Chapter 9: Natural and Cultural Resources Conservation and Monitoring

CHAPTER 9

Natural resource information is used to demonstrate compliance with applicable rules and regulations and to ensure that the Idaho National Laboratory (INL) Site mission and goals can be achieved with few-to-no impacts to natural resources. There are four key areas of emphasis: (1) special status species (2) conservation planning; (3) natural resource monitoring and research; and (4) land stewardship.

The U.S. Department of Energy's Idaho Operations Office (DOE-ID) addresses conservation by continually evaluating the regulatory rankings, abundance, and distribution of special status plant and animal species. For some species of elevated concern or with extensive populations and key habitats on the INL Site, DOE-ID has developed conservation plans to protect species and the valuable ecosystems they inhabit. These efforts include (1) the Candidate Conservation Agreement for Greater Sage-grouse (*Centrocercus urophasianus*) on the INL Site, (2) the INL Site Bat Protection Plan, (3) the Sagebrush Steppe Ecosystem Reserve, (4) the Migratory Bird Conservation Plan and Avian Protection Planning documents, and (5) the implementation of the U.S. Department of Energy (DOE) Conservation Action Plan.

Natural resource monitoring and research has been conducted for more than 70 years on the INL Site, with some studies dating back to the 1950s. The focus of this work is to better understand the INL Site's ecosystem and biota and to determine the impact on these species' populations from activities conducted at the INL Site. Natural resource monitoring activities include (1) breeding bird surveys, (2) midwinter raptor survey, (3) long-term vegetation transects, and (4) vegetation mapping. Additionally, the INL Site was designated as a National Environmental Research Park in 1975 and serves as an outdoor laboratory for environmental scientists to study Idaho's native plants and wildlife in an intact and relatively undisturbed ecosystem. Ongoing National Environmental Research Park (NERP) activities include (1) documenting ants and associated arthropods on the INL Site, (2) tracking rattlesnake movements through gestation and dispersal of young, (3) addressing ecohydrology in sagebrush steppe, (4) evaluating beta diversity within the context of fire severity, and (5) identifying high quality foodscapes critical to greater sage-grouse.

Land stewardship involves managing ecosystems on the INL Site through planning, assessment, restoration, and rehabilitation activities. Areas where DOE-ID is actively employing land stewardship activities include (1) wildland fire protection planning, management, and recovery; (2) restoration and revegetation; (3) weed management; and (4) ecological support for National Environmental Policy Act (NEPA).

The INL Cultural Resource Management Office (CRMO) coordinates cultural resource-related activities at the INL Site and implements the INL Cultural Resource Management Plan (DOE-ID 2016) with oversight by DOE-ID's Cultural Resource Coordinator. Cultural resource identification and evaluation studies in fiscal year 2022 included (1) archaeological field surveys, (2) cultural resource monitoring and site record updates related to INL Site project activities and research, (3) comprehensive evaluations of pre-1980 built environment resources, and (4) meaningful collaboration with members of the Shoshone-Bannock Tribes and public stakeholders.

9. NATURAL RESOURCES CONSERVATION AND MONITORING

The INL Site is in the Upper Snake River Plain, near the southern extent of the Beaverhead Mountains and the Lemhi and Lost River Ranges. It is host to a variety of wildlife species including, but not limited to, large ungulates, such as elk (*Cervus canadensis*) and pronghorn (*Antilocapra americana*); ten species of bats, commonplace being the western small-footed bat (*Myotis ciliolabrum*); and sagebrush obligates, such as the sagebrush lizard (*Sceloporus* graciosus) and the greater sage-grouse (*Centrocercus urophasianus*). Herpetofauna, such as the Great Basin rattlesnake (*Crotalus oreganus lutosus*) and the Great Basin spadefoot (*Spea intermontana*), use locally appropriate habitats, as do over 100 species of birds (e.g., raptor, waterfowl, passerine, and upland game species). The natural vegetation of the INL Site consists of an overstory of shrubs and an understory of grasses and forbs, or wildflowers. Big sagebrush (*Artemisia tridentata*) and green rabbitbrush (*Chrysothamnus viscidiflorus*) are the most common shrubs, while perennial grasses, such as needle and thread (*Hesperostipa comata*), Sandberg bluegrass (*Poa secunda*), and thickspike wheatgrass (*Elymus lanceolatus*), are generally the most abundant understory species. A diversity of flowering herbaceous forbs occurs in most plant communities, especially under favorable precipitation conditions.

The primary ecosystem of the INL Site is characterized as sagebrush steppe. Approximately 94% of the land on the INL Site is undeveloped (DOE-ID and USFWS 2014), with approximately 60% open to livestock grazing. Over the past two decades, wildland fire has affected natural resources across a substantial portion of the INL Site. Because of threats like these, the sagebrush ecosystem is considered one of the most imperiled ecosystems in the United States (Noss et al. 1995), and these ecosystems are being lost at an alarming rate. In fact, by the early 2000s, only about 56% of their historic range was occupied (Knick et al. 2003; Schroeder et al. 2004). Consequently, natural resources on the INL Site are a high conservation priority for the survival of species that are dependent upon sagebrush steppe, some of which may be at the risk of local extirpation or even regional loss (Davies et al. 2011). As such, effective natural resource monitoring and land stewardship are imperative to executing the INL Site's mission with minimal impacts to the local flora and fauna.

Natural resources conservation, monitoring, and land stewardship activities on the INL Site can be organized in four categories: (1) frequently evaluating the regulatory rankings, distribution, and populations for special status species; (2) planning and implementing conservation efforts for high-priority natural resources; (3) ongoing monitoring and research to provide baseline and trend data for specific taxa and broader ecological communities; and (4) conducting land stewardship activities to minimize impacts to natural resources and restore ecological condition, where appropriate. Natural resource data collected on vegetation and key wildlife species provide DOE-ID with an understanding of how species use the INL Site and context for analyzing trends. These data are often used in NEPA analyses and enable DOE-ID to make informed decisions for project planning and to maintain up-to-date information on potentially sensitive species on the INL Site. The data are also summarized and reported to support DOE-ID's compliance with environmental regulations, agreements, policies, and executive orders. Finally, conservation management, wildland fire recovery, and vegetation management plans are developed and maintained to provide land management guidance for a variety of land stewardship concerns.

9.1 Special Status Species

9.1.1 Wildlife

The INL Site provides breeding and foraging habitat for a variety of species, including 24 species of birds and 12 species of mammals that are of elevated conservation concern by state or federal agencies. Several of these species are sagebrush obligates, while others use habitats that are very localized on the INL Site such as juniper woodlands or surface water features. Many of these species are detected or monitored during annual survey efforts, including the midwinter raptor counts, sage-grouse lek counts, breeding bird surveys, and bat acoustical monitoring.

9.1.1.1 Federally Listed Species

Several species currently listed in the Endangered Species Act of 1973 (ESA) have been documented in the state of Idaho, including the bull trout (*Salvelinus confluentus*) and the Canada lynx (*Lynx canadensis*); however, due to habitat requirements of these and other listed species, they are not likely to occur on the INL Site. Several species that have either been proposed for listing under the ESA or have been recovered and delisted occur seasonally or are considered residents of the INL Site. The bald eagle (*Haliaeetus leucocephalus*), delisted in 2007, is commonly seen during the winter months on or near the INL Site. Species associated with sagebrush habitats, such as the pygmy rabbit (*Brachylagus idahoensis*) and the greater sage-grouse, were proposed for listing under the ESA in recent years. However, findings by the U.S. Fish and Wildlife Service (USFWS) deemed these listings unwarranted except for a distinct population segment of pygmy rabbits in Washington State.

While no wildlife species currently listed under the ESA are known to occur on the INL, there are at least 24 wildlife species of conservation concern identified by the Bureau of Land Management (BLM) as special status species (Type 2) that have been documented on the INL Site (Table 9-1). A BLM ranking of Type 2 indicates that a species is a candidate, was delisted within the past five years, is an experimental population, or has a proposed critical habitat by the USFWS (BLM 2008). Some of these species would also be considered sensitive if they were assigned a global or state conservation status ranking of three or less by NatureServe (2023). Of these BLM Type 2 species, some of the most common at the INL Site include the sage thrasher (*Oreoscoptes montanus*), the loggerhead shrike (*Lanius ludovicianus*), the ferruginous hawk (*Buteo regalis*), and the greater sage-grouse. Currently, DOE-ID and the USFWS are signatories on a Candidate Conservation Agreement for the sage-grouse and sage-grouse habitat; details of this agreement are discussed in Section 9.2.1.

9.1.1.2 State Sensitive Species

A minimum of 20 wildlife species identified in the Draft Statewide Wildlife Action Plan (2023) by the Idaho Department of Fish and Game (IDFG) as Species of Greatest Conservation Need (SGCN) have been documented on the INL Site (Table 9-1). These include occasional sightings of species, such as the American white pelican (*Pelecanus erythrorhynchos*) and the ring-billed gull (*Larus delawarensis*), to more commonly observed species, such as the greater sage-grouse and the burrowing owl (*Athene cunicularia*). As with BLM special status species, many SGCN species are detected or monitored during annual survey efforts at the INL Site; additional details of these survey efforts are discussed in Sections 9.2 and 9.3.

9.1.2 Plants

During the establishment of the INL Site research facilities in the 1950s, the flora and fauna were required to be monitored by the Atomic Energy Commission (Singlevich et al. 1951). Plant specimen collections were made during field surveys and founded the Plants of the Idaho National Laboratory herbarium. The herbarium contributes to the knowledge of species historically present across the INL Site. When the ESA (1973) was enacted, a list of proposed plant species for conservation protection was developed for the state of Idaho, but botanical professionals indicated there were state-specific data gaps (Henderson et al. 1977). On the INL Site, a concerted effort to survey rare and sensitive plant species was undertaken in the early 1980s, and another similar effort was completed during the early 1990s to fill the data gaps and to inform both state and federal assessments (Cholewa and Henderson 1984; Anderson et al. 1996). The INL contractor continues to conduct special status plant surveys to support federal conservation efforts, to provide information for NEPA assessment, and to facilitate mission critical activities in a manner that minimizes impacts to sensitive species (Atwood 1969; Cholewa and Henderson 1984; Anderson et al. 1996; Forman 2015).

There are currently 20 special status plant species that have been documented to occur on the INL Site. Many of those species are rare and occur very infrequently within their optimal habitats. Others may have slightly larger population sizes but are restricted by unique habitat requirements. A few special status plants have a widespread distribution across the INL Site.

Table 9-1. Special status animal taxa documented to occur onsite.

COMMON NAME	SCIENTIFIC NAME	GLOBAL RANK†	STATE RANK†	BLM RANK‡	SGCN RANK*	USESA STATUS	SEASONAL OCCURRENCE	ABUNDANCE
American white pelican	*Pelecanus erythrorhynchos*	G4	S3B	-[a]	Tier 2	Species of Concern	Migrant	Rare
bald eagle	*Haliaeetus leucocephalus*	G5	S5	Type 2	-	Delisted / Recovery	Migrant, Winter	Uncommon
big brown bat	*Eptesicus fuscus*	G5	S3	Type 2	-	species of concern	Year-round	Common
black-throated sparrow	*Amphispiza bilineata*	G5	S2B	Type 2	-	Species of Concern	Migrant, Summer	Rare
Brewer's sparrow	*Spizella breweri*	G5	S3B	Type 2	-	Species of Concern	Migrant, Breeding	Common
burrrowing owl	*Athene cunicularia*	G4	S2B	Type 2	Tier 2	Species of Concern	Migrant, Breeding	Common
California gull	*Larus californicus*	G5	S2B, S5N	-	Tier 2	Not Listed	Migrant	Uncommon
California myotis	*Myotis californicus*	G5	S3	Type 2	-	Species of Concern	Unknown	Unknown
Caspian tern	*Hydroprogne caspia*	G5	S1B	-	Tier 2	Species of Concern	Migrant, Summer	Rare
Clark's nutcracker	*Nucifraga columbiana*	G5	S3	-	Tier 3	Species of Concern	Year-round	Uncommon
common nighthawk	*Chordeiles minor*	G5	S4B	-	Tier 3	Species of Concern	Migrant, Breeding	Common
ferruginous hawk	*Buteo regalis*	G4	S3B	Type 2	Tier 2	Resolved	Migrant, Breeding	Uncommon
flammulated owl	*Psiloscops flammeolus*	G4	S3B	Type 2	-	-	Migrant	Rare
Franklin's gull	*Leucophaeus pipixcan*	G4/G5	S3B	-	Tier 3	Species of Concern	Migrant	Rare
fringed myotis	*Myotis thysanodes*	G4	S3	Type 2	-	Species of Concern	Summer	Uncommon
golden eagle	*Aquila chrysaetos*	G5	S3	Type 2	Tier 2	Species of Concern	Migrant, Summer, Winter	Uncommon
grasshopper sparrow	*Ammodramus savannarum*	G5	S3B	Type 2	Tier 3	Species of Concern	Migrant, Breeding	Common
greater sage-grouse	*Centrocercus urophasianus*	G3G4	S3	Type 2	Tier 1	Resolved	Year-round, Breeding	Common
green-tailed towhee	*Pipilo chlorurus*	G5	S4B	Type 2	-	Species of Concern	Summer	Rare
hoary bat	*Lasiurus cinereus*	G3G4	S3	Type 2	Tier 2	-	Summer, Migratory	Common
little brown myotis	*Myotis lucifugus*	G3	S3	Type 2	Tier 3	Petitioned for Listing	Summer	Common
loggerhead shrike	*Lanius ludovicianus*	G4	S3	Type 2	-	Species of Concern	Migrant, Breeding	Common
long-billed curlew	*Numenius americanus*	G5	S2B	Type 2	Tier 2	Resolved	Migrant, Breeding	Uncommon
long-legged myotis	*Myotis volans*	G4G5	S3	Type 2	-	Species of Concern	Summer	Uncommon
Piute ground squirrel	*Urocitellus mollis*	G5	S4	Type 2	-	-	Resident	Common

Table 9-1. continued.

