CHAPTER 9

Ecological information is used to ensure compliance with applicable rules and regulations and to provide information 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 three key areas of emphasis: (1) Conservation Planning; (2) Land Stewardship; and (3) Natural Resource Monitoring and Research.

The U.S. Department of Energy's Idaho Operations Office addresses conservation by developing conservation or protection plans to protect species and the valuable ecosystems they inhabit. These efforts include: (1) Candidate Conservation Agreement for Greater Sage-grouse (*Centrocercus urophasianus*) on the Idaho National Laboratory Site; (2) the INL Site Bat Protection Plan; (3) the Sagebrush Steppe Ecosystem Reserve; (4) the Migratory Bird Conservation Plan; and (5) the Avian Protection Plan and Bird Management Policy.

Land Stewardship consists of identifying ways to manage ecosystems on the INL Site through planning, restoration, rehabilitation, and preparing the INL Site for climate change. Areas where the U.S. Department of Energy's Idaho Operations Office is actively employing land stewardship activities include: (1) wildland fire protection planning, management, and recovery; (2) restoration and revegetation; (3) carbon sequestration; (4) weed management; (5) ecological support for National Environmental Policy Act; and (6) meeting conditions of Executive Order 14008 "Tackling the Climate Crisis at Home and Abroad."

Natural resource monitoring and research has been conducted for more than 70 years with some studies dating back to the 1950's. The focus of this work is to better understand the INL Site's ecosystem and biota, and to determine the impact on species from activities conducted at the INL Site. 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. Other routine monitoring activities include: (1) breeding bird surveys, (2) midwinter raptor survey, (3) long-term vegetation transects, and (4) vegetation mapping.

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 (FY) 2021 included: (1) archaeological field surveys; (2) monitoring, and site updates related to INL Site project activities; and (3) meaningful collaboration with members of the Shoshone-Bannock Tribes and public stakeholders.

9. NATURAL RESOURCES CONSERVATION AND MONITORING

The environmental setting of the Idaho National Laboratory (INL) Site is characterized as a sagebrush steppe ecosystem. Approximately 94% of the land on the INL Site is undeveloped (DOE-ID and USFWS 2014) with approximately 60% open to livestock grazing. The sagebrush ecosystem is considered one of the most imperiled ecosystems in the United States (Noss et al. 1995), as these ecosystems are being lost at an alarming rate. In fact, only about 56% of its historic range is currently occupied (Knick et al. 2003; Schroeder et al. 2004). Threats to this system

include wildland fire, invasive species, and infrastructure development. Therefore, natural resources on the INL Site are a high conservation priority for the survival of species that are dependent upon this ecosystem, some of which may be at the risk of local extirpation or even regional loss (Davies et al. 2011). Conservation, management, recovery, and revegetation plans are developed to provide management guidance and promote stewardship of the natural resources while meeting the INL Site's mission.

Ecological data collected on plants and key wildlife species provides the U.S. Department of Energy's Idaho Operations Office (DOE-ID) with an understanding of how species use the INL Site and context for analyzing trends. These data are often used in National Environmental Policy Act (NEPA) documents and enables DOE-ID to make informed decisions for project planning and to maintain up-to-date information on potentially sensitive species on the INL Site. These data also support DOE-ID's compliance with environmental regulations, agreements, policies, and executive orders, including:

- Endangered Species Act (ESA), 1973
- National Environmental Policy Act (NEPA), 1969
- Migratory Bird Treaty Act, 1918
- Executive Order 13186; Responsibilities of Federal Agencies to Protect Migratory Birds
- Migratory Bird Treaty Act Special Purpose Permit with U.S. Fish and Wildlife Service (USFWS)
- Bald and Golden Eagle Protection Act, 1940
- Memorandum of Understanding between the U.S. Department of Energy and the USFWS regarding implementation of Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds" (Federal Register 2013)
- Candidate Conservation Agreement (CCA) for Greater Sage-grouse on the INL Site (DOE-ID and USFWS 2014)
- Idaho National Laboratory Comprehensive Land Use and Environmental Stewardship Report (INL 2016)
- Idaho National Laboratory Site Bat Protection Plan (DOE-ID 2018)
- Executive Order 13751, "Safeguarding the Nation from the Impacts of Invasive Species"
- Sagebrush Steppe Ecosystem Reserve Management Plan (1999) (EA ID-074-02-067)
- Executive Order 14008, "Tackling the Climate Crisis at Home and Abroad"
- DOE Order 420.1C Chg. 3, "Facility Safety"
- 2001 Federal Wildland Fire Management Policy (NIFC 2001)
- National Fire Protection Association (NFPA) 1143, "Standard for Wildland Fire Management"
- NFPA 1144, "Standard for Reducing Structure Ignition Hazards from Wildland Fire"
- Idaho National Engineering and Environmental Laboratory Wildland Fire Management Environmental Assessment (DOE 2003).

9.1 Conservation Planning

The INL Site provides breeding and foraging habitat for a variety of species, including 43 species of birds and eight species of mammals that are listed as 'Species of Greatest Conservation Need' or 'Rare,' 'Imperiled,' or 'Critically Imperiled' within the state of Idaho. Conservation planning is a way to identify species that have the potential to become listed under the ESA and can be used when consulting with USFWS in their determination process.

9.1.1 Candidate Conservation Agreement for Greater Sage-grouse on the INL Site

Populations of 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). Although the rate of decline has slowed over the past two decades (Connelly et al. 2004, Garton et al. 2011, Western Association of Fish and Wildlife Agencies 2015), statewide, sage-grouse numbers have dropped 53% from 2016 to 2019, and birds north of the

Snake River have been disappearing in even greater numbers (Ellsworth 2020). Because of sage-grouse reliance on broad expanses of sagebrush (*Artemisia* spp.), there is concern for the future of sage-grouse. 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). Healthy stands of sagebrush 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).

Sage-grouse populations have been monitored on the INL Site for over 30 years. These efforts show that the overall numbers of sage-grouse on the INL Site are decreasing. When sage-grouse were petitioned for listing under the ESA, DOE-ID recognized the need to reduce the potential for impacts to existing and future mission activities. In 2014, DOE-ID entered into the CCA with the USFWS to identify threats to the species and its 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) shown in 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 and USFWS 2014).

