

**Avian Use Study  
Lava Ridge Wind Project  
Lincoln, Jerome, and Minidoka Counties, Idaho**

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**Final Report  
April 2020 – March 2021**



**Prepared for:**

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## EXECUTIVE SUMMARY

Magic Valley Energy, LLC contracted Western EcoSystems Technology, Inc. to conduct a pre-construction baseline avian use study at the Lava Ridge Wind Project. The primary objective of the study was to estimate levels of use by avian species within the Study Area (based on the Project boundary in the Plan of Development, February 2020). The study was conducted from April 3, 2020 to March 31, 2021 and the results encompass the first year of a two-year study. Study methodology was based upon the recommendations in the US Fish and Wildlife Service (USFWS) *Land-Based Wind Energy Guidelines and Eagle Conservation Plan Guidance (ECPG)*, and *Revisions to Regulations for Eagle Incidental Take and Take of Eagle Nests*. The Project is located in the Snake River Basin Ecoregion and is dominated by sagebrush and areas of barren lava fields. The Project area is primarily flat with low rolling hills and steeper terrain located to the north, with limited trees and water resources.

Surveys were conducted at 90 randomly selected survey points with 800-meter (m) radius survey plots that covered 32% of the Study Area. Surveys at each point were conducted for a period of 70 minutes (min) with only small birds recorded during the first 10 min of the survey out to a 100-m radius, and only large birds (including eagles) recorded for the remaining 60 min out to an 800-m radius. If any eagles were seen, data were collected based on the recommendations in the ECPG and the 2016 Final Eagle Rule. If incidental wildlife were observed, data was recorded in a similar fashion as data collected during surveys. Data collected from surveys were analyzed to estimate and provide metrics on levels of use by avian species.

Overall, 1,080 avian use surveys were conducted. Twenty-six species of large birds within 4,178 observations were recorded during the Study. Forty-one observations of golden eagles were recorded and no bald eagles were recorded. Golden eagle mean use was 0.03 observations/800-m radius plot/60-min survey in all seasons. Sixty-one golden eagle exposure minutes were recorded from 28 golden eagle observations. Spatially, golden eagle exposure minutes were recorded at 19 of 90 survey points. Golden eagle exposure minutes per survey hour were highest at survey Point 57, which was located near an eagle nest that was occupied in 2020. Golden eagle flight heights were recorded most frequently within the rotor swept height (RSH; 63.0%).

Large corvids overall had the highest use of all bird types and were seen more frequently than any other bird type during surveys, and common raven had the highest use among large bird species. Roughly half (47.9%) of large birds were recorded within the RSH. The highest large bird use values were recorded at Point 4, Point 83, and Point 37. Diurnal raptors were recorded in every season, with use being highest in the summer and fall.

Twenty-two species of small birds were recorded within 4,571 observations during the study. Passerines were the only small bird type recorded. Small bird flight heights were mainly below the RSH. The highest use for small birds were recorded at Point 6 and Point 49. Horned lark had the highest use among small bird species, followed by western meadowlark.

There were no federally threatened or endangered species recorded. Fifteen species of concern, defined as those listed as threatened or endangered under the Endangered Species Act, species listed as Species of Greatest Conservation Need (SGCN) by the Idaho Fish and Game Department, and species listed as Sensitive Species by the Bureau of Land Management in the Shoshone Field Office, were recorded, 12 of which are listed as BLM sensitive species, and 11 are listed as SGCN in Idaho.

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## **REPORT REFERENCE**

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## INTRODUCTION

Magic Valley Energy, LLC (MVE) is proposing the development of the Lava Ridge Wind Project (Project) in Lincoln, Jerome, and Minidoka counties, Idaho (Figure 1). To support the development of the Project, MVE contracted Western EcoSystems Technology, Inc. (WEST) to conduct a pre-construction avian use study at the proposed Project. Study methodology was based upon the recommendations in the US Fish and Wildlife Service (USFWS) 2012 *Land-Based Wind Energy Guidelines* (WEG), Appendix C(1)(a) of the 2013 USFWS *Eagle Conservation Plan Guidance* (ECPG), and the USFWS *Revisions to Regulations for Eagle Incidental Take and Take of Eagle Nests* (2016 Final Eagle Rule [81 Federal Register 91494 (December 16, 2016)]).

Revisions have been made to the Project boundary throughout Project development. The current Project boundary was updated in the June 2021 Plan of Development (POD). The year one avian use study was completed within the February 2020 POD Project boundary (defined here as the Study Area; Figure 1). The June 2021 Project area is included on all figures for reference. Given the amount of overlap between the two Project areas and similarity in habitat types in areas not covered by the Year 1 studies, data collected within the 2020 POD is anticipated to also be applicable to the revised Project area.

The primary objective of the avian use study was to estimate levels of use by avian species within the Study Area. These observational surveys are recommended in the ECPG and WEG for characterizing levels of potential risk caused by a proposed wind project, to eagles and other avian species (USFWS 2012, 2013, 2016). This report summarizes results from the first year avian use study completed at the Project from April 3, 2020 to March 31, 2021.

## PROJECT OVERVIEW

The proposed Project is located approximately 18 miles (29 kilometers [km]) northeast of Twin Falls, Idaho (Figure 1). The Project is located in the Snake River Basin Ecoregion (US Environmental Protection Agency [USEPA] 2017), which is comprised of alluvial flats and low hills surrounding the Snake River. Natural vegetation within this ecoregion is dominated by sagebrush, although barren lava fields also occur.

The Study Area was based on the approximately 140,000-acre Project area in the February 2020 POD. According to the National Land Cover Database (NLCD; 2016), the majority (82.4%) of the Project area is grassland/herbaceous. Shrub/scrubland cover composes 16.4% of the Project area, and remaining land cover types compose less than 2% (Table 1, Figure 2). These same land cover types are found within the Project area in the June 2021 POD (Figure 2). Topography within the Project is primarily flat with low rolling hills, with steeper terrain located in the northwest corner of the Project. Elevations range from approximately 4,050 feet (ft; 1,234 meters [m]) to 5,077 ft (1,547 m; Figure 2). Few trees or water resources are found within the Project.

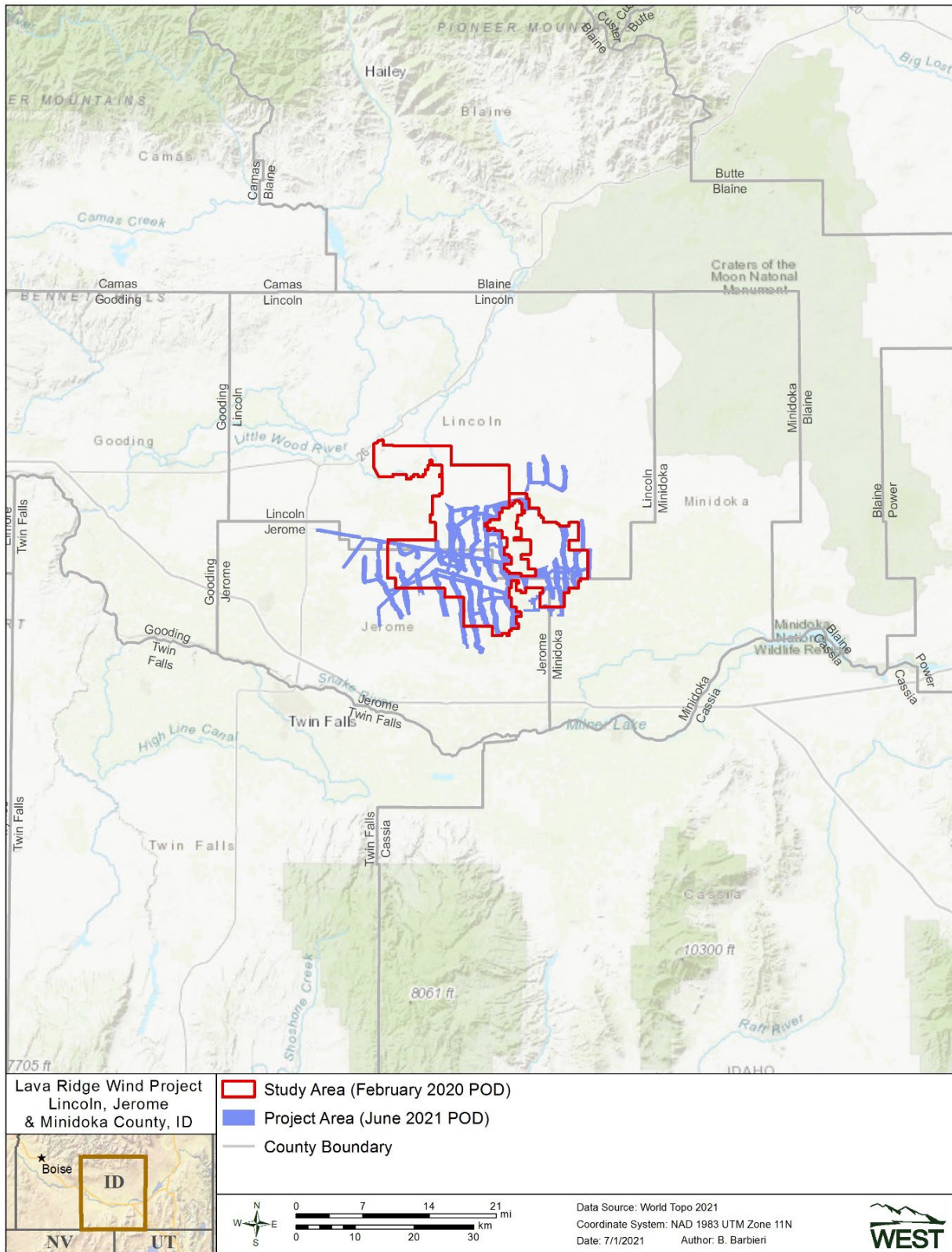


Figure 1. Location of the Lava Ridge Wind Project in Lincoln, Jerome, and Minidoka counties, Idaho (POD=Plan of Development).

**Table 1. Land cover, coverage, and percent composition within the Lava Ridge Wind Project Study Area in Lincoln, Jerome, and Minidoka counties, Idaho.**

<b>Land Cover Types</b>	<b>Area (sq km)</b>	<b>Area (Acres)</b>	<b>Percent</b>
Herbaceous	466.5	115274.6	82.4
Shrub/Scrub	92.8	22928.5	16.4
Developed, Open Space	5.3	1315.5	0.9
Cultivated Crops	0.9	213.9	0.2
Developed, Low Intensity	0.2	61.2	0.0
Hay/Pasture	0.2	39.4	0.0
Emergent Herbaceous Wetlands	0.0	2.2	0.0
Developed, Medium Intensity	0.0	0.9	0.0
Developed, High Intensity	0.0	0.0	0.0
<b>Total</b>	<b>565.9</b>	<b>139,836.3</b>	<b>100.0</b>

Source: National Land Cover Database (2016).

sq km=square kilometers.

Note: Sums may not equal totals shown due to rounding.

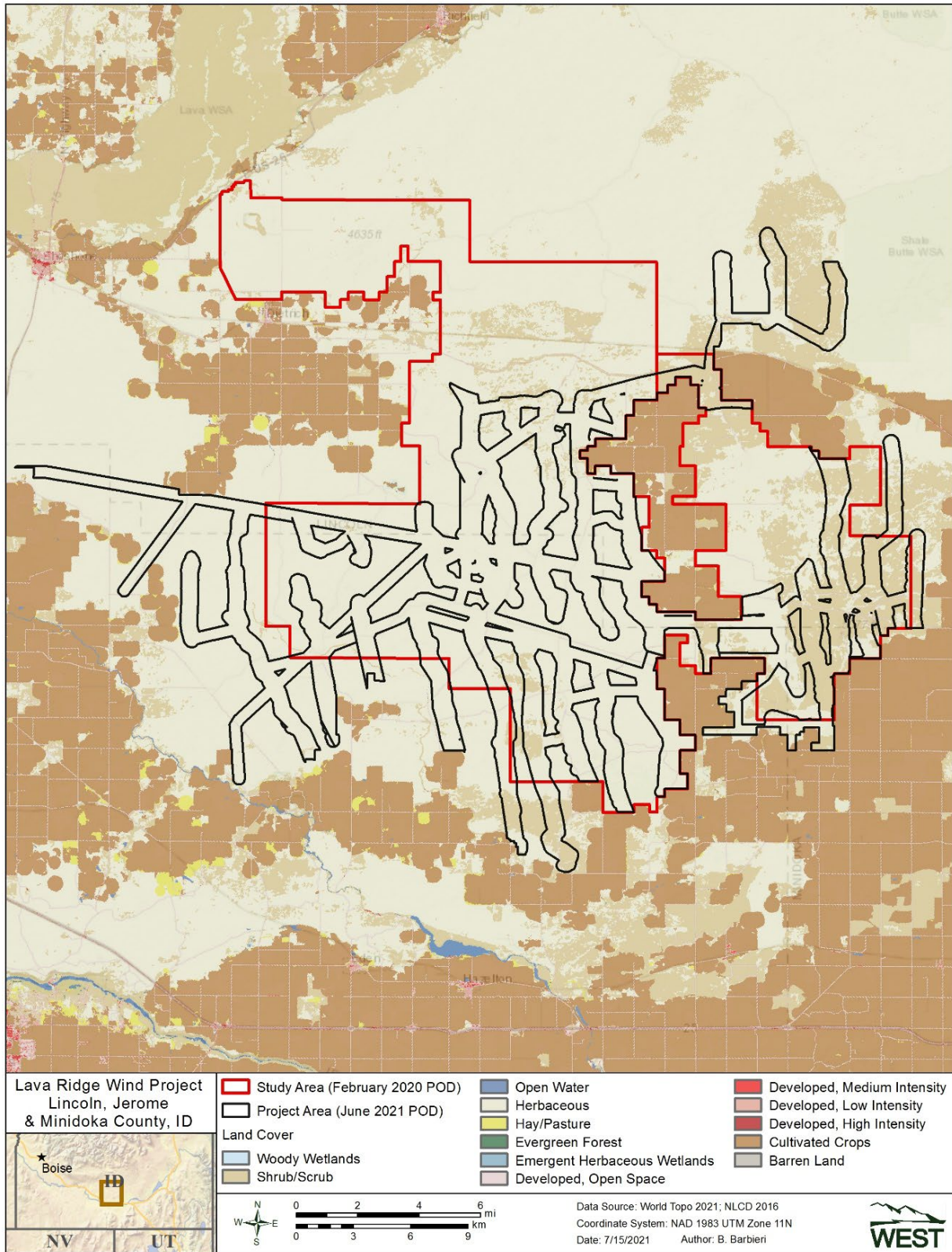


Figure 2. Land cover at the Lava Ridge Wind Project Study Area.

## METHODS

The study design and survey methods for birds recorded in this study were designed based on guidance in the ECPG and the 2016 Final Eagle Rule to satisfy the survey requirements needed for eagles, while also following guidance from the WEG to collect information on other birds. Methods described below, therefore, are common for all birds (i.e., large and small birds, eagles, and other species of concern), except as noted.

Species of concern are defined per the WEG as any species that 1) is either a) listed as an endangered, threatened or candidate species under the Endangered Species Act, subject to the Migratory Bird Treaty Act or Bald and Golden Eagle Protection Act, b) is designated by law, regulation, or other formal process for protection and/or management by the relevant agency or other authority, or c) has been shown to be significantly adversely affected by wind energy development, and 2) is determined to be possibly affected by the Project (USFWS 2012). Species of concern for this Project also included species listed as Species of Greatest Conservation Need (SGCN) by the Idaho Fish and Game Department (IDFG; 2016) and species listed as Sensitive Species by the Bureau of Land Management (BLM) in the Shoshone Field Office Region (BLM 2015).

Data in this report are presented separately for large birds and small birds. Large birds are defined as waterbirds, waterfowl, shorebirds, gulls/terns, diurnal raptors (i.e., kites, accipiters, hawks, eagles, falcons, northern harrier, and osprey), owls, vultures, upland game birds, doves/pigeons, nightjar, and large corvids. Small birds are defined as cuckoos, swifts/hummingbirds, woodpeckers, kingfishers, small corvids, and passerines.

