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2024 Breeding Bird Surveys on the Idaho National Laboratory Site

March 2025

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Idaho National Laboratory

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Idaho National Laboratory
Idaho Falls, Idaho 83415

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EXECUTIVE SUMMARY

Breeding Bird Surveys (BBS) have been conducted annually since 1985 (no surveys were conducted in 1992 and 1993) to monitor bird populations on the Idaho National Laboratory (INL) Site. In June 2024, a total of 13 survey routes were completed which included five U.S. Geological Survey BBS routes (remote routes) and eight INL Site facility routes (facility routes). A total of 3,561 birds from 61 species were documented during the 2024 surveys, which is 22.9% lower than the 37-year mean of 4,615 birds, the number of species (i.e., species richness) was higher than the 37-year average of 56.

Fifteen species observed during the 2024 BBS are considered by the Idaho Department of Fish and Game as Species of Greatest Conservation Need (IDFG 2024). These included the sage thrasher (*Oreoscoptes montanus*, n = 312), Brewer's sparrow (*Spizella breweri*, n = 300), sagebrush sparrow (*Artemisiospiza nevadensis*, n = 211), common nighthawk (*Chordeiles minor*, n = 71), Franklin's gull (*Leucophaeus pipixcan*, n = 46), grasshopper sparrow (*Ammodramus savannarum*, n = 25), loggerhead shrike (*Lanius ludovicanus*, n = 18), California gull (*Aythya americana*, n = 11), ferruginous hawk (*Buteo regalis*, n = 8), greater sage-grouse (*Centrocercus urophasianus*, n = 8), short-eared owl (*Asio flammeus,* n = 8), burrowing owl (*Athene cunicularia*, n = 7), white-faced ibis (*Plegadis chichi*, n = 4), golden eagle (*Aquila chrysaetos*, n = 2), and northern pintail (*Anas acuta*, n = 1). Brewer's sparrow, burrowing owl, ferruginous hawk, golden eagle, grasshopper sparrow, greater sage-grouse, loggerhead shrike, sage thrasher, sagebrush sparrow, and short-eared owl are also considered Special Status Species by the Bureau of Land Management. California and Franklin's gulls are both Birds of Conservation Concern (BCC) throughout their ranges in the contiguous U.S. and Alaska. Northern harriers (*Circus hudsonius*, n = 10) which were detected during the 2024 BBS, sage thrashers and short-eared owls are considered BCCs in Bird Conservation Region 9 and golden eagles are considered a Non-BCC Vulnerable species by U.S. Fish Wildlife Service and are protected under the Bald and Golden Eagle Protection Act (16 U.S. Code § 668).

The Tractor Flats (n = 438) and Big Lost River (n = 401) routes had the highest number of observations for remote routes in 2024. No remote routes had an annual count that was greater than the 37-year mean. For facility routes, only the Radioactive Waste Management Complex route had an annual count higher than the 37-year mean. Test Area North had the greatest number of observations for facility routes (n = 410), but it also has the most stops (n = 60) of any route. The Tractor Flats (n = 30) and Kyle Canyon (n = 25) routes had the highest species richness of remote routes while the Central Facilities Area (n = 30) and the Materials and Fuels Complex (n = 22) had the highest on facility routes.

Species were placed into assemblages based on habitat requirements during the breeding season. The Shrub-steppe/Grassland and Sagebrush-obligate assemblages were the most observed during 2024 BBSs, but observations were 23.5% and 58.7% lower than their respective 37-year means. Within these assemblages, Brewer's sparrow, sage thrasher, and common nighthawk populations appear stable or slightly declining, while sagebrush sparrow and loggerhead shrike populations are declining.

Based on both of Shannon's diversity indices, the Radioactive Waste Management Complex route had the most diverse and even bird community of all 13 routes (H=2.39, E_H=0.78). For the remote routes, Kyle Canyon had the most diverse bird community (H=2.27) while Twin Buttes had the most even community (E_H=0.72; Table 5). The Circular Butte route had the least diverse and least even bird community (H=1.15, E_H=0.45; Table 5) of all the routes. The Circular Butte and Critical Infrastructure Test Range Complex routes have seen declines in both metrics since 2020, likely because of the 2019 Sheep Fire.

Total observations on BBSs on the INL Site have been below average for 11 of the last 14 years, including in 2024. This decline in total observations is likely a result of multiple factors including a continent-wide decline in bird abundance, changes to the vegetation community on the INL Site from wildland fire, drought, and alterations in precipitation patterns, and to a lesser extent variation in observer

experience. While overall total bird observations have declined, species richness and diversity indices have remained relatively consistent, indicating that the INL Site continues to support a high diversity of species of breeding birds. Therefore, monitoring of bird populations on the INL Site should continue as should engagement in conservation efforts including native vegetation restoration and the Three Billion Birds Initiative.

ACKNOWLEDGEMENTS

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ACRONYMS

BBS	Breeding Bird Survey
BCC	Bird of Conservation Concern
BCR	Bird Conservation Region
BLM	Bureau of Land Management
CCA	Candidate Conservation Agreement
CFA	Central Facilities Area
CITRC	Critical Infrastructure Test Range Complex
DOE-ID	U.S. Department of Energy–Idaho Operations Office
IDFG	Idaho Department of Fish and Game
INL	Idaho National Laboratory
MFC	Materials and Fuels Complex
NEPA	National Environmental Policy Act
RWMC	Radioactive Waste Management Complex
SGCN	Species of Greatest Conservation Need
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

2024 Breeding Bird Surveys on the Idaho National Laboratory Site

1. INTRODUCTION

The North American Breeding Bird Survey (BBS) was developed by the U.S. Fish and Wildlife Service (USFWS) and the Canadian Wildlife Service to document trends in bird populations. Surveys began in 1966 in the eastern United States and by 1968 included the entire contiguous United States and southern Canada (Sauer et al. 2017). The BBS program in North America is managed by the U.S. Geological Survey (USGS) and currently consists of over 5,000 routes, with approximately 3,000 of these being sampled each year (Ziolkowski et al. 2023). BBS data provides long-term species abundance and distribution trends for > 500 species of birds across a broad geographic scale (Sauer et al. 2017). These data have been used to estimate population changes for hundreds of bird species and are the primary source for regional conservation programs and modeling efforts (Sauer et al. 2017).

Five official USGS BBS routes (i.e., remote routes) are on the Idaho National Laboratory (INL) Site and have been surveyed each year since 1985, except in 1992 and 1993. In 1985, the U.S. Department of Energy–Idaho Operations Office also established eight additional routes around INL Site facilities to monitor birds near the highest human activity centers (i.e., facility routes). These routes are also surveyed annually using the same techniques and methods as those used by the USGS. 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 inform documentation for the National Environmental Protection Act (NEPA). Additionally, the BBS complies with the direction to promote monitoring of migratory birds as described in the Memorandum of Understanding between the Department of Energy and the USFWS outlining responsibilities of federal agencies to protect migratory birds (U.S. Department of Energy and the USFWS 2006). This report summarizes results from the 2024 BBS and examines long-term trends across the INL Site.

1.1 Study Area

The INL Site encompasses almost 2,305 km^2 (890 mi^2) of land on the Upper Snake River Plain in southeast Idaho and is administered by the U.S. Department of Energy. This area is located within portions of Bingham, Bonneville, Butte, Clark, and Jefferson counties. Topography across the INL Site is mostly flat with an average elevation of 1,519 m (4,985 ft). Other than minor topographic variation created by basalt outcrops, the only significant geographical relief occurs around East and Middle Buttes and the southern portion of the Lemhi Mountains located near the northwest corner of the INL Site.

Surface water on the INL Site is limited, which may influence bird distribution during the summer breeding season. The Big Lost River and Birch Creek are both diverted upstream for agricultural purposes and consequently little, if any, water from these streams reaches the INL Site. During years of high flow, however, water from the Big Lost River can reach the INL Site where some of it is diverted into the spreading areas on the southern portion of the INL Site and the rest drains into an ephemeral playa known as the Big Lost River Sinks on the northern portion of the INL Site. The Big Lost River, Big Lost River Sinks, and the spreading areas provide the only substantial water source for waterfowl and shorebirds, however, several man-made storage lagoons near facilities also provide habitat for aquatic birds, as well as a water source for migratory bird species (Figure 1).

The INL Site has a semi-arid climate, characterized by hot, dry summers and cold winters. Annual precipitation on the INL Site averages 207 mm (7.9 in), with peak precipitation historically occurring in the spring. Surficial geology is strongly influenced by volcanic activity and soils include wind-blown sand or loess over basalt and a few alluvial deposits. The INL Site is composed primarily of a mosaic of shrublands and open grassland within the sagebrush-steppe ecosystem. Big sagebrush (*Artemisia tridentata*) is the dominant shrub species while other common species include rabbitbrush (*Chrysothamnus viscidiflorus*), spiny hopsage (*Grayia spinosa*), shadscale saltbrush (*Atriplex confertifolia*), winterfat (*Krascheninnikovia lanata*), and other sagebrush species (*A.* spp.). The most common native grasses are Sandberg bluegrass (*Poa secunda*), thickspike wheatgrass (*Elymus lanceolatus*), bottlebrush squirreltail (*Elymus elymoides*), Indian ricegrass (*Achnatherum hymenoides*), and needle-and-thread (*Hesperostipa comata*). Stands of Utah juniper (*Juniperus osteosperma*) form pockets of woodlands around and on East and Middle Buttes, and on the foothills of the Lemhi Range which extend into the northwest portion of the INL Site.

