seedlings presumed to be dead. The black dots indicate the total water-year precipitation, and the black line denotes precipitation trend. 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 regular deviations from precipitation timing and seasonal amount are likely contributing factors to low seedling survivorship over the past five years. Missing seedlings or, seedlings that were not able to be relocated the following year, can be a result of herbivory (e.g., ungulates and small mammals), death and decomposition, or less frequently, detection error. It is unfortunate that the 2019-2023 plantings have deviated from a trend of successful plantings, but INL continues to explore methods for improving the planting process such as those tested in 2023, to increase the success of future planting efforts.

To evaluate five-year survivorship, 500 seedlings planted in the fall of 2019 were revisited in the fall of 2024. Sixty-six seedlings were found. Of these, 51 were healthy and 12 were stressed. This means 12.6% of the marked seedlings have survived. The one-year results of the 2019 planting found that 4.6% of the seedlings had survived to the fall of 2020 (Shurtliff et al. 2020), so most of the seedlings that survived after one year survived five years. The higher survivorship from the five-year survey compared to the one year is likely an artifact of the difficulty of locating the small seedlings one year after planting. The fact that survivorship rates did not decrease between one-year and five-year monitoring efforts suggests these plantings only require one year of ideal conditions to become established and persist.

Since 2015, sagebrush seedling planting on the INL Site has been completed on 1,202.9 ha (2,972.4 acres). Over the past 10 years, a total of 349,675 seedlings have been planted from multiple collaborating agencies, including DOE-ID, INL, the Idaho Governor's Office of Species Conservation, and the Idaho Department of Fish and Game (IDFG).

6.0 SYNTHESIS AND ADAPTIVE MANAGEMENT RECOMMENDATIONS

6.1 Trends and Threats in a Regional Context

The IDFG annually compiles data and shares results from hundreds of sage-grouse lek counts conducted by its staff and partners. The INL contributes to this dataset by providing lek and route count information on an annual basis (i.e., IDFG lek routes, Figure 2-1). Comparing these two datasets allows the NRG to evaluate if trends observed on the INL Site are like those observed on statewide and/or regional levels. The peak male count of 829 for 2024 was 38% higher than in 2023 and was the highest ever recorded on the INL Site since 2011. This upward trend was observed throughout Idaho, with IDFG (2024) reporting a 22% statewide increase. Oregon and Wyoming also reported statewide increases of 63.9% (Vold 2024) and 33% (WGFD 2024), respectively, which suggests that populations increased in many areas range wide. Sage-grouse populations vary between high and low abundances on six to ten-year cycles and populations on the INL Site, in the State of Idaho, and in many places across the range, are clearly in the upward portion of this cycle after a low (nadir) from 2020–2021. Heavy snowpack, like what occurred in the winter of 2022–2023 has a positive, but lagged effect on sage-grouse populations (Blomberg et al. 2014, Coates et al. 2018, Lundblad et al. 2022). Snowpack ensures the availability of mesic resources the following summer which chicks rely on for food and shelter (Blomberg et al. 2014, Gibson et al. 2017, Lundblad et al. 2022). This increase in recruitment may then be reflected in lek counts one year (i.e., 2024) after heavy snowfall. It is important to note that a single major increase in males on leks does not indicate recovery. Because sage-grouse populations cycle naturally, population trend estimates should not be calculated year-to-year, but instead should be calculated peak-to-peak or nadir-to-nadir, otherwise estimates may indicate false declines or increases (Coates et al. 2023). Overall, sage-grouse populations are still declining throughout their range (Coates et al. 2023) and accurate trend estimates for the INL Site cannot be evaluated until the population reaches the next peak and then begins naturally cycling downward again.