### Study Design

The Study Area for year one avian use surveys was based on the Project boundary in the POD for the Project issued in February 2020 (Figure 1). Per the ECPG, eagle use studies should be designed provide at least 30% coverage of a minimum convex polygon inclusive of all proposed turbines in order to provide sufficient data to estimate eagle take. Proposed turbine locations were unavailable when designing the study; therefore, survey locations were selected to provide coverage of at least 30% of the Project area as defined at the time studies were initiated. The Project area was revised in June 2021 in response to environmental constraints, following the completion of the Year 1 study, and is included on all figures for reference.

Survey locations were selected to be spatially representative of the Study Area. To select survey locations, a grid with one-mile by one-mile cells was laid over the Study Area and grid cells were randomly selected using a spatially balanced sampling method referred to as Balance Acceptance Sampling recommended in the 2016 Final Eagle Rule (Brown et al. 2015). The center of the survey location (survey point) was placed within the randomly selected grid cell that maximized visibility and provided road access. When survey points could not be placed within a grid cell due to lack of access, alternate cells were used that retained the spatially balanced sample.

Ninety survey points were selected in the Study Area (Figure 3). Each survey point was centered within a circular survey plot with an 800-m (2,625-ft) radius for large birds (including eagles) and 100-m (328 ft) radius for small birds (Reynolds et al. 1980, ECPG, 2016 Final Eagle Rule). The 800-m survey plots provided 32% coverage of the Study Area and 20% coverage of the revised Project area in the June 2021 POD, shown in Figure 3. Although coverage of the revised Project area is lower than that of the Study Area, data collected at these plots is expected to be representative of the revised Project area based on habitat and topography within both areas.

Surveys were conducted once per month from April 3, 2020 to March 31, 2021 to capture use in all seasons, as specified in the ECPG and 2016 Final Eagle Rule. Seasons were defined as spring (April 1 – May 31), summer (June 1 – August 31), fall (September 1 – November 30), and winter (December 1 – March 31). Surveys were conducted during daylight hours, and survey times at survey points were randomized to cover all daylight hours during a season so that a single survey point was surveyed at different times of day throughout the year. Randomizing survey times is intended to remove bias that may occur due to variable species-specific activity levels and/or behaviors (e.g., detectability for small birds is typically highest during morning hours when birds are singing, raptors typically soar more during midday). Surveys were conducted under all weather conditions, except when visibility was less than 800 m horizontally and 200 m (656 ft) vertically due to fog, precipitation, or smoke (2016 Final Eagle Rule).

## Survey Methods

### *All Birds*

Surveys were conducted by experienced biologists with proven abilities to identify western bird species by using visual and auditory cues. Survey were conducted at each point for a period of 70 minutes (min), with only small birds recorded during the first 10 min of the survey period out to a 100-m radius, and only large birds (including eagles) recorded for the remaining 60 min of the survey period out to a 800-m radius. Biologists recorded the following information for each survey: date, start and end time, and weather (i.e., temperature, wind speed, wind direction, precipitation, and percent cloud cover). Additionally, the following data were recorded for each group of birds observed:

- Observation number
- Species (or best possible identification)
- Number of individuals
- Sex and age class (if possible)
- Distance from survey point to the nearest five-m interval (first & closest)
- Flight height above ground level (AGL) to the nearest five-m interval (first, lowest, and highest)
- Flight direction (first observed)
- Habitat

- Activity (e.g., flying, perched)
- Observation type (visual or aural)
- Flight paths and perch locations of eagles and other species of concern

### *Eagles*

Data were collected based on the recommendations in the ECPG and the 2016 Final Eagle Rule if a golden eagle or bald eagle or unidentified eagle was observed during the survey period. Biologists recorded eagle behavior (i.e., flight height, distance from observer, activity) each minute (eagle minute), at the top of the minute, to provide an instantaneous count for every eagle observed, whether or not the eagle was flying below 215 m AGL (based on maximum blade tip height of the largest turbine model currently available being considered) and within 800 m of the survey location at any time during the minute, and age class (juvenile [1st year], immature or sub-adult [2nd to 4th year], adult [5th year or older]).

### *Incidental Observations*

Incidental observations are wildlife seen outside the standardized avian use surveys but within the Study Area, and are focused on federal-protected species, species of concern, unusually large congregations of individuals, species not typically recorded during surveys, or species that could be associated with eagle activity (e.g., concentrations of rodents, lagomorphs, or big game species). Data recorded for incidentally observed species were similar to that recorded during scheduled surveys.

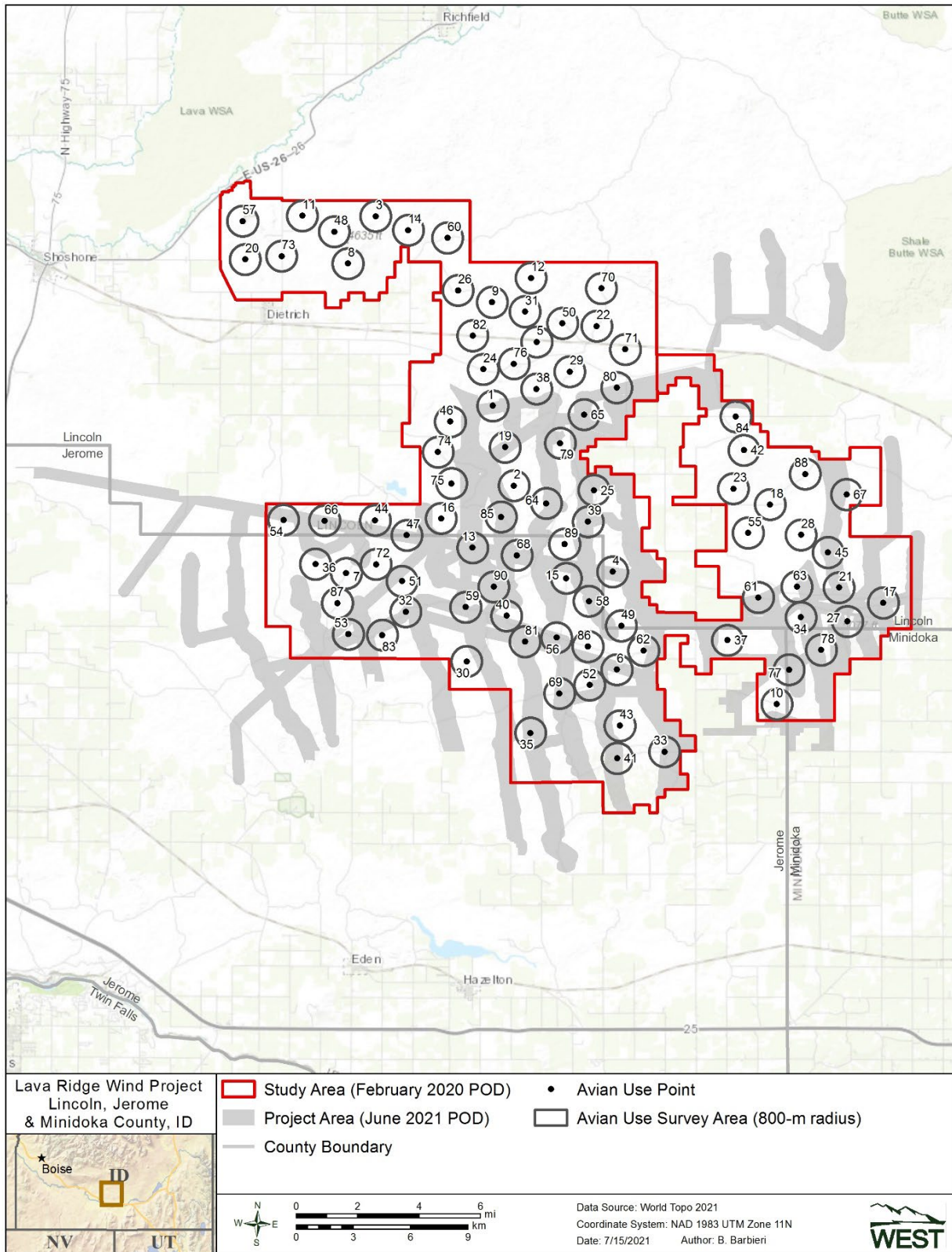


Figure 3. Avian use survey points and plots at the Lava Ridge Wind Project (POD=Plan of development).



## Data Management

### *Quality Assurance and Quality Control*

WEST implemented quality assurance and quality control (QA/QC) measures at all stages of the study, including in the field, during data entry and analysis, and report writing. Following surveys, biologists were responsible for inspecting data forms for completeness, accuracy, and legibility. If errors or anomalies were found within the data, follow-up measures were implemented including discussions and review of field data with field technicians and/or Project managers. If any errors, omissions, or problems were identified in later stages of analysis, they were traced back to the raw data forms where appropriate changes and measures were implemented, no matter what stage of analysis. Multiple reviews were conducted as QA/QC measures.

### *Data Compilation and Storage*

A Microsoft® SQL database was specifically developed to store, organize, and retrieve survey data. Project data were keyed into the electronic database using a pre-defined format to facilitate subsequent QA/QC and data analysis. WEST retained all data forms and electronic data files for reference.

## Statistical Analysis

A *visit* was defined as sequentially surveying all of the survey plots once within the Study Area and could occur across multiple dates but could not overlap and had to be completed in a single season (e.g., spring). If unforeseen conditions prevented all plots from being surveyed during a visit, then a visit might not have constituted a complete survey of all plots.

A *survey* was defined as a single 10-min or 60-min count of birds. In some cases, a count of bird observations may represent repeated observations of the same individual, where a distinction between individuals could not be made. Only observations within the survey plot were included for statistical analysis.

*Species richness* was defined as a count of species observed within the survey plot during avian use surveys. Groups of unidentified species were included in species richness if a species from that group was not otherwise recorded.

### *Mean Use, Percent of Use, and Frequency of Occurrence*

*Mean use* was the average number of birds observed per plot per survey for small or large birds. Small bird use (per 100-m radius plot per 10-min survey) and large bird use (per 800-m radius plot per 60-min survey) was calculated by: 1) summing birds per plot per visit, 2) averaging number of birds over plots within a visit, and 3) averaging number of birds across visits within a season. Overall mean use was calculated as a weighted average of seasonal values by the number of days in each season. *Percent of use* was calculated as the percentage of small or large bird use that was attributable to a particular bird type or species. *Frequency of occurrence* was calculated as the percent of surveys in which a particular bird type or species was observed.

Mean use and frequency of occurrence describe different aspects of relative abundance, in that mean use is based on the number of birds (i.e., large groups can produce high estimates), whereas frequency of occurrence is based on the number of groups (i.e., it is not influenced by group size). Qualitative comparisons were made with these metrics among bird types, seasons, and survey points to help illustrate temporal and spatial avian use of the Project.

### *Flight Height*

Flight heights are important metrics to assess relative potential exposure to turbine blades and were used to calculate the percentage of large birds, small birds, and eagles observed flying within the rotor-swept height (RSH) of proposed turbines. Flight heights and distance from observer were estimated by the observer using reference points on the landscape. A RSH of 25 – 215 m AGL was assumed for the purpose of this analysis, based on the blade tip height of the largest turbine model, currently commercially available, being considered for the Project. Flight height recorded during the initial observation was used to calculate the percentage of birds flying within the RSH and mean flight height.

### *Spatial Variation*

Mean use was calculated by survey point for eagles, large birds, and small birds to make spatial comparisons among the survey points. Additionally, flight paths and perched locations of eagles and diurnal raptors were mapped during large bird use surveys to qualitatively show potential areas of concentration of flight paths and consistent flight patterns within the Study Area compared to Study Area characteristics (e.g., topographic features).

### *Eagles*

Eagle observational data collected during surveys were summarized to create flight height (see *Flight Height*) estimates and flight path maps (see *Spatial Use*). Data collected during each minute eagles were observed were examined to count eagle exposure minutes, defined as the number of minutes an eagle was observed in flight within the risk cylinder (defined as the area within 800 m of the survey point and below 215 m AGL during the 60-min survey period per the ECPG). Total minutes (eagle activity minutes; defined as the amount of time eagles were observed inside and outside the risk cylinder) were also quantified. The eagle exposure minutes per observation hour were quantified by survey plot and month to enable spatial and temporal assessments of eagle risk within the Study Area. Data collected on perched eagles and those outside of survey plots were not considered eagle exposure minutes; however, they were considered in the total eagle minutes. The perch locations and flight paths of all eagles were mapped to qualitatively assess areas of eagle use within the Study Area.

## **RESULTS**

Overall, 1,080 avian use surveys were conducted for large and small birds within the Study Area and 48 identified species of birds were observed or heard over the 12-month study (Table 2). Large bird species richness was highest during the spring (20 species), followed by fall (18), summer (15), and winter (13; Table 2). Small bird species richness was highest during spring (18 species), followed by summer (16), fall (13), and winter (six; Table 2). Study results are

summarized below, supplemented by the appendices, which present species-level detail on the following: scientific names and numbers of groups and observations seen during surveys within and outside the survey plot (Appendices A1 and A2), avian mean use, percent of use, and frequency of occurrence within the survey plot by season (Appendices B1 and B2), and mean use by survey point (Appendix C).

**Table 2. Summary of survey effort and species richness at the Lava Ridge Wind Project Study Area in Lincoln, Jerome, and Minidoka counties, Idaho from April 3, 2020 to March 31, 2021.**

<b>Season</b>	<b># Visits</b>	<b># Surveys Conducted</b>	<b>Large Bird Species Richness</b>	<b>Small Bird Species Richness</b>
Spring	2	180	20	18
Summer	3	270	15	16
Fall	3	270	18	13
Winter	4	360	13	6
<b>Overall</b>	<b>12</b>	<b>1,080</b>	<b>26</b>	<b>22</b>

## Eagles

### *Mean Use, Percent of Use, and Frequency of Occurrence*

Golden eagle was the only species of eagle recorded during the 12-month study; no bald eagles were observed. Golden eagle use was 0.03 observations/800-m radius plot/60-min survey across all seasons. Golden eagles comprised 1.9% of large bird use in summer and less than 1.0% in all other seasons. Golden eagles were seen more frequently in the spring and fall (3.3%), compared with 1.9% of surveys in summer and 2.2% of surveys in winter (Appendix B1).

### *Activity Minutes*

During the study, 257 eagle minutes were recorded in 1,080 hours of survey, which includes eagle observations inside and outside the survey plot and perched eagle observations. Of these, 61 golden eagle exposure minutes from 28 eagle observations were recorded within the risk cylinder (Table 3). Eagle exposure minutes per survey hour ranged from zero in June to 0.167 in August (Table 3). The highest exposure minutes per survey hour were recorded in August (0.167) and November (0.133).

August was the month with the highest number of observations recorded within the risk cylinder (seven), followed by November (five). June was the only month with no eagle observations within the risk cylinder (Table 3).

**Table 3. Golden eagle activity minutes and observations per month recorded during avian use surveys at the Lava Ridge Wind Study Area in Lincoln, Jerome, and Minidoka counties, Idaho from April 3, 2020 to March 31, 2021.**

Month/Year	Eagle Minutes (Min)		Eagle Observations		Survey Hours	Eagle Exposure Min/Survey Hr
	Within Risk <sup>a</sup> Cylinder	Total <sup>b</sup>	Within Risk <sup>a</sup> Cylinder	Total <sup>b</sup>		
April 2020	6	12	2	4	90	0.067
May 2020	6	12	4	4	90	0.067
June 2020	0	7	0	2	90	0.000
July 2020	2	2	1	1	90	0.022
August 2020	15	23	7	7	90	0.167
September 2020	7	11	2	2	90	0.078
October 2020	3	6	2	2	90	0.033
November 2020	12	24	5	6	90	0.133
December 2020	2	9	1	1	90	0.022
January 2021	1	21	1	3	90	0.011
February 2021	2	117	1	6	90	0.022
March 2021	5	13	2	3	90	0.056
<b>Total</b>	<b>61</b>	<b>257</b>	<b>28</b>	<b>41</b>	<b>1080</b>	<b>0.0567</b>

<sup>a</sup> Within = minutes or observations of an eagle flying inside the risk cylinder; eagle exposure minutes = minutes inside risk cylinder.