Between 1994 and 2021, there were 147 wildland fires that burned 97,620 ha (241,225 ac) on the INL Site (Forman et al. 2024; Figure 1). Vegetation maps of the INL Site prior to 1994 (Kramber et al. 1992) indicate that plant communities across much of the landscape were dominated by big sagebrush. More recent vegetation maps reflect a transition to more grasslands and green rabbitbrush dominated communities that result after sagebrush has been lost to wildland fire (Shive et al. 2011, Shive et al. 2019). These changes can impact the community structure of breeding birds on the INL Site over time.

The INL Site is designated as an Important Bird Area by Idaho Partners in Flight and the Idaho Audubon Council because it is likely one of the largest blocks of least-disturbed sagebrush habitat in the western U.S. (IDFG 2005) and provides habitat for several Idaho Species of Greatest Conservation Need (SGCN; IDFG 2024). The INL Site has also been recognized as a Global Important Bird Area by the National Audubon Society (2013). The INL Site is located within Bird Conservation Region (BCR) 9 – Great Basin. BCRs were developed in 1998 as part of the U.S. North American Bird Conservation Initiative to promote integrated bird conservation (NABCI 2020). They are distinct ecological units that combine Commission for Environmental Cooperation ecoregions with knowledge of bird distributions and life history requirements. BCRs function as the primary conservation units for birds in North America. The USFWS designates certain bird species as Birds of Conservation Concern (BCCs) either within specific BCRs or across the entirety of the species' range in the contiguous U.S. and Alaska. Lastly, the INL Site is located adjacent to land managed by the Bureau of Land Management (BLM) and monitors bird species that are considered Special Status Species by the agency.

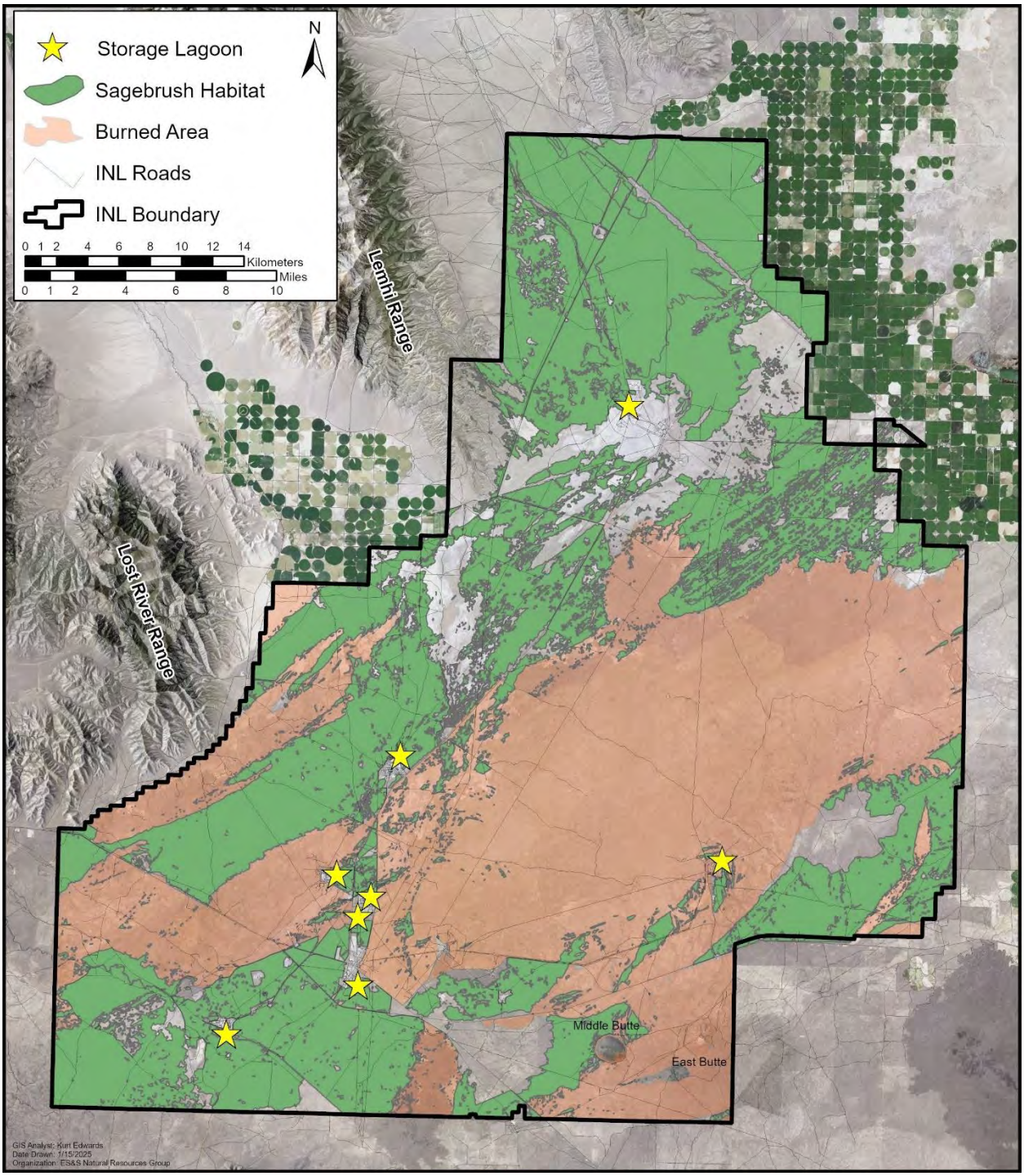

Figure 1. Map of the Idaho National Laboratory Site showing current sagebrush habitat, areas affected by wildland fire from 1994–2023, and man-made storage lagoons that provide water resources for birds.

2. METHODS

2.1 Data Collection

The BBS is a roadside count of all birds seen or heard along predefined routes. Thirteen BBS routes were surveyed in 2024 from June 5–25, consisting of five official USGS BBS (remote) routes and eight facility routes developed specifically for the INL Site (Figure 1). Each remote survey route is 24.5 mi (39.2 km) long, consisting of 50 sampling points systematically spaced every 0.5 mi (0.8 km). INL BBS surveys are mostly conducted on remote two-track roads with restricted public access and minimal traffic. Facility routes vary in length between 3.6 mi (5.8 km) and 11.9 mi (19.2 km), depending on the size of the facility. Sampling points along facility routes are separated by approximately 0.2 mi (0.32 km).

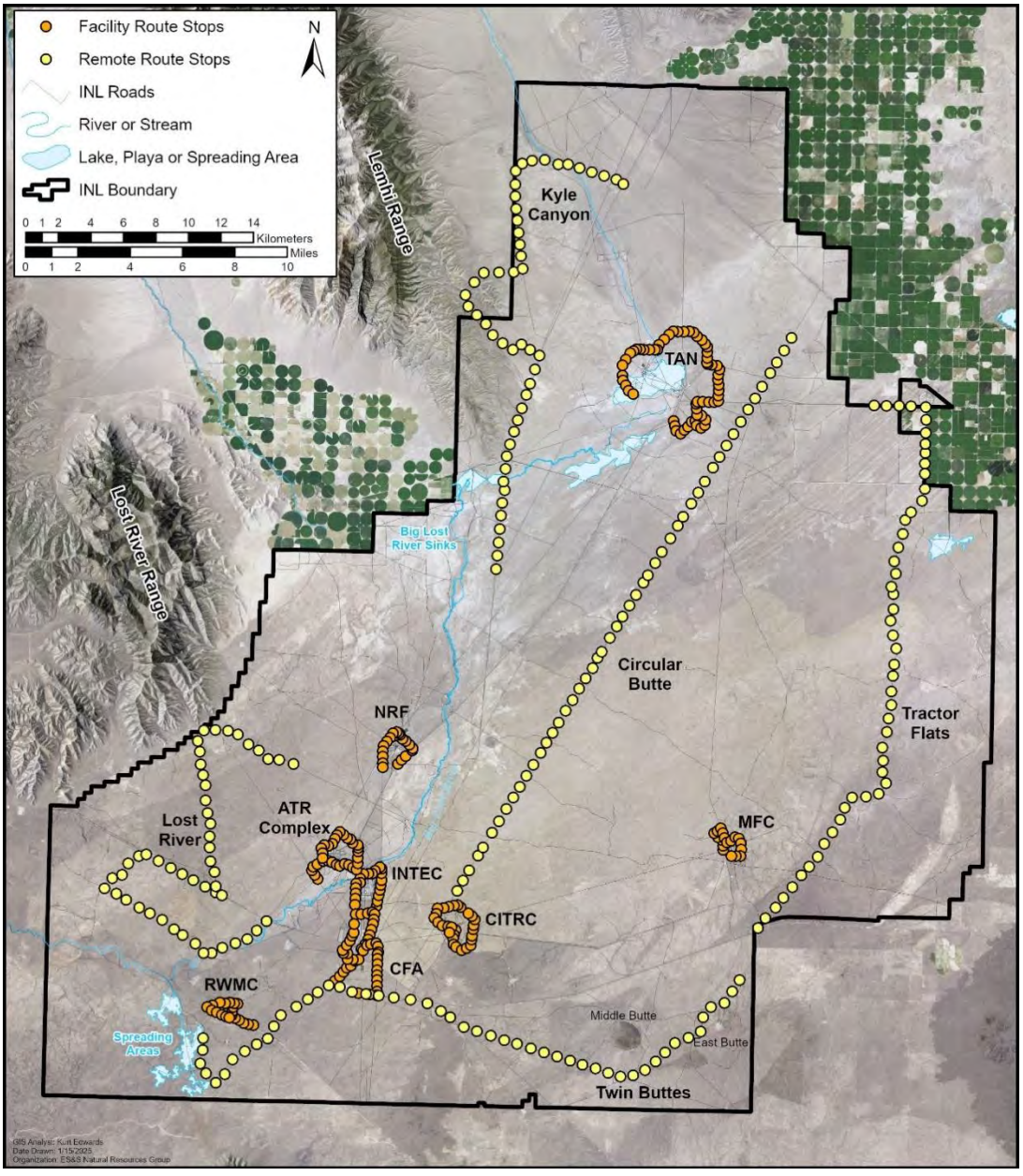

Figure 2. Breeding Bird Survey routes on the Idaho National Laboratory Site. Yellow dots represent survey points along facility routes and green dots represent the same for remote routes.