COMMON NAME	SCIENTIFIC NAME	GLOBAL RANK†	STATE RANK†	BLM RANK‡	SGCN RANK*	USESA STATUS	SEASONAL OCCURRENCE	ABUNDANCE
pronghorn	*Antilocapra americana*	G5	S4	-	*	-	Resident	Abundant
pygmy rabbit	*Brachylagus idahoensis*	G4	S3	Type 2	Tier 2	Resolved	Resident	Uncommon
ring-billed gull	*Larus delawarensis*	G5	S2B, S5N	-	Tier 3	Species of Concern	Migrant	Rare
sage thrasher	*Oreoscoptes montanus*	G5	S3B	Type 2	Tier 2	Species of Concern	Migrant, Breeding	Abundant
short-eared owl	*Asio flammeus*	G5	S3	Type 2	Tier 3	Species of Concern	Year-round, Breeding	Common
silver-haired bat	*Lasionycteris noctivagans*	G3G4	S3	Type 2	Tier 2	Species of Concern	Summer, Migratory	Common
Townsend's big-eared bat	*Corynorhinus townsendii*	G4	S3	Type 2	Tier 3	-	Winter	Common
western grebe	*Aechmophorus occidentalis*	G5	S2B	-	Tier 2	Species of Concern	Migrant, Summer, Winter	Rare
western long-eared myotis	*Myotis evotis*	G5	S3	Type 2	-	-	Year-round	Uncommon
western small-footed myotis	*Myotis ciliolabrum*	G5	S3	Type 2	Tier 3	-	Migratory	Uncommon
white-faced ibis	*Plegadis chihi*	G5	S2B	-	Tier 2	Species of Concern	Migrant, Summer	Rare
willow flycatcher	*Empidonax traillii*	G5	S4B	Type 2	-	Species of Concern	Unknown	Rare
Yuma myotis	*Myotis yumanensis*	G5	S3	Type 2	-	-	Year-round	Rare

*Proposed SGCN 2023 Draft SWAP; see SWAP for a description of rankings (IDFG 2023)
†See NatureServe for a description of rankings (NatureServe 2023)
‡See BLM Manual 6840 – Special Status Species Management for a description of rankings (BLM 2008)
a. - = Not applicable

9.1.2.1 Federally Listed Species

The state of Idaho is host to five federally listed plant species under the ESA. None of the federally listed species are known to occur on the INL Site. Ute ladies'-tresses (*Spiranthes diluvialis*) and whitebark pine (*Pinus albicaulis*) have population occurrences within proximity to the INL Site but require specific key habitats, which are negligible or nonexistent within the cold desert steppe site. Although appropriate slickspot peppergrass (*Lepidium papilliferum*) habitat is available on the INL Site, the only known populations do not occur on the INL Site and are located hundreds of miles to the west.

9.1.2.2 State Sensitive Species

In addition to those species that receive federal regulatory support, state agencies also maintain a list of sensitive species. The list is a tool for agencies to prioritize conservation efforts and to promote a unified conservation approach statewide, which can be used proactively to avoid potential ESA listings. The Idaho Natural Heritage Program (IDFG 2023) and the Idaho Native Plant Society established this list of state sensitive species for Idaho in the 1980s at the Idaho Rare Plant Conference (e.g., INPS 2023). The conference brings together experts from many organizations to evaluate state sensitive species using the National NatureServe Network framework (NaureServe 2023). The state of Idaho manages the data within the Idaho Fish and Wildlife Information Systems program and disseminates species' specific information to make species account evaluations possible for assessing potential environmental impacts for project activities. Additionally, the special status plant list is made publicly available after each biennial list revision. Species are assigned a global and subnational ranking (State Rank). Vulnerable (S3), imperiled (S2), and critically imperiled (S1) are considered rare and denoted as special status plant species. There have been 20 special status species documented on the INL Site within its diverse composition of sagebrush steppe habitats (Table 9-2).

Table 9-2. Special status plant taxa documented to occur onsite.

COMMON NAME	SCIENTIFIC NAME	GLOBAL RANK†	STATE RANK†	BLM RANK‡	HABITAT	ABUNDANCE
white sand verbena	*Abronia mellifera*	G4	S1	-[a]	Sandy substrates in scrub	Rare
Lemhi milkvetch	*Astragalus aquilonius*	G3	S3	Type 2	Talus, gravelly, sandy substrates	Rare
painted milkvetch*	*Astragalus ceramicus* var. *apus*	G4T3	S3	-	Sandy substrates in sagebrush	Widespread
plains milkvetch	*Astragalus gilviflorus*	G5	S2	Type 4	Talus, gravelly, sandy substrates	Rare
wingfruit suncup	*Camissonia pterosperma*	G4	S2	Type 4	Talus, gravelly substrates	Localized
rosy pussypaws	*Cistanthe rosea*	G5	S2	-	Gravelly substrates	Rare
desert dodder	*Cuscuta denticulata*	G4G5	S1	-	Parasitic; shrub and grass hosts	Rare
smooth larkspur	*Delphinium glaucescens*	G3G4	S3	-	Sagebrush to bunchgrass rocky slopes	Rare
Hooker's buckwheat	*Eriogonum hookeri*	G5	S1	-	Slopes of lose sandy, rocky, talus substrates	Localized
nakedstem gymnosteris	*Gymnosteris nudicaulis*	G4	S3	-	Open, dry sandy substrates	Localized
fineleaf Hymenopappus*	*Hymenopappus filifolius* var. *idahoensis*	G5T3	S3	-	Slopes of talus, gravelly, sandy substrates	Localized
manybranched ipomopsis	*Ipomopsis polycladon*	G4	S2	Type 3	Slopes of talus, gravelly, sandy substrates	Localized
King bladderpod	*Lesquerella kingii*	G5	S3	-	Open rocky areas with silty substrates	Rare
Middle Butte bladderpod	*Lesquerella obdeltata*	G2	S2	-	Open rocky areas with silty substrates	Rare
Torrey's desert dandelion	*Malacothrix torreyi*	G4	S2	-	Coarse rocky substrates on slopes	Rare
shortflower monkeyflower	*Mimulus breviflorus*	G4	S2	-	Ephemerally damp swales	Rare
narrowleaf oxytheca	*Oxytheca dendroidea*	G4	S3	-	Dry, sandy to rocky flats	Rare
mountain ball cactus	*Pediocactus simpsonii*	G5?	S3	-	Cobblestone, clayey loam substrates	Localized
hidden phacelia+	*Phacelia inconspicua*	G2	S1S2	Type 2	Loose sandy soils near persistent snowbanks	Rare
green princesplume	*Stanleya viridiflora*	G4	S3	-	Large rocky areas with clayey to volcanic substrates	Widespread

*USESA Resolved
+USESA Species of Concern
†See NatureServe for a description of rankings (NatureServe 2023)
‡See BLM Manual 6840 – Special Status Species Management for a description of rankings (BLM 2008)
a. - = Not applicable.

9.2 Conservation Planning

9.2.1 Candidate Conservation Agreement for Greater Sage-grouse Onsite

Populations of the greater sage-grouse (*Centrocercus urophasianus*; hereafter, sage-grouse) have declined in recent decades (Connelly et al. 2004), and the species' range-wide distribution across western North America has been reduced to nearly half of its historical distribution (Schroeder et al. 2004, Connelly et al. 2011a). Healthy stands of sagebrush (*Artemisia* spp.) are necessary for sage-grouse to survive throughout the year; however, young sage-grouse also require a diverse understory of native forbs and grasses during the summer months. Sagebrush habitats that consist of a diversity of vegetation provide protection from predators and supply high-protein insects necessary for rapidly growing chicks (Connelly et al. 2011b). Sagebrush habitats have been greatly altered during the past 150 years and are currently at risk from a variety of pressures (Connelly et al. 2004; Davies et al. 2011; Knick et al. 2011). Because of sage-grouse reliance on broad expanses of sagebrush, there is concern about the trajectory of sage-grouse populations.

When sage-grouse were petitioned for listing under the ESA, DOE-ID recognized the need to reduce the potential for impact to existing and future mission activities. In 2014, DOE-ID entered into the Candidate Conservation Agreement (CCA) with the USFWS to identify threats to the species and their habitat and develop conservation measures and objectives to avoid or minimize threats to sage-grouse. This voluntary agreement established a Sage-Grouse Conservation Area (SGCA) (see Figure 9-1), and DOE-ID committed to deprioritize the SGCA when planning infrastructure development and to establish mechanisms for reducing human disturbance of breeding and nesting sage-grouse (DOE-ID and USFWS 2014).

To evaluate sage-grouse population declines with respect to their natural range of variation, the CCA established population and habitat triggers. The baseline value for the sage-grouse population trigger for the INL Site equals the number of males counted in 2011 during peak male attendance on 27 active leks within the SGCA (i.e., 316 males). The population trigger will be tripped if the three-year running average of males on those 27 baseline leks decreases ≥ 20% (i.e., ≤ 253 males). The baseline value of the habitat trigger is equivalent to the amount of area within the SGCA that was characterized as a sagebrush-dominated (*Artemisia* spp.) habitat at the beginning of 2013. The habitat trigger will trip if there is a reduction of ≥ 20% (15,712 ha [38,824 ac]) of sagebrush habitat within the SGCA. The total sagebrush habitat area and distribution are monitored using aerial imagery and a Geographic Information System. If a trigger is tripped, an automatic response by both DOE and USFWS would be initiated, as described in the CCA (DOE-ID and USFWS 2014).

The INL contractor biologists monitor sage-grouse populations, sagebrush habitats, and activities that are considered threats to sage-grouse survival on the INL Site. For details about the most recent annual results, refer to *Implementing the Candidate Conservation Agreement for Greater Sage-Grouse on the Idaho National Laboratory Site 2022 Full Report* (INL 2023).