<sup>b</sup> Total = minutes or observations of an eagle inside and outside the risk cylinder; includes perched eagle observations.

hr = hour.

### Eagle Flight Height

Golden eagle flight heights were recorded most frequently (63.0%) within the rotor swept height (25–215 m) based on initial flight height from 27 observations. Fewer flights were recorded below (29.6%) and above (7.4%) the RSH (Table 4).

**Table 4. Group and individual observation flight height characteristics based on initial flight heights observed by bird type and raptor subtype during avian use surveys at the Lava Ridge Wind Project Study Area in Lincoln, Jerome, and Minidoka counties, Idaho from April 3, 2020 to March 31, 2021.**

Bird Type/Raptor Subtypes	# Groups Flying	# Obs Flying	% Obs Flying	Mean Flight Height (m)	% within Flight height Categories		
					<25 m	25 - 215 m <sup>a</sup>	> 215 m
Waterbirds	2	7	100	100	0	100	0
Waterfowl	19	310	86.1	81	30.6	64.2	5.2
Shorebirds	11	15	93.8	19	73.3	26.7	0
Gulls/Terns	32	145	100	74	21.4	75.2	3.4
Diurnal Raptors	459	471	91.1	50	50.7	46.7	2.5
<u>Accipiters</u>	2	2	100	7	100	0	0
<u>Buteos</u>	204	209	85.7	88	16.3	78.9	4.8
<u>Northern Harrier</u>	190	196	99.5	11	86.2	13.8	0
<u>Eagles</u>	27	27	84.4	76	29.6	63.0	7.4
<u>Falcons</u>	36	37	90.2	21	70.3	29.7	0
<u>Other Raptors</u>	0	0	0	NA	NA	NA	NA
Owls	8	10	58.8	7	90.0	10.0	0
Vultures	6	15	100	137	0	100	0
Upland Game	0	0	0	NA	NA	NA	NA

Birds							
Doves/Pigeons	3	3	75.0	8	100	0	0
Large Corvids	1,381	2,603	97.3	37	54.2	44.6	1.2
Nightjars	24	33	100	27	60.6	39.4	0
<b>Large Birds Overall</b>	<b>1,945</b>	<b>3,612</b>	<b>95.2</b>	<b>41</b>	<b>50.4</b>	<b>47.9</b>	<b>1.7</b>

<sup>a</sup> The assumed rotor-swept height for potential collision with a turbine blade

Note: Zeroes and NA values indicate the species was observed but not flying.

obs = observations

### *Spatial Variation*

Spatially, golden eagle exposure minutes were recorded at 19 of 90 survey points. Eagle exposure minutes per survey hour were highest at survey Point 57 (0.83), which is located near a golden eagle nest that was occupied in 2020 (McCormack et al. 2020; Figure 4). The next highest number of exposure min per hour were recorded at Point 10 (0.58), Point 53, (0.50) and Point 77 (0.50; Figure 4).

Golden eagle flight paths recorded during avian use surveys, perch observations, and incidental observations are included in Appendix D. Golden eagles were observed throughout the Project, with no apparent patterns of concentrated use discernable from observations aside from activity associated with the occupied nest. Multiple incidental observations of a perched eagle were recorded on a low north-south ridge located south of Point 69 (Appendix D4).

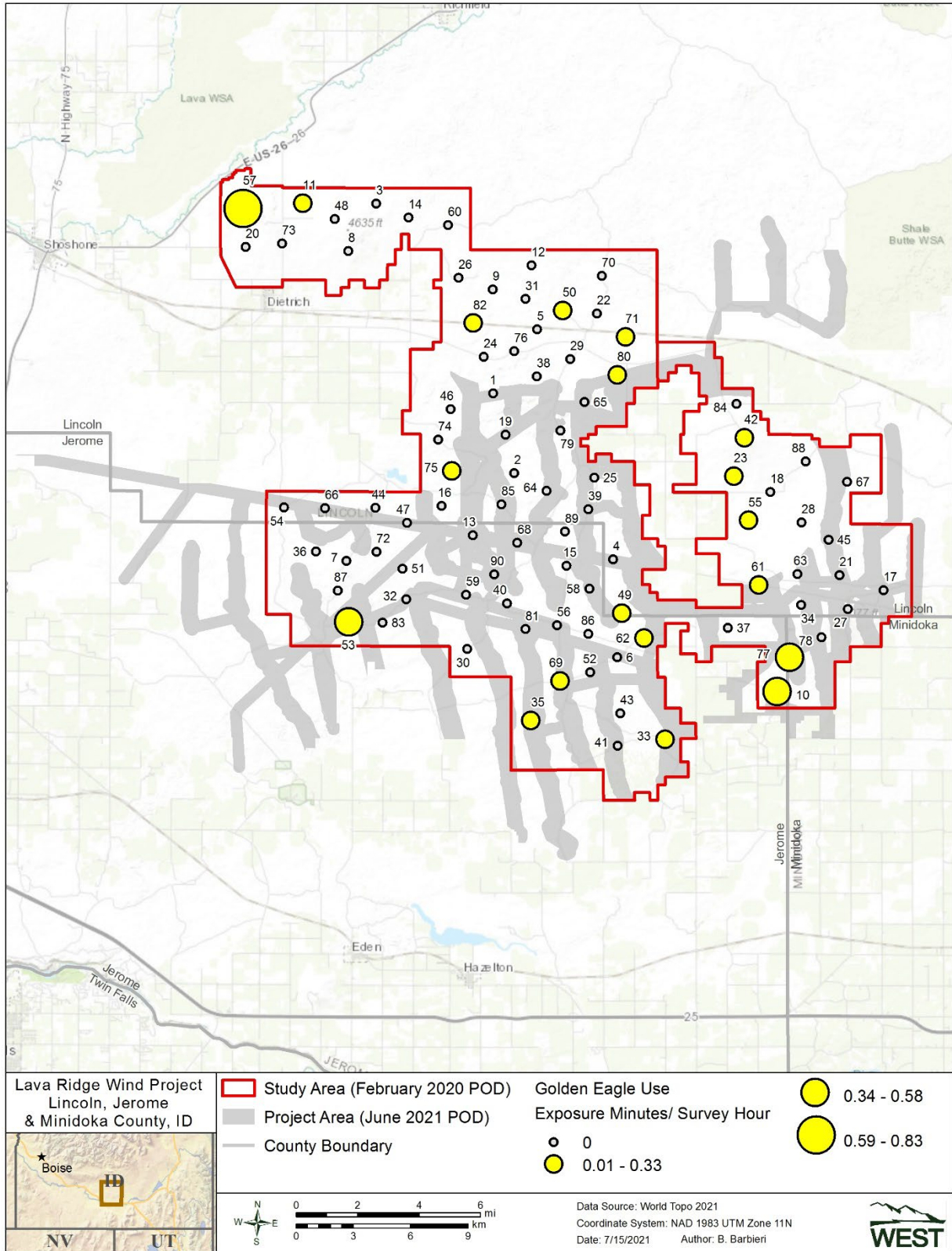


Figure 4. Eagle exposure minutes per survey hour at the Lava Ridge Wind Project Study Area from April 3, 2020 to March 31, 2021.

## Large Birds

Twenty-two species of large birds were recorded in 4,178 observations within 2,261 groups during the 12-month study. Among species, nine diurnal raptor species, two owl species, and five waterfowl species were recorded (Appendix B1).

### *Mean Use, Percent of Use, and Frequency of Occurrence*

Mean use, percent of use, and frequency of occurrence were calculated by season for large bird types (Table 6, Figures 5a, 5b, 5c) and species (Appendix B1). Large bird mean use ranged from 1.54 observations/800-m radius plot/60-min survey in summer to 4.57 in fall (Figure 6). Large corvids had the highest use in all seasons ranging from 0.66 observations/800-m radius plot/60-min survey in summer to 3.87 in fall (Table 6). Large corvid use was primarily composed of common raven observations (Appendix B1). Diurnal raptor use ranged from 0.37 observations/800-m radius plot/60-min survey in winter to 0.61 in summer (Table 5). Among diurnal raptors, buteos and harriers accounted for the majority of raptor use in all seasons (Table 6). Red-tailed hawk had the highest use among buteos in spring (0.12), summer (0.15), and fall (0.11), while rough-legged hawk had the highest use among buteos in winter (0.11; Appendix B1).

Large corvids comprised the majority of use during all seasons, ranging from 42.5% of use in summer to 84.6% of use in the fall (Table 5, Figure 5b). Large bird frequency of occurrence varied among seasons, with large corvids the most frequently observed during spring (64.4%), fall (71.1%) and winter (73.1%). Diurnal raptors were the most frequently observed species group during summer (35.2%; Table 6, Figure 5c). Among diurnal raptors, northern harrier (12.0%) and red-tailed hawk (9.9%) accounted for the majority of use during the summer (Appendix B1).

Waterfowl use was highest in the winter (0.69) and spring (0.44), and lower in fall and summer (0.12 and less than 0.01, respectively; Table 5). Among waterfowl, lesser scaup had the highest use (0.31) in the spring, while snow goose had the highest use (0.21) in the winter (Appendix B1). Shorebird use, comprised entirely of long-billed curlew, was only recorded in the spring season (0.09). Gull and tern use was highest in the spring (0.59) and was composed entirely of California gulls observed in relatively large groups.

**Table 5. Mean use (number of birds/800-m radius plot/60-minute survey), percent of total use (%), and frequency of occurrence (%) for each bird type and raptor subtype by season during avian bird use surveys at the Lava Ridge Wind Project Study Area in Lincoln, Jerome, and Minidoka counties, Idaho from April 3, 2020 to March 31, 2021.**

Type/raptor subtypes	Mean Use				% of Use				% Frequency			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
Waterbirds	0.03	0	0	0.01	0.8	0	0	0.1	0.6	0	0	0.3
Waterfowl	0.44	<0.01	0.12	0.69	12.4	0.2	2.7	16.4	2.2	0.4	1.1	1.7
Shorebirds	0.09	0	0	0	2.5	0	0	0	5.6	0	0	0
Gulls/Terns	0.59	0.10	0	0.03	16.7	6.5	0	0.7	4.4	3.7	0	1.4
Diurnal Raptors	0.45	0.61	0.51	0.37	12.7	39.7	11.3	8.8	31.7	35.2	35.6	26.1
<u>Accipiters</u>	0	0	0.01	0	0	0	0.2	0	0	0	0.7	0
<u>Buteos</u>	0.28	0.35	0.20	0.13	7.8	22.6	4.3	3.1	20.6	23.3	17.0	10.6
<u>Northern Harrier</u>	0.08	0.19	0.22	0.20	2.3	12.0	4.9	4.8	7.8	14.4	18.5	15.3
<u>Eagles</u>	0.03	0.03	0.03	0.03	0.9	1.9	0.7	0.6	3.3	1.9	3.3	2.2
<u>Falcons</u>	0.06	0.04	0.06	0.01	1.6	2.9	1.2	0.3	5.0	4.4	5.2	1.1
<u>Other Raptors</u>	0	<0.01	0	0	0	0.2	0	0	0	0.4	0	0
Owls	0.02	0.03	0.02	0	0.6	1.9	0.4	0	1.1	1.9	1.5	0
Vultures	0.02	0.01	0.03	0	0.5	0.7	0.7	0	1.1	1.1	0.4	0
Upland Game Birds	0	0	0.01	0	0	0	0.2	0	0	0	0.4	0
Doves/Pigeons	0.01	0.01	<0.01	0	0.2	0.5	0.1	0	0.6	0.4	0.4	0
Large Corvids	1.91	0.66	3.87	3.09	53.7	42.5	84.6	73.9	64.4	31.5	71.1	73.1
Nightjars	0	0.12	0	0	0	7.9	0	0	0	7.4	0	0
<b>Large Birds Overall</b>	<b>3.55</b>	<b>1.54</b>	<b>4.57</b>	<b>4.18</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>



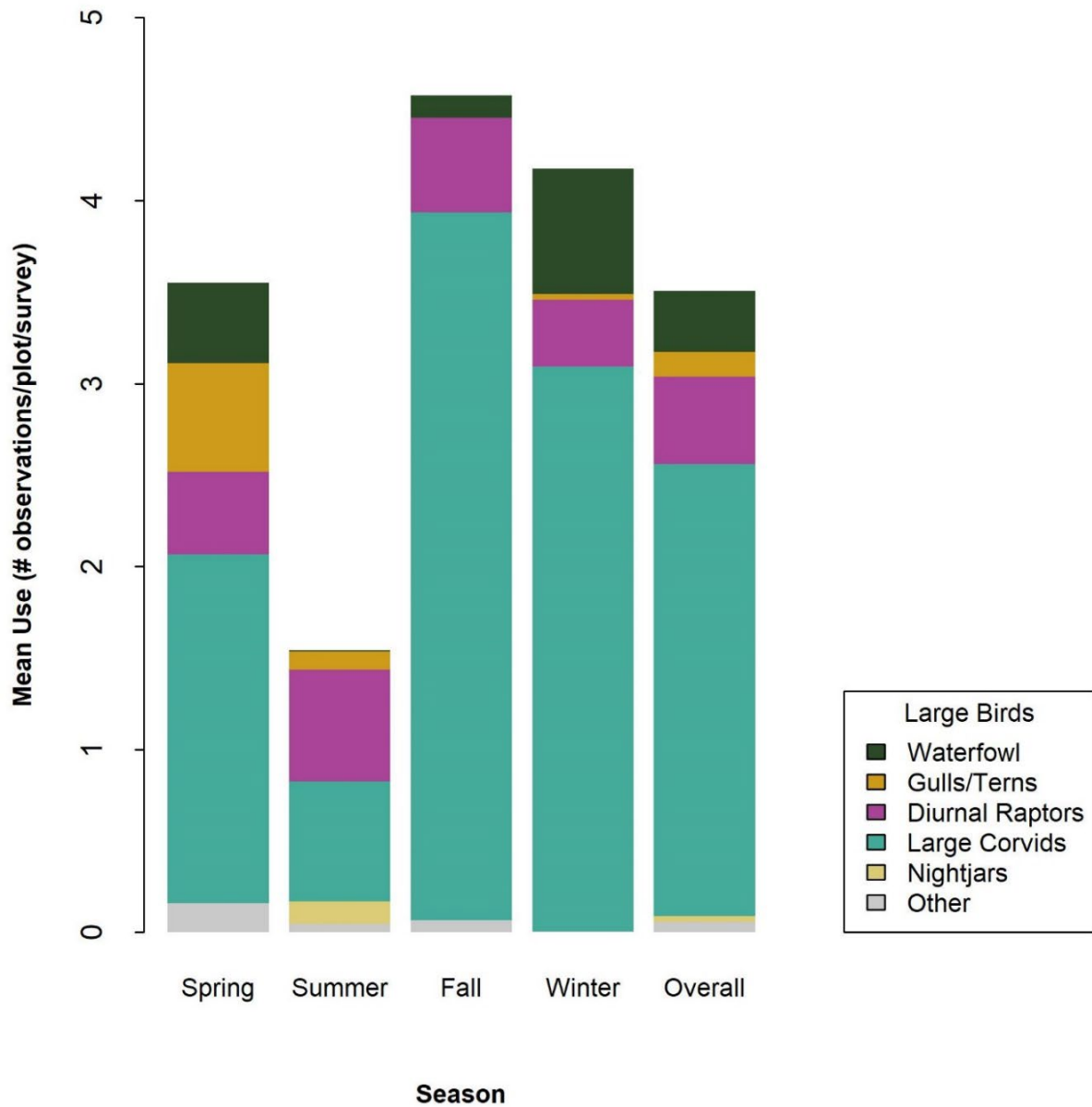


Figure 5a. Large bird mean use (number of observations/plot/60-minute survey) by season and bird type at the Lava Ridge Wind Project Study Area from April 3, 2020 to March 31, 2021.