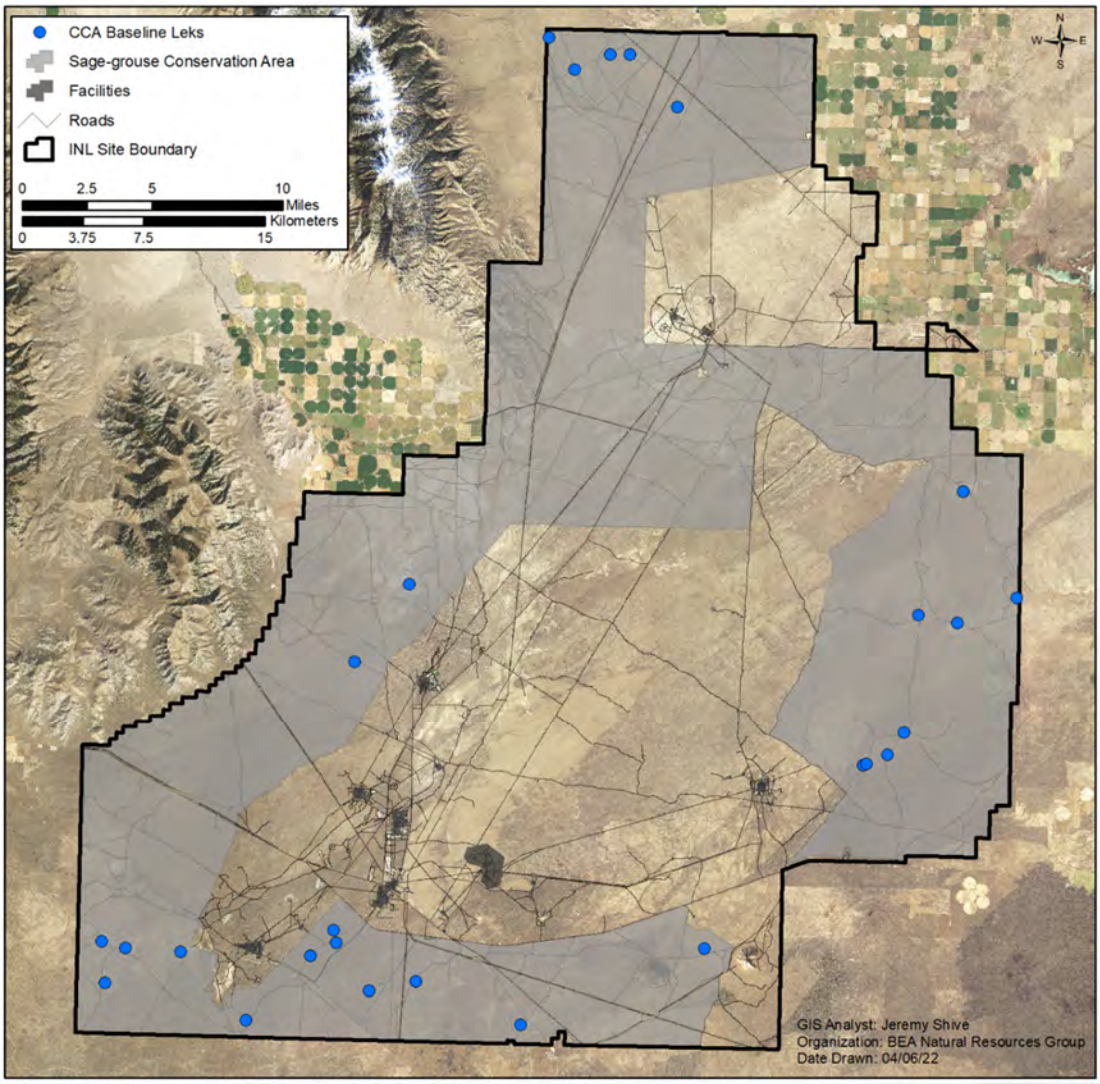

Figure 9-1. Area defined by the CCA for greater sage-grouse on the INL Site as a SGCA and location of baseline leks used for determining the population trigger.

To guard against sage-grouse population declines outside the natural range of variation, the CCA established population and habitat triggers. The sage-grouse population trigger baseline 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 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. 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 delineated in the CCA.

INL contractor wildlife biologists monitor sage-grouse populations, sagebrush habitats, and activities that are considered threats to sage-grouse survival on the INL Site. For the most recent annual results, please refer to Implementing the Candidate Conservation Agreement for Greater Sage-Grouse on the Idaho National Laboratory Site 2021 Full Report (INL 2021), found at https://idahoeser.inl.gov.

9.1.1.1 Population

Each spring, crews enter the field to monitor sage-grouse that have congregated on leks for breeding purposes. Baseline and all other active leks are monitored multiple times from March 20th 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 CY 2021, the peak male abundance on baseline leks was 227–the same number observed in 2020. This value remains the lowest recorded since 2011 when tracking baseline leks began.

9.1.1.2 Sagebrush Habitat Condition and Distribution

Two monitoring tasks are designed to identify vegetation changes across the landscape and assist in maintaining an accurate record of the condition and distribution of sagebrush habitat within the SGCA to facilitate annual evaluation of the habitat trigger: (1) Sagebrush Habitat Condition, and (2) Sagebrush Habitat Amount and Distribution.

Monitoring sagebrush condition provides data used to compare sagebrush habitat on the INL Site across years. 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 sagebrush habitat available will be compared to the baseline value established for the habitat trigger to determine status with respect to the habitat threshold.

Together, these two monitoring tasks provide the basis for maintaining an accurate map and estimate of condition and quantity of sagebrush habitat on the INL Site. The condition of sagebrush habitat remained high in 2021. Sagebrush cover was within its historical range of variability. Herbaceous cover exceeded its range of variability. The abundance of non-natives was generally low. The total area of sagebrush habitat in the SGCA on the INL Site remained unchanged from 2020 to 2021, with 77,486 ha (191,472.1 ac). This represents a total loss to date of approximately 1.4%.

9.1.1.3 Threats and Associated Conservation Measures

The CCA identifies and rates eight threats that potentially impact sage-grouse and its 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 towards mitigating impacts to the sage-grouse and its habitat by INL Site activities. This is accomplished through the avoidance and minimization of threats by utilizing best management practices (BMPs), such as setting seasonal and time-of-day restrictions. This restriction provides an additional 1 km (0.6 mile) of protection around every lek whether it occurs within the SGCA or not. 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 guides infrastructure development and other land-use decisions.

9.1.2 Bat Protection Plan

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 a 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 National Environmental Research Park (NERP). These efforts promoted general bat conservation and provided critical conservation data to DOE-ID decision-makers, as well as 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 a crucial bat habitat.

During CY 2021 a total of 1,021,503 files of echolocation calls from 18 passive acoustic monitoring stations were collected: (1) 394,117 files from facilities, and (2) 627,386 files from caves.

Over the past two decades, newly identified threats to bat populations (e.g., white-nose syndrome and large-scale commercial wind energy development) have caused widespread multiple 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. Because of these threats, regional agency initiatives were developed to address them, as well as potential for impacts to the INL Site mission. In 2011, DOE-ID and the Naval Reactors Laboratory Field Office/Idaho Branch Office decided to increase attention given 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. 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, Bureau of Land Management (BLM), and Idaho Department of Fish and Game (IDFG) on bat issues. The Bat Protection Plan was updated in 2020 and provides the most current INL Site bat data. This report can be found at https://idahoeser.inl.gov.

9.1.3 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 (Figure 9-2). 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 were needed to support INEEL's nuclear energy research mission (DOE-ID 2004).

A mission statement and four primary management goals were developed to guide management of the SSER. The mission statement reads: "The INEEL Sagebrush Steppe Ecosystem Reserve shall be managed as a laboratory where all native ecosystem components, cultural resources, and Native American Tribal values are conserved. Management will concentrate on providing opportunities for scientific investigation of the resources present on the Reserve." This mission statement is consistent with INL's designation as a NERP (see Section 9.3.5). The four SSER management goals included: (1) maintaining and protecting existing high-quality biological, cultural, and tribal resources; (2) providing for long-term resource management, plan implementation, and development of educational opportunities; (3) restoring degraded ecological resources; and (4) facilitating and managing scientific research.