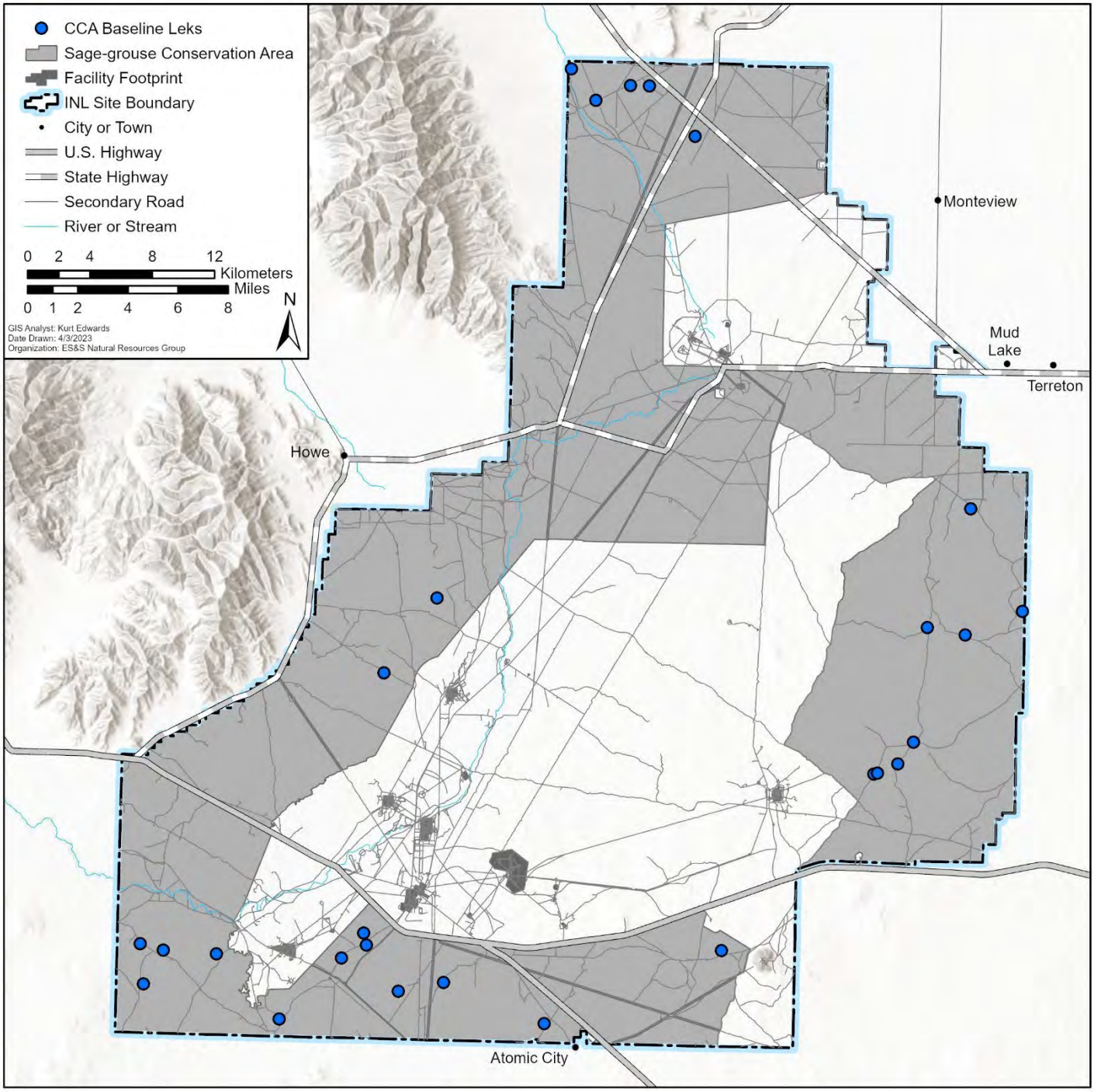

Figure 9-1. Area defined by the CCA for greater sage-grouse onsite as a SGCA and location of baseline leks used for determining the population trigger.

9.2.1.1 Population and Habitat Status

Each spring, crews monitor sage-grouse that have congregated on leks for breeding purposes. Baseline and all other active leks are monitored multiple times from March 20 until peak male attendance has been determined and recorded. Inactive leks are also surveyed every five years to determine if the lek status has changed. During 2022, the peak male abundance on baseline leks was 246—an 8.4% increase of males observed in 2021. Due to the overall declining trend in peak male attendance since 2016, the population trigger has been tripped for the first time based on the three-year running average, as stipulated in the CCA. However, the population decline observed on the INL Site is consistent with those observed statewide by the IDFG (Kemner 2022). Per the CCA (DOE-ID and USFWS 2014), additional cooperative action has been initiated between DOE and USFWS.

Two monitoring tasks are designed to identify vegetation changes across the landscape and assist in maintaining an accurate record of the condition and distribution of the sagebrush habitat within the SGCA to facilitate annual evaluation of the habitat trigger: (1) sagebrush habitat condition and (2) sagebrush habitat amount and distribution. Monitoring sagebrush condition provides data used to track annual changes in sagebrush habitat on the INL Site. Data collected to support this task may also be used to document gains in habitat as non-sagebrush map polygons transition back into sagebrush classes or to document losses when compositional changes occur within sagebrush polygons that may require a change in the assigned map class. Sagebrush habitat amount and distribution tracks losses to sagebrush habitat following events that alter vegetation communities, such as wildlife fires and land development. As updates are made to map classes (e.g., vegetation polygon boundaries), the total area of the sagebrush habitat available is compared to the baseline value established for the habitat trigger to determine the status with respect to the habitat threshold.

Together, these two monitoring tasks provide the basis for maintaining an accurate map and estimate of the condition and quantity of sagebrush habitat on the INL Site. The condition of sagebrush habitat remained high in 2022. Sagebrush cover was within its historical range of variability. Herbaceous cover exceeded its range of variability, and the abundance of non-natives was generally low. The total area of sagebrush habitat in the SGCA on the INL Site remained unchanged from 2021 to 2022, with 71,358.8 ha (176,331.4 ac). To date, a total loss of sagebrush habitat in the SGCA of approximately 1.3% has been reported.

9.2.1.2 Threats and Associated Conservation Measures

The CCA identifies and rates eight threats that potentially impact sage-grouse and their habitats on the INL Site, including wildland fire, infrastructure development, and raven predation. Conservation measures have been assigned to each threat and consist of actions aimed toward mitigating impacts to the sage-grouse and its habitat by INL Site activities. This is accomplished through the avoidance and minimization of threats by using best management practices (BMPs) such as setting seasonal and time-of-day restrictions. DOE-ID also recognizes that sagebrush-dominated communities outside of the SGCA serve as important habitats for sage-grouse, so BMPs were developed and applied to the entire INL Site, which guide infrastructure development and other land-use decisions.

9.2.2 Bat Protection Plan

Over the past several decades, newly identified threats to bat populations (e.g., white-nose syndrome and large-scale commercial wind energy development) have caused widespread mortality events in bats and resulted in precipitous declines of numerous common bat species and elevated conservation concern for bats across the United States, including additional listings under the ESA. Bats represent over 30% of mammal species described for the INL Site. Large undisturbed areas of shrub-steppe habitat, basalt outcrops, lava caves, juniper uplands, and ponds and landscape trees at industrial facilities provide complex and abundant foraging and roosting habitat for a variety of resident and transient bat species. Beginning in the early 1980s, the INL Site has supported bat research either through program funding or through outside-funded projects managed under the NERP. These efforts promoted general bat conservation and provided critical conservation data to DOE-ID decision makers state and federal resource agencies. The result of numerous publications, reports, conservation assessments, and theses has been the recognition of the INL Site and surrounding desert as crucial bat habitat.

In 2011, DOE-ID and the Naval Reactors Laboratory Field Office/Idaho Branch Office decided to increase the attention they give to bat resources and initiate the development of a comprehensive INL Site-wide bat protection and monitoring program. In 2018, the INL Site Bat Protection Plan was finalized (DOE-ID 2018). The Bat Protection Plan provides a framework for eliminating mission impacts associated with protected bat species, monitoring the status of bat populations, providing current data for environmental analyses, and engaging resource agency stakeholders such as the USFWS, BLM, and IDFG on bat issues. The *Idaho National Laboratory Site Bat Protection Plan Annual Report 2022* provides the most current INL Site bat data (Bybee et al. 2022).

During 2022, work performed under the INL Site Bat Protection Program scope included the following activities: there were 1,993,794 total files collected from acoustic monitoring stations, five caves were monitored year-round, four additional caves were monitored during the winter (November–April), two additional caves were monitored during the summer (May–October), and eight facilities were monitored during the summer. Of the total number of files, 288,800 files (104,648 identifiable as bat files) were from facilities and 1,702,839 files (286,339 identifiable as bat files) were from caves. Ongoing monitoring efforts show consistent patterns in seasonal bat distribution. The summer resident bat community consists predominantly of western small-footed myotis (*Myotis ciliolabrum*), Townsend's big-eared bat (*Corynorhinus townsendii*), big brown bat (*Eptesicus fuscus*), and western long-eared myotis (*Myotis evotis*) with some little brown myotis (*Myotis lucifugus*) and silver-haired bat (*Lasionycteris noctivagans*) detected at moderate levels at a few locations. Low levels of summer activity of hoary bat (*Lasiurus cinereus*) were detected during the summer at many monitoring locations. Western small-footed myotis was the most detected bat species at all surveyed features (facilities and caves). Little brown myotis are more commonly detected at facilities than at cave sites. Tree bats (hoary bats and silver-haired bats) were detected more frequently at facilities than caves. The results of the passive monitoring program are providing critical information regarding bat distribution, ecology, and conservation on the INL Site. The INL Site also participated in the North American Bat Monitoring program, facilitated by the United States Geological Survey (USGS) in 2022, collecting acoustic data in two priority grid cells as part of a nationwide sampling framework. These data were provided to IDFG.

In addition to the acoustical bat monitoring at the INL Site, several other activities were performed to address bat conservation. To support surveillance for white-nose syndrome (a disease impacting hibernating bats), humidity/temperature dataloggers were installed in eight monitored hibernacula during the summer of 2022. Five live bats were found in areas of facilities that were disrupting work and were relocated to safe areas. There were two other bats that were not interfering with work activities and left on their own. Thirty-four bat carcasses were recovered from facilities and submitted for radiological testing. Additionally, multiple public events were held at the Idaho Falls Zoo and Museum of Idaho.

9.2.3 Sagebrush Steppe Ecosystem Reserve

On July 19, 2004, DOE-ID signed a Finding of no Significant Impact for an Environmental Assessment (EA) and Management Plan that outlined a framework to collaboratively manage the Idaho National Engineering and Environmental Laboratory (INEEL) Sagebrush Steppe Ecosystem Reserve (SSER) with the BLM, USFWS, and IDFG. The SSER includes 29,945 ha (74,000 ac) of high desert land in the north central portion of the INL Site. In the 1999 Proclamation establishing the SSER, then Secretary of Energy Bill Richardson recognized that the "Reserve is a valuable ecological resource unique to the Intermountain West and contains lands that have had little human contact for over 50 years. The sagebrush steppe ecosystem across its entire range was listed as a critically endangered ecosystem by the National Biological Service in 1995, having experienced greater than a 98% decline since European Settlement." Because the SSER represents a unique ecological resource, "conservation management of the area is intended to maintain the current plant community and provide the opportunity for study of an undisturbed sagebrush steppe ecosystem." The Proclamation also specified that traditional rangeland uses will be allowed to continue under the SSER management designation and that the Public Land Orders, which withdrew INEEL lands, would supersede SSER management objectives if the land was needed to support INEEL's nuclear energy research mission (DOE-ID 2004).

Specific actions to guide the SSER management according to its mission and management goals were provided in the INEEL Sagebrush Steppe Ecosystem Reserve Final Management Plan (DOE-ID 2004). The primary actions included in the preferred alternative for managing the SSER were as follows: (1) establishment of a Reserve Management Committee, (2) reduction in road access and use, (3) implementation of an integrated weed management plan, (4) limitation of restoration actions to locally collected plant materials, (5) no changes in livestock class or increase in stocking levels, (6) no construction of wells for livestock watering purposes, (7) minimization of anthropogenic structures for raptor perching, and (8) responding to wildland fire suppression and post-fire restoration in a manner that is consistent with INL's Wildland Fire EA.

Implementation of the SSER Management Plan and associated actions were contingent on funding allocations from the cooperating agencies because those agencies recognized that innovative funding sources would likely be required for timely implementation. To date, the cooperating agencies have been unable to identify funding resources sufficient to establish the SSER managing committee and fully implement the SSER Management Plan. As such, DOE-ID is currently evaluating actions to improve the management of the SSER. However, DOE-ID and the INL contractor continue to consider the mission and goals of the SSER Management Plan in their planning processes and land management decisions on the INL Site. When federal actions are proposed by DOE-ID on or including portions of the SSER, the restrictions on travel, infrastructure development, and other activities described in the SSER Management Plan are documented and applied to any proposed actions through the INL NEPA process.

9.2.4 Migratory Bird Conservation and Avian Protection Planning

Most activities at the INL Site are conducted within fenced, industrial complexes that are up to several hundred acres in size. General actions from day-to-day operations that may affect migratory birds include mowing vegetated areas for wildland fire protection, maintenance of utilities and infrastructure, and moving equipment such as trailers and nuclear fuel casks. Therefore, it is not unusual to encounter a variety of animals, including migratory birds, while conducting these activities. As directed in Executive Order (EO) 13186 (2001) and outlined in a 2013 Memorandum of Understanding between the DOE and USFWS, DOE-ID has developed a Migratory Bird Conservation Plan (DOE-ID 2022) that provides a framework for protecting and conserving migratory birds and their habitat in accordance with the Migratory Bird Treaty Act of 1918 and the Bald and Golden Eagle Protection Act of 1940 while accomplishing critical DOE-ID and Naval Reactors Laboratory Field Office/Idaho Branch Office missions.