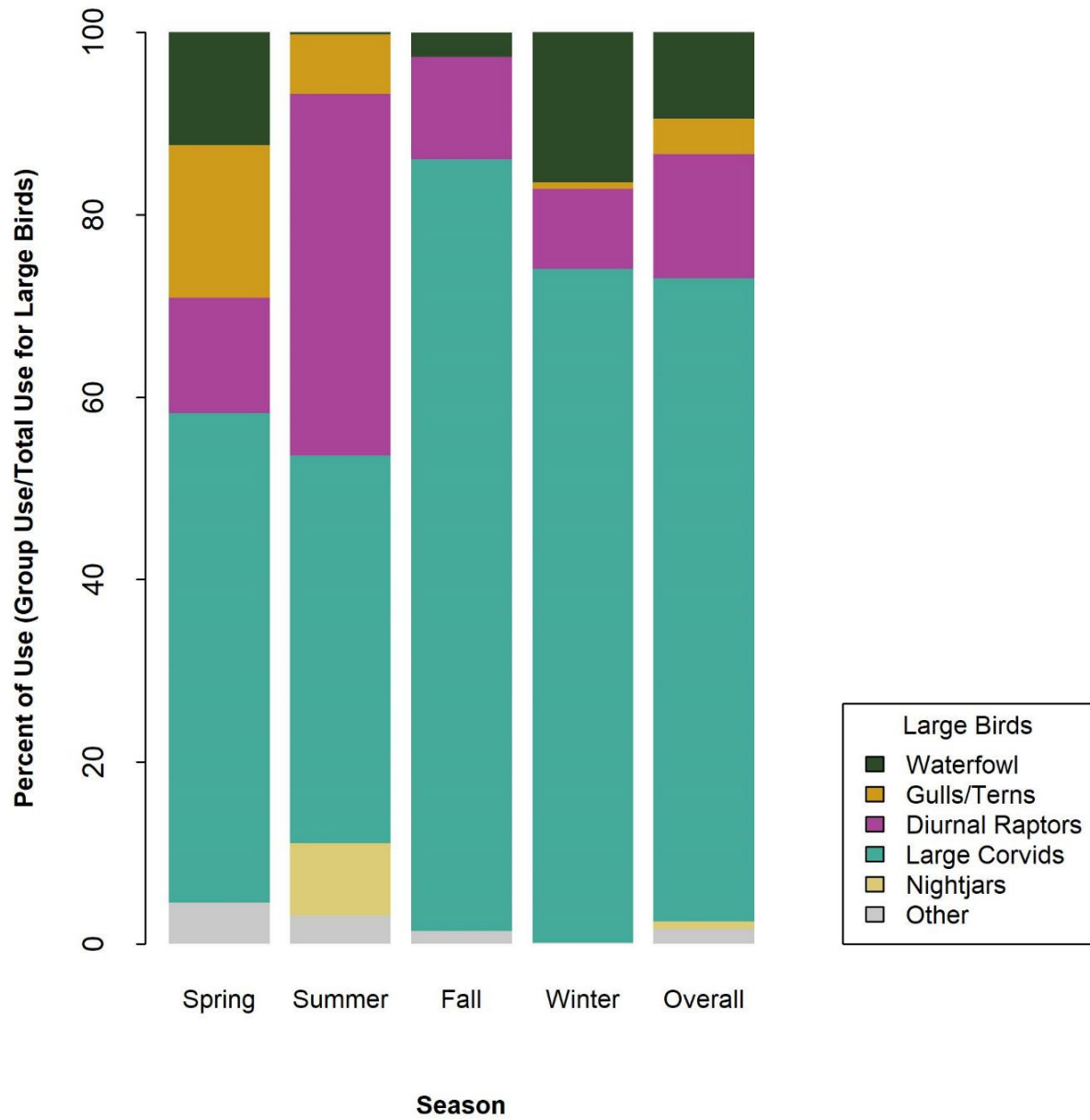


Figure 5b. Large bird percent of use by season and bird type at the Lava Ridge Wind Project Study Area from April 3, 2020 to March 31, 2021.

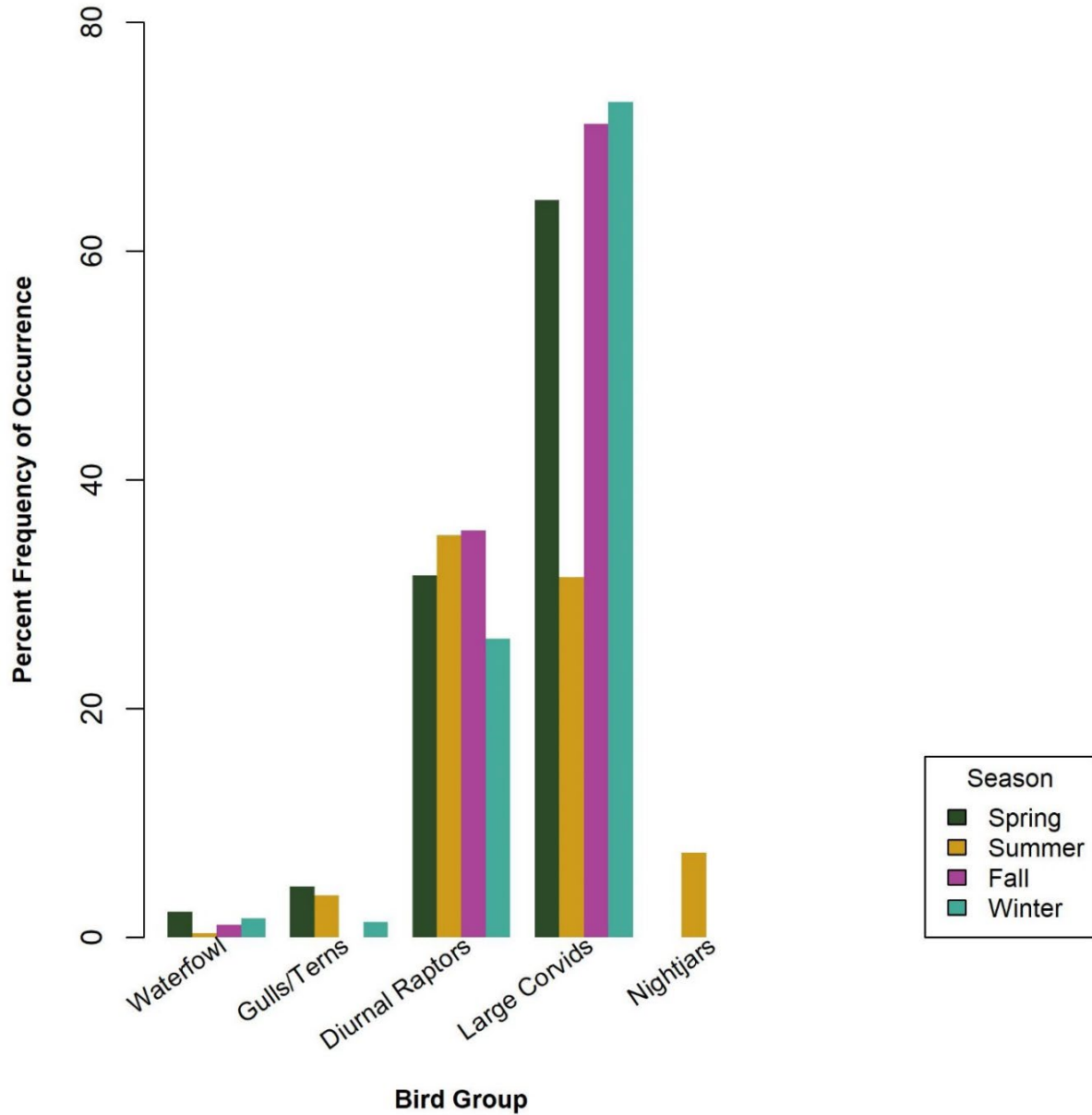


Figure 5c. Large bird frequency of occurrence by season and bird type at the Lava Ridge Wind Project Study Area from April 3, 2020 to March 31, 2021.

### *Mean Flight Height*

Mean large bird flight heights, based on the initial flight height for each observation, ranged from seven m (23 ft) for owls to 137 m (449 ft) for vultures. Waterbirds and vultures were observed 100% of the time within the RSH (25–215 m; Table 5). Additionally, waterfowl, gulls/terns, and buteo observations were primarily within the RSH (64.2%, 75.3%, and 78.9% respectively). Diurnal raptor heights were mainly below (50.7% of observations) or within (46.7% of observations) the RSH. All other groups, including the most frequently observed group (corvids; 54.2% of observations) were primarily below the RSH, with 100% of owl observations (composed of short-eared and burrowing owls) recorded below the RSH (Table 5).

### *Spatial Variation*

#### Mean Use by Point

Large bird use among survey locations ranged from 24.42 to 0.75 observations/800-m radius plot/ 60-min survey (Appendix C). Point 4 saw the highest overall use (24.42), with the majority of use at this location attributed to large corvid (primarily common raven) observations (23.50). Point 83 (18.58) and Point 37 (12.67) had the next highest use, with use at Point 83 largely attributed to waterfowl (lesser scaup and unidentified duck) observations, and use at Point 83 largely attributed to large corvid (primarily common raven) observations (Appendix C).

Mean use by point for diurnal raptors was zero at Points 20, 29, 74, and 76, and otherwise ranged from 0.08 to 1.50 observations/800-m radius plot/ 60-min survey. Use was highest at Point 10 (1.50), followed by Points 27, 37, 41, and 77, which all had 1.33 observations/800-m radius plot/ 60-min survey (Figure 7). Spatially, diurnal raptor use was generally highest at points in the southeast and south-central portions of the Study Area.

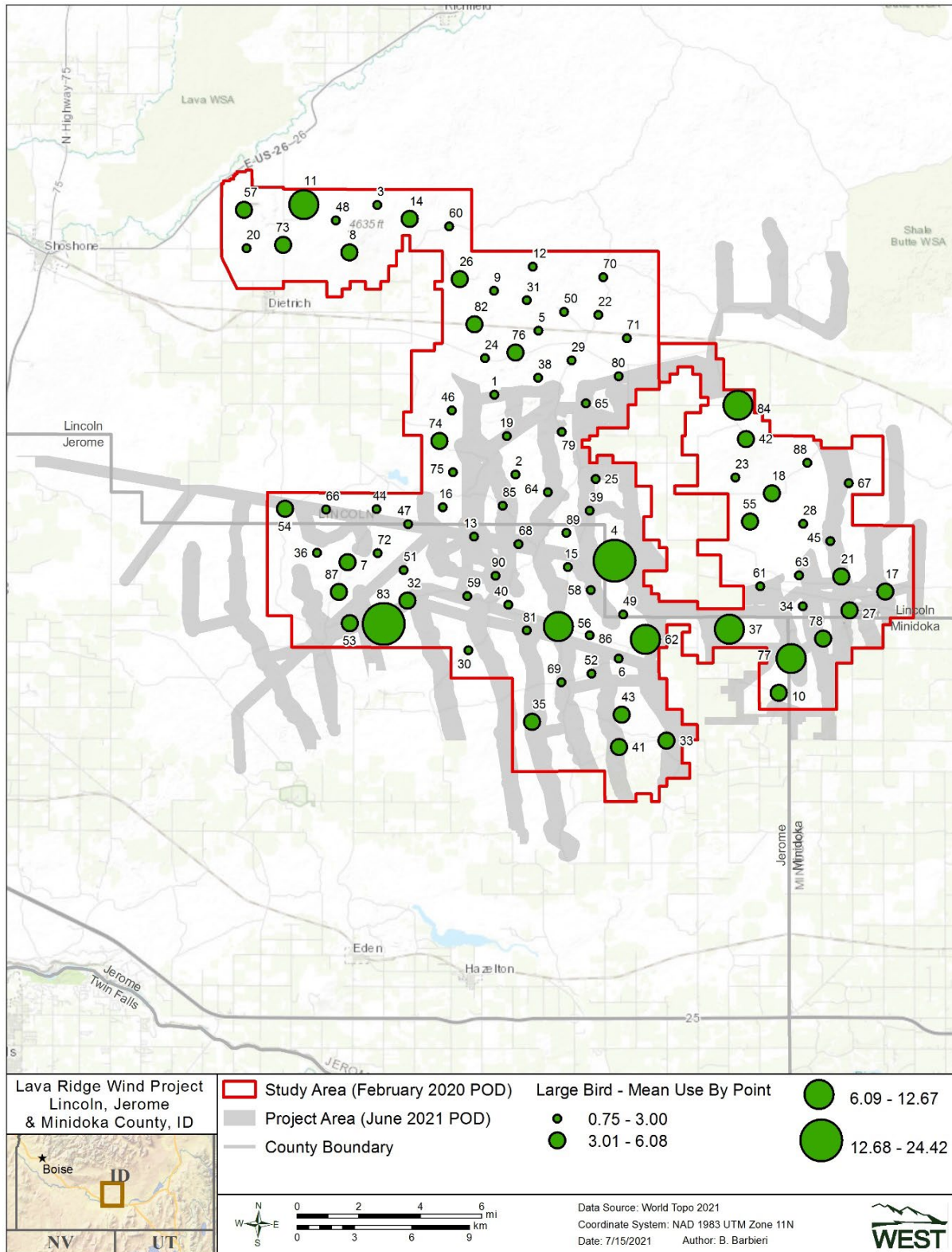


Figure 6. Large bird mean use (number of observations/800-meter radius plot/60-minute survey) by point at the Lava Ridge Wind Project Study Area from April 3, 2020 to March 31, 2021.

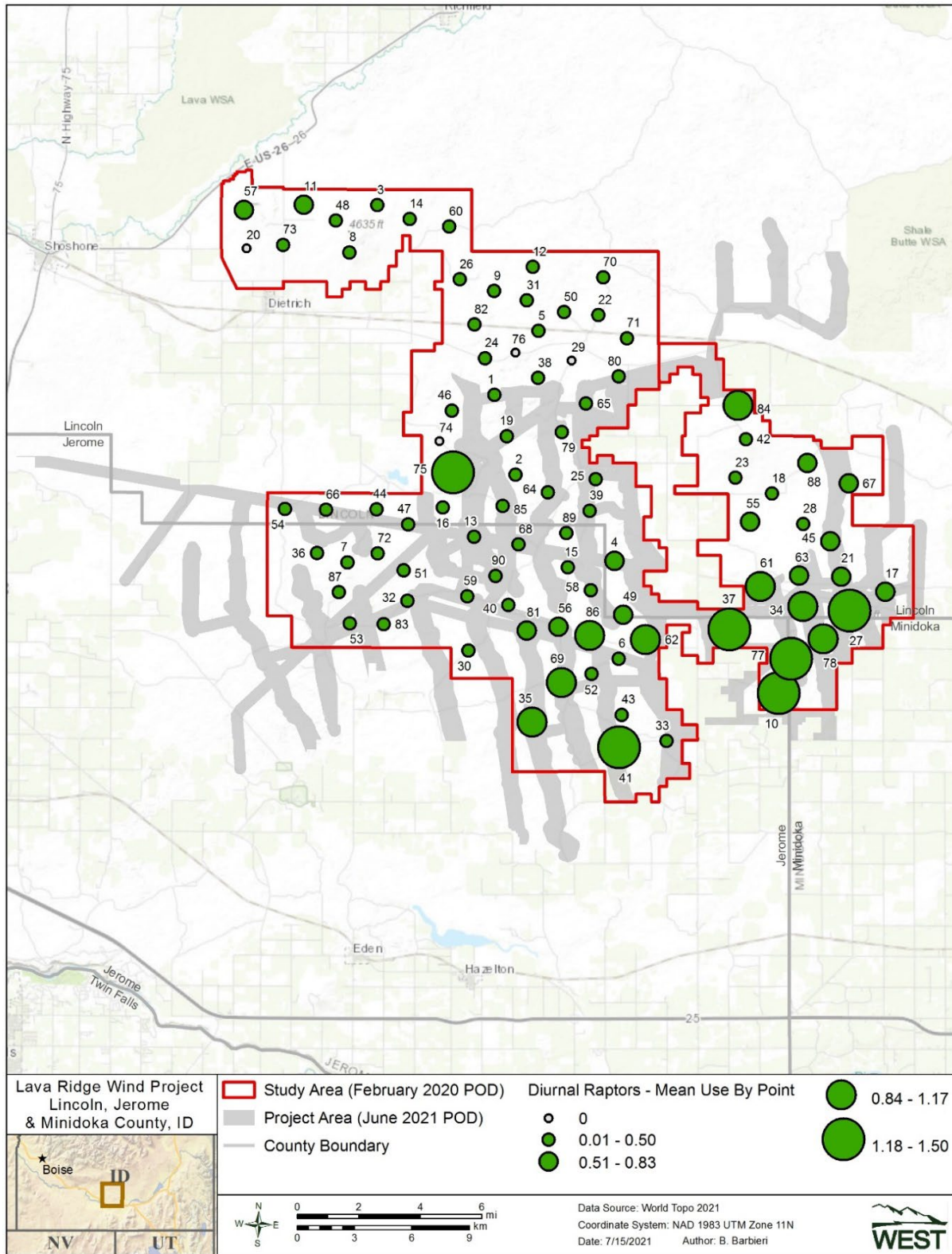


Figure 7. Diurnal raptor mean use (number of observations/800-meter radius plot/60-minute survey) by point at the Lava Ridge Wind Project Study Area from April 3, 2020 to March 31, 2021.