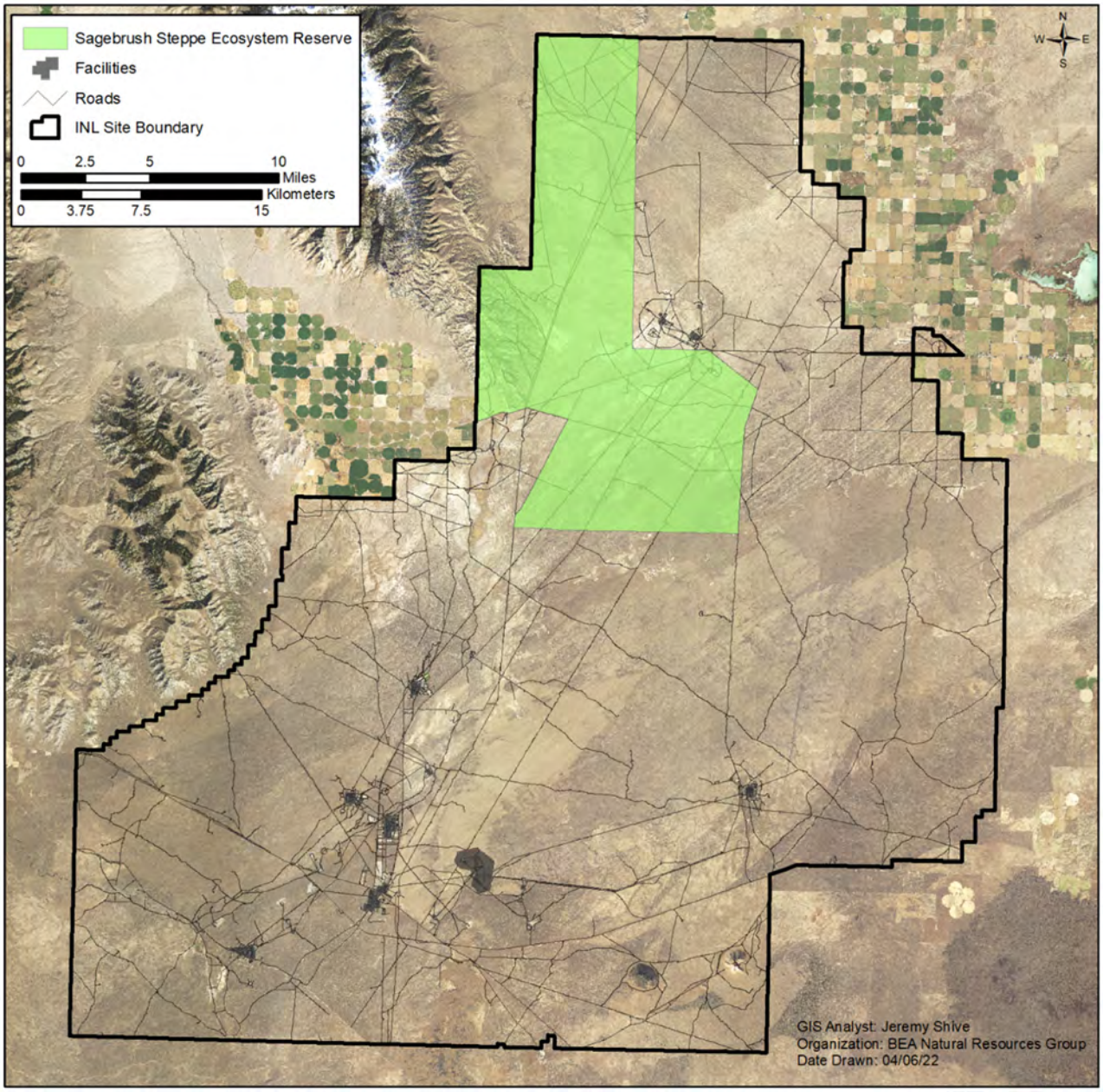

Figure 9-2. The SSER within the boundary of the INL Site.

Specific actions to guide management of the SSER 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: (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 was contingent on funding allocations from the cooperating agencies where it was 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, the INL continues 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. Additionally, the SSER is utilized for scientific research through the INL NERP. There is currently one NERP project where Boise State University researchers are utilizing the SSER as a portion of their study area for investigating sagebrush habitat utilization and forage selection by sage-grouse.

9.1.4 Migratory Bird Conservation Plan

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 moving equipment such as trailers and nuclear fuel casks, mowing vegetated areas for wildland fire protection, and maintenance of utilities and infrastructure. Therefore, it is not unusual to encounter a variety of animals, including migratory birds, while conducting these activities. 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 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 and an IDFG Scientific Collection Permit that allows for the destruction or relocation of a pre-determined number of migratory bird nests. 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 to 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 implemented through the NEPA program, which assesses the potential impacts to migratory birds during implementation of a project or activity. The plan also identifies BMPs that are implemented across the INL Site. BMPs include routine surveys conducted during nesting season (e.g., April 1st to October 1st) of structures, equipment, and vegetated areas 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 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.

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 is to promote the conservation of migratory birds, share ideas to minimize the impact of nesting birds to operations in INL critical areas, 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. Additional efforts are being made to track and map active nests using the Global Positioning System. These efforts will aid in identifying areas where the installation of deterrents or other actions may benefit critical facility activities.

9.1.5 Avian Protection Plan and Bird Management Policy

The INL contractor has developed an Avian Protection Plan and Bird Management Policy (MCP-3367) in keeping 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 Land Stewardship

9.2.1 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, where 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 within the larger burned area; (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 utilize 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 additional 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 identified in Figure 9-3. 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 that were prioritized by INL's WFMC included: (1) monitoring temporary fire suppression access roads for natural recovery; (2) installing signs; and (3) replanting those roads if necessary, and 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 are scheduled to be planted in the Telegraph Fire footprint in 2022.

The Sheep Fire burned more than 40,000 ha (98,842 ac) of land on the INL Site in July 2019 (Figure 9-3). Under the direction of the WFMC, the Sheep Fire Ecological Resources Post-Fire Recovery Plan (Forman et al. 2020) was completed. Soil stabilization efforts were finished on the Sheep Fire containment lines in 2020 and the WFMC prioritized restoration/treatment actions within two post-fire recovery objectives: noxious weed/cheatgrass control and big sagebrush habitat restoration. Noxious weed treatment continued throughout the Sheep Fire footprint in 2021. Cheatgrass treatment was completed along sections of accessible two-track roads in a swath extending 6 m (20 ft) on each side of the road for a total of 13.7 km (8.5 mi). 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 are scheduled to be planted in October 2022.

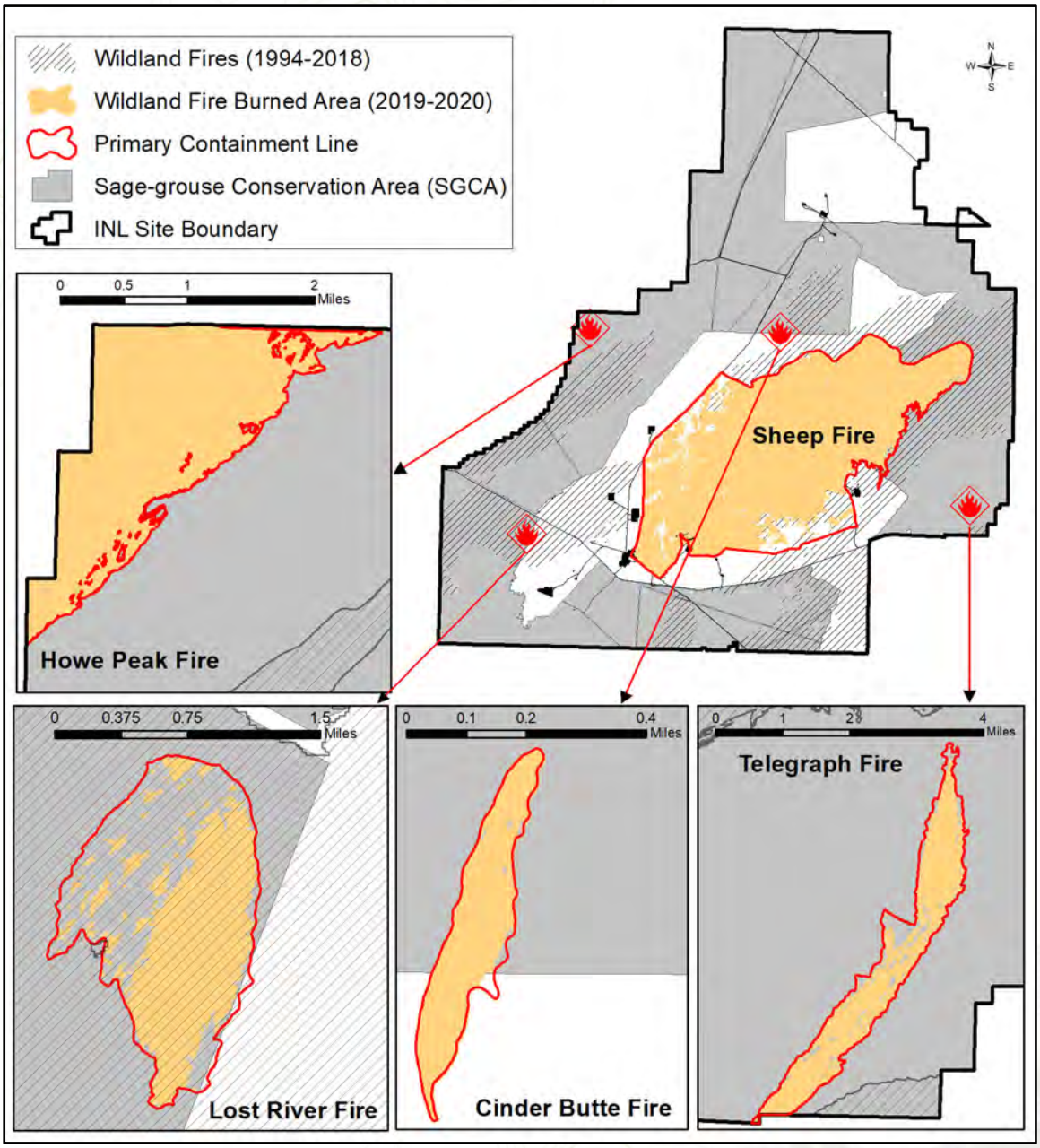

Figure 9-3. Wildland fires on the INL Site since 1994. *Additional detail provided for 2019 and 2020 fires.*