DOE-ID maintains a Special Purpose Permit issued by USFWS that allows for the destruction or relocation of a pre-determined number of migratory bird nests, when permit conditions are met. Additionally, a Scientific Collection Permit issued by IDFG allows for the capture of certain migratory birds for the intent of using them for scientific and monitoring purposes. All practicable minimization and avoidance efforts identified in the Migratory Bird Conservation Plan are to be implemented before parties exercise their ability to take migratory birds under these permits. The conservation plan identifies measures that are designed to eliminate or minimize impacts on migratory birds and to protect their habitat. These measures include the protection of native vegetation, avoiding disturbing nesting birds, reducing the potential for conflicts with missions, and enhancing native habitat as practical. Conservation measures are identified through the NEPA process, which assesses the potential impacts on migratory birds during the implementation of a project or activity. The plan also identifies BMPs that are implemented across the INL Site. BMPs include routine surveys of structures, equipment, and vegetated areas conducted during nesting season (i.e., April 1 to October 1) to ensure project activities do not disturb or otherwise interfere with active nests. If an active nest with eggs or chicks is discovered, all work that could result in abandonment or destruction of the nest is suspended and the appropriate environmental personnel are contacted for assistance and guidance. Until a determination is made whether to remove the nest, actions are conducted to ensure the nest is not abandoned due to work activities.

On July 14, 2022, an unauthorized removal of swallow nests occurred at a bus stop at the Central Facilities Area resulting in the take of seven nests with viable eggs and 10 hatchlings. This unauthorized take was committed by one or more individuals and was immediately reported to the USFWS for further investigation.

Immediate actions taken after the incident included:

- The area was secured to preserve the scene in anticipation of a USFWS investigation. Photos were taken of the scene.

- Carpenters built and installed two bird boxes to help protect the chicks that survived. Adults were observed entering one of the boxes with food the following morning, indicating the success of the box. Chicks in the second box were placed in the first box which had been accepted by the adults.
- Materials and carcasses have been collected by DOE for USFWS review
- iNote was developed to reinforce expectations to protect migratory birds.

During 2019, DOE-ID established a Migratory Bird/Wildlife Conservation Working Group to provide a forum for discussing, resolving, and collaborating on all activities related to migratory bird and other wildlife matters arising on the INL Site. A primary task of this group is to promote the conservation of migratory birds, share ideas to minimize the impact of nesting birds to operations, and ensure compliance with permit requirements. Accomplishments to date include the development of online Migratory Bird Awareness Training for environmental staff, facility maintenance, operations, and program managers; mitigation actions, such as incorporating critical equipment inspections into daily operations orders to identify nesting activities; use of window dressings to reduce mortality from window collisions; and effectively exchanging information regarding the use of relocating bird eggs or young to licensed rehabilitators are used as options in lieu of unavoidable destruction and take situations.

In 2022, two dead birds (a raven and a red-tailed hawk) were found along powerlines. The INL contractor has developed an Avian Protection Plan and Bird Management Policy (MCP-3367) in accordance with Avian Power Line Interaction Committee requirements (Avian Power Line Interaction Committee 2006). This plan includes documenting, tracking, and correcting conditions that resulted in a migratory bird's death. When birds are electrocuted, power poles are either retrofitted or modified with avian protection devices during the next scheduled power outage. These efforts help to reduce future electrocutions. Avian interactions are also considered when siting new line locations and when replacing existing poles to reduce risks to migratory birds through proactive and innovative resolutions.

9.2.5 Conservation Action Plan

EO 14008, "Tackling the Climate Crisis at Home and Abroad" (2021), establishes the need for the United States to increase the speed and scale of necessary actions to mitigate the effects of the climate crisis. This EO states, "The United States will also move quickly to build resilience, both at home and abroad, against the impacts of climate change that are already manifest and will continue to intensify according to current trajectories." Additionally, it requires federal agencies to identify strategies that will encourage broad participation in the goal of conserving 30% of the Nation's lands and waters by 2030.

To address EO 14008 and its requirements, the *Conserving and Restoring America the Beautiful* report (2021) was developed by federal resource agencies and the Council on Environmental Quality. The report outlines seven focus areas for early action, and DOE developed a Conservation Action Plan (2021) to summarize ongoing and planned conservation projects within each of those focus areas that are broadly applicable across DOE lands. The focus areas that are specifically addressed at each DOE site are related to the complexity and sensitivity of the mission at that site. The following are long-term and ongoing projects that are conducted on the INL Site to address some of these focus areas:

- ***Support Tribal Led Conservation and Restoration Priorities*** – The lands now designated as the INL Site are included in the ancestral homelands of the Shoshone and Bannock people. Archaeological sites on the INL Site and far beyond are held by the Shoshone-Bannock Tribes as evincing their cultural heritage and a reflection of their ancestors. Landmarks, such as Middle Butte, define home and territory, figure in oral histories that tell how the world came to be the way it is, and provide a living link between contemporary Shoshone and Bannock people and their ancestral homelands. This landscape is part of the tribe's past subsistence and settlement, seasonal round for hunting (e.g., buffalo), plant gathering, travel and trade routes, tool sources (i.e., obsidian), and features many areas that are of great importance or are sacred to them. As a signatory to the *Memorandum of Understanding Regarding Interagency Coordination and Collaboration for the Protection of Indigenous Sacred Sites Among the U.S. Department of the Interior, U.S. Department of Agriculture, U.S. Department of Transportation, U.S. Department of Energy, U.S. Environmental Protection Agency, White House Council on Environmental Quality, Advisory Council on Historic Preservation, Tennessee Valley Authority,* DOE-ID works to provide access to and protection of such sites.

DOE-ID's long-term relationship with the Shoshone-Bannock Tribes is documented in an Agreement in Principle that formalizes tribal involvement in DOE-ID planning and implementation of environmental restoration, long-term stewardship, cultural resources protections, waste management operations, and nuclear energy programs. For example, the tribes, DOE-ID, the INL contractor, and BLM staff began planning restoration efforts at the Birch Creek site to stabilize soils and vegetation in the area. In 2022, soil samples were collected and analyzed so that nutrient deficiencies can be addressed prior to planting. Weed management activities at Middle Butte Cave and Aviator's Cave reduced weed propagation, which allows other beneficial vegetation to establish in the area and stabilizes the soil. Weed management projects also improved access to the caves by humans and bats. Additionally, the tribes, DOE-ID, and the INL contractor collaborated to plant approximately 11,000 sagebrush seedlings where sagebrush had been lost to wildland fire near Middle Butte.

- ***Expand Collaborative Conservation of Fish and Wildlife Habitats and Corridors*** – IDFG has identified sagebrush steppe as one of the most important ecosystems for wildlife in Idaho (IDFG 2023) and the INL Site remains one of the best remaining examples of an intact sagebrush steppe ecosystem in the region. DOE-ID is working to restore these important habitats that were impacted by fires or other disturbances by planting sagebrush seedlings (Section 9.2.2), reducing invasive species (Section 9.2.4), and developing conservation plans for key species such as sage-grouse (Section 9.1.1) and bats (Section 9.1.2). DOE-ID has also set aside 29,945 ha (74,000 ac) of sagebrush steppe habitat as an ecosystem reserve (Section 9.1.3). In many cases, these conservation efforts are undertaken in collaboration with federal and state stakeholders, such as USFWS, BLM, IDFG, and the Idaho State Office of Species Conservation. In addition to these ongoing efforts, several new conservation opportunities were identified in the Climate Vulnerability and Resilience Planning for INL (see Other Actions Supportive of the America the Beautiful Campaign in this section below).
- ***Increase Access for Outdoor Recreation Opportunities*** – DOE-ID and the INL Site facilitate outdoor recreation opportunities to the public via big game hunting. Hunting zones for elk and pronghorn were established by DOE-ID and are administered by the IDFG on 8,704 ha (21,508 ac) along the Site boundary in northern portions of the INL Site. A valid hunting license and an IDFG-issued INL Site hunting permit are required to access these areas.
- ***Incentivize and Reward Voluntary Conservation Efforts of Fishers, Ranchers, Farmers, and Forest Owners*** – Livestock grazing permits for cattle and sheep are administered by BLM on eight allotments that overlap the INL Site boundary, resulting in approximately 60% of the INL Site that is open to ranching operations. DOE-ID and the INL contractor collaborate with BLM and allotment permittees by attending allotment reviews, providing vegetation monitoring data, reviewing EAs for activities that may impact the INL Site, and sharing resources for fire recovery of sagebrush ecosystems and sagebrush habitat restoration. These parties also cooperate to ensure that conservation measures, such as ensuring that fences are wildlife compatible and water troughs are located to minimize impacts to vegetation, are implemented and yield the desired outcome. In many cases, these conservation measures have the potential to reduce impacts from livestock operations on natural resources and increase efficiencies for permittees.
- ***Other Actions Supportive of the America the Beautiful Campaign*** – In addition to the Conservation Action Plan (DOE 2021), DOE also developed the Climate Adaptation and Resilience Plan (CARP) (DOE 2021) in response to EO 14008. The CARP provides a framework for developing a Vulnerability Assessment and Resilience Plan for each DOE site. The INL Vulnerability Assessment and Resilience Plan, or *Climate Vulnerability Assessment and Resilience Planning for Idaho National Laboratory* (Ischay and Nate 2022), identifies programmatic and technological solutions to increase resilience to climate change across INL Site facilities (see Chapter 3), and it also includes opportunities to increase climate resilience across the natural landscape through inventory, monitoring, and resource management plans. Finally, DOE-ID and the INL contractor are participating in DOE's Sustainable Climate-Ready Sites program, which is a voluntary recognition program designed to foster excellence in sustainability, climate resilience, and natural resource protection. This program supports implementation of the Conservation Action Plan and the CARP.

9.3 Natural Resource Monitoring and Research

9.3.1 Breeding Bird Surveys

The North American Breeding Bird Survey (BBS) was developed by the USFWS and the Canadian Wildlife Service to document trends in bird populations. Pilot surveys began in 1965 and immediately expanded to cover the United States east of the Mississippi and Canada, and by 1968, included all North America (Sauer and Link 2011). The BBS program in North America is managed by the USGS and currently consists of over 5,100 routes, with approximately 2,500 of these being sampled each year (Sauer and Link 2011).

BBS data provide long-term species abundance and distribution trends for more than 420 species of birds across a broad-geographic extent (Sauer and Link 2011). These data have been used to estimate population changes for hundreds of bird species, and they are the primary source for regional conservation programs and modeling efforts for birds (Sauer and Link 2011). The BBS provides a wealth of information about population trends of birds in North America and is the foundation for broad conservation assessments extending beyond local jurisdictional boundaries (Sauer and Link 2011).

Five official USGS BBS routes (i.e., remote routes) are on the INL Site and have been surveyed nearly each year since 1985 (except 1992 and 1993). In 1985, DOE-ID also established eight additional routes around INL Site facilities to monitor birds near human activity centers (i.e., facility routes; see Figure 9-2). These routes are also surveyed annually using the same techniques and methods as those indicated by USGS. Surveys are conducted from late May until early July and are scheduled to be conducted as close to the same day each year. All birds seen and heard during the survey are recorded regardless of breeding status (e.g., flyovers). BBS data can directly benefit INL Site managers by providing information on local breeding bird populations, which may be useful as they consider new activities and comply with the NEPA assessment process.

A total of 7,125 birds and 58 species were documented during the 2022 surveys. Total observations were 58.8% higher than the 36-year mean of 4,598 birds (1985–1991 and 1994–2022). The total number of species recorded was also higher than the 36-year mean of 55 species.