During the surveys, observers followed the North American BBS protocols provided by the USGS Patuxent Wildlife Research Center (USGS 2024). At each sampling location (i.e., stop), a trained observer recorded every bird species observed within a 400 m (0.25 mi) radius or heard at any distance during a three-minute interval. Any bird that was suspected of being counted on the previous stop was not recorded again (USGS 2024). Additional data such as temperature, wind speed, and sky condition were recorded after every ten stops along the remote routes, and at the beginning and end of each facility route. Surveys were only conducted when weather conditions were appropriate (e.g., no heavy rain or strong wind). Surveys began one-half hour before sunrise and continued until the route was completed. While most stops on remote routes are on dirt two-track roads, a few stops are along major roads (e.g., Highway 20). In these cases, the number of vehicles that passed observers during the three-minute sampling period was recorded on all remote routes and observers noted whether background noise interfered with audible detection of birds.

2.2 Data Analyses

Community Diversity Indices

An ecological community is comprised of all interacting species within a given environment. A community with low species diversity may indicate that an ecosystem is unhealthy or improperly functioning, whereas high species diversity is often used as an indicator of a healthy and stable ecosystem. Consequently, maintaining a meaningful range of variability for diversity is the goal of many management activities.

Species diversity indices are mathematical methods used to quantify community composition. Many diversity indices are commonly used in ecology, and each has particular strengths depending on the data to be analyzed and the questions asked. The simplest estimate of community diversity is species richness, which represents the total number of unique species present. Although species richness is a useful measure of diversity, it does not account for differences in abundance between communities. For example, if there are many species for which one individual is observed, richness will be high, but its overall composition may not be comparable to another community with the same number of species and higher abundances of those species. Diversity indices that consider both species richness and species abundance provide a more useful measure of community diversity.

Shannon's diversity index (H) is a method for quantifying diversity of species in an area. This index accounts for both species richness (S) and relative abundance of each species in a community. Shannon's diversity index is derived by first calculating the proportion of species (i) relative to the total number of species (p_i), and then multiplying this proportion by the natural logarithm ($\ln p_i$). Shannon's H can range from 0 to about 4.6, where higher values represent higher diversity.

$$H = -\sum_{j=1}^{S} p_i \ln p_i$$

Another useful measure is Shannon's equitability (E_H). Shannon's equitability represents a measure of evenness, which is how similar species abundance is within a community. E_H ranges from 0 to 1, with 1 representing a completely even community where all species abundances are equal.

$$E_H = H / \ln S$$

Shannon's H and E_H were calculated for all BBS routes and were compared to past reports. It was assumed that data obtained from each survey route is an accurate representation of the local bird community.

Species Assemblages

Bird species can be placed into assemblages based on habitat requirements. The composition and abundance of these assemblages can be used as indicators regarding the general ecological health of the associated habitats. For example, if a study area contains emergent wetland (riparian) habitat and the corresponding bird assemblage begins declining even though the vegetation community hasn't changed, it may indicate additional problems such as a decline in the insect population the birds rely on for food, a change in the predator population, or an invasive species may be displacing native species in the assemblage.

The species assemblages for the INL Site were recategorized in 2024. There are eight assemblages, four of which remain unchanged from prior reporting: Sagebrush-obligate, Shorebird, Shrub-steppe/Grassland, and Waterfowl. The Raptor, Corvid, and Shrike, Other, and Urban/Exotic assemblages were replaced with four new categories: Generalist, Non-native, Riparian, and Shrub-steppe/Woodland. The Generalist assemblage is comprised of species that thrive in multiple habitat types, including habitats that are not present on the INL Site. The non-native assemblage includes species that are not native to North America (e.g., European starlings [*Sturnus vulgaris*], house sparrows [*Passer domesticus*], rock pigeons [*Columba livia*]). The Riparian assemblage comprises species that are riparian-obligates or riparian-associated that are not waterfowl. Finally, the Shrub-steppe/Woodland assemblage includes those species that thrive at the ecotone of shrubland and wooded ecosystems. Except for the Non-native assemblage, species were placed in assemblages based on breeding habitat requirements provided by the Cornell Lab of Ornithology's Birds of the World (2022). The reorganization of the species assemblages recognizes all habitat types present on the INL Site and places species in ecologically meaningful categories that provide context for population trends. The new assemblages were applied to the previous years of BBS data so that year-to-year trends were comparable.

Trend Estimates

Thirty-eight-year trend estimates for SGCN or BCC designated species were completed in 2024 for species with enough observations. Trend estimates were calculated as lambda (λ) with 95% confidence intervals using open binomial N-mixture models (Dail and Madsen 2011, Hostetler and Chandler 2015). Populations were considered declining if λ and the entire confidence interval were <1. Populations were considered stable if the confidence interval overlapped 1, and populations were considered increasing if λ and the entire confidence interval were >1.

3. RESULTS AND DISCUSSION

3.1 Site-wide

The 2024 surveys documented 3,561 birds and 61 species (Table 1). Total observations were 22.9% lower than the 37-year mean of 4,615 birds (1985–1991 and 1994–2023; Figure 2). Species richness (i.e., the total number of species recorded) was 61, which was higher than the 37-year mean of 56 species. Total observations for 11 of the last 14 years have been below the mean (Figure 2). Multiple factors are likely contributing to this decrease in observations. First, turnover in designated BBS observers and variations in their experience may partially influence the number and species of birds detected. Second, big sagebrush cover at its lowest on the INL Site since records began in 1950 due to losses from wildland fire (Forman 2024). Changes in precipitation patterns, drought, and reburning of areas already impacted by wildland fire have changed the vegetation community (Forman 2024) and have been a consistent source of disturbance in many areas on the INL Site which can reduce, nest, chick and adult survival of breeding birds. Lastly, bird abundance in North America has declined continent-wide. Rosenberg et al. (2019) found that North American bird populations, including sensitive and common species, have declined by

nearly 29% since 1970, resulting in an estimated loss of 3.2 billion birds. Results from Rosenberg et al. (2019) also indicated a 17% decline (35.6 million individuals) in abundance in the Aridlands Biome of North America which encompass the INL Site.

Fifteen species observed during the 2024 BBS are considered by the IDFG as SGCN (IDFG 2024). These included the sage thrasher (*Oreoscoptes montanus*, n = 312), Brewer's sparrow (*Spizella breweri*, n = 300), sagebrush sparrow (*Artemisiospiza nevadensis*, n = 211), common nighthawk (*Chordeiles minor*, n = 71), Franklin's gull (*Leucophaeus pipixcan*, n = 46), grasshopper sparrow (*Ammodramus savannarum*, n = 25), loggerhead shrike (*Lanius ludovicanus*, n = 18), California gull (*Aythya americana*, n = 11), ferruginous hawk (*Buteo regalis*, n = 8), greater sage-grouse (*Centrocercus urophasianus*, n = 8), short-eared owl (*Asio flammeus,* n = 8), burrowing owl (*Athene cunicularia*, n = 7), white-faced ibis (*Plegadis chichi*, n = 4), golden eagle (*Aquila chrysaetos*, n = 2), and northern pintail (*Anas acuta*, n = 1). Brewer's sparrow, burrowing owl, ferruginous hawk, golden eagle, grasshopper sparrow, greater sage-grouse, loggerhead shrike, sage thrasher, sagebrush sparrow, and short-eared owl are also considered Special Status Species by the BLM. California and Franklin's gulls are both BCCs throughout their ranges in the contiguous U.S. and Alaska. Northern harriers (*Circus hudsonius*, n = 10) which were detected during the 2024 BBS, sage thrashers and short-eared owls are considered BCCs in BCR 9 and golden eagles are considered a Non-BCC Vulnerable species by USFWS and are protected under the Bald and Golden Eagle Protection Act (16 U.S. Code § 668).

The five most abundant birds across all routes were horned lark (*Eremophila alpestris*, n = 1,534), Brewer's sparrow (n = 312), sage thrasher (n = 300), western meadowlark (*Sturnella neglecta*, n = 283), and the sagebrush sparrow (n = 211). All of these species were observed on every remote route (Table 1, Appendix A). Horned lark, western meadowlark, sage thrasher, sagebrush sparrow, and Brewer's sparrow have been the five most abundant species in 25 of the 38 years of INL Site BBS. These five species comprised 74.1% of all observations in 2024.