Emergency wildland fire response and associated soil stabilization actions are addressed in the INL Wildland Fire EA (DOE 2003). However, each non-emergency post-fire recovery action is currently subject to NEPA review. Although this approach was adequate at the time the EA was signed, there have been changes in fire frequency and land cover over the past twenty years, making it less effective. Because of the changing ecological conditions at the INL Site and the number of post-fire recovery actions that were recommended by the WFMC after the Sheep Fire and the 2020 fires, the INL contractor is in the process of updating the fire management plan, the framework for the ecological resource's recovery plan, and the NEPA analysis necessary to implement changes to both plans. These updates will facilitate a more comprehensive and efficient response in fire suppression and in post-fire restoration in the future.

9.2.2 Restoration and Revegetation

9.2.2.1 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 assessed for appropriate revegetation methods based on site condition and disturbance size. A baseline condition of areas that may be disturbed are collected 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 methods on the INL Site include but are not limited to hand broadcasting seed, seedbed preparation, soil augmentation, drill seeding, and planting nursery stock. In calendar year (CY) 2021, one revegetation project was initiated by INL's Facility and Site Services on approximately 0.4 ha (4.75 ac) to address soil stabilization. Revegetation projects on the INL are revisited one- and five-years after planting to monitor success and determine if further actions need to be taken. There were no revegetation projects assessed in CY 2021.

9.2.2.2 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 9.2.1, which has the potential to remove large tracts of sagebrush habitat that can take more than 100 years to recover naturally. 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 multiple methods, including planting containerized sagebrush seedlings 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. In CY 2021, 45,000 sagebrush seedlings provided by the INL contractor, and 38,750 sagebrush seedlings provided by IDFG were planted across 391.6 ha (967.7 ac). As a result of sagebrush habitat restoration on the INL Site since 2015, 155,750 sagebrush seedlings have been planted across 610 ha (1,507.4 ac). Seedlings planted on the INL Site are monitored one- and five-years following planting.

9.2.3 Carbon Sequestration

The maintenance and enhancement of healthy rangeland vegetation on the INL Site is guided by several plans, such as INL Wildland Fire Ecological Recovery Plans (Forman et al. 2020, and Forman et al. 2021) and the Sitewide Noxious Weed Management Plan (PLN-611). These plans all include components that promote carbon sequestration on the INL Site. Planned activities are ongoing and will continue through 2023. Rangelands store most of their carbon long-term in the soil in the form of organic carbon through deep-rooted native perennial grasses and shrubs. Keeping INL rangeland soils intact is an important action for preserving this natural carbon storage. INL can maintain and promote carbon sequestration because access is restricted to the general public, resulting in the ecosystem being relatively undisturbed and natural over most of its acreage. Below-ground carbon stores are lost when annual invasive grasses, like cheatgrass, displace deep-rooted perennial plants. Combatting this threat requires preventative management and targeted restoration. Benefits include conserving wildlife habitat for the imperiled sage-grouse and other sagebrush-dependent species, reduced wildfire risk, and enhanced plant and soil carbon storage. Cheatgrass and other annual grasses also have an increased risk of further carbon loss due to fire. INL plans to address controlling annual grass invasion, which is critical to protect currently stored carbon and disrupt the devastation of the invasive fire cycle.

9.2.4 Weed Management

The INL contractor maintains and funds a noxious and invasive weed management program to target, control the spread of, and eliminate invasive and noxious weeds that threaten the mission of the INL Site. Noxious weeds carry federal and

state designations that require the control and containment of their populations. Applying liquid pesticide through spraying is the primary method used to control and eliminate noxious and invasive weeds on the INL Site. In addition to spraying pesticides, the INL contractor uses a sterilant in facility footprints and heavy traffic areas to prevent the introduction and spread of invasive and noxious weeds in those areas. In some cases where the application of pesticides is not appropriate, INL staff will remove noxious weeds by hand. Following the removal of large infestations of noxious weeds, INL contractor will revegetate the area with appropriate native species to prevent invasive weeds from returning and promote soil stabilization.

In 2021, 903.9 L (238.8 gal) of pesticides mixed with water and 793.8 kg (1,750 lbs) of granular pesticide were applied to 267.5 ha (661 ac) of INL property by Facility and Site Services and other INL Site contractors to prevent and control noxious weeds and other invasive plant species. An additional 7.7 ha (19 ac) of weeds were controlled via shoveling and hand-pulling. Twenty different pesticide products were applied. The areas treated included a range from backcountry locations where wildland fire has provided a vector for noxious weeds to roadside locations that are monitored regularly for infestations. Noxious weed species targeted and controlled in 2021 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 (*Euphorbia esula*), and Canada thistle (*Cirsium arvense*).

Coordination between INL Site contractors, and adjacent land management agencies has been crucial in controlling noxious weeds on the INL Site. In CY 2021, INL pesticide applicators took part in four joint spray days with surrounding county and land management agencies to work together and target larger known infestations. Pesticide applicators at INL also attend periodic regional meetings to continually improve the program by learning from other applicators and to keep up on the latest techniques and technologies for managing weeds.

9.2.5 Ecological Support for National Environmental Policy Act

Actions undergoing any level of NEPA review receive ecological support at the INL Site. The Natural Resources Group prepares an ecological resource review document to support Environmental Impact Statement (EIS) or EA proposed actions. These ecological resource review documents are typically derived from analyzing existing ecological data from vegetation and wildlife monitoring programs on the INL Site in conjunction with field-based surveys of the proposed area of impact. In CY 2021, there were no newly proposed actions undergoing NEPA review at the EIS or EA level.

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 186 ECPs initiated in CY 2021. Ecological support for ECPs is carried out predominantly though a Biological Resource Review (BRR) process for activities outside of facility footprints with the potential to disturb wildlife, vegetation, or soils. The BRR is intended to assess the biological impacts and fulfill any regulatory compliance requirements associated with the project. This is typically done in two parts. The first is collecting a baseline condition of the INL Site prior to conducting activities. The second 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, areas requiring soil stabilization, areas where compensatory sagebrush mitigation may be required, nesting birds, and native plant species that should be utilized for revegetation. There were 23 BRRs initiated in support of ECPs in CY 2021.

9.2.6 Executive Order 14008 Tackling the Climate Crisis at Home and Abroad

Executive Order 14008, *Tackling the Climate Crisis at Home and Abroad,* stresses the importance to "protect America's natural treasures, increase reforestation, improve access to recreation, and increase resilience to wildfires and storms…". Under this Order, a goal was identified to preserve 30% of America's lands and waters by 2030. To meet this goal, Federal land management agencies issued an initial report, Conserving and Restoring America the Beautiful, which identified several focus areas to meet this goal.

To assist in meeting the conservation of 30% of United States lands and waters established in the Executive Order, and goals and principles identified in America the Beautiful, DOE developed a Conservation Action Plan, which identified seven focus areas for early action including:

- Creating more parks and safe outdoor opportunities in nature-deprived communities
- Supporting tribal-led conservation and restoration priorities
- Expanding collaborative conservation of fish and wildlife habitats and corridors
- Increasing access to outdoor recreation
- Incentivizing and rewarding the voluntary conservation efforts of fishers, ranchers, farmers, and forest owners
- Creating jobs by investing in restoration and resilience
- Other actions supportive of the America the Beautiful campaign.