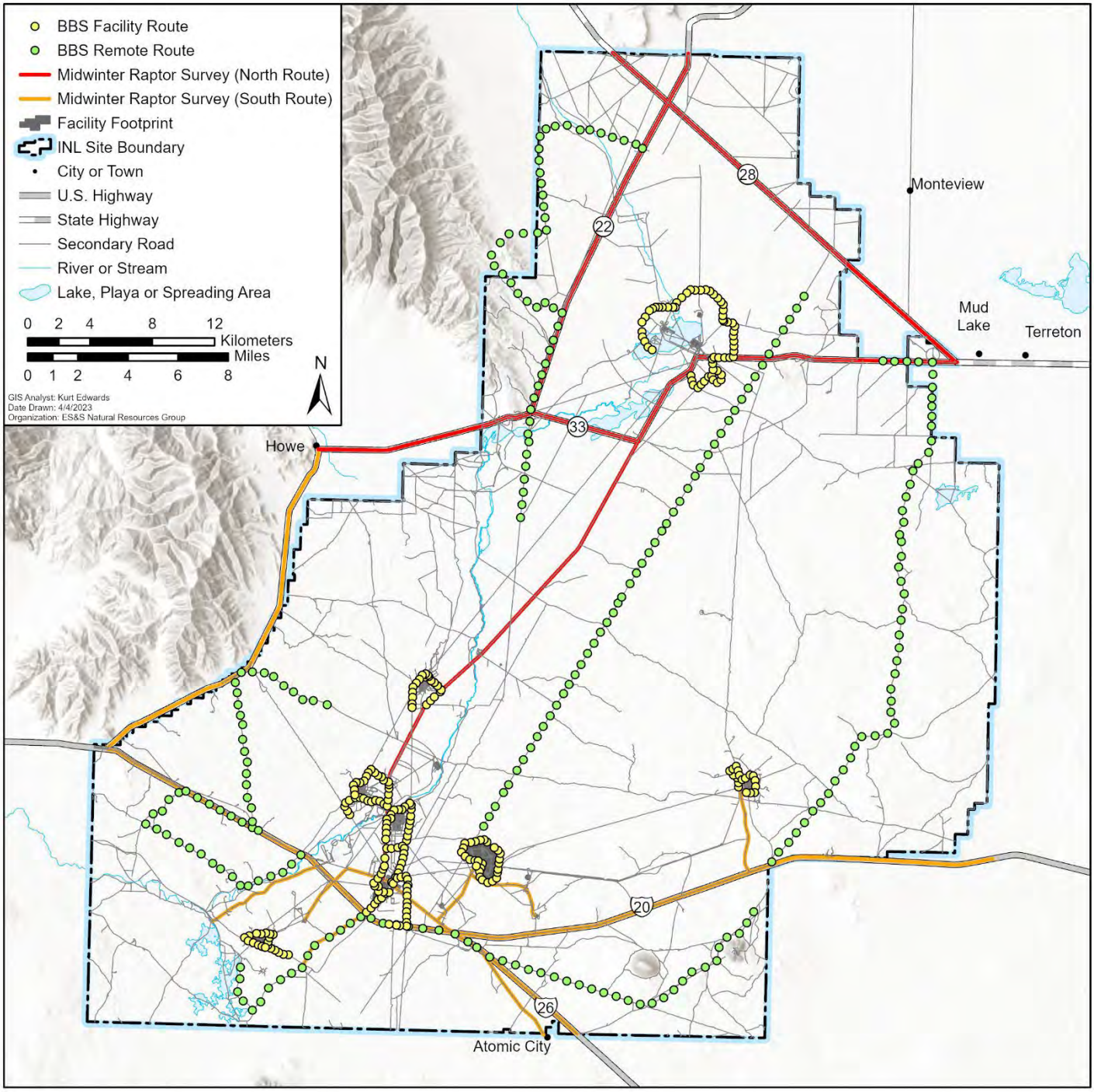

Figure 9-2. Remote and facility BBS routes and north and south midwinter raptor survey routes onsite.

Five species observed during the 2022 BBS are considered by the IDFG as SGCN, which includes the Franklin's gull (*Leucophaeus pipixcan*, n=880), California gull (*Larus californicus*, n=419), sage thrasher (*Oreoscoptes montanus*, n=313), sagebrush sparrow (*Artemisiospiza nevadensis*, n=250), and burrowing owl (*Athene cunicularia*, n=5). When Franklin's gulls and California gulls are observed, they are often in large flocks foraging on the INL Site, and it is unlikely they are nesting on Site.

The five most abundant bird species across all routes were horned lark (*Eremophila alpestris*, n=2,733), Franklin's gull, western meadowlark (*Sturnella neglecta*, n=666), Brewer's sparrow (*Spizella breweri*, n=474), and the California gull. Horned lark, western meadowlark, sage thrasher, sagebrush sparrow, and Brewer's sparrow were observed on every route (Bybee and Williams 2023).

9.3.2 Midwinter Raptor Survey

Midwinter eagle surveys were initiated during 1979 by the USGS to develop a population index of wintering bald eagles in the lower 48 states, determine bald eagle distribution, and identify previously unrecognized areas of important wintering habitat. In 1983, two midwinter eagle survey routes were established on the INL Site, one that encompasses the northern portion of the INL Site and one that encompasses the south (Figure 9-2). Initially, the counts focused on eagle populations; however, biologists recognized the importance of collecting data on raptor abundance during this survey and started recording all raptors, including owls, hawks, and falcons in 1985. In 1992, the list of recorded species expanded to include corvids and shrikes.

In early January of each year, teams of biologists survey along the two established routes to detect any target species perched, hovering, or soaring. The number of individuals per species is counted for each of the target species detected. A total of 403 birds representing eight species were observed during the 2022 midwinter raptor surveys. Common ravens and rough-legged hawks are typically the most observed species during this survey and made up 76% and 15% of the observations in 2022, respectively.

9.3.3 Long-term Vegetation Transects

The long-term vegetation (LTV) transects and associated permanent plots were established on what is now the INL Site in 1950 for the purposes of assessing impacts of nuclear energy research and production on surrounding ecosystems (Singlevich et al. 1951). Initial sampling efforts focused on potential fallout from nuclear reactors and the effects of radionuclides on the flora and fauna of the Upper Snake River Plain. After several years of sampling, however, the concentrations and any related effects of radionuclides on the sagebrush steppe ecosystem of the INL Site were determined to be negligible (Harniss 1968). Because the LTV plots were widely distributed across two transects that bisect the INL Site, as shown in Figure 9-3, and vegetation abundance data had been collected periodically since their establishment, the LTV plots' utility as a basis for monitoring vegetation trends in terms of species composition, abundance, and distribution was eventually recognized. Regular vegetation data collection has continued on the LTV plots—occurring about once every five years. Eighty-nine LTV plots are still accessible, and most have been sampled consistently between 1950–2022, making the resulting dataset one of the oldest, largest, and most comprehensive for sagebrush steppe ecosystems in North America.

As the mission of the INL Site has grown and changed over the past 70 years, so too has the purpose and utility of the LTV project. Although the LTV project was initiated to address energy development at the INL Site, it is unique in its capacity to allow investigators to observe long-term vegetation change and the potential impacts of that change at the INL Site and across the region. Abiotic and biotic conditions (e.g., conditions created by the physical environment and by other living organisms) have been characterized by rapid change over the past few decades. These changes include shifts in land cover, land use, and weather patterns. Several wildland fires have removed sagebrush from a large portion of the Upper Snake River Plain over the past few decades; approximately 99,000 ha (250,000 ac) have burned on the INL Site since 1994. Soil disturbance associated with fighting wildland fires and disturbance associated with general increases in the use of remote backcountry areas are notable at INL and throughout the Intermountain West. Concurrently, many of the hottest and driest years during the 70-year INL Site weather record occurred during the past decade. All these factors contribute to increasing stress on native plant communities and potentially set the stage for a period of dramatic change in vegetation across the region. The LTV project is documenting this change and may provide some context for understanding resistance and resilience in local sagebrush steppe.

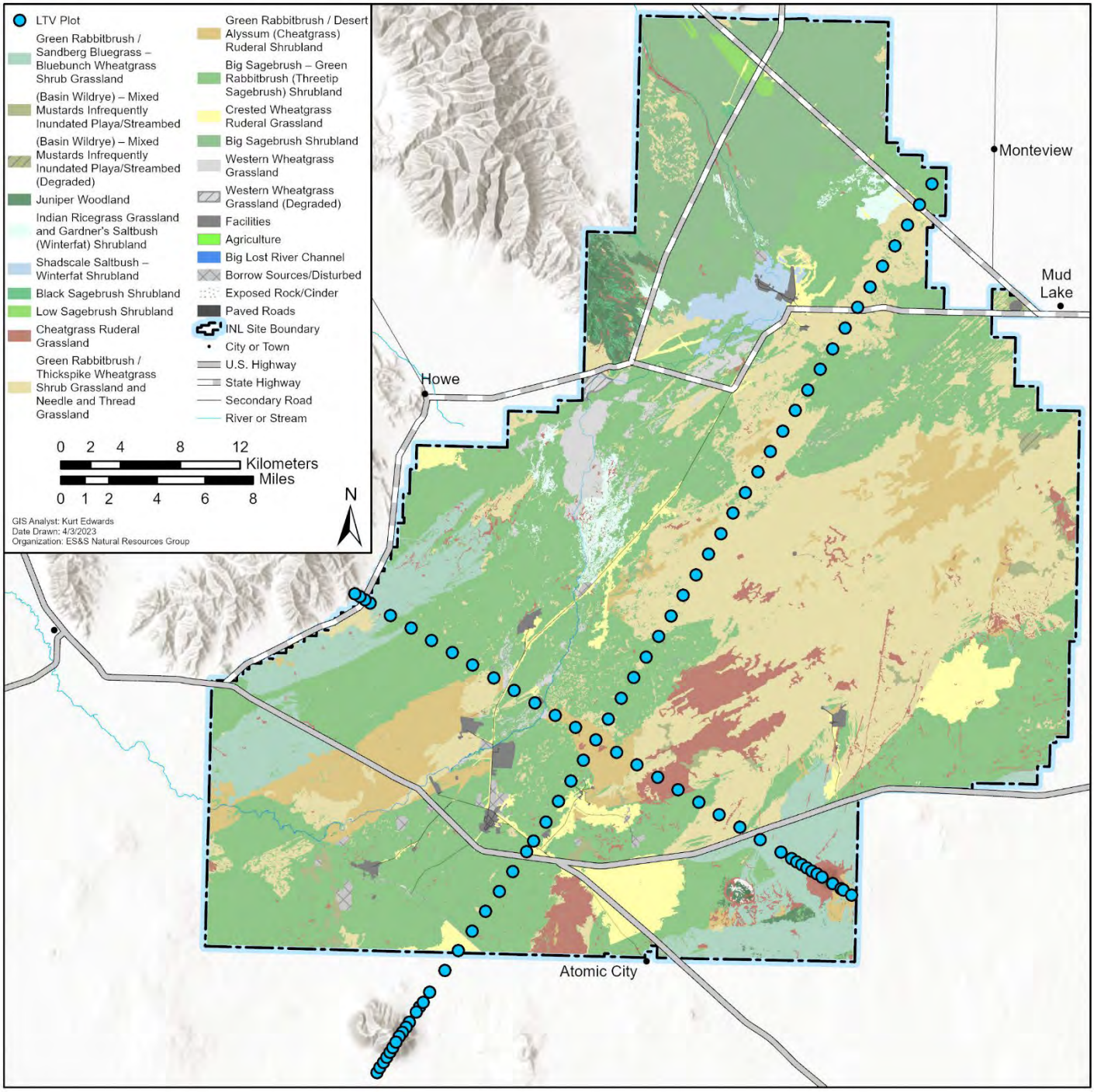

Figure 9-3. Locations for the LTV plots established onsite in 1950 and sampled regularly over the past 70 years shown with the INL Site vegetation community classification map published in 2019.

Data were collected across the 89 active LTV plots for the fourteenth time between June and August of 2022. Plots were sampled for cover and density by species according to methodologies developed in 1950, with supplemental sampling protocols added in 1985 (see Forman and Hafla [2018] for details of the project sample design). The 2022 data will be integrated into the larger LTV dataset, and summary results will be presented in a technical report scheduled to be released in 2024. Notable changes between the 2011 and 2016 sample periods (the most recent sample periods for which data have been published) include decreases in shrub cover and particularly big sagebrush, increases in native grass cover, and declines in the densities of introduced annual grasses and forbs. In terms of long-term trends, big sagebrush cover was at its lowest point in the 66-year history of the dataset, and native, perennial grasses were near the upper end of their historical range of variability. Introduced annuals, primarily cheatgrass (*Bromus tectorum*), exhibited fluctuations with greater magnitudes of change from one sample period to the next over the past two decades when compared with earlier sample periods.

9.3.4 Vegetation Map

The vegetation map published in 2011 represented a substantial improvement over previous maps of the INL Site in terms of resolution, accuracy, and statistical rigor (Shive et al. 2011). Since completion, the vegetation map has been used extensively to support the inventory and monitoring of ecological resources, prioritizing potential habitat for other sensitive species, identifying restoration and weed control opportunities, and characterizing affected environments for NEPA analyses. There have been many changes in vegetation distribution and composition since the map was completed. The most discrete changes were caused by four relatively large wildland fires that burned approximately 52,820 ha (130,521 ac) from 2010–2012, representing approximately 23% of the INL Site. More gradual changes in plant community composition, such as increases in the abundance and distribution of non-native annual grasses and forbs, have also been occurring over the past decade.

A comprehensive update to the current vegetation map was initiated in 2017 and involved three steps: (1) a plant community classification to define vegetation classes, (2) manual map delineations of those classes, and (3) an accuracy assessment of the completed map. A total of 16 unique vegetation classes resulted from the plant community classification, in which 12 represented natural vegetation classes and 4 were ruderal classes (e.g., classes dominated by non-native species; Shive et al. 2019). Within the native classes, there was one woodland class, six shrubland classes, two shrub grasslands, and three grasslands. Within the ruderal classes, there was one shrubland, two grasslands, and a class characterized by mixed weedy forbs that tend to dominate areas with a specific hydrologic regime, namely playas.