Although the State of Idaho has established habitat distribution triggers (Idaho 2021) like the INL Site, and the State recommends managing habitat condition so that it meets the same general guidelines as those used for the INL Site, results of local and/or regional summaries are not annually published for management areas at a fine enough scale to facilitate direct comparisons of habitat distribution and/or condition every year. The most recent summaries were published in 2020 as part of a causal factor analysis (Idaho Adaptive Management Team 2020). Of the fine scale management areas that overlap the INL Site, the adaptive management team reported that a soft habitat trigger (a decrease in distribution of >10% but < 20%) was tripped in the Mountain Valley Important Habitat Management Area, which extends onto approximately the northern one-quarter of the INL Site. This trigger was tripped due primarily to two wildland fires that did not directly affect the INL Site.

No habitat triggers were tripped within the Desert Conservation Area, which includes the southern three-quarters of the INL Site. Within the Desert Conservation Area, much of the INL Site is included in the Twin Buttes Target Fine Scale Area. Landscape cover of sagebrush across this Fine Scale Area was estimated to be between 60% and 70% across all seasonal habitat types, which is comparable to the distribution of sagebrush habitat across the INL Site. The Idaho Adaptive Management Team has identified the Tractor Flats area within the Twin Buttes Target Fine Scale Area as an important winter habitat. They have recommended considering top management priorities such as minimizing any further loss of sagebrush and restoring sagebrush where it has been lost, particularly from the 2010 Jefferson Fire. They have also recommended identifying priority areas where cheatgrass control can be used to improve nesting habitat. INL habitat condition data and spatial vegetation distribution data (Shive et al. 2019) indicate the most extensive cheatgrass-dominated areas within the Jefferson Fire footprint are also within Sheep Fire footprint, located west of Tractor Flats. Four potential cheatgrass treatment areas have

been identified within the overlapping footprints of these two fires. Section 5.2.1 includes a summary of sagebrush restoration and cheatgrass treatment efforts proposed and in progress for in this area.

Although habitat condition data from the INL Site indicates that cheatgrass is more abundant in burned areas than intact sagebrush habitat, post-fire areas on the INL Site are still largely dominated by native, perennial species. Cheatgrass cover can fluctuate considerably from one year to the next and a decrease in cover is as likely as an increase (Forman and Hafla 2018), so it is important to interpret annual changes within the context of longer-term patterns. Because cheatgrass cover generally does not increase at the expense of cover from native perennial species, it does not appear to be affecting overall habitat condition. There are localized areas on the INL Site where cheatgrass has become dominant (Shive et al. 2019), but they are limited in extent and are not yet widespread enough to influence the fire regime. In fact, the most recent update to the INL Site Vegetation Map indicates slight decreases in the amount of area dominated by cheatgrass in footprints of recent wildfires (Shive 2024). Although the fire regime at the INL Site is not driven by cheatgrass dominance, fires have been more frequent in the past 30 years when compared to the previous 30 years, most likely due to changes in weather patterns and other anthropogenic influences. Therefore, the INL continues to prioritize reducing wildland fire impacts to habit by minimizing fire size and by implementing post-fire recovery strategies.

The CCA and resulting relationship between its signatories have helped DOE-ID and its contractors take proactive, focused measures (Table A-1) to conserve sage-grouse while still pursuing DOE-ID's mission. The agreement and conservation measures therein have also been the key to strengthening relationships with natural resource partners to collaborate on projects relevant to sage-grouse. For example, in 2023, BIL funding was awarded to USFWS, BLM, and DOE-ID to facilitate a large-scale sagebrush seed collection effort on the INL Site and adjacent BLM property. The seed will be used to support sagebrush restoration in important winter habitat than spans DOE-ID/BLM boundaries. Additionally, DOE-ID shares habitat data with BLM when allotments are reassessed, and BLM invites DOE-ID to participate in grazing allotment assessments on the INL Site. This increased collaboration and pursuit of common land management goals are among the benefits that have resulted from DOE-ID's efforts, via the CCA, to join with federal and state partners to conserve sage-grouse and sagebrush lands in eastern Idaho.

6.2 Proposed Changes to the CCA

No changes to the CCA were proposed during 2024.