The following are long-term and ongoing projects that are conducted on the INL Site meeting some of these focus areas.

9.2.6.1 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 viewed by the Shoshone-Bannock Tribes as concrete evidence of their cultural heritage and a direct link to their ancestors. This landscape is populated by plants, animals, and water that are not only important for subsistence and medicine, but are sacred. Landmarks, such as Middle Butte, define home and territory, figure in stories 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. DOE-ID has a long-term relationship with the Shoshone-Bannock Tribes 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. In CY 2021, the Tribes initiated a bat management program on the Fort Hall Reservation. ESER Program biologists provided advice to the Tribes on deploying and operating detectors to monitor bat populations that reside on and migrate across Reservation lands.

9.2.6.2 Expand Collaborative Conservation of Fish and Wildlife Habitats and Corridors

Sagebrush steppe ecosystems are facing accelerated declines and have been identified as one of the most endangered ecosystems in the world due to threats from grazing, invasive plants, and altered fire regimes (Schroeder et al. 2004; Noss 1995). Significant alterations to the sagebrush ecosystem have resulted in altered ecological processes and components of the remaining systems (Chambers et al. 2017). This ecosystem is home to a variety of species and provides a critical winter habitat for wildlife species, such as sage-grouse and pronghorn. Species that rely on sagebrush during portions of their life cycle are at risk of local extirpation or regional extinctions (Davies et al. 2011). IDFG has identified sagebrush steppe as one of the most important ecosystems for wildlife in Idaho, 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).

9.2.6.3 Outdoor Recreation Opportunities

As a component of conservation, the INL Site provides outdoor recreation opportunities to staff and the public as well as valuable research opportunities to university researchers under the NERP (Section 9.3.5) program. The INL provides more than 64 km (40 mi) of designated jogging/walking trails for INL Site employees and limited hunting opportunities are available to the general public. Hunting for elk and pronghorn only are established by the IDFG on 8,704 ha (21,508 ac) along the Site boundary in northern portions of the INL Site (Figure 9-4). A valid hunting license and an IDFG-issued INL Site hunting permit are required to access these areas.

9.2.6.4 Collaboration with Other Agency Stakeholders to Conserve Habitat

DOE-ID and the INL contractor collaborate with agency stakeholders 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.

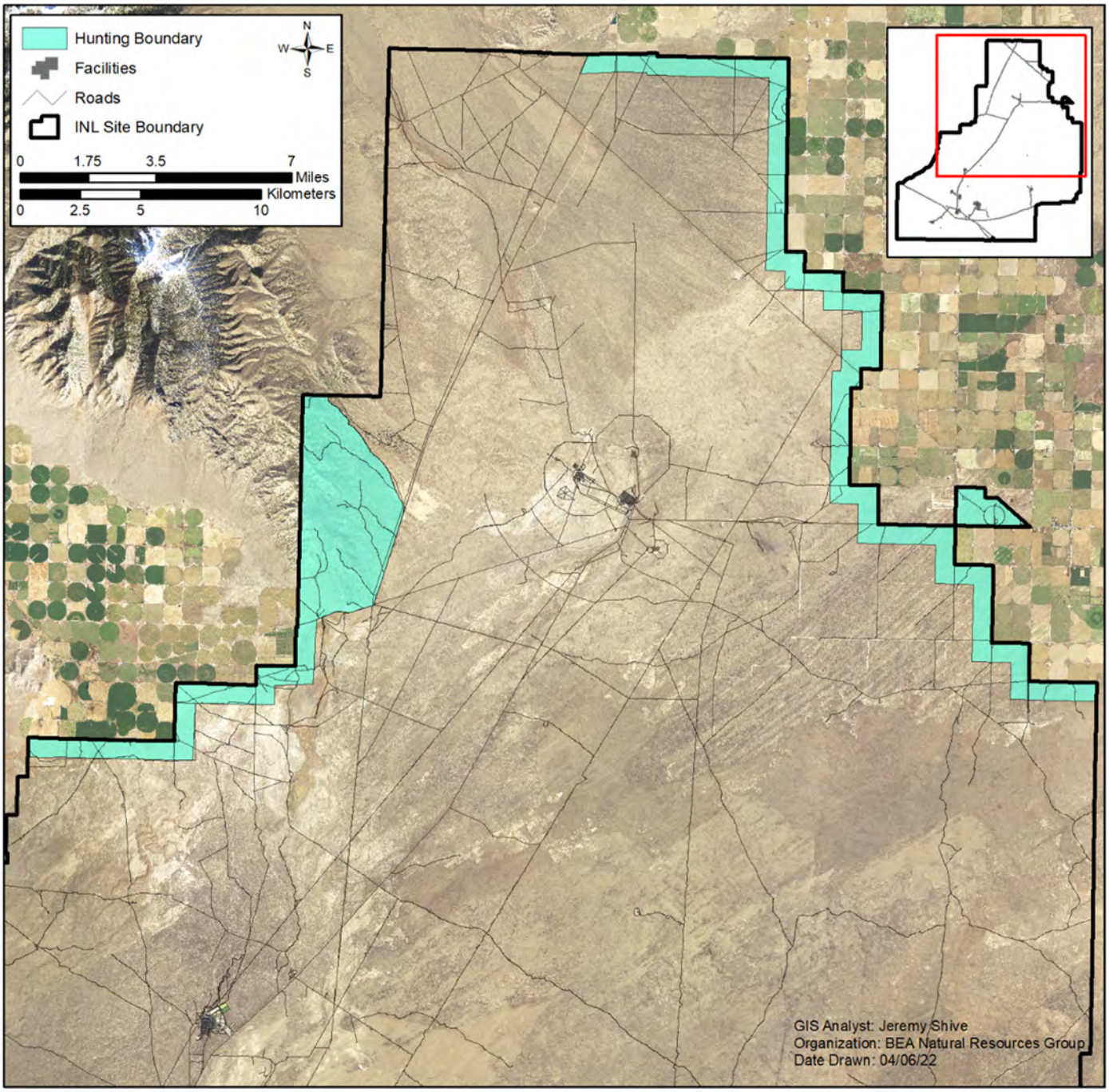

Figure 9-4. Designated elk and pronghorn hunting boundary on the INL Site.

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 of North America (Sauer and Link 2011). The BBS

program in North America is managed by the United States Geological Survey (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 > 420 species of birds across a broad-geographic scale (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, the DOE-ID also established eight additional routes around INL Site facilities to monitor birds near human activity centers (i.e., facility routes) as shown in Figure 9-5. 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 benefit INL Site managers directly by providing information on local breeding bird populations, which may be useful as they consider new activities and comply with NEPA. For the most recent BBS results, visit https://idahoeser.inl.gov.

During CY 2021, a total of 2,752 birds from 49 species were documented during these BBS surveys, which is 39.1% lower than the 34-year mean of 4,577 from the same number of species.

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 as identified in Figure 9-6. Initially, the counts focused on eagle populations; however, biologists recognized the importance of collecting data on raptor abundances 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 and ecologists drive along each of two established routes. The methods that were used to conduct the survey consisted of each member of the team (excluding the driver) continually scanning the landscape to detect any target species perched, hovering, or soaring. If a target species was detected, the vehicle stopped, and, using binoculars and/or spotting scopes, each species was identified (if more than one species is observed) and the number of individuals per species was counted. A total of 273 birds representing seven species were observed during the 2021 midwinter raptor surveys. Common ravens and rough-legged hawks are typically the most observed species during this survey, and during CY 2021 made up 47% and 37% of the observations, 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 9-7, and vegetation abundance data had been collected periodically since their establishment, their utility as a basis for monitoring vegetation trends in terms of species composition, abundance, and distribution was eventually recognized. Vegetation data collection has continued on the LTV plots on a regular basis—about once every five years. Eighty-nine LTV plots are still accessible, and most have now been sampled consistently between 1950–2016, making the resulting dataset one of the oldest, largest, and most comprehensive for sagebrush steppe ecosystems in North America.