The Big Sagebrush – Green Rabbitbrush (Threetip Sagebrush) Shrubland class contained the largest amount of total area of the INL Site mapped, with 851.2 km^2 (210,330.9 ac), and the greatest number of map polygons with 2,388 (Figure 9-3). The second largest mapped area was the combined Green Rabbitbrush/Thickspike Wheatgrass Shrub Grassland and Needle and Thread Grassland class with 570.8 km^2 (141,035 ac). The three largest map classes cover 73.2% of the vegetated area on the INL Site, suggesting most vegetation communities are dominated by big sagebrush or species most commonly associated with post-fire communities where big sagebrush was previously present. The Cheatgrass Ruderal Grassland contained the second largest number of polygons with 1,435. However, the mean area for the Cheatgrass Ruderal Grassland class was much smaller at 0.06 km^2 (15.9 ac) and many of the polygons mapped were isolated individual patches rather than larger contiguous areas.

Some plant community classes were combined prior to the map accuracy assessment because those classes were known to be hard to map with imagery. This resulted in 13 map classes that were evaluated through an independent map accuracy assessment. Overall map accuracy across all classes was 77.3% with a Kappa value of 0.75. These results indicate the new vegetation map is not only the highest spatial resolution (i.e., 1:6,000), but also the most accurate map ever produced for the INL Site. The Juniper Woodland class had the highest individual class accuracy (i.e., user's and producer's accuracy) of 100%, but was limited in distribution and spatial extent. The Big Sagebrush – Green Rabbitbrush (Threetip Sagebrush) Shrubland class contained the largest amount of mapped area and was the second most accurate map class with a user's accuracy of 93.9%. For more information about vegetation classification and mapping results, visit the Vegetation Community Classification and Mapping of the INL Site 2019.

9.3.5 National Environmental Research Park

The INL Site was designated as a NERP in 1975 through a NERP Charter, the Energy Reorganization Act, and Non-nuclear Energy Research and Development Act. The Idaho NERP and NERPs at other DOE sites are outdoor laboratories that provide opportunities for environmental studies on protected lands that act as buffers around DOE facilities. The objective of the NERP system is to facilitate research and education, particularly to demonstrate the compatibility of energy technology development and a quality environment. INL's NERP designation has allowed the INL Site to host environmental scientists to study Idaho's native plants and wildlife in an intact and relatively undisturbed ecosystem (Figure 9-4). The Idaho NERP provides exceptional opportunities for research because of its established facilities, a security buffer that protects research areas, extensive historical data, and partnerships with universities. In 2022, the INL contractor facilitated university-led research on five ecological research projects through the NERP: (1) documenting ants and associated arthropods on the INL Site, (2) tracking rattlesnake movements through gestation and dispersal of young, (3) addressing ecohydrology in sagebrush steppe, (4) evaluating beta diversity within the context of fire severity, and (5) identifying high quality foodscapes critical to greater sage-grouse.

Figure 9-4. Researchers studying the flora and fauna of the Idaho NERP.

Entomological studies facilitated through the Idaho NERP include an array of research on taxa relationships, new species descriptions, and documentation of species new to the INL Site. A list of ants found at the INL Site was developed by Clark and Blom (2007) and has been used as a basis for studying ecological relationships between some of the ant taxa and a variety of ant guests. In the ecological context, guests are generally defined as animals living within the nest or colony of another species. One ant guest taxon, a desert beetle (*Philolithus elatus*), was not previously known from the INL Site (Stafford et al. 1986) but has recently been collected from harvester ant (*Pogonomyrmex salinus)* nests; it is currently the subject of study and description. An undescribed species of the Jerusalem cricket (*Stenopelmatus* sp.) has also been found in ant nests at the INL Site; work to formally describe this species continues. Field observations indicate a predatory crab spider (*Xysticus* sp.) that has not been documented previously on the INL Site was noted to be feeding on *Pogonomyrmex salinus*. Additionally, researchers continued to make incidental observations and field records for flea beetles (*Disonycha latifrons)* that feed on green rabbitbrush (*Chrysothamnus viscidifloris*) and *Moneilema* sp. (not previously found at the Site), a rare cactus feeding beetle. Voucher specimens

collected at the INL Site have been deposited in the insect collection at the Orma J. Smith Museum of Natural History and College of Idaho and are available for research. The principal investigator leading this research effort is William Clark from the College of Idaho; his work on invertebrates at the INL Site spans several decades and will continue into the foreseeable future.

More ecological studies have been conducted on the Great Basin rattlesnake (*Crotalus oreganus* ssp. *lutosus)* than any other reptile species on the INL Site. This species occurs in large numbers in several areas on the INL Site and is best known for their large aggregations of sometimes several hundred individuals at underground overwintering sites (hibernacula). During their activity season, Great Basin rattlesnakes make a lengthy migration away from and back to a hibernaculum. While adult male and non-pregnant female rattlesnakes travel several kilometers during their active season to forage and find mates, pregnant individuals move less and generally remain within 1 km of their hibernaculum. These pregnant snakes spend most of their active season gestating under rocks until they give birth. The selection of an appropriate gestation site is important for pregnant snakes to avoid predators, such as badgers and hawks, and to provide proper thermoregulatory opportunities because embryonic development is influenced by temperature. In 2018 and 2019, a project was conducted on the INL Site to locate gestation rocks used by pregnant Great Basin rattlesnakes and to measure their attributes to determine if pregnant rattlesnakes were selecting specific rocks. Initial results indicate that gestation rocks fall within a specific size range and have attributes that are a subset of the available rocks; this suggests pregnant snakes are likely making choices to use specific rocks. From a management and conservation perspective, once identified, the persistence and non-destruction of gestation rocks could be important for maintaining Great Basin rattlesnake populations because these rocks have specific characteristics that allow yearly success in reproduction. The principal investigator for this project is Dr. Vincent Cobb from Middle Tennessee State University and he is working on manuscripts that describe the results from this study.

The INL Site and other landscapes with sagebrush steppe vegetation are experiencing a simultaneous change in climate and plant community composition that is impacting habitat for wildlife, wildfire risks, and ecosystem services such as forage. Determining the separate and combined/interactive effects of climate and vegetation change is important for assessing future changes on the landscape and for hydrologic processes. Since the early 2000s, investigators have used an existing INL ecohydrology research facility, the former Protective Cap/Biobarrier Experiment, to study vegetation change with respect to precipitation regime, vegetation type, and soil depth. The focus of current research is to compare the impacts of grass invasion and shifts in timing of precipitation to the function of the whole ecosystem, including biogeochemistry, carbon storage, and other attributes that relate to resistance and resilience in a changing environment. The experiment site was burned in its entirety by the 2019 Sheep Fire, which created an exceptional opportunity to test the underlying basis for the theory on resistance to exotic annual-grass invasion (cheatgrass) and resilience of sagebrush steppe. The long-term treatments conveniently create a gradient of pre-fire climate differences, and the cessation of treatment application has induced large differences in simulated drought conditions on the experiment. Researchers continue to sample the differences in cheatgrass among the treatments along with the corresponding soil nutrients and water. The research team includes Dr. Matthew Germino from the USGS Forest and Rangeland Ecosystem Science Center and Dr. Toby Maxwell and Dr. Marie-Anne DeGraff from Boise State University; their research continues to use a facility that has been in operation since 1994. They will continue to collect data for at least the next few years.

In 2017, vegetation abundance data were collected from over three hundred plots across the INL Site to support an update to the INL Site vegetation map. These plots were used to classify plant communities into mappable units and were therefore distributed across a range of representative vegetation types. The plant communities sampled during this survey effort included intact sagebrush steppe and recovering post-fire assemblages from areas that burned at various times and intensities prior to data collection. In 2022, an effort to revisit these data and summarize them for publication in the peer-reviewed literature was initiated. The purpose is two-fold. The first objective of this research effort is to document and describe the methodologies used to develop the INL Site plant community classification. The second objective is to evaluate changes to beta diversity in the context of fire severity across the INL Site. The principal investigator for this project is Dr. Ken Aho from Idaho State University, and his work to complete analyses and develop manuscripts related to this study is ongoing.

The Idaho NERP is collaborating in a multiagency research project focused on identifying high quality foodscapes critical to sage-grouse habitat conservation across the sagebrush steppe ecosystem. The project has been conducted for

several years and spans across multiple western states. The research team aims to identify the chemical phenotype (or chemotype) of sagebrush species linked with high sage-grouse forage fidelity to identify which habitats are crucial dietary hotspots for sage-grouse that should be prioritized for conservation and where seed collection should occur for local restoration of plants that are palatable to local sage-grouse populations. Field research is conducted during the winter and spring months to identify the seasonal changes in chemotypes of sagebrush consumed by sage-grouse. Browsed vegetation and excreta of sage-grouse are collected and used to determine diet quality using Near Infrared Spectroscopy and analytical chemistry of plants, diet composition using DNA barcoding of feces, digestibility of food using a particle size analysis of feces, and detoxification capacity by analyzing renal metabolites in uric acid. Overall, the project is focused on supporting preventative management actions, protecting functional biodiversity and palatable sagebrush, and improving the availability of locally adapted seed sources most appropriate in habitat restoration projects that aim to promote health populations of sage-grouse. The principal investigator is Boise State University researcher, Dr. Jennifer Forbey, and her work is anticipated to continue on the INL Site.

9.4 Land Stewardship

9.4.1 Wildland Fire Protection Planning, Management, and Recovery

The INL fire department provides wildland fire suppression services on the rangeland within the Site boundary as well as a five-mile buffer outside of the INL Site boundary. The fire department employs pre-incident strategies, such as the identification of special hazards, mitigation procedures, and mapping necessary to facilitate response to fires. DOE-ID maintains mutual aid agreements with regional agencies, including the BLM, to assist in response to high challenge wildland fires. Additionally, the INL contractor implements PLN-14401, “Idaho National Laboratory Wildland Fire Management Plan,” which incorporates essential elements of various federal and state fire management standards, policies, and agreements. A balanced fire management approach has been adopted to ensure the protection of improved laboratory assets in a manner that minimizes effects on natural, cultural, and biological resources. The INL contractor has established a Wildland Fire Management Committee (WFMC) to review seasonal fuel management activities and the potential impact of all fires greater than 40.5 ha (100 ac).

A primary responsibility of the WFMC is to determine if a post-fire recovery plan is warranted for a given fire. Once an ecological resources post-fire recovery plan is requested, the INL Natural Resources Group completes an ecological resource assessment to evaluate the resources potentially impacted by a wildland fire and drafts a recovery plan for treatment prioritization and implementation by the WFMC. After the 2019 Sheep Fire, WFMC members expressed an interest in a recovery plan where implementation is phased over five years and is flexible, in that actions can be implemented individually depending on specific resource concerns and funding availability. The resulting plan was organized into four natural resource recovery objectives: (1) soil stabilization for erosion, (2) cheatgrass and noxious weed control, (3) native herbaceous recovery, and (4) sagebrush habitat restoration. Multiple treatment options were provided in the plan for improving post-fire recovery. Because the structure and organization of the plan, as well as the options of prioritizing treatment actions, were useful to the WFMC, subsequent post-fire ecological recovery plans continue to use this framework. There are two post-fire ecological resource recovery plans that are actively being implemented on the INL Site—one plan for four fires that burned in 2020 and one plan for the 2019 Sheep Fire.

In 2020, the WFMC requested an ecological assessment and fire recovery plan for four fires ranging in size from 11 ha (27 ac) to 678 ha (1,675 ac): the Howe Peak Fire, the Telegraph Fire, the Cinder Butte Fire, and the Lost River Fire. Under approved emergency stabilization actions listed in the existing Wildland Fire EA (DOE 2003), the INL contractor 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 (Forman et al. 2021), additional recovery actions were prioritized by INL’s WFMC, including (1) monitoring temporary fire suppression access roads for natural recovery, (2) installing signs, and (3) replanting those roads, if necessary, and (4) ongoing noxious weed inventory and treatment across all four fires. Additionally, sagebrush restoration was recommended on the Telegraph Fire because it would improve habitat value in proximity to an active sage-grouse 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 footprint in October 2022.

The Sheep Fire burned more than 40,000 ha (98,842 ac) of land on the INL Site in July 2019. Under the direction of the WFMC, several restoration efforts outlined in the Sheep Fire Ecological Resources Post-Fire Recovery Plan (Forman et al. 2020) were completed. Soil stabilization efforts were finished on the Sheep Fire containment lines in 2020, and the WFMC prioritized additional 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. Cheatgrass treatments were completed adjacent to approximately 13.7 km (8.5 mi) of a two-track road in 2021 and was revisited to assess treatment efficacy in 2022. DOE-ID and agency stakeholders collaborated to seed sagebrush on portions of the Sheep Fire during the winter of 2019/2020. The seeding was completed across a target area of approximately 10,100 ha (25,000 ac) in and adjacent to the SGCA. Because of poor initial germination and establishment from the aerial seeding, a total of 45,000 seedlings were planted in the Sheep Fire in October 2021, and an additional 45,000 seedlings were planted in October 2022. Except for ongoing noxious weed treatment, all post-fire recovery activities prioritized by the WFMC for the Sheep Fire were completed by the end of fiscal year (FY) 2022.