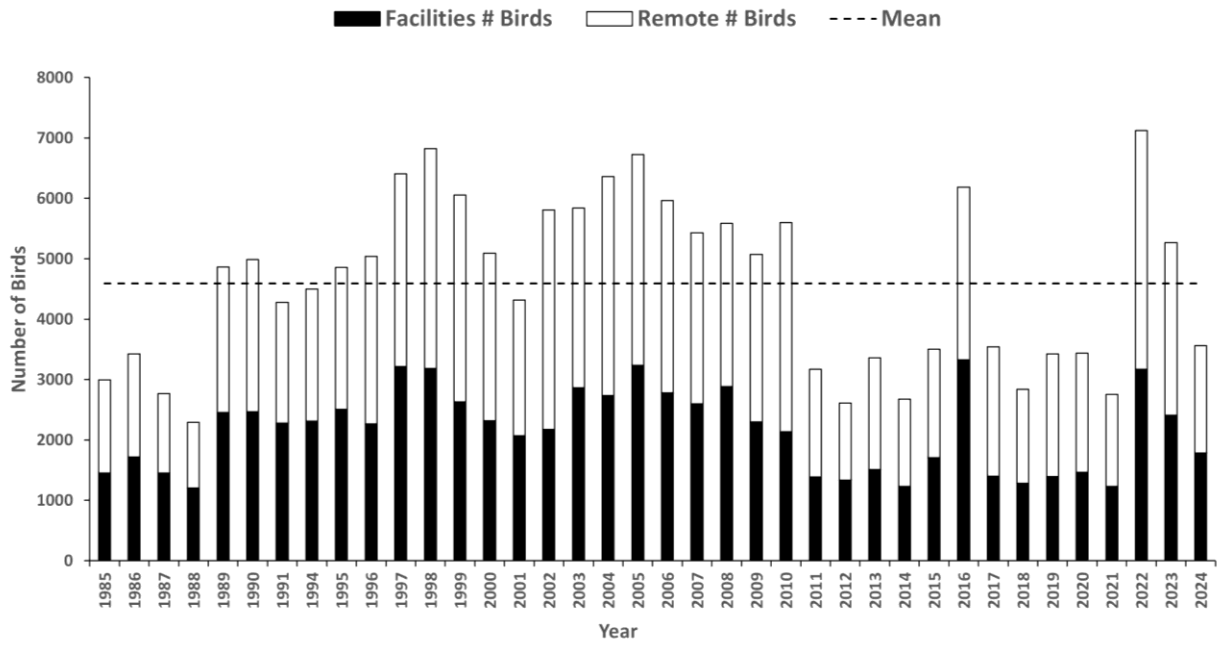

Figure 3. The number of birds observed on Breeding Bird Survey routes on the Idaho National Laboratory Site. The dashed black line indicates the mean number of birds observed from 1985 to 2023. No surveys were conducted on the Idaho National Laboratory Site in 1992 or 1993.

Table 1. A summary of species from 13 routes, sorted by total observations, which were observed during the 2024 Breeding Bird Survey routes on the Idaho National Laboratory Site.

Common Name	Scientific Name	Assemblage[1]	n	%	Routes[2]	Stops[3]	%[4]
horned lark	*Eremophila alpestris*	SSG	1,534	43.08%	5, 8	404	82.28%
Brewer's sparrow[5,7]	*Spizella breweri*	SO	300	8.42%	5, 8	199	40.53%
sage thrasher[5,6,7]	*Oreoscoptes montanus*	SO	312	8.76%	5, 8	187	38.09%
western meadowlark	*Sturnella neglecta*	SSG	283	7.95%	5, 8	154	31.36%
sagebrush sparrow[5,7]	*Artemisiospiza nevadensis*	SO	211	5.93%	5, 7	134	27.29%
common raven	*Corvus corax*	G	156	4.38%	5, 8	81	16.50%
barn swallow	*Hirundo rustica*	R	112	3.15%	1, 6	35	7.13%
Vesper's sparrow	*Pooecetes gramineus*	SSG	76	2.13%	3, 5	44	8.96%
common nighthawk[5]	*Chordeiles minor*	SSG	71	1.99%	4, 6	49	9.98%
mourning dove	*Zenaida macroura*	G	49	1.38%	5, 6	39	7.94%
Franklin's gull[5,6]	*Leucophaeus pipixcan*	S	46	1.29%	2, 0	4	0.81%
cliff swallow	*Petrochelidon pyrrhonota*	R	43	1.21%	0, 3	13	2.65%
Brewer's blackbird	*Euphagus cyanocelphalus*	G	29	0.81%	0, 6	16	3.26%
grasshopper sparrow[5,7]	*Ammodramus savannarum*	SSG	25	0.70%	5, 4	20	4.07%
house sparrow	*Passer domesticus*	NN	23	0.65%	1, 2	5	1.02%
red-tailed hawk	*Buteo jamaicensis*	G	19	0.65%	5, 2	14	2.85%
brown-headed cowbird	*Molothrus ater*	G	19	0.53%	3, 3	13	2.65%
killdeer	*Charadrius vociferus*	S	19	0.53%	0, 5	14	2.85%
Swainson's hawk	*Buteo swainsoni*	G	18	0.51%	4, 2	14	2.85%
loggerhead shrike[5,7]	*Lanius ludovicianus*	SSG	18	0.51%	5, 2	16	3.26%
black-billed magpie	*Pica hudsonia*	G	16	0.45%	2, 0	6	1.22%
American robin	*Turdus migratorius*	G	12	0.34%	1, 2	5	1.02%
Say's phoebe	*Sayornis saya*	SSG	12	0.34%	0, 5	12	2.44%
red-winged blackbird	*Agelaius phoeniceus*	R	11	0.31%	0, 3	7	1.43%
California gull[5,6]	*Larus californicus*	S	11	0.31%	1, 0	1	0.20%
norther harrier[6]	*Circus hudsonius*	SSG	10	0.28%	4, 3	10	2.04%
house finch	*Haemorhous mexicanus*	G	9	0.25%	0, 2	4	0.81%
European starling	*Sturnus vulgaris*	NN	8	0.22%	1, 2	7	1.43%
short-eared owl[5,6,7]	*Asio flammeus*	SSG	8	0.22%	2, 2	7	1.43%
ferruginous hawk[5,7]	*Buteo regalis*	SSG	8	0.22%	4, 0	6	1.22%

Table 1. continued.

Common Name	Scientific Name	Assemblage[1]	n	%	Routes[2]	Stops[3]	%[4]
mallard	*Anas platyrhynchos*	W	8	0.22%	0, 1	4	0.81%
greater sage-grouse[5,7]	*Centrocercus urophasianus*	SO	8	0.11%	1, 0	2	0.41%
burrowing owl[5,7]	*Athene cunicularia*	SSG	7	0.20%	2, 2	6	1.22%
American kestrel	*Falco sparverius*	G	6	0.17%	0, 3	4	0.81%
rock wren	*Salpinctes obsoletus*	SSG	6	0.17%	2, 2	6	1.22%
savannah sparrow	*Passerculus sandwichensis*	SSG	6	0.17%	0, 2	4	0.81%
western kingbird	*Tyrannus verticalis*	SSG	6	0.17%	2, 0	4	0.81%
chipping sparrow	*Spizella passerina*	SW	6	0.17%	3, 1	6	1.22%
bank swallow	*Riparia riparia*	R	4	0.11%	1, 0	1	0.20%
white-faced ibis[5]	*Plegadis chihi*	S	4	0.11%	1, 0	2	0.41%
gray flycatcher	*Empidonax wrightii*	SW	4	0.11%	1, 0	2	0.41%
lark sparrow	*Chondestes grammacus*	SSG	3	0.08%	1, 2	4	0.81%
hermit thrush	*Catharus guttatus*	SW	3	0.08%	1, 1	3	0.61%
Canada goose	*Branta canadensis*	W	3	0.08%	0, 1	1	0.20%
golden eagle[5,7]	*Aquila chrysaetos*	SSG	2	0.06%	1, 1	2	0.41%
northern shoveler	*Spatula clypeata*	W	2	0.06%	0, 1	1	0.20%
dark-eyed junco	*Junco hyemalis*	G	1	0.03%	0, 1	1	0.20%
merlin	*Falco columbarius*	G	1	0.03%	1, 0	1	0.20%
northern flicker	*Colaptes auratus cafer*	G	1	0.03%	1, 0	1	0.20%
song sparrow	*Melospiza melodia*	G	1	0.03%	0, 1	1	0.20%
rock pigeon	*Columba livia*	NN	1	0.03%	1, 0	1	0.20%
yellow-headed blackbird	*Xanthocephalus xanthocephalus*	R	1	0.03%	0, 1	1	0.20%
spotted sandpiper	*Actitis macularia*	S	1	0.03%	0, 1	1	0.20%
eastern kingbird	*Tyrannus tyrannus*	SSG	1	0.03%	0, 1	1	0.20%
prairie falcon	*Falco mexicanus*	SSG	1	0.03%	0, 1	1	0.20%
western bluebird	*Sialia mexicana*	SSG	1	0.03%	2, 1	1	0.20%
dusky flycatcher	*Empidonax oberholseri*	SW	1	0.03%	1, 0	1	0.20%
American coot	*Fulica americana*	W	1	0.03%	0, 1	1	0.20%
northern pintail[5]	*Anas acuta*	W	1	0.03%	0, 1	1	0.20%
gadwall	*Mareca strepera*	W	1	0.03%	0, 1	1	0.20%
redhead	*Aythya americana*	W	1	0.03%	0, 1	1	0.20%

Table 1. continued.