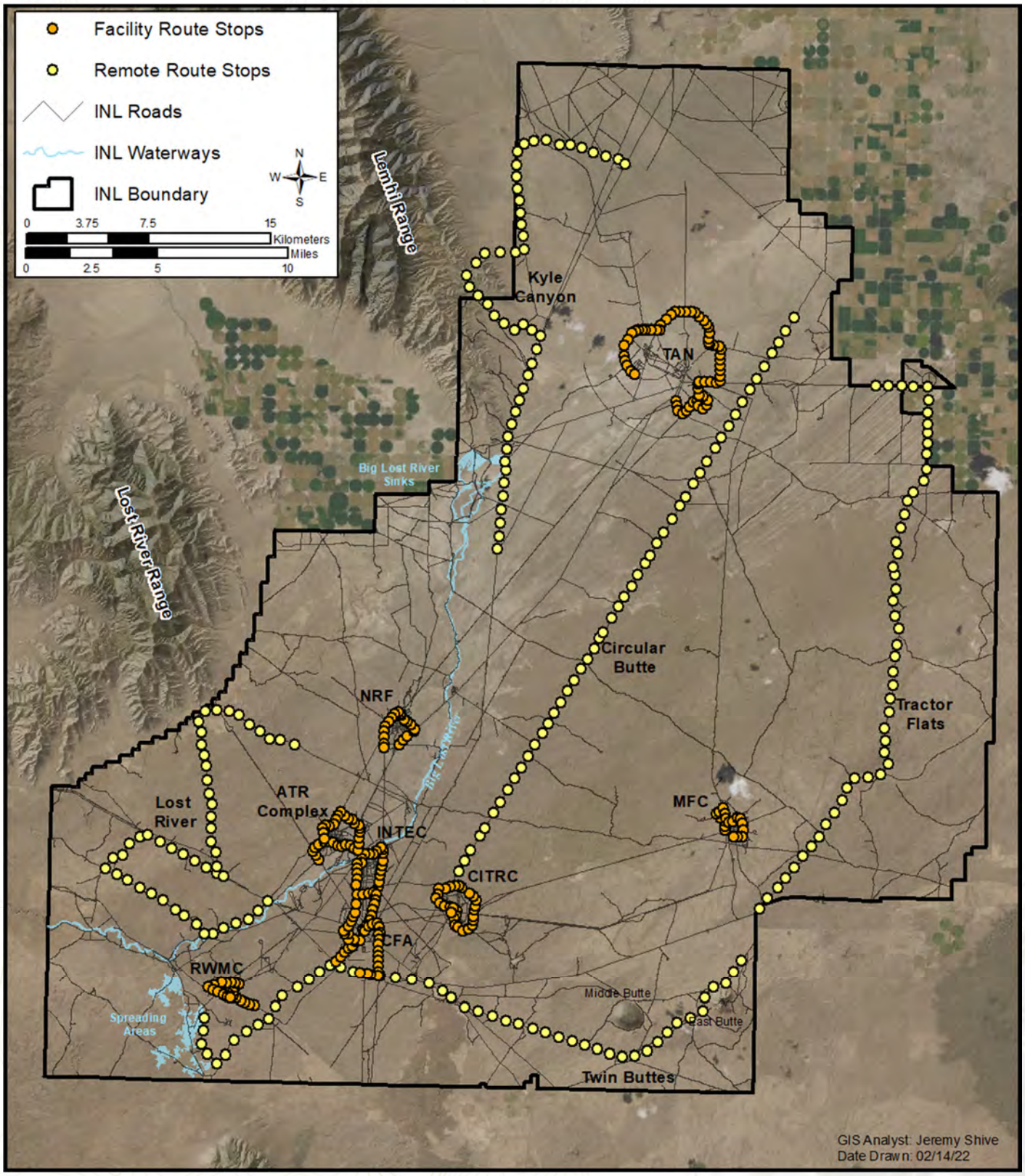

Figure 9-5. Remote and facility BBS routes on the INL Site.

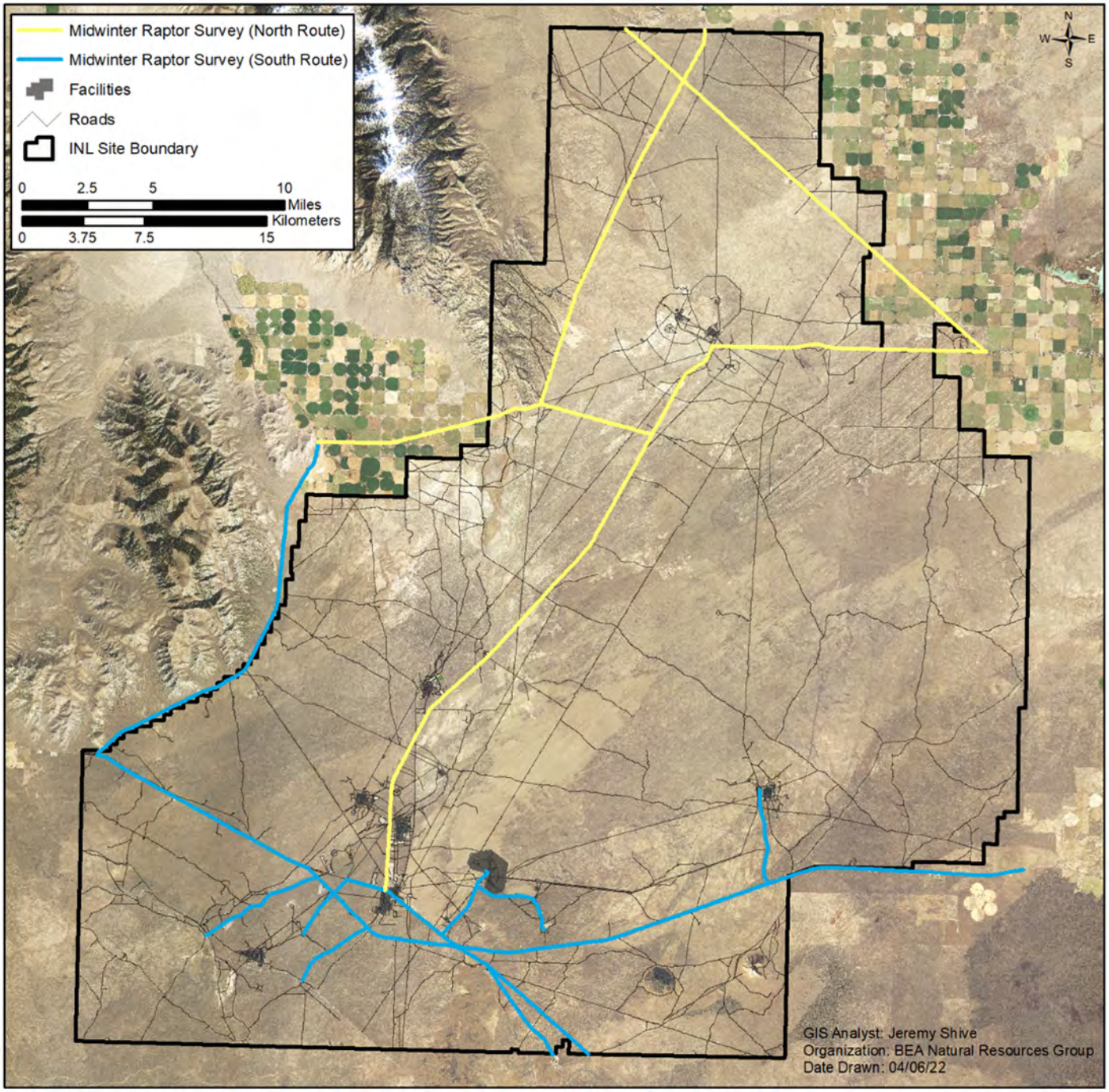

Figure 9-6. North and south midwinter raptor survey routes on the INL Site.