Emergency wildland fire response and associated soil stabilization actions are addressed in the INL Wildland Fire EA (DOE 2003). Because there have been changes in fire frequency and land cover over the past twenty years, updates to the wildland fire management and recovery plans are necessary. The INL contractor is currently in the process of updating wildland fire management plans and the framework for post-fire recovery plans. These updates are based on the recommendations by the WFMC after the Sheep Fire and the 2020 fires. DOE will perform the necessary NEPA analysis to assess any potential impacts attributed to the implementation of updated plans. Updated plans and additional NEPA analysis will facilitate a more comprehensive and effective response to wildland fire management and post-fire restoration in the future.

9.4.2 Restoration and Revegetation

9.4.2.1 Revegetation for Soil Stabilization

Revegetation with native species is required on the INL Site for activities that disturb or remove soil and vegetation where the area will not be physically stabilized and maintained as sterile. These areas are left exposed and vulnerable to erosion and invasive or noxious weed infestation. Areas requiring revegetation are evaluated for appropriate revegetation methods based on site condition and disturbance size. The baseline condition of areas that may be disturbed are characterized prior to disturbance, partly to assess the native species present. The native species observed inform an appropriate seed mix that is to be used during revegetation efforts following the disturbance. Revegetation strategies on the INL Site include but are not limited to hand broadcasting seed, seedbed preparation, soil augmentation, drill seeding, and planting nursery stock.

In 2022, one revegetation project was initiated by INL's Facility and Site Services on approximately 0.13 ha (0.33 ac) to address soil stabilization. The project occurred in disturbed areas containing little to no vegetation along a recently built power line. Initial germination and establishment of native grass seed that was hand broadcast and raked in will be assessed in 2023.

Revegetation projects on the INL Site are revisited at least one growing season after the revegetation attempt, and revegetation assessments involve a two-step process to monitor success and determine if further actions need to be taken. The first step includes collecting qualitative data to provide a rapid assessment of the area. This initial assessment is used to determine if a more rigorous quantitative assessment is warranted or if the revegetation actions are obviously unsuccessful and further revegetation actions are needed. The second step is a quantitative assessment, which is used to assess the ground cover by species of the revegetated area for comparison to the background vegetative cover of the surrounding plant community. Revegetation is considered successful if the vegetative cover of desirable species is within an acceptable threshold of background values.

There were three revegetation projects evaluated in 2022 with an initial qualitative assessment. The first revegetation project was for an area used for road improvements along Nile Avenue near Test Area North (TAN) and the Specific Manufacturing Capability facility. The initial assessment of this area indicated that vegetative cover was sparse, and the area has continued to be utilized for staging by multiple projects in the vicinity. Efforts to maintain the area as a stabilized and sterilized construction laydown area would be a better use of resources than continued revegetation

efforts, and it would prevent the establishment of additional staging areas in previously undisturbed vegetation. The second project was for revegetation on an area where excess soil was placed at TAN in support of the TAN Fire and Potable Water Line Replacement project. The initial assessment of this area indicated that vegetative cover was sparse and patchy, and the most abundant plant species were undesirable, introduced species. It was recommended a new revegetation plan be developed and implemented for this area. The third project was the revegetation of disturbed areas in support of the construction and operation of a Remote-Handled Low-Level waste disposal facility project. This project was revegetated in the 2016–2017 timeframe, but the 2022 assessment was the first assessment completed for the area. This initial qualitative assessment indicated there was a reasonable diversity of native species, and they were well distributed across the revegetation area. There were no further revegetation actions recommended at the time, and the quantitative second step in assessing this project shall be conducted to evaluate progress toward background conditions.

9.4.2.2 Sagebrush Habitat Restoration

Sagebrush habitat restoration on the INL Site is conducted in response to DOE-ID's goal of no net loss of sagebrush. The potential to lose sagebrush habitat on the INL Site occurs in two instances. The first is due to wildland fire, as discussed in Section 9.4.1, which has the potential to remove large tracts of sagebrush habitat and can take more than 100 years to recover naturally (Blew and Forman 2010). The second instance where sagebrush habitat is lost is due to infrastructure expansion and mission critical project activities. The INL contractor implements multiple BMPs to minimize sagebrush habitat loss, such as co-locating infrastructure, but in some cases, removal of sagebrush habitat is necessary to support the INL mission. The INL contractor carries out a compensatory sagebrush mitigation strategy for projects that must remove sagebrush habitat. This strategy outlines an approach for projects to provide funds for sagebrush to be restored in designated priority areas where they can provide the greatest habitat benefit.

Sagebrush habitat restoration has been conducted using containerized sagebrush seedlings (Figure 9-5) and aerially applying sagebrush seed. Due to the semiarid nature of the local ecosystem, the INL contractor has found that planting sagebrush seedlings results in higher survivorship than trying to establish sagebrush from seed. Therefore, current efforts focus on containerized planting, but DOE-ID and the INL contractor continue to partner with agencies to test and develop additional planting methods.

Figure 9-5. Planters using hoedads to install big sagebrush seedlings onsite.

In 2022 a total of 100,000 sagebrush seedlings were planted. The seedlings were distributed as follows: 45,000 sagebrush seedlings were planted in the Sheep Fire burned area, 41,300 sagebrush seedlings were planted in the Telegraph Fire burned area, and 13,700 seedlings were planted in the Twin Buttes Fire and Middle Butte Fire burned areas. The areas planted in the Sheep and Telegraph Fires were to address fire recovery priorities for those areas, and the planting in the Twin Buttes and Middle Butte Fires were to provide compensatory mitigation for infrastructure development. As a result of sagebrush habitat restoration on the INL Site since 2015, 255,750 sagebrush seedlings have been planted across 988.7 ha (2,443.1 ac). Seedlings planted on the INL Site are monitored one year and five years after planting to assess survivorship, and planting strategies are adjusted according to past survivorship data.

9.4.3 Weed Management

The INL contractor maintains and funds a noxious and invasive weed management program to address requirements of federal agencies described in *EO 13112, Invasive Species*, as amended by EO 13751, *Safeguarding the Nation from the Impacts of Invasive Species.* The Noxious and Invasive Weed Species Management program on the INL Site fulfills these requirements by first ensuring that prevention of the introduction, establishment, and spread of invasive species is prioritized during all activities. The risks from noxious weeds and invasive species are also minimized by discouraging unnecessary actions that can create spreading vectors or new introductions. Another strategy the INL contractor uses to prevent the introduction of noxious weeds to unaffected areas is focusing treatment efforts along potential vectors such as perimeter roads, along highways, interior two-track roads, and within facility footprints.

Trained INL Applicators can detect, identify, mark, and in most cases, treat invasive weed species quickly in cooperation with the Natural Resource Group. Each time noxious and invasive weeds are encountered, INL Applicators use integrated pest management principles that determine whether treatment actions are required and what type of treatment is needed (biological, cultural, physical, mechanical, or chemical). Noxious weed species and invasive species are typically treated differently from one another on the INL Site. INL Applicators generally treat noxious weeds with pesticide application when the pesticide label allows but, in some cases, certain species are treated using manual or mechanical treatments. Most treatments targeting invasive species without a noxious weed designation take place in the form of mechanical removal such as mowing or trimming. These treatments are often conducted for defensible space around infrastructure. In some cases, following the removal of large infestations of noxious weeds, the INL contractor will revegetate the area with appropriate native species to prevent invasive weeds from returning and promote soil stabilization.

INL Applicators are also able to monitor known noxious weed and invasive species locations along with any treatments conducted. This capability allows INL Applicators to understand where, how, and which noxious weeds are spreading on the INL Site so they can more effectively allocate time and resources. This information can be used to determine if additional treatments are necessary and identify which treatment methods can be applied to achieve greater control and to ensure they are the most effective, cost-efficient, and present little to no risk to people or the environment.

Along with directly targeting and treating weeds, INL has implemented programmatic strategies to reduce the potential introduction and spread of weeds. These include both employee education and work controls. Every year employees are provided briefings and training material about how to identify, report, and minimize the spread of weeds. Work controls to limit risks of weed introduction and spread during work activities are implemented through the Biological Resource Review (BRR) process. During the BRR process, a natural resource scientist reviews and identifies projects with the potential to create weed vectors or that may require monitoring for noxious weeds and invasive species and provides strategies for addressing those concerns.

Because invasive species do not recognize ownership boundaries, INL Applicators participate in invasive species management with surrounding land management agencies and municipalities by participating in Cooperative Weed Management Area (CWMA) activities. The INL Site is located within three different CWMAs designated by the Idaho State Department of Agriculture, and CWMA activities often include joint spray days in which adjacent landowners, county employees, or federal and state employees who maintain a state of Idaho issued Pesticide Applicator License collaborate to treat large infestations. In 2022 INL Applicators attended two joint spray days hosted by regional CWMAs to treat noxious weeds in regions adjacent to INL, and INL hosted a CWMA spray day on the INL Site where Applicators treated nearly 150 acres in the Big Lost River Spreading Area that was infested mostly by leafy spurge (*Euphorbia esula*).

All pesticide applications on the INL Site are conducted in accordance with the specific pesticide label instructions in accordance with the Federal Insecticide, Fungicide, and Rodenticide Act (1996). All records associated with pesticide applications on the INL Site are kept for a minimum of three years in accordance with Idaho Administrative Procedures Act 02.03.03, "Rules Governing Pesticide and Chemigation Use and Application" (Idaho State Department of Agriculture 2022). In 2022, 1778 noxious weed observations were made, and 119 pesticide applications were conducted. Additionally, weeds were controlled via shoveling and hand-pulling when appropriate. Noxious weed species targeted and controlled in 2022 were rush skeletonweed (*Chondrilla juncea*), scotch thistle (*Onopordum acanthium*), musk thistle (*Carduus nutans*), Russian knapweed (*Acroptilon repens*), spotted knapweed (*Centaurea stoebe*), black henbane (*Hyoscyamus niger*), leafy spurge, houndstounge (*Cynnoglassum officinale*), sowthistle (*Sonchus arvensis*), and Canada thistle (*Cirsium arvense*).

9.4.4 Ecological Support for National Environmental Policy Act

Individual actions performed under Categorical Exclusions at the INL Site are addressed in Environmental Compliance Permits (ECPs). These are the lowest level of NEPA review. There were 70 new ECPs initiated in 2022. Ecological support for ECPs is carried out predominantly through Technical Point of Contact review and the BRR process for activities outside of facility footprints with the potential to disturb wildlife, vegetation, or soils. There were 25 BRRs initiated in support of ECPs in 2022. The BRR is intended to assess the biological impacts and fulfill any regulatory compliance requirements associated with the project. The first part of the BRR process is collecting a baseline condition of the project site prior to conducting activities. The second part is conducting a follow-up survey of project activities to assess project impacts. The BRR also acts as a tracking mechanism for multiple monitoring requirements that must be reported at the end of the year. Some monitoring requirements that are documented in the BRR include identifying noxious weed locations, evaluating areas requiring soil stabilization, quantifying areas where compensatory sagebrush mitigation may be required, completing nesting bird surveys, and identifying native plant species that should be used for revegetation.

9.5 INL Site Cultural Resource Management

The INL CRMO resides within the INL Management and Operating contractor, Battelle Energy Alliance. Cultural resource professionals within the INL CRMO coordinate cultural resource-related activities at the INL Site and implement the INL Cultural Resource Management Plan (DOE-ID 2016) with oversight by DOE-ID's Cultural Resource Coordinator. Provisions to protect the unique cultural resources of the land and facilities at the INL Site are included in environmental policies issued by Battelle Energy Alliance and other INL Site contractors and in company procedures that guide work completion. Cultural resource identification and evaluation studies in 2022 included archaeological field surveys, monitoring, and site updates related to INL Site project activities, and the studies supported DOE-ID in facilitating meaningful collaboration with members of the Shoshone-Bannock Tribes and public stakeholders.

9.5.1 INL Section 106 Project Reviews

During 2022, the INL CRMO reviewed approximately 500 projects under Section 106 of the National Historic Preservation Act. Increased efficiencies in the review process grew from CRMO integration into the NEPA review process via the rollout of the new Environmental Review Process system and the issuance of a Timely Order that clarified the use of exempted activities and property types. These changes to the CRMO Section 106 review process streamlined sharing project information and communication, resulting in shorter review times and integration of information required to support decisions. Approximately 200 of these Section 106 reviews were issued CRMO project numbers. Of these, three projects resulted in No Adverse Effects to historic properties and two required hold points for further review. The remainder of the projects resulted in findings of No Historic Properties Affected. Section 106 reviews that did not involve exempt activities and property types were provided to the DOE-ID Cultural Resource Coordinator for review and approval as the 36 CFR 800 agency official prior to completion of the NEPA reviews.