6.3 Adopted Changes

No changes to the CCA were adopted during 2024.

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APPENDIX A. 2024 ACCOMPLISHMENTS FOR EACH CCA CONSERVATION MEASURE

Table A-1. Accomplishments in 2024 for each conservation measure listed in the Candidate Conservation Agreement for the greater sage-grouse on the Idaho National Laboratory Site.

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-ID would prepare an approach for hastening sagebrush reestablishment in burned areas and reduce the impact of wildland fires >40 ha (99 ac).

Conservation Measure 1—Accomplishments in 2024:

BURN ASSESSMENT— Five fires occurred on the INL Site that burned a total of approximately 57.77 ha (142.75 ac). Only one fire exceeded 40 ha (99 ac). The total mapped burned area of the Dry Channel Fire was 46 ha (113.7 ac) and there was a smaller area outside the fire where 708 m^2 (0.2 ac) was bladed and vegetation was removed. Idaho National Laboratory's Natural Resources Group (NRG) will prepare an assessment of the Dry Channel Fire and make recommendations for recovery in the winter of 2024 and 2025.

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 2024, BEA Facilities and Site Services mowed 6–12 m (20–40 ft) defensible space along 190 km (118 mi) of roadways and around 27 facilities and other infrastructure.

UPDATE THE INL APPROACH TO FUELS MANAGEMENT, FIRE SUPPRESSION, AND FIRE RECOVERY—To better address preparedness, response, and recovery from wildland fires, the INL Fire Department is planning to update an existing plan for fuels management and fire suppression and the NRG published a Wildland Fire Recovery Framework for the INL Site. A new Environmental Assessment will evaluate the proposed actions contained in both the plan and the recovery framework.

SAGEBRUSH REESTABLISHMENT—INL carried out the first mechanical sagebrush seeding across approximately 283.3 ha (700 ac) using locally collected sagebrush seed in the Tractor Flats area. Additionally, INL planted 19,050 seedlings within the 2010 Middle Butte Fire and 2007 Twin Butte Fire to support habitat restoration efforts. Weed control efforts continue in recently burned areas. A subset of sagebrush seedlings planted in 2023 and 2019 were revisited in 2024, 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 within 1 km (0.6 mi) of active leks and minimize the impact of infrastructure development on all other seasonal and potential habitats on the INL Site.
Conservation Measures:	2) Adopt best management practices outside facility footprints for new infrastructure development. 3) Infrastructure development within the SGCA or within 1 km (0.6 mi) of an active lek will be avoided unless there are no feasible alternatives.

Conservation Measure 2—Implementation of Best Management Practices in 2024:

In 2024 multiple projects outside facility footprints adopted and implemented best management practices 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.

- An upgrade to Critical Infrastructure Test Range Complex Pad D Access (Environmental Compliance Permit [ECP] INL-23-092) was completed within and adjacent to existing access routes at Critical Infrastructure Test Range Complex.
- New CFA Fire Station Gravel Lots (ECP INL-24-012) was sited mostly within the existing disturbance footprint of the CFA waterline project completed in 2023.
- Cell Site #6 Expansion (ECP INL-23-068 R1) was sited immediately adjacent to the existing Cell Site #6 footprint.
- A Relocatable Storage Unit Area (ECP INL-21-039 R1) was sited immediately adjacent to the existing MFC perimeter road.

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.

- CFA Salt and Sand Shelter (ECP INL-23-090) was sited within the previously developed footprint used for salt and sand storage.
- Green Day/Snow Eagle II (ECP INL-23-012 R1) infrastructure was all sited within the disturbed footprint of the Radiological Response Test Range.
- MFC-721 Transient Reactor Test Facility Office Building & MFC-724 Transient Reactor Test Facility Control Building (INL-21-084 R1) were sited within the previously disturbed footprints of existing buildings.

Best Management Practices employed in INL Power Management Activities 2022 (ECP INL-21-067 R1) included the installation of avian protection devices where possible.