## Small Birds

Twenty-two species of small birds were recorded in 4,571 observations within 2,789 groups during the 12-month study period (Table 2).

### *Mean Use, Percent of Use, and Frequency of Occurrence*

Mean use, percent of use, and frequency of occurrence were calculated by season for small bird types (Table 6) and species (Appendix B2). Small bird mean use was relatively consistent across seasons and ranged from 3.62 observations/100-m radius plot/10-min survey in winter to 4.47 in fall (Table 6). Passerines were the only species group recorded. Among subgroups, grassland/sparrows comprised the majority of use during all seasons, ranging from 58.7% of use in spring to 93.0% of use in fall (Table 6). Use within this subgroup was largely driven by horned lark use, which ranged from 49.9% of all use in the spring to 92.1% of all use in the fall. Western meadowlark was the species with the second highest percent of use, comprising 33.2% of use in spring and 17.3% of use in summer.

Grassland/sparrows were the most frequently observed subgroup during all seasons, driven largely by horned lark observations, with highest frequency in fall (93.0% of fall surveys; Table 6, Appendix B2). Blackbirds were the second-most frequently observed subtype in the spring (78.9%) and summer (42.6%) during surveys.

**Table 6. Mean use (number of birds/100 meter radius plot/10-minute survey), percent of total use (%), and frequency of occurrence (%) for each bird type and subtype by season during avian bird use surveys at the Lava Ridge Wind Project Study Area in Lincoln, Jerome, and Minidoka counties, Idaho from April 3, 2020 to March 31, 2021.**

Type/Subtype	Mean Use				% of Use				% Frequency			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
Passerines	4.40	3.76	4.47	3.62	100	100	100	100	98.3	84.4	64.8	58.3
<u>Unidentified</u>	0	<0.01	0	0	0	0.1	0	0	0	0.4	0	0
<u>Passerine</u>												
<u>Blackbirds/Orioles</u>	1.59	0.67	0.23	0.27	36.1	17.8	5.0	7.4	78.9	42.6	12.2	14.2
<u>Finches/Crossbills</u>	0	0	<0.01	0.24	0	0	0.1	6.7	0	0	0.4	0.8
<u>Flycatchers</u>	0.01	0.01	0	0	0.1	0.2	0	0	0.6	0.4	0	0
<u>Grassland/Sparrows</u>	2.58	2.82	4.16	3.11	58.7	74.9	93.0	85.7	84.4	74.4	63.0	56.7
<u>Mimids</u>	0.10	0.16	0.03	0	2.3	4.3	0.7	0	8.3	14.1	3.0	0
<u>Swallows</u>	0.08	0.01	0.03	0	1.8	0.4	0.6	0	5.6	1.1	1.5	0
<u>Shrikes</u>	0.01	0.03	0.01	0.01	0.3	0.9	0.2	0.2	1.1	3.0	1.1	0.6
<u>Thrushes</u>	0.01	<0.01	0.01	<0.01	0.3	0.1	0.2	0.1	1.1	0.4	0.7	0.3
<u>Wrens</u>	0.02	0.05	0.01	0	0.5	1.3	0.2	0	2.2	3.3	0.7	0
<b>Small Birds Overall</b>	<b>4.40</b>	<b>3.76</b>	<b>4.47</b>	<b>3.62</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>



*Small Bird Mean Flight Height*

Mean small bird flight heights, based on the initial flight height for each observation, were mainly below the RSH (98.7%). Grassland/sparrows was the only bird type recorded within the RSH, during 1.5% of observations (Table 7).

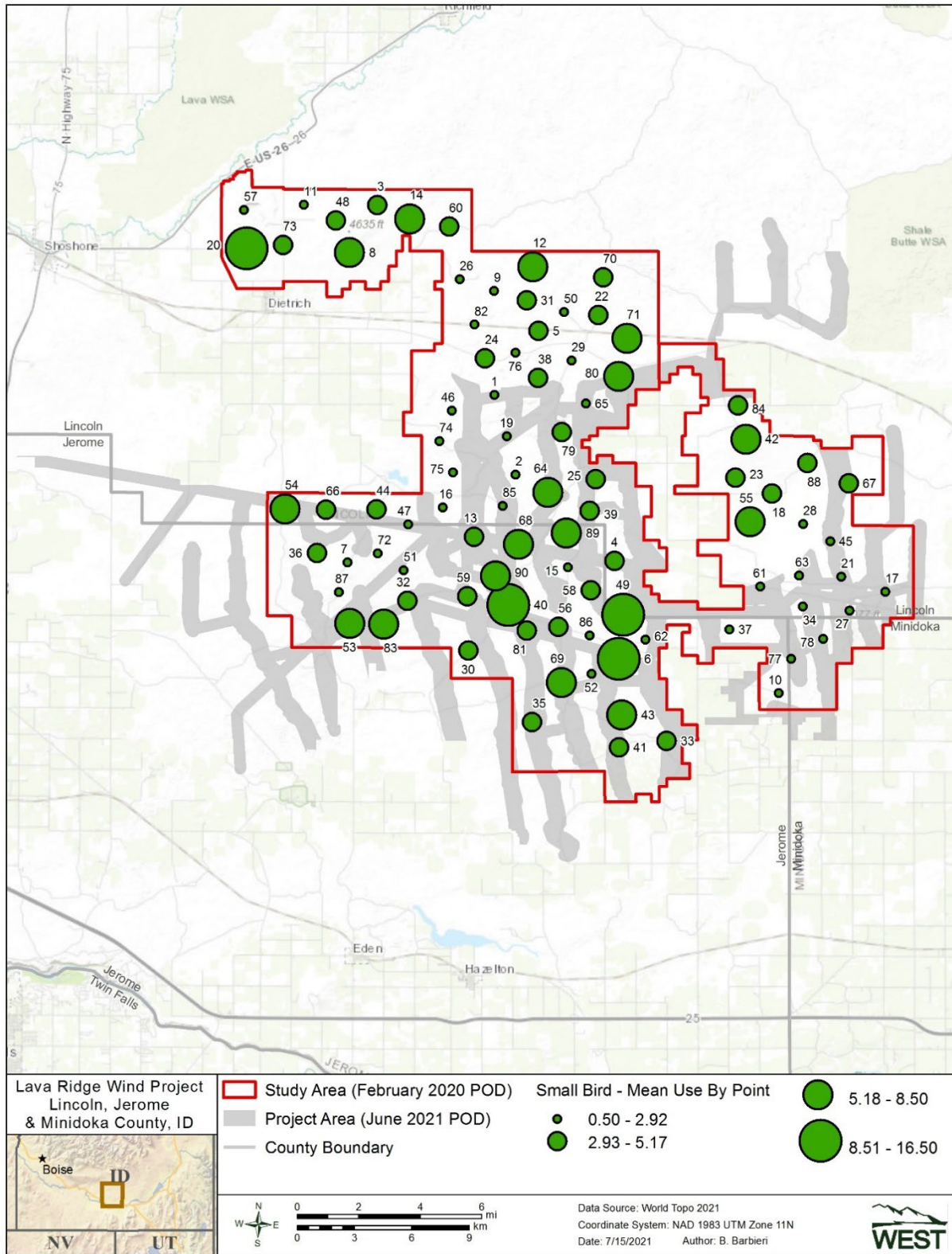
**Table 7. Group and individual observation flight height characteristics by bird type and subtypes during avian bird use surveys at the Lava Ridge Wind Project Study Area in Lincoln, Jerome, and Minidoka counties, Idaho from April 3, 2020 to March 31, 2021.**

Bird Type and subtypes	# Groups Flying	# Obs Flying	% Obs Flying	Mean Flight Height (m)	% within Flight height Categories		
					<25 m	25 - 215 m <sup>b</sup>	> 215 m
Passerines	1,065	2,599	60.2	4	98.7	1.3	0
<i>Passerines(Subtype)</i>	1	1	100	20	100	0	0
<i>Blackbirds/Orioles</i>	103	128	20.5	4	100	0	0
<i>Finches/Crossbills</i>	4	88	100	13	100	0	0
<i>Flycatchers</i>	0	0	0	NA	NA	NA	NA
<i>Grassland/Sparrows</i>	924	2,340	67.5	5	98.5	1.5	0
<i>Mimids</i>	7	7	9.9	3	100	0	0
<i>Swallows</i>	17	25	100	3	100	0	0
<i>Shrikes</i>	6	6	37.5	3	100	0	0
<i>Thrushes</i>	2	2	33.3	3	100	0	0
<i>Wrens</i>	1	2	10.5	3	100	0	0
<b>Small Birds Overall</b>	<b>1,065</b>	<b>2,599</b>	<b>60.2</b>	<b>4</b>	<b>98.7</b>	<b>1.3</b>	<b>0</b>

m=meter

*Spatial Variation*Mean Use by Point

Small bird use ranged from 16.50 observations/100-m radius plot/10-minute survey to 0.50 across survey points (Figure 9). The highest use values were recorded at Point 6 (16.50) and Point 49 (10.25), which are both located in the south-central area of the Study Area (Figure 8, Appendix C1). Mean use was lowest in the southeast portion of the Study Area.



**Figure 8. Small bird mean use (number of observations/100-meter radius plot/10-minute survey) by survey point at the Lava Ridge Wind Project Study from April 3, 2020 to March 31, 2021.**

## Incidental Observations

Incidental observations were recorded for 295 individuals in 172 groups. One avian species, gray partridge, was not observed during standardized surveys but was observed during the study period (Table 8).

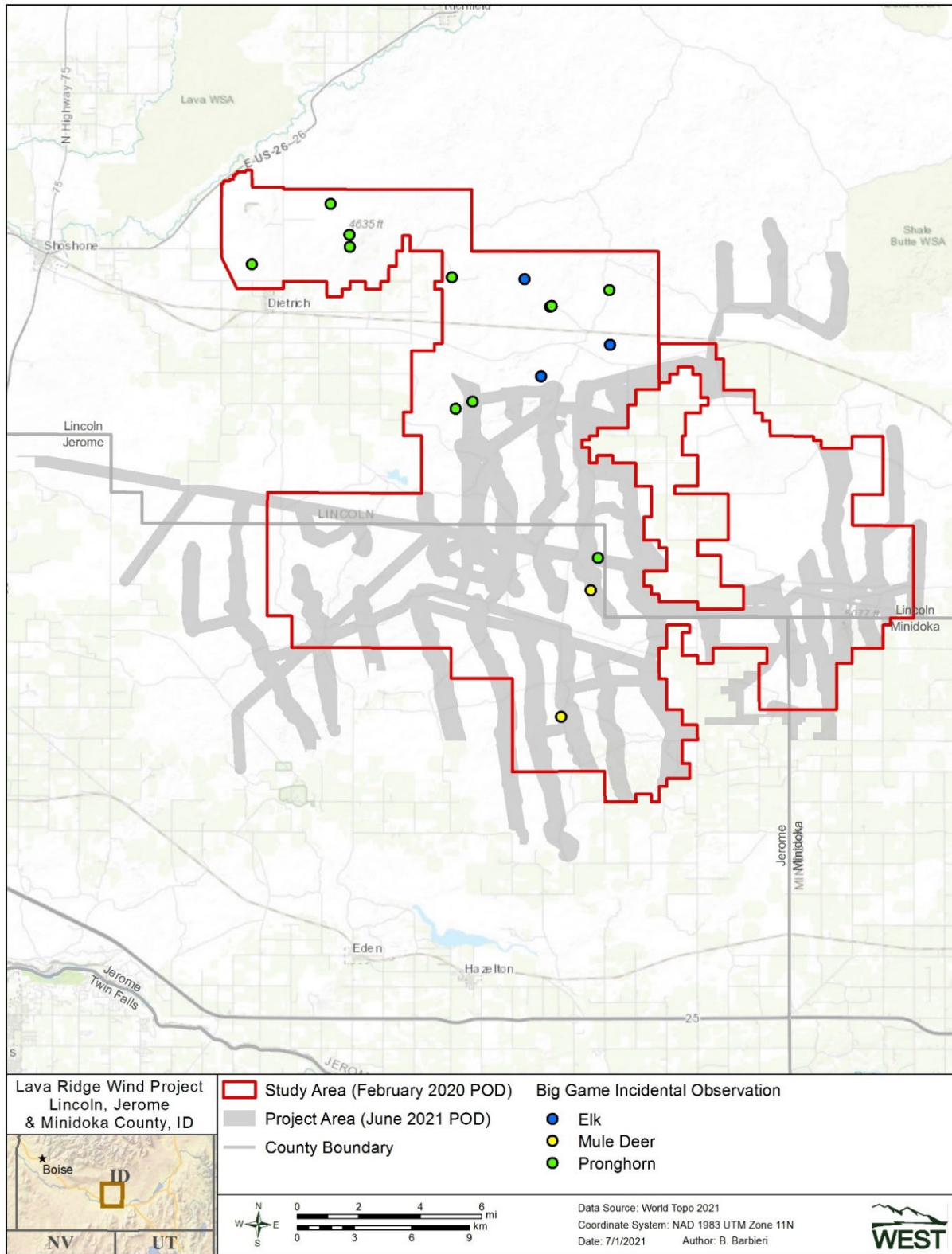
**Table 8. Group and individual observations of bird species incidentally seen outside of the standardized avian use surveys at the Lava Ridge Wind Project Study Area in Lincoln, Jerome, and Minidoka counties, Idaho from April 3, 2020 to March 31, 2021.**

Species	Scientific Name	# groups	# observations
long-billed curlew	<i>Numenius americanus</i>	10	14
red-tailed hawk	<i>Buteo jamaicensis</i>	1	10
ferruginous hawk	<i>Buteo regalis</i>	11	15
Swainson's hawk	<i>Buteo swainsoni</i>	3	51
northern harrier	<i>Circus hudsonius</i>	3	10
golden eagle	<i>Aquila chrysaetos</i>	25	25
short-eared owl	<i>Asio flammeus</i>	8	10
burrowing owl	<i>Athene cunicularia</i>	11	18
greater sage-grouse	<i>Centrocercus urophasianus</i>	3	4
gray partridge	<i>Perdix</i>	1	11
grasshopper sparrow	<i>Ammodramus savannarum</i>	25	29
Brewer's sparrow	<i>Spizella breweri</i>	39	48
sage thrasher	<i>Oreoscoptes montanus</i>	12	15
bank swallow	<i>Riparia</i>	1	5
loggerhead shrike	<i>Lanius ludovicianus</i>	17	28
Townsend's solitaire	<i>Myadestes townsendi</i>	1	1
common nighthawk	<i>Chordeiles minor</i>	1	1
<b>Total</b>	<b>17 species</b>	<b>172</b>	<b>295</b>

Five non-avian species were also recorded as incidentals during the study period (Table 9). One of the species observed, Piute ground squirrel, is listed as a BLM sensitive species and an Idaho SGCN. Three big game species were recorded including pronghorn and elk (primarily recorded in the northern portion of the Study Area, north of Highway 24) and mule deer (recorded in the southern portion of the Study Area; Figure 9).