9.5.2 INL Section 110 Research

Cultural resource identification and evaluation studies in FY 2022 were many and varied. Class III inventories for Section 110 surveys related to areas identified by the Shoshone-Bannock Tribes and INL CRMO research interests. These interests include the acquisition of data to support the ongoing development of the Precontact Context and other active research proposals. There are currently two active multi-year Section 110 research proposals, including “Pluvial Lake Terreton: Building a Multidisciplinary Dataset to Understand Human Land Use During the Terminal Pleistocene” (INL 2017a) and “Decoding the Southern Idaho Cultural Landscape Through Volcanic Glass Source Analysis” (INL 2017b). The INL CRMO staff is coordinating these research efforts with the Shoshone-Bannock Tribes.

9.5.2.1 Precontact Context Initiation

As part of DOE-ID commitments to strengthen the INL Site historic preservation program, the INL CRMO, DOE-ID, and Shoshone-Bannock Heritage Tribal Office (HeTO) initiated efforts on the Precontact Context (PCC). Precontact refers to the period when the Shoshone and Bannock Tribes occupied North America prior to contact with Europeans and Euroamericans. The Precontact Context identifies the time span as roughly 13,000 years before the present to contact with Lewis and Clark in 1805. A draft proposal was prepared and is currently under review by the HeTO staff. The proposal includes the following themes (along with associated research questions): Shoshone and Bannock ethnohistory, changes in the landscape and environment, projectile point chronology, settlement and subsistence, volcanic glass transport and trade.

Because the INL Site only covers 569,600 acres of the ancestral territory of the Shoshone and Bannock people, it was necessary to consider cultural resources beyond those on DOE-managed lands. The draft proposal includes an 8-million-acre study area, with the understanding that this area represents only a small portion of the Shoshone and Bannock ancestral territories.

The INL CRMO and HeTO are currently in the “Assessing, Synthesizing and Identification” phase of the PCC. Given that much of the study area includes lands managed by the Idaho Falls BLM, the agency has agreed to share their existing cultural resource information and will assist in the identification process. Preliminary property types, based on previous eastern Snake River Plain research, have been refined during 2022, with guidance from HeTO staff.

During the summer of 2022, the CRMO staff, HeTO, and the BLM archaeologist rerecorded ten previously recorded precontact sites within the study area thought to represent specific property types. Most of these sites had not been visited by Shoshone-Bannock Tribal representatives before 2022. During the summer of 2023, the rerecording of other sites in the study area will continue.

Work has also been initiated on context themes, including the generation of Accelerator Mass Spectrometry assays to refine the eastern Snake River Plain point chronology and characterize environmental changes over the past 13,000 years. Previously collected projectile points from excavated sites within the study area, including Weston Canyon Rock Shelter, Jackknife Cave, the Wasden Site, and the Birch Creek Rock Shelters, have been analyzed via X-ray Fluorescence Spectroscopy (XRF). These efforts will continue into 2023 and involve XRF analysis of existing surface collections from the study area.

Assignment of property types in the PCC geospatial database will take place in 2023. Once this task is complete, the INL CRMO and HeTO staff will work to characterize the locational patterns of property types and characterize the current condition of property types. This task will assist in defining physical integrity guidelines and provide the necessary information for evaluating National Register eligibility.

9.5.2.2 Owl Cave Research

To better understand the Shoshone and Bannock peoples' use of the landscape within the Pioneer Basin, the physiographic region encompassing the INL Site, INL CRMO archaeologist graduate interns began investigations at the oldest and only stratigraphic site in the region. Working in conjunction with Museum of Idaho collection managers, INL researchers inventoried and classified the entire stone tool collection for the purpose of establishing the collection's extent and potential for future research. In addition to organizing lithic artifacts, INL researchers reviewed and digitized notes on features, units, and layers to evaluate the potential for undisturbed stratigraphic sections of the site, resulting in a three-dimensional model of excavations, artifacts, and features at Owl Cave. Finally, a selection of obsidian stone tools of differing functional type and stratigraphic context were subjected to X-ray fluorescence analysis. The results of all these efforts will be published in a peer-reviewed journal article in 2023.

9.5.2.3 Decoding the Southern Idaho Cultural Landscape Through Volcanic Glass Source Analysis

Over the past two years, researchers at the INL CRMO and HeTO have undertaken a massive, collaborative study of obsidian source use on the Upper Snake River Plain to understand how mobility, trade, and lithic resource use may have changed over time. By comparing the trace-element composition of obsidian artifacts to a comprehensive reference collection of geologic obsidian from across the state, archaeologists at the CRMO can determine the provenance or "source" of each artifact. Drawing on legacy collections of artifacts held at the Idaho Museum of Natural History (IMNH), CRMO and HeTO staff have thus far selected over 1,200 temporally diagnostic obsidian projectile points for non-destructive analysis via XRF at the CRMO lab. Combined with data from prior analyses of early projectile point types found in association with Lake Terreton, a large Late Pleistocene lake that once covered much of the INL Site, the data will provide a rich new source of information on how the changing environment of the eastern Snake River Plain conditioned patterns of landscape use and subsistence over the past 13,000 years. Development of the CRMO Idaho obsidian reference collection was made possible through a Memorandum of Understanding between DOE-ID, the BLM, and the United States Forest Service. Analysis of collections held at the IMNH was permitted by the IMNH as well as DOE-ID and the BLM and in coordination with the Shoshone-Bannock Tribes.

9.5.2.4 Built Environment Comprehensive Inventory

In 2021, the INL CRMO contracted the Center for the Environmental Management of Military Lands (CEMML), housed at Colorado State University, to complete a comprehensive survey of built environment resources at the INL Site constructed prior to 1980. While select INL Site campuses were surveyed in the late 1990s, those records did not capture the necessary depth of detail to provide sound evaluations of eligibility for the National Register of Historic Places. As the years passed, additional resources have reached 50 years of age, a requirement for listing on the National Register of Historic Places. For the past two decades, historic-age resources were surveyed on a project-by-project basis only. CEMML's comprehensive inventory will provide both an up-to-date record of historic-age built resources across the INL Site and a planning document for future growth. During 2022, CEMML completed draft reports and site forms for Central Facilities Area, Critical Infrastructure Test Range Complex, Materials and Fuels Complex, Idaho Nuclear Technology and Engineering Center, and Advanced Test Reactor Complex. INL CRMO architectural historians reviewed the drafts and provided comments before submitting the reports to DOE-ID and Idaho State Historic Preservation Office for review. Final comments and concurrence are expected during 2023.

To support the needs of the evolving INL Site campuses, the INL CRMO continued updating the Historic and Post-World War II Contexts to provide a fuller understanding of the human history of what would become the INL Site and to better situate the resources preserved within their temporal and thematic contexts.

9.5.3 Cultural Resource Monitoring

Field work in 2022 also included a broad, annual program involving routine visits to monitor current conditions at select previously recorded archaeological resources across the INL Site. In 2022, INL CRMO, Shoshone-Bannock Tribes HeTO, and DOE-ID staff monitored site conditions at seven locations on the INL Site. The data acquired during the 2022 monitoring efforts of these sites allowed for a complete evaluation of their current condition as compared to previous recordings. No impact to historic properties were observed during these monitoring visits in 2022. Based on prior monitoring efforts, stabilization and restoration activities at three sites occurred within 2022. One such activity included the replacement of a fence designed to protect the area from unauthorized use. Furthermore, weed control was completed at two sites to enable appropriate site conditions to preserve cultural resources.

9.5.4 Stakeholder, Tribal, Public, and Professional Outreach

In 2022, the CRMO staff continued public outreach, combining virtual opportunities to expand reach and accommodate schedules with in-person meetings and site visits as COVID-19 restrictions eased. Educational exhibits at the Experimental Breeder Reactor I (EBR-I) National Historic Landmark within the boundaries of the INL Site are important tools for public outreach, and in-person employee and public tours resumed during the summer of 2022. There was a total of 9,164 visitors in 2022. Even with the resumption of in-person tours, EBR-I has maintained the infrastructure necessary for self-guided tours of the facility available through a free app. Following the success of the virtual tours of the EBR-I museum, the INL CRMO developed and conducted three virtual archaeology tours for over 100 INL employees and members of the public. These tours included discussions of DOE-ID's archaeological responsibilities, eastern Idaho precontact history, and specific examples of historic sites and nuclear history at the INL Site.

In addition to tours, INL CRMO archaeologists visited three local schools to give presentations on archaeology in southern Idaho, reaching over 200 hundred elementary, middle, and high school students. CRMO staff also assisted the Shoshone-Bannock HeTO with a presentation on cultural resource management to about 30 students at the Shoshone-Bannock Junior-Senior High School and presented a lecture to a group of students attending the Pacific Northwest Historic Preservation Field School.

DOE-ID and CRMO staff hosted the Idaho State Historical Society Board of Trustees and members of Idaho State Historic Preservation Office (SHPO) at INL. The meetings consisted of presentations from Suzann Henrikson (CRMO) and Taylor Haskett (Shoshone-Bannock Tribes) on precontact archaeology of INL. Jon Grams (CRMO) and Shelly Norman (Tours) discussed the reactors' history at the INL, and Tricia Canaday of Idaho SHPO and Betsy Holmes of DOE-ID discussed the importance of the consultation process and Section 106 success stories. Later, the group visited EBR-II and the original control room, and they discussed how adaptive reuse and repurposing of the structure will host new microreactors. This highlights DOE-ID's dedication and ability to balance historic preservation and lab mission at highly scientific facilities. Eastern Idaho legislators joined the group for the afternoon tours and offered additional support of the historic reuse of these buildings. Staff also gave a presentation to local government officials focused on how INL CRMO supports INL Site missions. This included highlights on our working relationship with the Shoshone-Bannock Tribes and Idaho SHPO and a brief history of the INL Site from the precontact period to the naval and nuclear period. Approximately 12 people were in attendance.

In 2022, CRMO staff participated in a site-wide long-term stewardship tour organized by DOE-ID for environmental and cultural resource staff of the Shoshone-Bannock Tribes. The group visited Radioactive Waste Management Complex, Idaho Nuclear Technology and Engineering Center, and Central Facilities Area to discuss goals and strategies for environmental remediation and monitoring at these and other INL Site Waste Area Groups. The group also stopped at important Native American sites near Radioactive Waste Management Complex and Critical Infrastructure Test Range Complex, where CRMO and HeTO staff led discussions regarding complementary efforts to preserve and protect cultural resources as an aspect of long-term stewardship of the INL desert Site.

On April 22, 2022, the Shoshone-Bannock Tribes held an Earth Day celebration for students from the Shoshone-Bannock Junior-Senior High School at the INL Site. The event was organized by the Shoshone-Bannock Heritage Tribal Office and the INL K-12 Science, Technology, Engineering, and Mathematics (STEM) Education Program with logistical support from the CRMO, INL Facilities and Site Services, and the INL Fire Department. Activities included a morning

visit to Middle Butte cave followed by a ceremony at Central Facilities Area. Over sixty students were able to visit Middle Butte cave, where tribal elder Darrell Shay, Fort Hall Business Council member Ladd Edmo, and HeTO staff underscored the enduring importance of the cave and other lands of the INL Site to the Shoshone-Bannock Tribes. In the afternoon, a ceremony and demonstration of traditional dances were held at Central Facilities Area. In addition to the students, the event was attended by members of the Fort Hall Business Council, senior leadership and staff from DOE-ID and BEA, and HeTO staff.

The CRMO staff continue to support the DOE-ID with the Shoshone-Bannock relationship by supporting and facilitating attendance at Language and Cultural Committee Meetings, Cultural Resource Working Group Meetings, and an annual update to the Fort Hall Business Council.

9.5.5 INL Archives and Special Collections

During 2022, the INL Archives and Special Collections retained one full-time intern and added a second to assist the INL archivist. Together, archives staff completed the scanning, editing, and metadata entry for 3,535 large format architectural drawings, photographs, and slides requested by CEMML. Furthermore, archives staff completed 16 accessions for the INL Archives and Special Collections, including 1,171 architectural and engineering drawings, 960 archival photographs, 378 INL specific booklets and articles, 5 maps, 44 slides, and 13 archival objects, including the original wooden Zero Power Plutonium Reactor road sign, which was autographed by the scientists.

Archives staff also completed five itemized inventories of 2,337 contractor newsletters (1968–1999), historical publications, external news publications (1989–1999), EBR-I visitor logbooks (1989–2006), Stationary Low-Power Plant Number 1 newspaper clippings, reports, booklets, factsheets, journal articles, correspondence, historical photographs, area plot plans, contractor magazines, leaflets, books, engineering drawings, compact disks, video home system tapes, film reel, slides, pamphlets, brochure, newsletters, project plan, photograph narrative sheets, and negatives (1956–2005). Repairs were completed for 70 damaged architectural drawings.

Archives staff surveyed all institutional objects at West One and updated the Special Collections inventory with photographs of the items and INL property numbers for each. Metadata for more than 6,000 inventoried architectural and engineering drawings was standardized.

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