Common Name	Scientific Name	Assemblage[1]	n	%	Routes[2]	Stops[3]	%[4]

Note that G = Generalist; NN = Non-Native; R = Riparian; S = Shorebird; SO = Sagebrush-obligate; SSG = Shrub-steppe/Grassland; SW = Shrub-steppe/Woodland; and W = Waterfowl

1. What species assemblage the bird species is assigned. See species assemblage section.
2. The first value represents the number of remote routes at which a species was recorded, and the second value represents the number of facility routes at which a species was recorded.
3. Number of stops at which a species was documented.
4. Percent of stops (from a total of 491) at which a species was recorded.
5. Identified as a Species of Greatest Conservation Need.
6. Identified as a Bird of Conservation Concern.
7. Identified as a Special Status Species by the Bureau of Land Management.

3.2 Routes

The Tractor Flats (n = 438) and Big Lost River (n = 401) routes had the highest number of observations for remote routes surveyed in 2024 (Table 2). No remote routes had an annual count that was greater than the 37-year mean. For facility routes, only the Radioactive Waste Management Complex (RWMC) route had an annual count higher than the 37-year mean. Test Area North had the greatest number of observations for facility routes (n = 410), but it also has the most stops (n = 60) of any route.

Species richness is the number of species observed during the survey and the value is independent of the abundance of each species. On remote routes, the most species observed in 2024 was on the Tractor Flats route (n = 30), followed closely by the Kyle Canyon route (n = 25). The Central Facilities Area (CFA) route had the most species observed on a facility route followed by the Materials and Fuels Complex (MFC; Table 2). The number of species observed would be expected to change between years; however, for all routes, the number of species observed appears to be stable and the species present on the INL Site remain relatively the same.

Table 2. Comparison of total observations and species richness to their perspective 37-year means for each breeding bird route that was surveyed in 2024 on the Idaho National Laboratory Site.

Route	Stops	Species Richness	Mean Species Richness[1]	Total Observations	Mean Observations[2]
Remote Routes					
Lost River	50	15	17	401	416 (-3.7%)
Circular Butte	50	14	15	366	461 (-20.6%)
Kyle Canyon	50	25	23	265	398 (-33.5%)
Tractor Flats	50	30	23	438	747 (-41.4%)
Twin Buttes	50	19	21	309	428 (-27.9%)
Subtotal	**250**	**39[3]**		**1,779**	
Facility Routes					
Central Facilities Area	42	30	21	315	326 (-3.4%)
Idaho Nuclear Technology and Engineering Center	25	15	16	170	209 (-18.7%)
Materials and Fuels Complex	18	22	21	176	261 (-32.5%)
Naval Reactors Facility	16	11	20	103	*
Critical Infrastructure Test Range Complex	28	11	15	184	256 (-28.2%)
Advanced Test Reactor Complex	32	15	18	242	284 (-14.8%)
Radioactive Waste Management Complex	20	21	19	182	176 (3.7%)
Test Area North	60	15	17	410	436 (-6.0%)
Subtotal	**241**	**48[3]**		**1,782**	
Total	**491**	**61[3]**		**3,561**	

1. Mean species richness 1985–2023.
2. Mean number of observations 1985–2023 and percent different from mean.
3. Total combined number of unique species.

* The Naval Reactors Facility Route was altered in 2019 due to construction. The number of stops has varied on the route, and it would be inaccurate to compare the data to previous data.

3.3 Species Assemblages

The species assemblage with the highest bird abundance in 2024 was the Shrub-steppe/Grassland assemblage, which consisted of 18 species and represented 58.3% of all BBS observations (Figure 3). This assemblage normally has the highest number of observations because the majority of the INL Site consists of shrub-steppe and grassland habitats. The second most abundant species assemblage was the Sagebrush-obligates assemblage that consisted of four species and represented 23.3% of all observations. The third most abundant species assemblage was the habitat Generalist assemblage, which consisted of 14 species and represented 9.5% of all observations.

Table 3. Comparison of 2024 total observations and species richness to their perspective 37-year means for each species assemblage on the Idaho National Laboratory Site.

Species Assemblage	Number of Species	Mean Number of Species[1]	Total Observations	Mean Observations[1]
Shrub-steppe/Grassland	18	17	2,077	2,714
Sagebrush-obligate	4	4	831	1,437
Generalist	14	12	337	525
Riparian	5	6	171	114
Shorebird	5	5	81	280
Non-native	3	3	33	65
Waterfowl	7	6	17	43
Shrub-steppe/Woodland	4	4	14	26

1. Means are from 1985–1991 and 1994–2023.

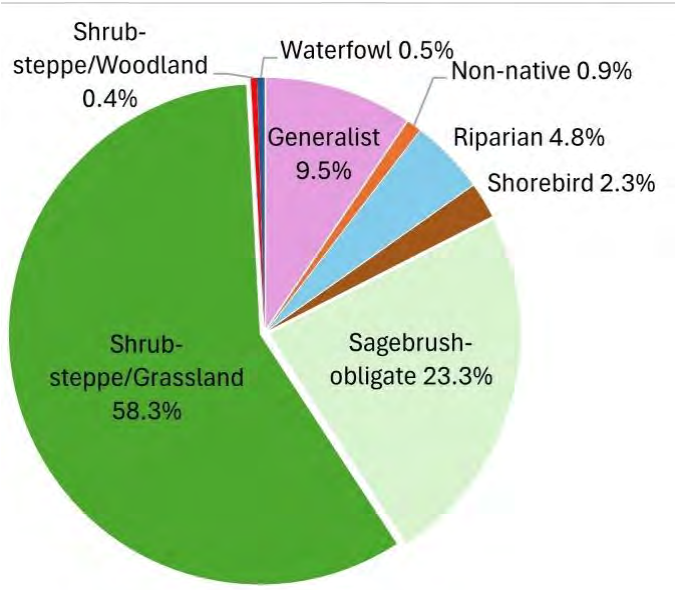

Figure 4. Summary of Breeding Bird Survey species abundance among assemblages for remote and facility routes on the Idaho National Laboratory Site in 2024.

Shrub-steppe/Grassland

Species within this assemblage may use intact sagebrush dominated communities that include open areas with forbs and grasses or areas recovering from wildland fire that are comprised of non-sagebrush shrubs (e.g., green rabbitbrush) and herbaceous vegetation, or areas that are grass-dominated. Bird species in this assemblage are associated with open areas with few trees like those represented in shrub-steppe vegetation communities and while some species in this assemblage benefit from intact sagebrush dominated communities, they do not necessarily need sagebrush to fulfill all or part of their life history requirements (e.g., food, shelter, nesting).

Species representing the Shrub-steppe/Grassland assemblage have always been observed in the greatest numbers in past BBSs, and they again dominated observations in 2024 (n = 2,077; Figure 3; Table 3). Common shrub-steppe/grassland species include horned lark, western meadowlark, Vesper's sparrow (*Pooecetes gramineus*), and common nighthawk (Table 1). Horned lark and western meadowlark were the most abundant species in this assemblage and were in the top five most abundant species for the entire survey (Table 1). The total number of birds observed within the Shrub-steppe/Grassland assemblage was lower than the 37-year mean of 2,714 (Table 3).

Eight SGCN, BCC, or BLM Special Status Species occur in this assemblage including the burrowing owl, common nighthawk, ferruginous hawk, golden eagle, grasshopper sparrow, loggerhead shrike, northern harrier, and short-eared owl. Sufficient observations for trend estimates existed for common nighthawks and loggerhead shrikes. Populations appear stable for common nighthawks while loggerhead shrike populations are declining (Table 4). Loggerhead shrike populations have declined across the U.S., including in BCR 9, since the 1960s (Ziolkowski et al. 2023). While this species utilizes many habitats across its range, in the western U.S. it is primarily associated with dense shrubs and woodlands used for nesting, interspersed with open grasslands used for hunting. Studies in Washington (Poole 1992), Oregon (Humple and Holmes 2006), and southwestern Idaho (Woods 1993, Woods and Cade 1996), indicated that loggerhead shrikes primarily nested in shrubs, particularly in big sagebrush, in patches that had structural complexity offering a variety of perch heights used for hunting. Miller et al. (2017) found that loggerhead shrike presence was higher in plots with taller shrubs and was negatively associated with plots with increasing cover of perennial grasses and forbs. Additionally, Humple and Holmes (2006) found that nest survivorship of loggerhead shrikes declined after a wildland fire in northeastern Oregon. Therefore, it is likely that the loss of structurally complex stands of sagebrush after wildland fire (Forman 2024) is a contributing factor to the declining population trend of loggerhead shrikes on the INL Site.

Table 4. Thiry-eight-year trend estimates for selected Species of Greatest Conservation Need (SGCN) and Birds of Conservation Concern (BCC) on the Idaho National Laboratory Site. Species were selected if there were a sufficient number of observations to complete the analysis. Populations are declining if lambda (λ) and the entire confidence interval are <1, populations are stable if the confidence interval overlaps 1, and populations are increasing if λ and the entire confidence interval are >1.