COMPENSETORY MITIGATION: The sagebrush seedlings discussed in Conservation Measure 1 were planted as compensatory mitigation required by a past infrastructure project at the INL Site. Multiple projects currently taking place on the INL Site are going to be required to carry out compensatory mitigation for existing and potential sagebrush habitat destruction. These projects will be assessed following their activities to determine the amount of area requiring compensatory mitigation per the INL compensatory mitigation strategy.

Conservation Measure 3—Accomplishments in 2024:

- Three polygons associated with two infrastructure projects were observed within the SGCA while completing Task 8 in 2024. DOE was consulted on the preferred siting for each location.
    - One polygon was mapped at the USGS Geotechnical Drilling for USGS 153 (ECP INL-22-025) project location. This project was initiated and approved in 2022. As required by the CCA, DOE consulted with the USFWS on how to minimize impacts to sage-grouse prior to ground disturbing activities.
    - Two polygons were mapped resulting from disturbance associated with the installation of an underground fiber optic line along U.S. Highway 20/26.

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.~~ (See Section 6.2.4, Shurtliff et al. 2019).
Conservation Measure 4—Discontinued	
Threat:	Livestock
Objective:	Limit direct disturbance of sage-grouse on leks by livestock operations and promote healthy sagebrush and native perennial grass and forb communities within grazing allotments.
Conservation Measures:	5) Encourage the Bureau of Land Management (BLM) to seek voluntary commitments from allotment permittees and to add stipulations during the permit renewal process to keep livestock at least 1 km 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 2024:

LEK DISTURBANCE - During the 2024 sage-grouse lek counts, biologists did not observe any livestock on leks.

Conservation Measure 6—Accomplishments in 2024:

COMMUNICATION & COLLABORATION - DOE-ID and BLM continued to collaborate on updating their Memorandum of Understanding for management of land currently occupied by the INL Site.

Bipartisan Infrastructure Law funding was allocated for a local sagebrush seed collection to take place on the INL Site in 2023 in collaboration between INL, BLM and USFWS. This seed was planted using mechanical means on previously burned areas on the INL Site and adjacent BLM lands to promote the recovery of sagebrush habitat. This mechanical seeding effort was initiated mid-October 2024 and ran into logistical, management and labor issues preventing it from covering the entire proposed area. Additional mechanical seeding efforts are planned for future years.

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

Conservation Measure 7—Accomplishments in 2024:

The NRG assisted projects by recommending a project-specific native perennial seed mix list for revegetation work. It is mandatory that all seed mixes exclude intentional use of crested wheatgrass seed. Because crested wheatgrass is not native, it is never included as acceptable plant materials in INL Site revegetation plans.

Threat:	Landfills and Borrow Sources
Objective:	Minimize the impact of borrow source and landfill activities and development on sage-grouse and sagebrush habitat.
Conservation Measures:	8) Eliminate human disturbance of sage-grouse that use borrow sources as leks (measure applies only to activities from 6 p.m. to 9 a.m., March 15–May 15, within 1 km [0.6 mi] of active leks). 9) Ensure that no net loss of sagebrush habitat occurs due to new borrow pit or landfill development. DOE-ID 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.

Conservation Measure 8—Accomplishments in 2024:

INL complied with seasonal and time-of-day restrictions associated with sage-grouse. Per "Idaho National Laboratory Gravel/Borrow Pits (Overarching) Environmental Checklist [EC]" (EC 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 Blvd, Lincoln Blvd, Monroe Blvd, Ryegrass Flats, T-12, and T-28 South are covered by this EC. Historically, sage-grouse leks have been observed in three borrow pits: T-12, Adams Blvd, and Ryegrass Flats. Source material was removed from the Ryegrass Flats, T-12, and Adams Blvd borrow pits after 9 a.m. and before 6 p.m., complying with seasonal restrictions.

Conservation Measure 9—Accomplishments in 2024:

No new borrow pits or landfills were opened in 2024.