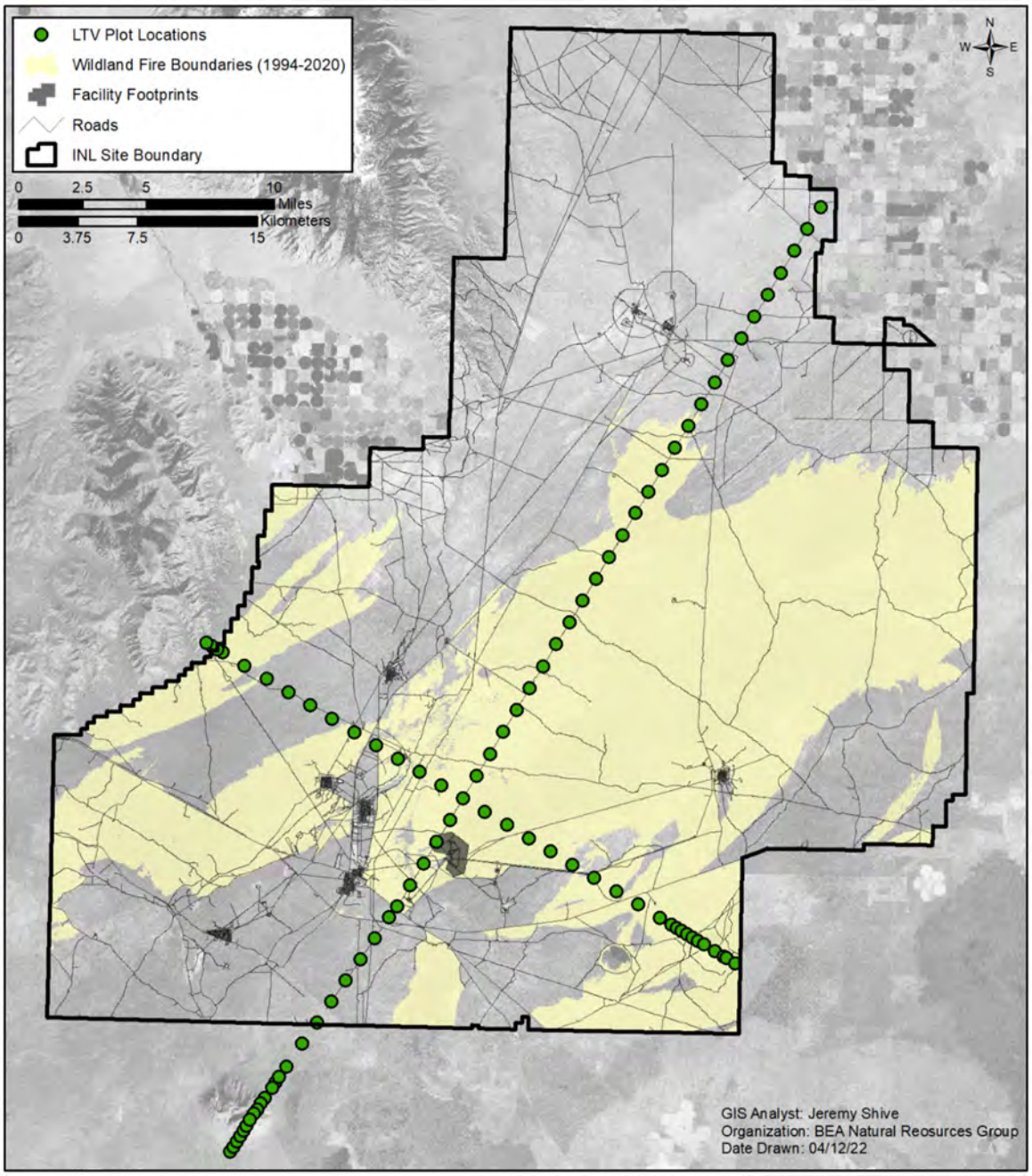

Figure 9-7. Locations for the long-term vegetation transect plots established on the INL Site in 1950 and sampled regularly over the past 70 years.

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 large wildland fires have removed sagebrush from a large portion of the Upper Snake River Plain over the past twenty years; approximately 99,000 ha (250,000 ac) have burned on the INL Site since 1994 shown in Figure 9-7. Soil disturbance associated with fighting wildland fires and disturbance

associated with general increases in the use of remote backcountry areas are notable 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 of 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.

Data were last collected across the 89 active LTV plots for the 13th time between June and August of 2016. 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.) Notable changes between the 2011 and 2016 sample periods include decreases in shrub cover and particularly big sagebrush (*Artemisia tridentata*); 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 data set, 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. The 14th comprehensive data collection effort for the LTV plots is scheduled to occur again during the 2022 growing season.

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/or 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, like 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, where 12 represented natural vegetation classes and four were ruderal classes (e.g., classes dominated by non-native species). 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 also the greatest number of map polygons with 2,388 presented in Figure 9-8. 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 the majority of 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 also

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.pdf.

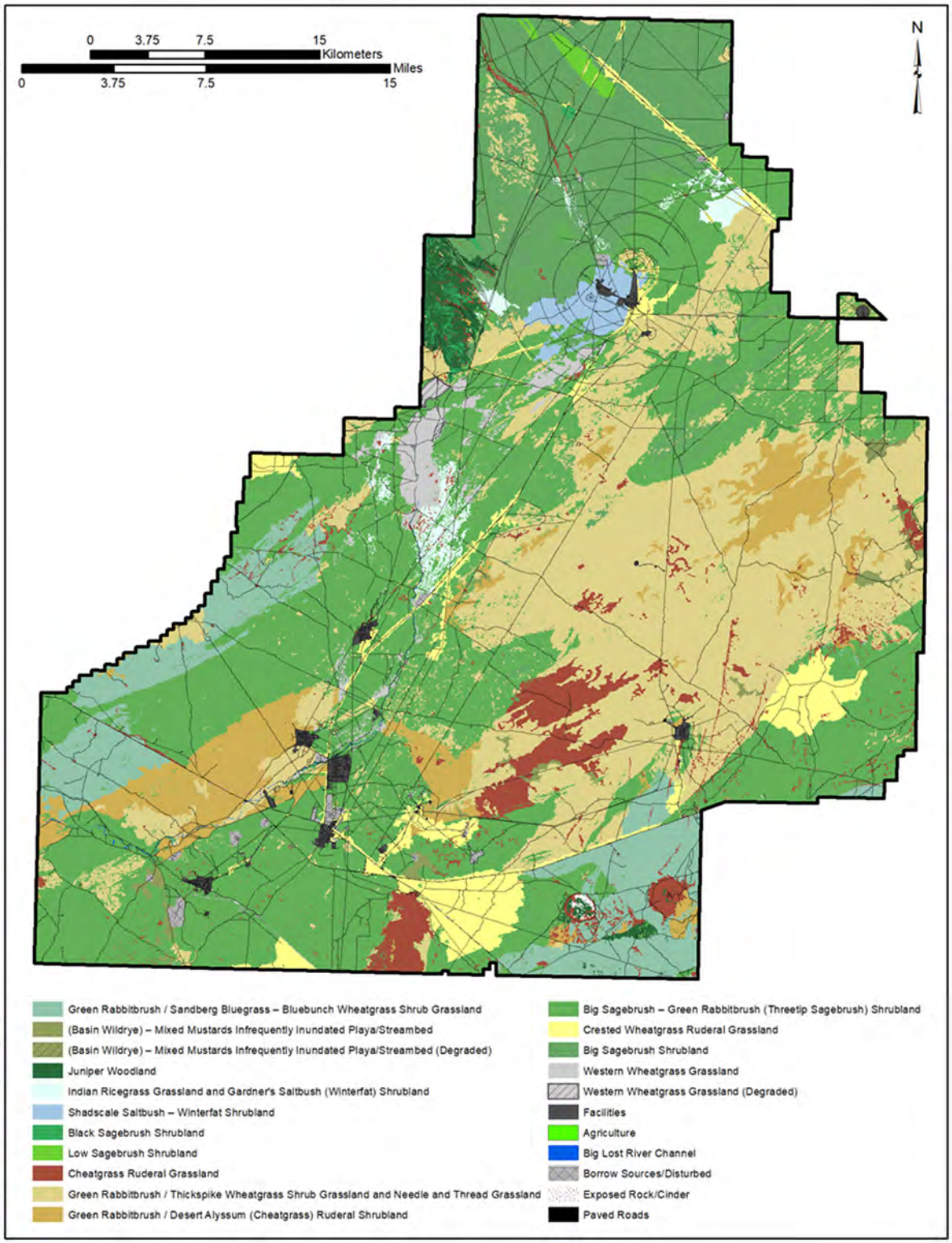

Figure 9-8. INL Site vegetation community classification map published in 2019.