Common Name	Conservation Status	Lambda (λ)	95% Confidence Interval
Brewer's sparrow	SGCN	0.998	0.990–1.006
common nighthawk	SGCN	0.993	0.975–1.011
loggerhead shrike	SGCN	0.951	0.933–0.970
sage thrasher	SGCN, BCC – BCR 9	0.995	0.989–1.001
sagebrush sparrow	SGCN	0.978	0.969–0.987

Sagebrush-obligate

Species in this assemblage require sagebrush to fulfill all or part of their life history requirements and populations are negatively affected by loss and fragmentation of sagebrush dominated communities. The sagebrush-obligate assemblage had the second highest number of observations with 831 individuals; however, it was 57.8% below the mean of 1,437 observations (Figure 3; Table 3). This assemblage only includes four species: Brewer's sparrow, greater sage-grouse, sage thrasher, and sagebrush sparrow. Sage thrasher was the most abundant sagebrush-obligate (n = 312), followed by Brewer's sparrow (n = 300), sagebrush sparrow (n = 211), and greater sage-grouse (n = 8). There were sufficient observations to complete trend estimated for Brewer's sparrows, sage thrashers, and sagebrush sparrows. Brewer's

sparrow and sage thrasher populations have declined slightly but appear to be stable on the INL Site while sagebrush sparrow populations are declining (Table 4). Greater sage-grouse are not commonly observed on BBS routes on the INL Site and populations are monitored via spring leks counts. For a more detailed breakdown of greater sage-grouse populations on the INL Site refer to the 2025 Candidate Conservation Agreement (CCA) Implementation Report (Williams et al. 2025).

Sagebrush-obligate songbird populations are declining across their range (Ziolkowski et al. 2023) due to loss and fragmentation of sagebrush ecosystems from wildland fire, land conversion, rural expansion, energy infrastructure, resource extraction, and invasive annual grasses (Doherty et al. 2022, Pyke and Boyd 2023). Stable populations of Brewer's sparrows and sage thrashers on the INL Site may be attributed to management actions to conserve and restore sagebrush to promote greater sage-grouse population growth as outlined in the CCA. Both species have been associated with higher occurrence probability of greater sage-grouse (Timmer et al. 2019) and there is evidence that these two species may be more tolerant of some habitat degradation (Miller et al. 2017, Dinkins and Beck 2019). However, Timmer et al. (2019) found lower densities of sagebrush sparrows in areas with high probability of greater sage-grouse occurrence in Colorado and Dinkins and Beck (2019) found no difference in sagebrush sparrow trends in greater sage-grouse core and non-core conservation areas in Wyoming. This suggests that sagebrush sparrows may not entirely benefit from the "umbrella" provided by conservation strategies for greater sage-grouse due to differences in habitat requirements (e.g., height and structure of sagebrush). However, Kumar et al. (2024) did find that core sagebrush areas, as designated in the Sagebrush Conservation Design (Doherty et al. 2022), which did not explicitly consider distribution or abundance of sagebrush wildlife, promoted higher densities of all three sagebrush-obligate songbird species. Therefore, continued restoration of sagebrush as outlined in the Wildland Fire Recovery Framework (Forman et al. 2024) and Revegetation Guide (INL 2012) may promote sagebrush sparrow populations in the future.

Generalist

Species in this assemblage may use a variety of habitats including grasslands, shrublands, and woodlands. Many of these species are tolerant of human disturbance and may be found in exurban, suburban, or even urban areas. Some of these species directly benefit from humans by utilizing artificial structures for nesting and perching or by consuming food subsidies at bird feeders, trash bins, landfills, or road-killed animals.

The Generalist assemblage consisted of 14 species and represented 9.5% of total observations (Figure 3; Table 3). Among these were three species of raptors (i.e., eagles, hawks, falcons, and owls) which included red-tailed hawk (*Buteo jamaicensis,* n = 19), Swainson's hawk (*Buteo swainsoni*, n = 18), and American kestrel (*Falco sparverius*, n = 6) and two species of corvids, the common raven (*Corvus corax*, n = 156) and black-billed magpie (*Pica hudsonia,* n = 16). Common ravens, the most abundant species of this assemblage, have expanded their range and populations have increased throughout the Great Basin (Coates et al. 2020, Dinkins et al. 2021, Harju et al. 2021). They are documented nest predators of several sensitive species including greater sage-grouse (Coates and Delehanty 2010). Common raven observations have increased on the INL Site over the years (Figure 4), but it is unclear if this increase has affected local populations of sensitive species. There were no SGCN, BCC, or BLM Special Status Species detected for this assemblage in 2024.

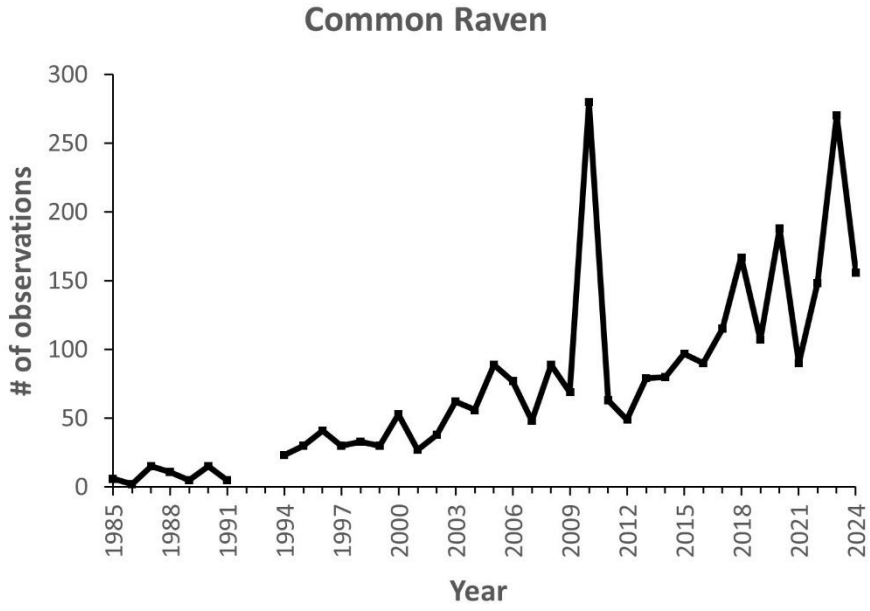

Figure 5. Common raven observations on the Idaho National Laboratory Site 1985–2024. No surveys were conducted in 1992 and 1993.

Riparian

Species in this assemblage have diets that primarily consist of flying or aquatic insects during the breeding season. Habitat for these insects is often associated with shallow water with abundant emergent vegetation where the insects can lay their eggs. Bird species in this assemblage have a variety of nesting strategies including building nests out of mud on cliffs or man-made structures, weaving together nests out of reedy vegetation, or nesting in tree cavities or burrows.

The Riparian assemblage consisted of five species and represented 4.8% of total observations (Figure 3, Table 3). The most common species was the barn swallow (*Hirundo rustica*, n = 112), followed by cliff swallow (*Petrochelidon pyrrhonota*, n = 43), red-winged blackbird (*Agelaius phoeniceus*, n = 11), bank swallow (*Riparia riparia*, n = 4), and yellow-headed blackbird (*Xantheocephalus xanthocephalus*, n = 1). All observations of these species occurred on facility routes or at the end of the Tractor Flats remote route. While limited, storage lagoons at facilities provide foraging habitat and appropriate wetland vegetation that supports nesting for red-winged and yellow-headed blackbirds. Buildings provide vertical structures used by barn and cliff swallows during nesting. Bank swallows were only detected at the end of the Tractor Flats route, where canal systems associated with local agriculture provide elevated banks that support nesting for this species. While many insectivorous and riparian-associated birds are declining across North America (Ziolkowski et al. 2023), this assemblage was the only one whose total observations was above the 37-year mean. There were no SGCN, BCC, or BLM Special Status Species detected for this assemblage in 2024.

Shorebird

Species in this assemblage include wading birds and gulls that require bare ground, usually sand or gravel, for nesting. The shorebird assemblage consisted of five species and represented 2.3% of observations (Figure 3, Table 3). Standing water is rare on the INL Site and typically most observations of shorebirds occur in proximity to storage lagoons along facility routes or near the Mud Lake Landfill

and agricultural fields adjacent to the INL Site boundary. In 2024, Franklin's gull observations (n = 46) comprised 56.8% of all shorebird observations. The other shorebirds observed were killdeer (*Charadrius vociferus*, n = 19), California gull (n = 11), white-faced ibis (n = 4), and spotted sandpiper (*Actitis macularia*, n = 1). Franklin's gulls, California gulls, and white-faced ibis are SGCN species in Idaho and both gull species are BCCs throughout their range in the contiguous U.S. All three species are colonial nesters, and no breeding habitat exists on the INL Site that can accommodate a colony of these species. All observations, except for two Franklin's gulls on the Kyle Canyon route, were observed on the last ten stops of the Tractor Flats route. This section of the route passes through cropland that provides foraging opportunities, and the route ends approximately five miles from the Mud Lake Wildlife Management Area that does have habitat that supports breeding colonies for these three species.