Expansion of existing borrow sources and landfills is limited to footprints approved in Appendix C of the Spent Nuclear Fuel Environmental Impact Statement (DOE/EIS-0203) or the EA for Silt/Clay Development and Use (DOE-EA-1083) with the exception of the T-12 pit, Monroe Blvd pit, and the Adams Blvd pit. The T-12 pit was expanded through appropriate authorizations in 2023. The Monroe Blvd pit and Adams Blvd pit experienced expansions within the previous two years and will initiate the need for compensatory mitigation in years to follow.

All noxious weeds are treated when encountered and other invasive species are treated or removed when defensible space is required around infrastructure and equipment within landfills and borrow sources in accordance with INL's Sitewide Noxious Weed Management Plan, PLN-611. In 2024, Noxious weeds were observed and treated at the CFA landfill in five instances. The weeds treated include, rush skeletonweed (*Chondrilla juncea*), spotted knapweed (*Centaurea stoebe*), Russian knapweed (*Acroptilon repens*), and musk thistle (*Carduus nutans*). Additionally, sterilant was applied to prevent the establishment and spread of noxious and invasive species and provide necessary defensible space at the T-28 gravel pit.

All landfills and borrow sources are planned to have reclamation activities completed when they are deemed to be no longer of use.

Threat:	Raven Predation
Objective:	Reduce food and nesting subsidies for ravens on the INL Site.
Conservation Measures:	10) DOE-ID will work with INL contractors and the National Oceanic and Atmospheric Administration to opportunistically reduce raven nesting on power lines and towers and at facilities.

	11) Instruct the INL to include an informational component in its annual Environment, Safety, and Health training module by January 2015 that teaches the importance of eliminating food subsidies to ravens and other wildlife near facilities.

Conservation Measure 10—Accomplishments in 2024:

During 2024, three INL-controlled transmission structures were retrofitted with single crossarms, permanently excluding future raven nesting at these sites (Section 4.1.1). In total, 66 INL-controlled transmission structures have been retrofitted.

Conservation Measure 11: Completed

Threat:	Human Disturbance
Objective:	Minimize human disturbance of sage-grouse courtship behavior on leks and nesting females within the SGCA and within 1 km (0.6 mi) Lek Buffers.
Conservation Measures:	12) Seasonal guidelines (March 15–May 15) for human-related activities within 1 km (0.6 mi) Lek Buffers both in and out of the SGCA (exemptions apply—see Section 10.9.3): • Avoid erecting portable or temporary towers, including meteorological, SODAR, and cellular towers. • Unmanned aerial vehicle flights conducted before 9 a.m. and after 6 p.m. will be programmed so that flights conducted at altitudes <305 m (1,000 ft) will not pass over land within 1 km (0.6 mi) of an active lek. • Detonation of explosives >1,225 kg (2,700 lb) will only occur at the National Security Test Range from 9 a.m.–6 p.m. • No non-emergency disruptive activities allowed within Lek Buffers March 15–May 15. 13) Seasonal guidelines (April 1–June 30) for human-related activities within the SGCA (exemptions apply—see Section 10.9.3): • Avoid non-emergency disruptive activities within the SGCA. • Avoid erecting mobile cell towers in the SGCA, especially within sagebrush-dominated plant communities.

Conservation Measures 12 and 13—Accomplishments in 2024:

The Carbon Free Power Project site was located within the SGCA. In 2023 this project was discontinued, and cleanup activities took place in the spring of 2024. These activities were considered exempt from Conservation Measure 13 but adhered to time-of-day restrictions outlined in Conservation Measure 12. Revegetation, weed treatment, and compensatory mitigation for the removal of potential sagebrush habitat will take place in the years following the discontinuation.

All unmanned aerial vehicle flights conducted at the Unmanned Aerial Systems runway or at the National Security Test Range 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 (2,700 lb) did not occur at the National Security Test Range between 6 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 nor within the SGCA during 2024.