9.3.5 National Environmental Research Park

The INL Site was designated as a NERP in 1975. According to the Charter for the NERP, NERPs are intended to be outdoor laboratories where research can be carried out to achieve agency and national environmental goals, as shown in Figure 9-9. Those environmental goals are stated in the NEPA, Energy Reorganization Act, and Non-nuclear Energy Research and Development Act. Environmental goals stated in these acts have been used to define the purpose of the Idaho NERP as a place that can be used for research to sufficiently understand our environment so that we may enjoy its bounty without detracting from its value and eventually to evolve an equilibrium use of our natural resources. The desirability of conducting research on the Idaho NERP is enhanced by having access to relatively undisturbed sagebrush steppe habitat and restricted public access. In 2021, the INL contractor facilitated university-led research on three ongoing 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; and (3) addressing ecohydrology in sagebrush steppe.

Figure 9-9. 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 (Clark et al. in prep). An undescribed species of Jerusalem cricket (*Stenopelmatus* sp.) also has been found in ant nests at the INL Site and 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 and now 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 yet 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, *C. o. lutosus* 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, but also 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 *C. o. lutosus* 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 his work is ongoing for manuscripts describing 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 are impacting habitat for wildlife, wildfire risks, and ecosystem services 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 utilized 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 on functioning 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 Drs. Toby Maxwell and Marie-Anne DeGraff from Boise State University; their research continues to utilize a facility that has been in operation since 1994 and they will continue to collect data for at least the next few years.

9.4 INL Cultural Resource Management

The INL Cultural Resource Management Office (CRMO) resides within the INL 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 lands 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 fiscal year (FY) 2021 included: (1) archaeological field surveys; (2) monitoring, and site updates related to INL Site project activities; and (3) meaningful collaboration with members of the Shoshone-Bannock Tribes and public stakeholders.

9.4.1 INL Section 106 Project Reviews

The INL CRMO resides within DOE-ID INL Management and Operations 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 lands 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 FY 2021 included archaeological field surveys, monitoring, and site updates related to INL Site project activities, and meaningful collaboration with members of the Shoshone-Bannock Tribes and public stakeholders.

9.4.2 INL Section 110 Research

Cultural resource identification and evaluation studies in FY 2021 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. 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.

Decoding the Southern Idaho Cultural Landscape Through Volcanic Glass Source Analysis

In order to fully characterize the geographic distribution of Southern Idaho obsidian source groups, the INL CRMO has compiled a comprehensive Idaho obsidian reference collection. On March 16, 2021, INL CRMO staff provided the Fort Hall Business Council a progress report on source characterization efforts. Several more obsidian and fine-grained volcanic sources were added to the reference collection in FY 2021. The current dataset contains over 2,000 samples of geologic obsidian from 155 locations that correspond to 30 geochemically distinct source groups, a few of which have not been previously defined or recognized by archaeologists. This is the most comprehensive reference database of obsidian sources yet compiled for Southern Idaho. In FY 2022, the INL CRMO will publish results of analyses conducted in FY 2020 and FY 2021, including sources defined in the reference collection and provenance determinations for legacy collections of Terminal Pleistocene/Early Holocene projectile points held at the Earl Swanson Archaeological Repository.

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, 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 with the results of all these efforts to be published in a peer-reviewed journal article in FY 2022.

Built Environment Comprehensive Inventory

In FY 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 (NRHP). As the years passed, additional resources have reached 50 years of age, a requirement for listing on the NRHP. 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 and a planning document for future growth. During FY 2021, CEMML conducted fieldwork at the Central Facilities Area, the Critical Infrastructure Test Range Complex, the Materials and Fuels Complex, the Idaho Nuclear Technology and Engineering Center, and the Advanced Test Reactor Complex. The inventory reports will be submitted to INL CRMO during FY 2022.

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

9.4.3 Cultural Resource Monitoring

Field work in FY 2021 also included a broad, yearly program involving routine visits to monitor current conditions at previously recorded archaeological resources across the INL Site. In FY 2021, INL CRMO, Shoshone-Bannock Tribes Heritage Tribal Office, and DOE-ID staff monitored site condition at six locations on the INL Site. The data acquired during the FY 2021 monitoring efforts of these sites allowed for a complete evaluation of the current condition as compared to the initial recordings, but also establish a more detailed baseline for future monitoring efforts.

9.4.4 Stakeholder, Tribal, Public, and Professional Outreach

In FY 2021, the CRMO staff continued public outreach components amidst the continuation of the COVID-19 pandemic. Educational exhibits at the EBR-I National Historic Landmark within the boundaries of the INL Site are important tools for public outreach. Unfortunately, due to the COVID-19 pandemic and necessary restrictions, face-to-face employee and public tours at EBR-I were not possible in FY 2021. However, visitors could download a free app that provided a virtual tour of the EBR-I museum. Following the success of the virtual tours of the EBR-I museum, the INL CRMO developed and conducted two 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 site.

In addition to tours, INL CRMO archaeologists working with the Museum of Idaho to provide professional expertise and assistance in teaching a brief archaeology summer course for local public-school teachers on July 28-29, 2021. This included providing instruction on Idaho's precontact period, archaeological survey and excavation techniques, and the protection of cultural resources. This outreach effort included 16 public school teachers in history, science, and social studies curriculum.

In FY 2021, INL CRMO archaeologists, Shoshone-Bannock Heritage Tribal Office staff, and the DOE-ID Cultural Resource Coordinator facilitated access to the INL Site for members of the Fort Hall Business Council. Council members visited Middle Butte Cave and two archaeological sites adjacent to the Big Lost River. During this visit, CRMO staff demonstrated current protocols for in-field x-ray fluorescence analysis of obsidian artifacts that reduce the need for surface collection and curation. Additionally, an INL CRMO archaeologist and an undergraduate intern led two archaeology workshops for about 25 Shoshone-Bannock middle school science, technology, engineering, and mathematics students.

Goodale's Cutoff, a spur trail of the Oregon Trail, intersects the southwest corner of the INL Site. In conjunction with the development of the historic context statement for Goodale's Cutoff in FY 2021, interpretive panels were finalized and approved for display at the Big Lost River Rest Area. The design has been approved by DOE-ID, the Idaho SHPO, and the Shoshone-Bannock Tribes. Production and installation are scheduled for FY 2022.

9.4.5 INL Archives and Special Collections

During FY 2021, the INL archives and special collections retained a full-time intern to assist the INL archivist. Together, they completed the scanning, editing, and metadata entry for 554 large format architectural drawings and photographs requested by CEMML, completed scanning of 3,989 seismographs for INL seismology, and added relevant metadata to 1,691 of the scans. Archives staff reviewed over 600 records retention schedules and created a list of record series that may contain historically significant information to retain in the INL archives.

Three new internal acquisitions and one external acquisition were accessioned into the INL archives. Included within these new collections are approximately 95,000 historical photographs for which a folder level inventory was completed.

Archives staff completed 11 accessions of existing but not formally accessioned collections, which were comprised of items that were present in the archive prior to 2019, including: (1) 991 architectural and engineering drawings; (2) 1,532 archival photographs; (3) 44 slides; (4) 170 glass plate negatives; (5) 304 audio media/visual media/booklets/manuals;

and (6) 1,063 contractor newsletters. Archives staff also created item-level inventories for 1,740 historical publications (1989-1999), contractor newsletters (1968-1999), reports, booklets, historical photographs, compact discs, video home system, film reels, and slides.

Archives staff updated, corrected, and completed, 13 existing accessions for 633 architectural and engineering drawings that were present in the archives prior to 2019.

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