Non-native

This assemblage is not tied to specific vegetation communities and only includes species that are not native to North America. In 2024, The Non-native assemblage consisted of three species and represented 0.9% of observations (Figure 3, Table 3). Species observed included house sparrow (n = 23), European starling (n = 8), and rock pigeon (n = 1). Observations of these species occurred on facility routes or in cropland on the Tractor Flats route and were 50.7% lower than the 37-year mean.

Waterfowl

Species in this assemblage include ducks, geese, and coots. Most of these species build nests out of vegetation that either float on top of the water, are hidden in vegetation near a water body, or nest in upland habitats adjacent to bodies of water. A few species in this assemblage nest in tree cavities or man-made nest boxes near aquatic habitats. The Waterfowl assemblage consisted of seven species and represented 0.5% of observations (Figure 3, Table 3). Species observed included mallards (*Anas platyrhynchos,* n = 8), Canada geese (*Branta canadensis*, n = 3), northern shovelers (*Spatula clypeata*, n = 2), and one individual each of American coot (*Fulica american*), gadwall (*Mareca strepera*), northern pintail, and redhead (*Aythya americana*).

Waterfowl are commonly observed during the BBS even though little standing water exists on the INL Site. Apart from the ephemeral Big Lost River, the Big Lost River spreading area, and the Big Lost River Sinks playa, the only standing water bodies on the INL Site during these surveys are storage lagoons near facilities. These man-made ponds serve as stopover locations for migrating birds and upland habitat occasionally provides nesting opportunities for some waterfowl species.

The northern pintail was the only SGCN species detected in this assemblage. Northern pintails are ground nesters that nest in upland habitats (e.g. grasslands), as well as croplands, wet meadows, and seasonal wetlands (Clark et al. 2020). While it is possible that the species is nesting on the INL Site, given the limited amount of habitat and detections on BBS routes, it is more likely that observed individuals are transient.

Sage-steppe/Woodland

Species in this assemblage breed in open woodlands like those found at the ecotone of shrub-steppe and juniper woodlands. Some nest in trees, however, others nest on the ground or in shrubs and therefore require adequate ground and shrub cover to conceal their nests.

The Shrub-steppe/Woodland assemblage consisted of four species and represented 0.4% of observations (Figure 3, Table 3). Species observed included: chipping sparrow (*Spizella passerina*, n = 6), gray flycatcher (*Empidomax wrightii*, n = 4), hermit thrush (*Catharus guttatus*, n = 3), and dusky flycatcher (*Empidomax oberholseri*, n = 1). Observations occurred on the Kyle Canyon and Twin Buttes remote routes where there is limited habitat for these species, although they are occasionally observed on facility routes where trees are present. None of the species detected are considered SGCN, BCC, or Special Status by the BLM.

3.4 Community Diversity Index

Based on both of Shannon's measures of diversity, the RWMC Route had the most diverse and even bird community of all 13 routes (H=2.39, E_H=0.78). For the remote routes, Kyle Canyon had the most diverse bird community (H=2.27) while Twin Buttes had the most even community (E_H=0.72; Table 5). The Circular Butte route had the least diverse and least even bird community (H=1.15, E_H=0.45; Table 5) of all the routes.

Table 5. Values for Shannon Diversity (H), and Equitability (E_H) indices during the 2024 Breeding Bird Surveys on the Idaho National Laboratory Site.

Route	Shannon's H	Shannon's E_H
Remote Routes		
Tractor Flats	2.21	0.70
Kyle Canyon	2.27	0.71
Twin Buttes	2.13	0.72
Lost River	1.74	0.64
Circular Butte	1.15	0.45
Facility Routes		
Materials and Fuels Complex	2.38	0.77
Central Facilities Area	2.48	0.73
Radioactive Waste Management Complex	2.39	0.78
Idaho Nuclear Technology and Engineering Center	2.17	0.80
Advanced Test Reactor Complex	2.03	0.67
Naval Reactors Facility*	1.96	0.82
Test Area North	1.52	0.56
Critical Infrastructure Test Range Complex	1.21	0.50

* The Naval Reactors Facility Route was altered in 2022. These stops cannot be accurately compared to previous years.

Generally, facility routes have more diverse bird communities than remote routes. This is because facilities have more habitat complexity due to the presence of buildings, trees, storage lagoons, and corresponding edge with shrub and grassland vegetation. Diversity and evenness indices have remained largely consistent since 2012 for all routes except for the Circular Butte and CITRC routes (Figure 5). Declines in bird species diversity and evenness begin after 2019 and are likely due to the changes in the vegetation community after the Sheep Fire which impacted the entire CITRC route and ~50% of the Circular Butte route (Forman et al. 2020).

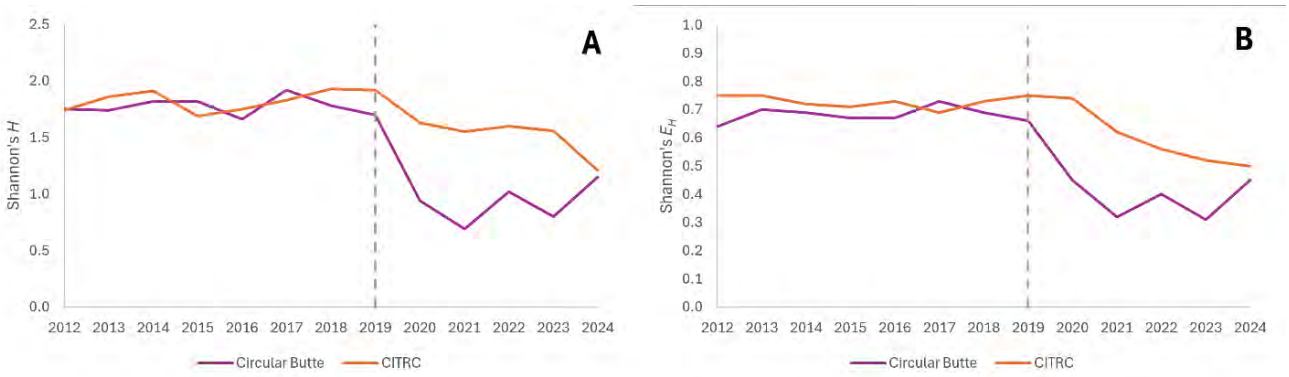

Figure 6. Shannon's H (diversity; A) and Shannon's EH (evenness; B) indices from 2012–2024 for the Circular Butte and CITRC BBS routes. The gray dashed line indicates the 2019 Sheep Fire which impacted both routes.

4. CONCLUSIONS

General patterns of the most commonly detected species and assemblages remained consistent on BBSs in 2024. However, total observations on BBSs on the INL Site have been below average for 11 of the last 14 years, including in 2024. This decline in observations is likely a result of multiple factors including a continent-wide decline in bird abundance, changes to the vegetation community on the INL Site from wildland fire, drought, and alterations in precipitation patterns, and to a lesser extent variation in observer experience. Two species of conservation concern, the sagebrush sparrow and the loggerhead shrike, have populations that are declining on the INL Site. Overall bird observations have declined, but species richness and diversity indices have remained relatively consistent, indicating that the INL Site continues to support a high diversity of species of breeding birds. Therefore, monitoring of bird populations on the INL Site should continue as should engagement in conservation efforts including native vegetation restoration and the Three Billion Birds Initiative, a joint initiative by the American Bird Conservancy, National Audubon Society, Bird Conservancy of the Rockies, Georgetown University, The Cornell Lab of Ornithology, and the Smithsonian that promotes land management and mitigation strategies that conserve and restore birds and their habitats (https://www.3billionbirds.org/).

4.1 FUTURE DATA ANALYSES

Given the steep decline of bird populations in North America (Rosenberg et al. 2019), additional trend analyses for the INL Site should be completed for all species that have sufficient observations, regardless of conservation status. Additionally, finer scale analyses that use individual stops rather than entire routes should be completed to investigate the link between vegetation communities and abundance for birds commonly observed on the INL Site and to investigate changes in bird communities after disturbance (e.g., wildland fire). Results from these analyses will help to inform restoration actions, planning of new activities, siting of infrastructure, and compliance with both NEPA, Nuclear Regulatory Commission, and Migratory Bird Treaty Act regulations.