**Table 9. Group and individual observations of non-bird species incidentally observed outside of the standardized avian use surveys at the Lava Ridge Wind Project Study Area in Lincoln, Jerome, and Minidoka counties, Idaho from April 3, 2020 to March 31, 2021.**

Species	Scientific Name	# groups	# observations
pronghorn	<i>Antilocapra americana</i>	17	222
elk	<i>Cervus canadensis</i>	4	15
mule deer	<i>Odocoileus hemionus</i>	1	3
piute ground squirrel	<i>Spermophilus mollis</i>	2	2
long-nosed leopard lizard	<i>Gambelia wislizenii</i>	1	1
<b>Total</b>	<b>5 species</b>	<b>25</b>	<b>243</b>



**Figure 9. Observations of big game species recorded incidentally at the Lava Ridge Wind Project Study Area from April 3, 2020 to March 31, 2021.**

## Species of Concern

Fifteen species of concern were recorded during the 12-month study. Of these, 12 are listed as BLM sensitive species, and 11 are listed as SGCN in Idaho. Figures depicting mean use by survey point for species of concern are provided in Appendix E. Greater sage-grouse and American white pelican were each only recorded at one location, Point 42 (Appendix E1) and Point 53 (Appendix E2), respectively. Most species were observed at multiple points throughout the Study Area. Brewer's sparrow had the highest number of observations among species of concern, followed by California gull and grasshopper sparrow (Table 10; Appendix E3, E4, E5, respectively). Ferruginous hawk was recorded at 13 of the 90 survey points, with highest use at Point 75 (Appendix E6). Use at this point was likely correlated with an active nest nearby, the only active ferruginous hawk nest identified within the Study Area during the 2020 nesting season (McCormack et al. 2020). Long-billed curlew was recorded at 10 survey locations within the Study Area with highest use recorded in the eastern portion of the Project (Appendix E7). Burrowing owl was recorded at eight survey points, and short-eared owl was recorded at three survey points (Appendix E8 and E9, respectively).

**Table 10. Summary of group and individual observations of sensitive species observed during the avian bird use surveys and as incidental wildlife observations at the Lava Ridge Wind Project Study Area in Lincoln, Jerome, and Minidoka counties, Idaho from April 3, 2020 to March 31, 2021.**

Species	Scientific Name	Status	Surveys		Incidental		Total	
			# grps	# obs	# grps	# obs	# grps	# obs
golden eagle	<i>Aquila chrysaetos</i>	S3;SGCN;BLM;BGEPA	41	41	25	25	66	66
short-eared owl	<i>Asio flammeus</i>	S3;SGCN;BLM	5	7	8	10	13	17
burrowing owl	<i>Athene cunicularia</i>	S2B;SGCN BLM	8	10	11	18	19	28
ferruginous hawk	<i>Buteo regalis</i>	S3B;SGCN;BLM	28	31	11	15	39	46
greater sage-grouse	<i>Centrocercus urophasianus</i>	S3;SGCN;BLM	1	3	3	4	4	7
common nighthawk	<i>Chordeiles minor</i>	S4B;SGCN	24	33	1	1	25	34
California gull	<i>Larus californicus</i>	S2N;S3B;SGCN	34	182	0	0	34	182
long-billed curlew	<i>Numenius americanus</i>	S2B;SGCN;BLM	12	16	10	14	22	30
American white pelican	<i>Pelecanus erythrorhynchos</i>	S3B;SGCN	1	5	0	0	1	5
<b>Large Birds Overall</b>	<b>9 species</b>		<b>154</b>	<b>328</b>	<b>69</b>	<b>87</b>	<b>223</b>	<b>415</b>

**Table 10. Summary of group and individual observations of sensitive species observed during the avian bird use surveys and as incidental wildlife observations at the Lava Ridge Wind Project Study Area in Lincoln, Jerome, and Minidoka counties, Idaho from April 3, 2020 to March 31, 2021.**

Species	Scientific Name	Status	Surveys		Incidental		Total	
			# grps	# obs	# grps	# obs	# grps	# obs
sagebrush sparrow	<i>Artemisospiza nevadensis</i>	S3B;SGCN;BLM	2	2	0	0	2	2
sage thrasher	<i>Oreoscoptes montanus</i>	S3B;SGCN;BLM	76	78	12	15	88	93
grasshopper sparrow	<i>Ammodramus savannarum</i>	BLM	78	78	25	29	103	107
green-tailed towhee	<i>Pipilo chlororus</i>	BLM	4	4	0	0	4	4
Brewer's sparrow	<i>Spizella breweri</i>	BLM	133	143	39	48	172	191
loggerhead shrike	<i>Lanius ludovicianus</i>	BLM	19	20	17	28	36	48
<b>Small Birds Overall</b>	<b>6 species</b>		<b>312</b>	<b>325</b>	<b>93</b>	<b>120</b>	<b>405</b>	<b>445</b>

S3 = Vulnerable—Vulnerable in the state/province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.

S2B = Imperiled Breeding Population—Imperiled in the state/province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the state/province.

S3B = Vulnerable Breeding Population—Vulnerable in the state/province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.

S4B = Apparently Secure Breeding Population—Uncommon but not rare; some cause for long-term concern due to declines or other factors.

S2N = Imperiled Non-Breeding Population—Imperiled in the state/province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the state/province.

SGCN = Species of Greatest Conservation Need in Idaho.

BLM = Bureau of Land Management Sensitive Species in the Shoshone Field Office Region.

BGEPA = Bald and Golden Eagle Protection Act.

grps = groups; obs = observations.

## DISCUSSION

The principal objectives of this avian use study were to estimate levels of use by avian species within the Study Area and to characterize levels of potential risk of the proposed Project to eagles and other avian species. The data presented in this report represent the first year of data collected for the two-year study; as such, interpretation of the first year of results should be considered preliminary when applying these results to Project planning. A number of factors can contribute to variability in avian activity from year to year, including climatic conditions, prey abundance, and variability in nest occupancy (USFWS 2012). Further, additional avian use points will be included in the second year of studies to increase coverage of the proposed Project corridors, which will provide data on avian use in areas not included in the first year of avian use surveys.

Golden eagle use was relatively low throughout the Study Area compared to most other diurnal raptor species recorded during the study; however, the mean use and number of risk minutes recorded for golden eagles indicates golden eagles may use the Project year-round. Highest use was recorded at Point 57, which was near a nest occupied by golden eagles in 2020. Point 57 and the surrounding northwest portion of the Study Area have since been removed from the Project to minimize eagle risk. Additional measures to avoid and minimize risk to eagles will be addressed in an Eagle Conservation Plan for the Project. No bald eagles were recorded during the study; however, the Project is within the species' range and bald eagles could occur in the Project.

Diurnal raptors were recorded at 86 of the 90 survey points. Higher use in the southeast and south-central portions of the Project may be correlated with adjacent agricultural fields, which could provide more cover for prey species, or residences, where trees may provide nesting and roosting sites. Due to the absence of trees within the Project, perches and nest substrates for most raptor species are limited to utility poles and rock outcrops, which may limit diurnal raptor use in some areas of the Project.

Temporally, use was rather consistent across seasons for eagles and small birds, and more variable among other groups. For example, diurnal raptor use was highest in the summer, which may indicate use by resident raptors is more prevalent than use by migrant or wintering individuals. In contrast, waterfowl use was highest in winter and spring but minimal in the summer, suggesting that waterfowl are more abundant during migration and overwinter. However, waterfowl numbers were relatively low regardless of season, with only 20 groups of waterfowl observed during the 1,080 surveys. Given that increased use in the fall and spring migration periods was not observed by the majority of avian groups, the Project does not appear to be located within an area of concentrated avian migration. In addition, the Project lacks steep topography, and has no significant features (e.g., mountain ranges or rivers) that would be expected to funnel avian migrants through the Project area.

Fifteen species of concern were recorded during the study. Six of these species of concern are associated with sagebrush habitat, including Brewer's sparrow, which is the most common avian species within sagebrush shrublands (Rotenberry et al. 2020) and was among the most frequently observed small bird species recorded in the Study Area (Appendix A2). Sage thrasher (Appendix E11) and loggerhead shrike (Appendix E12) were observed throughout the Study Area. Sagebrush sparrow (Appendix E13) was recorded at two locations, but may be more widespread given the species is less conspicuous than other sparrow species (Martin and Carlson 2020). Greater sage-grouse were observed at one location during avian use surveys, which was within two miles of an occupied lek. Measures to avoid and minimize impacts to avian species, including these species of concern, will be addressed in a Bird and Bat Conservation Strategy for the Project.

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**Appendix A. All Bird Types and Species Observed at the Lava Ridge Wind Project Study Area during Avian Use Surveys from April 3, 2020 to March 31, 2021.**



**Appendix A1. Summary of all groups and individual observations, regardless of distance from observer, by bird type and species during large bird use surveys at the Lava Ridge Wind Project Study Area in Lincoln, Jerome, and Minidoka counties, Idaho from April 3, 2020 to March 31, 2021.**

Type/Species	Scientific Name	Spring		Summer		Fall		Winter		Total	
		# grps	# obs	# grps	# obs	# grps	# obs	# grps	# obs	# grps	# obs
<i>Other Raptors</i>		0	0	3	5	0	0	0	0	3	5
unidentified raptor		0	0	3	5	0	0	0	0	3	5
<b>Owls</b>		<b>3</b>	<b>4</b>	<b>6</b>	<b>8</b>	<b>4</b>	<b>5</b>	<b>0</b>	<b>0</b>	<b>13</b>	<b>17</b>
short-eared owl	<i>Asio flammeus</i>	1	1	3	5	1	1	0	0	5	7
burrowing owl	<i>Athene cunicularia</i>	2	3	3	3	3	4	0	0	8	10
<b>Vultures</b>		<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>4</b>	<b>12</b>	<b>0</b>	<b>0</b>	<b>10</b>	<b>20</b>
turkey vulture	<i>Cathartes aura</i>	2	3	4	5	4	12	0	0	10	20
<b>Upland Game Birds</b>		<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>3</b>
greater sage- grouse	<i>Centrocercus urophasianus</i>	0	0	0	0	1	3	0	0	1	3
<b>Doves/Pigeons</b>		<b>1</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>4</b>
mourning dove	<i>Zenaida macroura</i>	1	1	2	2	1	1	0	0	4	4
<b>Large Corvids</b>		<b>247</b>	<b>400</b>	<b>152</b>	<b>220</b>	<b>536</b>	<b>1,144</b>	<b>665</b>	<b>1,212</b>	<b>1,600</b>	<b>2,976</b>
common raven	<i>Corvus corax</i>	247	400	152	220	529	1,137	658	1,205	1,586	2,962
black-billed magpie	<i>Pica hudsonia</i>	0	0	0	0	7	7	7	7	14	14
<b>Nightjars</b>		<b>0</b>	<b>0</b>	<b>24</b>	<b>33</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>24</b>	<b>33</b>
common nighthawk	<i>Chordeiles minor</i>	0	0	24	33	0	0	0	0	24	33
<b>Overall</b>		<b>376</b>	<b>726</b>	<b>369</b>	<b>497</b>	<b>696</b>	<b>1,344</b>	<b>820</b>	<b>1,611</b>	<b>2,261</b>	<b>4,178</b>



**Appendix A2. Summary of all groups and individual observations, regardless of distance from observer, by bird type and species during small bird use surveys at the Lava Ridge Wind Project Study Area in Lincoln, Jerome, and Minidoka counties, Idaho from April 3, 2020 to March 31, 2021.**

Type/Species	Scientific Name	Spring		Summer		Fall		Winter		Total	
		# grps	# obs	# grps	# obs	# grps	# obs	# grps	# obs	# grps	# obs
bank swallow	<i>Riparia riparia</i>	9	11	3	4	3	6	0	0	15	21
unidentified swallow	<i>pyrrhonota</i>	0	0	0	0	1	1	0	0	1	1
<u>Shrikes</u>		3	3	11	12	3	3	2	2	19	20
loggerhead shrike	<i>Lanius ludovicianus</i>	3	3	11	12	3	3	2	2	19	20
<u>Thrushes</u>		2	2	1	1	2	2	1	1	6	6
Townsend's solitaire	<i>Myadestes townsendi</i>	0	0	0	0	0	0	1	1	1	1
mountain bluebird	<i>Sialia currucoides</i>	1	1	1	1	2	2	0	0	4	4
unidentified bluebird		1	1	0	0	0	0	0	0	1	1
<u>Wrens</u>		5	5	12	15	2	2	0	0	19	22
rock wren	<i>Salpinctes obsoletus</i>	5	5	12	15	2	2	0	0	19	22
<b>Overall</b>		<b>759</b>	<b>877</b>	<b>868</b>	<b>1,124</b>	<b>496</b>	<b>1,250</b>	<b>666</b>	<b>1,320</b>	<b>2,789</b>	<b>4,571</b>

<sup>a</sup> grps = groups; obs = observations.

**Appendix B. Bird Use, Percent of Use, and Frequency of Occurrence for Large Birds and Small Birds Observed during Avian Use Surveys at the Lava Ridge Wind Project Study Area from April 3, 2020 to March 31, 2021.**

**Appendix B1. Mean large birds use (number of large birds/800-m radius plot/60-minute survey), percent of total use (%), and frequency of occurrence (%) for each large bird type and species by season during avian bird use surveys at the Lava Ridge Wind Project Study Area in Lincoln, Jerome, and Minidoka counties, Idaho from April 3, 2020 to March 31, 2021.**

Type/Species	Mean Use				% of Use				% Frequency			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
<b>Waterbirds</b>	<b>0.03</b>	<b>0</b>	<b>0</b>	<b>0.01</b>	<b>0.8</b>	<b>0</b>	<b>0</b>	<b>0.1</b>	<b>0.6</b>	<b>0</b>	<b>0</b>	<b>0.3</b>
sandhill crane	0	0	0	0.01	0	0	0	0.1	0	0	0	0.3
American white pelican	0.03	0	0	0	0.8	0	0	0	0.6	0	0	0
<b>Waterfowl</b>	<b>0.44</b>	<b>&lt;0.01</b>	<b>0.12</b>	<b>0.69</b>	<b>12.4</b>	<b>0.2</b>	<b>2.7</b>	<b>16.4</b>	<b>2.2</b>	<b>0.4</b>	<b>1.1</b>	<b>1.7</b>
mallard	0.01	<0.01	0	0.11	0.2	0.2	0	2.7	0.6	0.4	0	0.3
snow goose	0	0	0	0.21	0	0	0	5.1	0	0	0	0.6
lesser scaup	0.31	0	0	0	8.8	0	0	0	0.6	0	0	0
Canada goose	0.02	0	0.03	0.09	0.6	0	0.6	2.1	1.1	0	1.1	0.6
northern shoveler	0.06	0	0	0	1.7	0	0	0	0.6	0	0	0
unidentified duck	0.04	0	0.10	0.28	1.1	0	2.1	6.7	0.6	0	0.4	0.6
<b>Shorebirds</b>	<b>0.09</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2.5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>5.6</b>	<b>0</b>	<b>0</b>	<b>0</b>
long-billed curlew	0.09	0	0	0	2.5	0	0	0	5.6	0	0	0
<b>Gulls/Terns</b>	<b>0.59</b>	<b>0.10</b>	<b>0</b>	<b>0.03</b>	<b>16.7</b>	<b>6.5</b>	<b>0</b>	<b>0.7</b>	<b>4.4</b>	<b>3.7</b>	<b>0</b>	<b>1.4</b>
California gull	0.59	0.10	0	0.03	16.7	6.3	0	0.7	4.4	3.3	0	1.4
unidentified gull	0	<0.01	0	0	0	0.2	0	0	0	0.4	0	0
<b>Diurnal Raptors</b>	<b>0.45</b>	<b>0.61</b>	<b>0.51</b>	<b>0.37</b>	<b>12.7</b>	<b>39.7</b>	<b>11.3</b>	<b>8.8</b>	<b>31.7</b>	<b>35.2</b>	<b>35.6</b>	<b>26.1</b>
<i>Accipiters</i>	0	0	0.01	0	0	0	0.2	0	0	0	0.7	0
Cooper's hawk	0	0	<0.01	0	0	0	0.1	0	0	0	0.4	0
unidentified accipiter	0	0	<0.01	0	0	0	0.1	0	0	0	0.4	0
<i>Buteos</i>	0.28	0.35	0.20	0.13	7.8	22.6	4.3	3.1	20.6	23.3	17.0	10.6
red-tailed hawk	0.12	0.15	0.11	0.02	3.3	9.9	2.3	0.5	10.0	12.6	10.4	1.7
rough-legged hawk	0	0	0.06	0.11	0	0	1.2	2.7	0	0	5.2	9.4
ferruginous hawk	0.04	0.04	0.02	0	1.1	2.9	0.5	0	2.8	2.6	1.9	0
unidentified buteo	0.02	0.01	0	0	0.5	0.7	0	0	1.7	1.1	0	0
Swainson's hawk	0.11	0.14	0.01	0	3.0	9.1	0.2	0	8.3	10.4	1.1	0
<i>Northern Harrier</i>	0.08	0.19	0.22	0.20	2.3	12.0	4.9	4.8	7.8	14.4	18.5	15.3
northern harrier	0.08	0.19	0.22	0.20	2.3	12.0	4.9	4.8	7.8	14.4	18.5	15.3
<i>Eagles</i>	0.03	0.03	0.03	0.03	0.9	1.9	0.7	0.6	3.3	1.9	3.3	2.2
golden eagle	0.03	0.03	0.03	0.03	0.9	1.9	0.7	0.6	3.3	1.9	3.3	2.2
<i>Falcons</i>	0.06	0.04	0.06	0.01	1.6	2.9	1.2	0.3	5.0	4.4	5.2	1.1
prairie falcon	0.02	0.03	0.03	0.01	0.6	1.9	0.7	0.3	2.2	3.0	3.0	1.1



**Appendix B1. Mean large birds use (number of large birds/800-m radius plot/60-minute survey), percent of total use (%), and frequency of occurrence (%) for each large bird type and species by season during avian bird use surveys at the Lava Ridge Wind Project Study Area in Lincoln, Jerome, and Minidoka counties, Idaho from April 3, 2020 to March 31, 2021.**

Type/Species	Mean Use				% of Use				% Frequency			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
American kestrel	0.03	0.01	0.02	0	0.8	1.0	0.5	0	2.2	1.5	2.2	0
unidentified falcon	0.01	0	0	0	0.2	0	0	0	0.6	0	0	0
<i>Other Raptors</i>	0	<0.01	0	0	0	0.2	0	0	0	0.4	0	0
unidentified raptor	0	<0.01	0	0	0	0.2	0	0	0	0.4	0	0
<b>Owls</b>	<b>0.02</b>	<b>0.03</b>	<b>0.02</b>	<b>0</b>	<b>0.6</b>	<b>1.9</b>	<b>0.4</b>	<b>0</b>	<b>1.1</b>	<b>1.9</b>	<b>1.5</b>	<b>0</b>
short-eared owl	0.01	0.02	<0.01	0	0.2	1.2	0.1	0	0.6	0.7	0.4	0
burrowing owl	0.02	0.01	0.01	0	0.5	0.7	0.3	0	1.1	1.1	1.1	0
<b>Vultures</b>	<b>0.02</b>	<b>0.01</b>	<b>0.03</b>	<b>0</b>	<b>0.5</b>	<b>0.7</b>	<b>0.7</b>	<b>0</b>	<b>1.1</b>	<b>1.1</b>	<b>0.4</b>	<b>0</b>
turkey vulture	0.02	0.01	0.03	0	0.5	0.7	0.7	0	1.1	1.1	0.4	0
<b>Upland Game Birds</b>	<b>0</b>	<b>0</b>	<b>0.01</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.4</b>	<b>0</b>
greater sage grouse	0	0	0.01	0	0	0	0.2	0	0	0	0.4	0
<b>Doves/Pigeons</b>	<b>0.01</b>	<b>0.01</b>	<b>&lt;0.01</b>	<b>0</b>	<b>0.2</b>	<b>0.5</b>	<b>0.1</b>	<b>0</b>	<b>0.6</b>	<b>0.4</b>	<b>0.4</b>	<b>0</b>
mourning dove	0.01	0.01	<0.01	0	0.2	0.5	0.1	0	0.6	0.4	0.4	0
<b>Large Corvids</b>	<b>1.91</b>	<b>0.66</b>	<b>3.87</b>	<b>3.09</b>	<b>53.7</b>	<b>42.5</b>	<b>84.6</b>	<b>73.9</b>	<b>64.4</b>	<b>31.5</b>	<b>71.1</b>	<b>73.1</b>
common raven	1.91	0.66	3.84	3.07	53.7	42.5	84.0	73.5	64.4	31.5	70.4	72.5
black-billed magpie	0	0	0.03	0.02	0	0	0.6	0.5	0	0	2.2	1.9
<b>Nightjars</b>	<b>0</b>	<b>0.12</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>7.9</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>7.4</b>	<b>0</b>	<b>0</b>
common nighthawk	0	0.12	0	0	0	7.9	0	0	0	7.4	0	0
<b>Overall</b>	<b>3.55</b>	<b>1.54</b>	<b>4.57</b>	<b>4.18</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>

**Appendix B2. Mean small birds use (number of small birds/100-m radius plot<sup>2</sup>/10-minute survey), percent of total use (%), and frequency of occurrence (%) for each small bird type and species by season during avian bird use surveys at the Lava Ridge Wind Project Study area in Lincoln, Jerome, and Minidoka counties, Idaho from April 3, 2020 to March 31, 2021.**

Type/Species	Mean Use				% of Use				% Frequency			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
<b>Passerines</b>	<b>4.40</b>	<b>3.76</b>	<b>4.47</b>	<b>3.62</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>98.3</b>	<b>84.4</b>	<b>64.8</b>	<b>58.3</b>
<i>Passerines(Subtype)</i>	0	<0.01	0	0	0	0.1	0	0	0	0.4	0	0
unidentified passerine	0	<0.01	0	0	0	0.1	0	0	0	0.4	0	0
<b>Blackbirds/Orioles</b>	<b>1.59</b>	<b>0.67</b>	<b>0.23</b>	<b>0.27</b>	<b>36.1</b>	<b>17.8</b>	<b>5.0</b>	<b>7.4</b>	<b>78.9</b>	<b>42.6</b>	<b>12.2</b>	<b>14.2</b>
red-winged blackbird	0.04	<0.01	0	0	1.0	0.1	0	0	2.8	0.4	0	0
Brewer's blackbird	0.01	<0.01	0	0	0.3	0.1	0	0	0.6	0.4	0	0
brown-headed cowbird	0.05	0.01	0	0	1.1	0.2	0	0	2.2	0.4	0	0
western meadowlark	1.46	0.65	0.20	0.25	33.2	17.3	4.5	7.0	78.9	42.6	11.1	13.9
European starling	0.02	<0.01	0.03	0.01	0.5	0.1	0.6	0.4	1.7	0.4	1.5	0.3
<b>Finches/Crossbills</b>	<b>0</b>	<b>0</b>	<b>&lt;0.01</b>	<b>0.24</b>	<b>0</b>	<b>0</b>	<b>0.1</b>	<b>6.7</b>	<b>0</b>	<b>0</b>	<b>0.4</b>	<b>0.8</b>
pine siskin	0	0	<0.01	0	0	0	0.1	0	0	0	0.4	0
American goldfinch	0	0	0	0.24	0	0	0	6.7	0	0	0	0.8
<b>Flycatchers</b>	<b>0.01</b>	<b>0.01</b>	<b>0</b>	<b>0</b>	<b>0.1</b>	<b>0.2</b>	<b>0</b>	<b>0</b>	<b>0.6</b>	<b>0.4</b>	<b>0</b>	<b>0</b>
western kingbird	0.01	0.01	0	0	0.1	0.2	0	0	0.6	0.4	0	0
<b>Grassland/Sparrows</b>	<b>2.58</b>	<b>2.82</b>	<b>4.16</b>	<b>3.11</b>	<b>58.7</b>	<b>74.9</b>	<b>93.0</b>	<b>85.7</b>	<b>84.4</b>	<b>74.4</b>	<b>63.0</b>	<b>56.7</b>
grasshopper sparrow	0.14	0.19	<0.01	0	3.2	5.1	0.1	0	10.6	15.9	0.4	0
sagebrush sparrow	0.01	0	0	0	0.3	0	0	0	1.1	0	0	0
horned lark	2.19	2.36	4.12	3.11	49.9	62.6	92.1	85.7	79.4	70.4	61.9	56.7
green-tailed towhee	0.01	<0.01	<0.01	0	0.1	0.1	0.1	0	0.6	0.4	0.4	0
vesper sparrow	0.01	0.07	0	0	0.1	1.8	0	0	0.6	5.6	0	0
Brewer's sparrow	0.22	0.19	0.03	0	4.9	5.0	0.7	0	16.1	12.2	2.2	0
unidentified sparrow	0.01	0.01	0	0	0.3	0.3	0	0	0.6	0.7	0	0
<b>Mimids</b>	<b>0.10</b>	<b>0.16</b>	<b>0.03</b>	<b>0</b>	<b>2.3</b>	<b>4.3</b>	<b>0.7</b>	<b>0</b>	<b>8.3</b>	<b>14.1</b>	<b>3.0</b>	<b>0</b>
gray catbird	0	0	<0.01	0	0	0	0.1	0	0	0	0.4	0
sage thrasher	0.10	0.16	0.03	0	2.3	4.3	0.7	0	8.3	14.1	2.6	0
<b>Swallows</b>	<b>0.08</b>	<b>0.01</b>	<b>0.03</b>	<b>0</b>	<b>1.8</b>	<b>0.4</b>	<b>0.6</b>	<b>0</b>	<b>5.6</b>	<b>1.1</b>	<b>1.5</b>	<b>0</b>
cliff swallow	0.02	0	0	0	0.4	0	0	0	0.6	0	0	0
bank swallow	0.06	0.01	0.02	0	1.4	0.4	0.5	0	5.0	1.1	1.1	0
unidentified swallow	0	0	<0.01	0	0	0	0.1	0	0	0	0.4	0
<b>Shrikes</b>	<b>0.01</b>	<b>0.03</b>	<b>0.01</b>	<b>0.01</b>	<b>0.3</b>	<b>0.9</b>	<b>0.2</b>	<b>0.2</b>	<b>1.1</b>	<b>3.0</b>	<b>1.1</b>	<b>0.6</b>
loggerhead shrike	0.01	0.03	0.01	0.01	0.3	0.9	0.2	0.2	1.1	3.0	1.1	0.6

**Appendix B2. Mean small birds use (number of small birds/100-m radius plot<sup>a</sup>/10-minute survey), percent of total use (%), and frequency of occurrence (%) for each small bird type and species by season during avian bird use surveys at the Lava Ridge Wind Project Study area in Lincoln, Jerome, and Minidoka counties, Idaho from April 3, 2020 to March 31, 2021.**

Type/Species	Mean Use				% of Use				% Frequency			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
<u>Thrushes</u>	0.01	<0.01	0.01	<0.01	0.3	0.1	0.2	0.1	1.1	0.4	0.7	0.3
Townsend's solitaire	0	0	0	<0.01	0	0	0	0.1	0	0	0	0.3
mountain bluebird	0.01	<0.01	0.01	0	0.1	0.1	0.2	0	0.6	0.4	0.7	0
unidentified bluebird	0.01	0	0	0	0.1	0	0	0	0.6	0	0	0
<u>Wrens</u>	0.02	0.05	0.01	0	0.5	1.3	0.2	0	2.2	3.3	0.7	0
rock wren	0.02	0.05	0.01	0	0.5	1.3	0.2	0	2.2	3.3	0.7	0
<b>Overall</b>	<b>4.40</b>	<b>3.76</b>	<b>4.47</b>	<b>3.62</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>

**Appendix C. Mean Use by Point for All Birds, Bird Types, and Diurnal Raptor Subtypes  
Observed during Avian Use Surveys at the Lava Ridge Wind Project Study Area from  
April 3, 2020 to March 31, 2021**

**Appendix C1. Mean use (number of birds/plot<sup>a</sup>/60-minute survey) by point for all bird groups and bird types observed during avian bird use surveys at the Lava Ridge Wind Project Study Area in Lincoln, Jerome, and Minidoka counties, Idaho from April 3, 2020 to March 31, 2021.**

Bird Type	Survey Point									
	1	2	3	4	5	6	7	8	9	10
Waterbirds	0	0	0	0	0	0	0	0	0	0
Waterfowl	0	0	0	0	0	0	0	0	0	0
Shorebirds	0	0	0	0	0	0.25	0	0	0	0
Gulls/Terns	0	0	0	0	0	0	0.50	0	0	0
Diurnal Raptors	0.25	0.17	0.33	0.83	0.33	0.50	0.08	0.17	0.33	1.50
<u>Accipiters</u>	0	0	0	0	0	0	0	0	0	0
<u>Buteos</u>	0.08	0.08	0.17	0.33	0	0.08	0	0	0	0.58
<u>Northern Harrier</u>	0.08	0.08	0.17	0.50	0.33	0.42	0	0	0.25	0.50
<u>Eagles</u>	0	0	0	0	0	0	0.08	0	0	0.25
<u>Falcons</u>	0.08	0	0	0	0	0	0	0.17	0.08	0.17
<u>Other Raptors</u>	0	0	0	0	0	0	0	0	0	0
Owls	0	0	0	0	0	0.08	0	0	0	0
Vultures	0	0.75	0	0.08	0	0	0	0	0	0
Upland Game Birds	0	0	0	0	0	0	0	0	0	0
Doves/Pigeons	0	0.08	0	0	0	0	0	0	0	0
Large Corvids	1.17	1.17	0.75	23.50	1.67	1.83	2.83	3.08	2.50	2.58
Nightjars	0.42	0	0.25	0	0	0	0	0	0	0
<b>All Large Birds</b>	<b>1.83</b>	<b>2.17</b>	<b>1.33</b>	<b>24.42</b>	<b>2.00</b>	<b>2.67</b>	<b>3.42</b>	<b>3.25</b>	<b>2.83</b>	<b>4.08</b>
<b>All Small Birds</b>	<b>2.83</b>	<b>1.67</b>	<b>4.17</b>	<b>3.50</b>	<b>4.67</b>	<b>16.50</b>	<b>2.17</b>	<b>5.75</b>	<b>2.33</b>	<b>2.33</b>

<sup>a</sup> 800-meter radius plot for large birds, 100-meter radius plot for small birds

**Appendix C1. Mean use (number of birds/plot<sup>a</sup>/60-minute survey) by point for all bird groups and bird types observed during avian bird use surveys at the Lava Ridge Wind Project Study Area in Lincoln, Jerome, and Minidoka counties, Idaho from April 3, 2020 to March 31, 2021.**