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APPENDIX A

SUMMARY OF SPECIES BY ROUTE 2024

Survey Route: Advanced Test Reactor Complex (ATRC)

Survey Date: June 24, 2024

Species	Abundance	Percentage
horned lark	122	50.41
Brewer's sparrow	15	6.20
cliff swallow	14	5.89
Brewer's blackbird	13	5.37
western meadowlark	12	4.96
house sparrow	10	4.13
Vesper's sparrow	10	4.13
sage thrasher	8	3.31
barn swallow	7	2.89
common raven	5	2.07
sagebrush sparrow	5	2.07
brown-headed cowbird	3	1.24
common nighthawk	3	1.24
killdeer	3	1.24
red-winged blackbird	3	1.24
savannah sparrow	3	1.24
American Robin	2	0.83
American kestrel	1	0.41
lark sparrow	1	0.41
mourning dove	1	0.41
prairie falcon	1	0.41
Total Individuals	*242*	
Total Species	*21*	

Survey Route: Central Facilities Area (CFA)

Survey Date: June 24, 2024

Species	Observations	Percentage
horned lark	114	36.19
sage thrasher	31	9.84
barn swallow	30	9.52
common raven	19	6.03
common nighthawk	18	5.71
western meadowlark	10	3.17
brown-headed cowbird	9	2.86
sagebrush sparrow	9	2.86
American robin	8	2.54
house sparrow	8	2.54
Brewer's sparrow	7	2.22
house finch	7	2.22
killdeer	7	2.22
European starling	6	1.90
American kestrel	4	1.27
Brewer's blackbird	4	1.27
Canada goose	3	0.95
mourning dove	3	0.95
red-tailed hawk	3	0.95
grasshopper sparrow	2	0.63
rock wren	2	0.63
Say's phoebe	2	0.63
Swainson's hawk	2	0.63
dark-eyed junco	1	0.32
eastern kingbird	1	0.32
hermit thrush	1	0.32
loggerhead shrike	1	0.32
norther harrier	1	0.32
red-winged blackbird	1	0.32
song sparrow	1	0.32
Total Individuals	*315*	
Total Species	*30*	

Survey Route: Circular Butte
Survey Date: June 20, 2024

Species	Observations	Percentage
horned lark	269	73.50
common raven	21	5.74
western meadowlark	17	4.64
sage thrasher	15	4.10
Brewer's sparrow	9	2.46
greater sage-grouse	8	2.19
sagebrush sparrow	7	1.91
mourning dove	6	1.64
common nighthawk	5	1.37
red-tailed hawk	3	0.82
ferruginous hawk	2	0.55
grasshopper sparrow	2	0.55
loggerhead shrike	1	0.27
northern harrier	1	0.27
Total Individuals	*366*	
Total Species	*14*	

Survey Route: Critical Infrastructure Test Range Complex (CITRC)

Survey Date: June 21, 2024

Species	Observations	Percentage
horned lark	130	70.65
Brewer's sparrow	12	6.52
Vesper's sparrow	10	5.43
sage thrasher	8	4.35
western meadowlark	8	4.35
common nighthawk	4	2.17
mourning dove	4	2.17
sagebrush sparrow	4	2.17
common raven	2	1.09
grasshopper sparrow	1	0.54
Say's phoebe	1	0.54
Total Individuals	*184*	
Total Species	*11*	

Survey Route: Idaho Nuclear Technology and Engineering Center (INTEC)

Survey Date: June 21, 2024

Species	Observations	Percentage
horned lark	53	31.18
sage thrasher	22	12.94
common raven	20	11.76
sagebrush sparrow	16	9.41
Brewer's sparrow	14	8.24
barn swallow	13	7.65
common nighthawk	12	7.06
Brewer's blackbird	6	3.53
short-eared owl	3	1.76
western meadowlark	3	1.76
burrowing owl	2	1.18
grasshopper sparrow	2	1.18
Say's Phoebe	2	1.18
chipping sparrow	1	0.59
mourning dove	1	0.59
Total Individuals	*170*	
Total Species	*15*	

Survey Route: Kyle Canyon
Survey Date: June 13, 2024

Species	Observations	Percentage
sagebrush sparrow	56	21.13
horned lark	53	20.00
western meadowlark	51	19.25
sage thrasher	33	12.45
Brewer's sparrow	21	7.92
mourning dove	8	3.02
loggerhead shrike	7	2.64
common raven	5	1.89
gray flycatcher	4	1.51
red-tailed hawk	4	1.51
chipping sparrow	3	1.13
black-billed magpie	2	0.75
ferruginous hawk	2	0.75
Franklin’s gull	2	0.75
lark sparrow	2	0.75
Swainson’s hawk	2	0.75
western kingbird	2	0.75
brown-headed cowbird	1	0.38
common nighthawk	1	0.38
dusky flycatcher	1	0.38
golden eagle	1	0.38
grasshopper sparrow	1	0.38
merlin	1	0.38
northern harrier	1	0.38
rock wren	1	0.38
Total Individuals	*265*	
Total Species	*25*	

Survey Route: Lost River

Survey Date: June 6, 2024

Species	Observations	Percentage
horned lark	181	45.14
Brewer's sparrow	69	17.21
western meadowlark	53	13.22
sage thrasher	38	9.48
sagebrush sparrow	14	3.49
Vesper's sparrow	12	2.99
grasshopper sparrow	10	2.49
common raven	8	2.00
mourning dove	7	1.75
ferruginous hawk	3	0.75
red-tailed hawk	2	0.50
brown-headed cowbird	1	0.25
loggerhead shrike	1	0.25
northern harrier	1	0.25
Swainson's hawk	1	0.25
Total Individuals	401	
Total Species	*15*	

Survey Route: Materials and Fuels Complex (MFC)
Survey Date: June 5, 2024

Species	Observations	Percentage
horned lark	53	30.11
barn swallow	29	16.48
western meadowlark	20	11.36
common raven	11	6.25
cliff swallow	10	5.68
mallard	8	4.55
Brewer's Sparrow	7	3.98
red-winged blackbird	7	3.98
killdeer	5	2.84
sage thrasher	5	2.84
Brewer’s blackbird	3	1.70
mourning dove	3	1.70
norther harrier	2	1.14
northern shoveler	2	1.14
red-tailed hawk	2	1.14
Say’s phoebe	2	1.14
Vesper’s sparrow	2	1.14
American coot	1	0.57
gadwall	1	0.57
redhead	1	0.57
Swainson’s hawk	1	0.57
yellow-headed blackbird	1	0.57
Total Individuals	*176*	
Total Species	*22*	

Survey Route: Naval Reactors Facility (NRF)

Survey Date: June 19, 2024

Species	Observations	Percentage
sagebrush sparrow	26	25.24
horned lark	22	21.36
common raven	14	13.59
sage thrasher	14	13.59
Brewer's sparrow	10	9.71
western meadowlark	10	9.71
brown-headed cowbird	2	1.94
mourning dove	2	1.94
Brewer's blackbird	1	0.97
killdeer	1	0.97
lark sparrow	1	0.97
Total Individuals	*103*	
Total Species	*11*	

Survey Route: Radioactive Waste Management Complex (RWMC)

Survey Date: June 7, 2024

Species	Observations	Percentage
Brewer's sparrow	40	21.98
horned lark	27	14.84
barn swallow	24	13.19
western meadowlark	24	13.19
cliff swallow	19	10.44
sage thrasher	9	4.95
common nighthawk	8	4.40
sagebrush sparrow	6	3.30
Say's phoebe	5	2.75
killdeer	3	1.65
savannah sparrow	3	1.65
Brewer's blackbird	2	1.10
common raven	2	1.10
house finch	2	1.10
rock wren	2	1.10
American kestrel	1	0.55
European starling	1	0.55
northern pintail	1	0.55
spotted sandpiper	1	0.55
Vesper's sparrow	1	0.55
western bluebird	1	0.55
Total Individuals	*182*	
Total Species	*21*	

Survey Route: Test Area North (TAN)

Survey Date: June 12, 2024

Species	Observations	Percentage
horned lark	218	53.17
sage thrasher	68	16.59
Brewer's sparrow	47	11.46
sagebrush sparrow	39	9.51
Vesper's sparrow	10	2.44
barn swallow	8	1.95
western meadowlark	6	1.46
common raven	4	0.98
common nighthawk	3	0.73
burrowing owl	2	0.49
golden eagle	1	0.24
grasshopper sparrow	1	0.24
loggerhead shrike	1	0.24
northern harrier	1	0.24
short-eared owl	1	0.24
Total Individuals	*410*	
Total Species	*15*	

Survey Route: Tractor Flats

Survey Date: June 18, 2024

Species	Observations	Percentage
horned lark	173	39.50
Franklin's gull	44	10.05
western meadowlark	41	9.36
Brewer's sparrow	38	8.68
common raven	27	6.16
sage thrasher	20	4.57
black-billed magpie	14	3.20
California gull	11	2.51
Vesper's sparrow	9	2.05
mourning dove	8	1.83
sagebrush sparrow	8	1.83
house sparrow	5	1.14
bank swallow	4	0.91
loggerhead shrike	4	0.91
white-face ibis	4	0.91
brown-headed cowbird	3	0.68
grasshopper sparrow	3	0.68
northern harrier	3	0.68
Swainson's hawk	3	0.68
American robin	2	0.46
burrowing owl	2	0.46
red-tailed hawk	2	0.46
rock pigeon	2	0.46
western kingbird	2	0.46
barn swallow	1	0.23
chipping sparrow	1	0.23
common nighthawk	1	0.23
European starling	1	0.23
ferruginous hawk	1	0.23
short-eared owl	1	0.23
Total Individuals	*438*	
Total Species	*30*	

Survey Route: Twin Buttes

Survey Date: June 25, 2024

Species	Observations	Percentage
horned lark	119	38.51
sage thrasher	41	13.27
western meadowlark	28	9.06
Vesper's sparrow	22	7.12
sagebrush sparrow	21	6.80
common raven	18	5.83
common nighthawk	16	5.18
Brewer's sparrow	11	3.56
Swainson's hawk	9	2.91
mourning dove	6	1.94
grasshopper sparrow	3	0.97
loggerhead shrike	3	0.97
red-tailed hawk	3	0.97
short-eared owl	3	0.97
hermit thrush	2	0.65
burrowing owl	1	0.32
chipping sparrow	1	0.32
northern flicker	1	0.32
rock wren	1	0.32
Total Individuals	*309*	
Total Species	*19*	