Bird Type	Survey Point									
	11	12	13	14	15	16	17	18	19	20
Waterbirds	0	0	0	0	0	0	0	0	0	0
Waterfowl	0	0	0	0.08	0.08	0	0.08	0	0	0
Shorebirds	0	0	0	0	0	0	0	0.17	0	0
Gulls/Terns	6.25	0	0	0.17	0	0	0	0	0	0.08
Diurnal Raptors	0.75	0.25	0.33	0.42	0.25	0.08	0.67	0.33	0.25	0
<u>Accipiters</u>	0	0	0	0	0	0	0	0	0	0
<u>Buteos</u>	0.58	0.08	0.17	0.25	0.08	0	0.50	0.08	0.17	0
<u>Northern Harrier</u>	0.08	0.17	0.08	0.17	0	0.08	0.17	0.25	0	0
<u>Eagles</u>	0.08	0	0	0	0	0	0	0	0	0
<u>Falcons</u>	0	0	0.08	0	0.17	0	0	0	0.08	0
<u>Other Raptors</u>	0	0	0	0	0	0	0	0	0	0
Owls	0	0	0	0	0	0	0	0.17	0	0
Vultures	0	0	0	0	0	0	0	0	0	0
Upland Game Birds	0	0	0	0	0	0	0	0	0	0
Doves/Pigeons	0	0	0	0	0	0	0	0	0	0
Large Corvids	1.33	0.50	1.58	2.25	2.08	1.50	4.58	3.42	1.17	1.25
Nightjars	0.25	0	0	0.25	0	0	0.08	0	0	0
<b>All Large Birds</b>	<b>8.58</b>	<b>0.75</b>	<b>1.92</b>	<b>3.17</b>	<b>2.42</b>	<b>1.58</b>	<b>5.42</b>	<b>4.08</b>	<b>1.42</b>	<b>1.33</b>
<b>All Small Birds</b>	<b>2.58</b>	<b>6.75</b>	<b>4.33</b>	<b>7.58</b>	<b>2.50</b>	<b>2.67</b>	<b>1.50</b>	<b>3.50</b>	<b>1.42</b>	<b>9.67</b>

<sup>a</sup> 800-meter radius plot for large birds, 100-meter radius plot for small birds

**Appendix C1. Mean use (number of birds/plot<sup>a</sup>/60-minute survey) by point for all bird groups and bird types observed during avian bird use surveys at the Lava Ridge Wind Project Study Area in Lincoln, Jerome, and Minidoka counties, Idaho from April 3, 2020 to March 31, 2021.**

Bird Type	Survey Point									
	21	22	23	24	25	26	27	28	29	30
Waterbirds	0	0	0.17	0	0	0	0	0	0	0
Waterfowl	0	0	0	0	0	0	0	0	0	0
Shorebirds	0	0	0	0	0.08	0.17	0	0	0	0
Gulls/Terns	0	0	0	0	0	0	0	0	0	0.17
Diurnal Raptors	0.67	0.17	0.50	0.17	0.08	0.17	1.33	0.42	0	0.25
<u>Accipiters</u>	0	0	0	0	0	0	0	0	0	0
<u>Buteos</u>	0.25	0.08	0.08	0	0	0	1.00	0.17	0	0.08
<u>Northern Harrier</u>	0.33	0.08	0.25	0.08	0.08	0.08	0.33	0.17	0	0.08
<u>Eagles</u>	0	0	0.17	0	0	0	0	0	0	0
<u>Falcons</u>	0.08	0	0	0.08	0	0.08	0	0.08	0	0.08
<u>Other Raptors</u>	0	0	0	0	0	0	0	0	0	0
Owls	0	0	0	0	0	0	0	0	0	0
Vultures	0	0	0	0	0	0	0	0	0	0
Upland Game Birds	0	0	0	0	0	0	0	0	0	0
Doves/Pigeons	0	0	0	0	0	0	0.08	0	0	0
Large Corvids	2.83	1.42	1.50	1.58	1.67	3.33	2.92	2.08	1.42	0.75
Nightjars	0	0	0.17	0.08	0	0	0.08	0	0	0.08
<b>All Large Birds</b>	<b>3.50</b>	<b>1.58</b>	<b>2.33</b>	<b>1.83</b>	<b>1.83</b>	<b>3.67</b>	<b>4.42</b>	<b>2.50</b>	<b>1.42</b>	<b>1.25</b>
<b>All Small Birds</b>	<b>1.17</b>	<b>4.83</b>	<b>3.58</b>	<b>3.08</b>	<b>3.83</b>	<b>1.67</b>	<b>1.58</b>	<b>2.25</b>	<b>1.92</b>	<b>4.42</b>

<sup>a</sup> 800-meter radius plot for large birds, 100-meter radius plot for small birds

**Appendix C1. Mean use (number of birds/plot<sup>a</sup>/60-minute survey) by point for all bird groups and bird types observed during avian bird use surveys at the Lava Ridge Wind Project Study Area in Lincoln, Jerome, and Minidoka counties, Idaho from April 3, 2020 to March 31, 2021.**

Bird Type	Survey Point									
	31	32	33	34	35	36	37	38	39	40
Waterbirds	0	0	0	0	0	0	0	0	0	0
Waterfowl	0	2.08	0	0	0	0	0	0	1.33	0
Shorebirds	0	0	0	0	0	0	0.08	0	0	0
Gulls/Terns	0	0.08	0	0	0	0.25	0	0	0	1.25
Diurnal Raptors	0.42	0.08	0.50	0.92	1.00	0.42	1.33	0.17	0.25	0.17
<u>Accipiters</u>	0	0	0	0	0	0	0	0	0	0
<u>Buteos</u>	0.25	0.08	0.17	0.67	0.33	0.42	0.83	0.17	0.17	0.17
<u>Northern Harrier</u>	0.17	0	0.25	0.17	0.42	0	0.50	0	0.08	0
<u>Eagles</u>	0	0	0.08	0	0.08	0	0	0	0	0
<u>Falcons</u>	0	0	0	0.08	0.17	0	0	0	0	0
<u>Other Raptors</u>	0	0	0	0	0	0	0	0	0	0
Owls	0	0.08	0	0	0.42	0	0	0	0	0
Vultures	0	0	0	0	0	0	0	0	0	0
Upland Game Birds	0	0	0	0	0	0	0	0	0	0
Doves/Pigeons	0	0	0	0	0	0	0	0	0	0
Large Corvids	0.50	2.58	4.33	1.08	2.33	2.08	11.17	1.92	1.08	1.33
Nightjars	0	0	0	0	0.08	0	0.08	0	0	0
<b>All Large Birds</b>	<b>0.92</b>	<b>4.92</b>	<b>4.83</b>	<b>2.00</b>	<b>3.83</b>	<b>2.75</b>	<b>12.67</b>	<b>2.08</b>	<b>2.67</b>	<b>2.75</b>
<b>All Small Birds</b>	<b>4.58</b>	<b>5.08</b>	<b>3.83</b>	<b>1.50</b>	<b>3.58</b>	<b>3.75</b>	<b>1.83</b>	<b>4.00</b>	<b>4.75</b>	<b>9.58</b>

<sup>a</sup> 800-meter radius plot for large birds, 100-meter radius plot for small birds

**Appendix C1. Mean use (number of birds/plot<sup>a</sup>/60-minute survey) by point for all bird groups and bird types observed during avian bird use surveys at the Lava Ridge Wind Project Study Area in Lincoln, Jerome, and Minidoka counties, Idaho from April 3, 2020 to March 31, 2021.**

Bird Type	Survey Point									
	41	42	43	44	45	46	47	48	49	50
Waterbirds	0	0	0	0	0	0	0	0	0	0
Waterfowl	0	0	0	0	0	0	0	0	0	0
Shorebirds	0	0	0	0	0	0	0	0	0	0
Gulls/Terns	0.08	0	0	0.42	0	0	0	0	0	0
Diurnal Raptors	1.33	0.33	0.42	0.33	0.58	0.25	0.42	0.17	0.58	0.25
<i>Accipiters</i>	0	0	0	0	0	0	0	0	0	0
<i>Buteos</i>	0.83	0.17	0.33	0.17	0.33	0.08	0.33	0.08	0.42	0.17
<i>Northern Harrier</i>	0.50	0.08	0.08	0.08	0.17	0.17	0.08	0.08	0.08	0
<i>Eagles</i>	0	0.08	0	0	0	0	0	0	0.08	0.08
<i>Falcons</i>	0	0	0	0.08	0.08	0	0	0	0	0
<i>Other Raptors</i>	0	0	0	0	0	0	0	0	0	0
Owls	0	0.25	0	0	0	0	0	0	0	0
Vultures	0	0	0	0	0	0	0	0	0	0
Upland Game Birds	0	0.25	0	0	0	0	0	0	0	0
Doves/Pigeons	0	0	0	0	0	0	0	0	0	0
Large Corvids	2.75	2.75	4.83	2.08	0.92	1.08	2.08	0.92	1.33	1.08
Nightjars	0	0.08	0	0.08	0	0	0	0	0	0
<b>All Large Birds</b>	<b>4.17</b>	<b>3.67</b>	<b>5.25</b>	<b>2.92</b>	<b>1.50</b>	<b>1.33</b>	<b>2.50</b>	<b>1.08</b>	<b>1.92</b>	<b>1.33</b>
<b>All Small Birds</b>	<b>3.58</b>	<b>7.08</b>	<b>5.75</b>	<b>4.58</b>	<b>1.08</b>	<b>2.83</b>	<b>2.75</b>	<b>5.08</b>	<b>10.25</b>	<b>2.92</b>

<sup>a</sup> 800-meter radius plot for large birds, 100-meter radius plot for small birds

**Appendix C1. Mean use (number of birds/plot<sup>a</sup>/60-minute survey) by point for all bird groups and bird types observed during avian bird use surveys at the Lava Ridge Wind Project Study Area in Lincoln, Jerome, and Minidoka counties, Idaho from April 3, 2020 to March 31, 2021.**

Bird Type	Survey Point									
	51	52	53	54	55	56	57	58	59	60
Waterbirds	0	0	0.42	0	0	0	0	0	0	0
Waterfowl	0	0	0.08	0	0	5.00	0	0	0	0
Shorebirds	0	0.08	0	0	0.25	0	0	0	0	0
Gulls/Terns	0.08	0	1.75	0.58	0	0	0.08	0	0	0
Diurnal Raptors	0.33	0.50	0.42	0.50	0.83	0.75	0.67	0.50	0.50	0.25
<i>Accipiters</i>	0	0	0	0	0	0	0	0	0	0
<i>Buteos</i>	0.25	0.25	0.17	0.33	0.08	0.58	0.08	0.42	0.33	0.17
<i>Northern Harrier</i>	0.08	0.25	0	0.17	0.50	0.08	0.08	0.08	0.17	0
<i>Eagles</i>	0	0	0.08	0	0.25	0	0.42	0	0	0
<i>Falcons</i>	0	0	0.17	0	0	0.08	0	0	0	0.08
<i>Other Raptors</i>	0	0	0	0	0	0	0.08	0	0	0
Owls	0	0	0	0	0	0	0	0	0	0
Vultures	0	0	0	0	0	0	0	0	0	0
Upland Game Birds	0	0	0	0	0	0	0	0	0	0
Doves/Pigeons	0	0	0	0	0	0	0	0	0	0
Large Corvids	2.58	1.58	1.42	2.33	3.17	1.75	3.33	0.92	2.08	0.83
Nightjars	0	0	0	0.25	0	0	0	0	0	0
<b>All Large Birds</b>	<b>3.00</b>	<b>2.17</b>	<b>4.08</b>	<b>3.67</b>	<b>4.25</b>	<b>7.50</b>	<b>4.08</b>	<b>1.42</b>	<b>2.58</b>	<b>1.08</b>
<b>All Small Birds</b>	<b>2.33</b>	<b>1.50</b>	<b>5.50</b>	<b>6.08</b>	<b>7.83</b>	<b>4.67</b>	<b>2.42</b>	<b>3.92</b>	<b>5.17</b>	<b>4.00</b>

<sup>a</sup> 800-meter radius plot for large birds, 100-meter radius plot for small birds

**Appendix C1. Mean use (number of birds/plot<sup>a</sup>/60-minute survey) by point for all bird groups and bird types observed during avian bird use surveys at the Lava Ridge Wind Project Study Area in Lincoln, Jerome, and Minidoka counties, Idaho from April 3, 2020 to March 31, 2021.**

Bird Type	Survey Point									
	61	62	63	64	65	66	67	68	69	70
Waterbirds	0	0	0	0	0	0	0	0	0	0
Waterfowl	0	0	0	0	0	0	0	0	0	0
Shorebirds	0	0	0	0	0	0	0	0	0	0
Gulls/Terns	0	0	0	0	0	0.08	0	0	0	0
Diurnal Raptors	0.92	1.08	0.58	0.08	0.25	0.42	0.75	0.08	1.00	0.17
<i>Accipiters</i>	0	0	0	0	0	0	0	0	0	0
<i>Buteos</i>	0.58	0.25	0.42	0	0.08	0.42	0.25	0.08	0.33	0.17
<i>Northern Harrier</i>	0.08	0.75	0.17	0.08	0.17	0	0.42	0	0.25	0
<i>Eagles</i>	0.08	0.08	0	0	0	0	0	0	0.17	0
<i>Falcons</i>	0.17	0	0	0	0	0	0.08	0	0.25	0
<i>Other Raptors</i>	0	0	0	0	0	0	0	0	0	0
Owls	0	0	0	0	0.08	0	0.08	0	0.17	0
Vultures	0.08	0	0.08	0	0	0	0	0	0	0
Upland Game Birds	0	0	0	0	0	0	0	0	0	0
Doves/Pigeons	0	0	0	0	0	0	0	0	0	0
Large Corvids	1.83	7.75	1.58	1.08	0.75	2.00	1.50	1.00	1.58	1.08
Nightjars	0	0	0	0	0	0.08	0	0	0	0
<b>All Large Birds</b>	<b>2.83</b>	<b>8.83</b>	<b>2.25</b>	<b>1.17</b>	<b>1.08</b>	<b>2.58</b>	<b>2.33</b>	<b>1.08</b>	<b>2.75</b>	<b>1.25</b>
<b>All Small Birds</b>	<b>2.00</b>	<b>2.67</b>	<b>1.25</b>	<b>5.67</b>	<b>2.58</b>	<b>4.17</b>	<b>3.25</b>	<b>6.92</b>	<b>8.50</b>	<b>3.67</b>

<sup>a</sup> 800-meter radius plot for large birds, 100-meter radius plot for small birds

**Appendix C1. Mean use (number of birds/plot<sup>a</sup>/60-minute survey) by point for all bird groups and bird types observed during avian bird use surveys at the Lava Ridge Wind Project Study Area in Lincoln, Jerome, and Minidoka counties, Idaho from April 3, 2020 to March 31, 2021.**

Bird Type	Survey Point									
	71	72	73	74	75	76	77	78	79	80
Waterbirds	0	0	0	0	0	0	0	0	0	0
Waterfowl	0	0	3.33	0	0	0	0	0	0	0.08
Shorebirds	0.08	0	0	0.08	0	0	0	0	0	0
Gulls/Terns	0	0.08	0	0	0	0	0	0	0	0
Diurnal Raptors	0.42	0.17	0.42	0	1.25	0	1.33	1.17	0.33	0.25
<i>Accipiters</i>	0	0	0	0	0	0	0	0	0	0
<i>Buteos</i>	0.25	0	0.08	0	0.92	0	0.08	0.42	0.17	0.08
<i>Northern Harrier</i>	0.08	0.17	0.25	0	0.08	0	1.00	0.58	0.17	0
<i>Eagles</i>	0.08	0	0	0	0.17	0	0.17	0	0	0.08
<i>Falcons</i>	0	0	0.08	0	0.08	0	0.08	0.17	0	0.08
<i>Other Raptors</i>	0	0	0	0	0	0	0	0	0	0
Owls	0	0	0	0	0	0	0	0	0	0
Vultures	0	0	0	0	0	0	0	0	0	0
Upland Game Birds	0	0	0	0	0	0	0	0	0	0
Doves/Pigeons	0	0	0	0	0	0	0	0	0	0
Large Corvids	1.75	2.33	2.17	5.00	1.58	6.00	5.50	3.50	1.83	2.25
Nightjars	0.17	0	0.17	0	0	0	0	0	0	0.08
<b>All Large Birds</b>	<b>2.42</b>	<b>2.58</b>	<b>6.08</b>	<b>5.08</b>	<b>2.83</b>	<b>6.00</b>	<b>6.83</b>	<b>4.67</b>	<b>2.17</b>	<b>2.67</b>
<b>All Small Birds</b>	<b>5.67</b>	<b>2.42</b>	<b>3.33</b>	<b>2.75</b>	<b>0.50</b>	<b>1.75</b>	<b>2.08</b>	<b>1.50</b>	<b>4.25</b>	<b>5.83</b>

<sup>a</sup> 800-meter radius plot for large birds, 100-meter radius plot for small birds

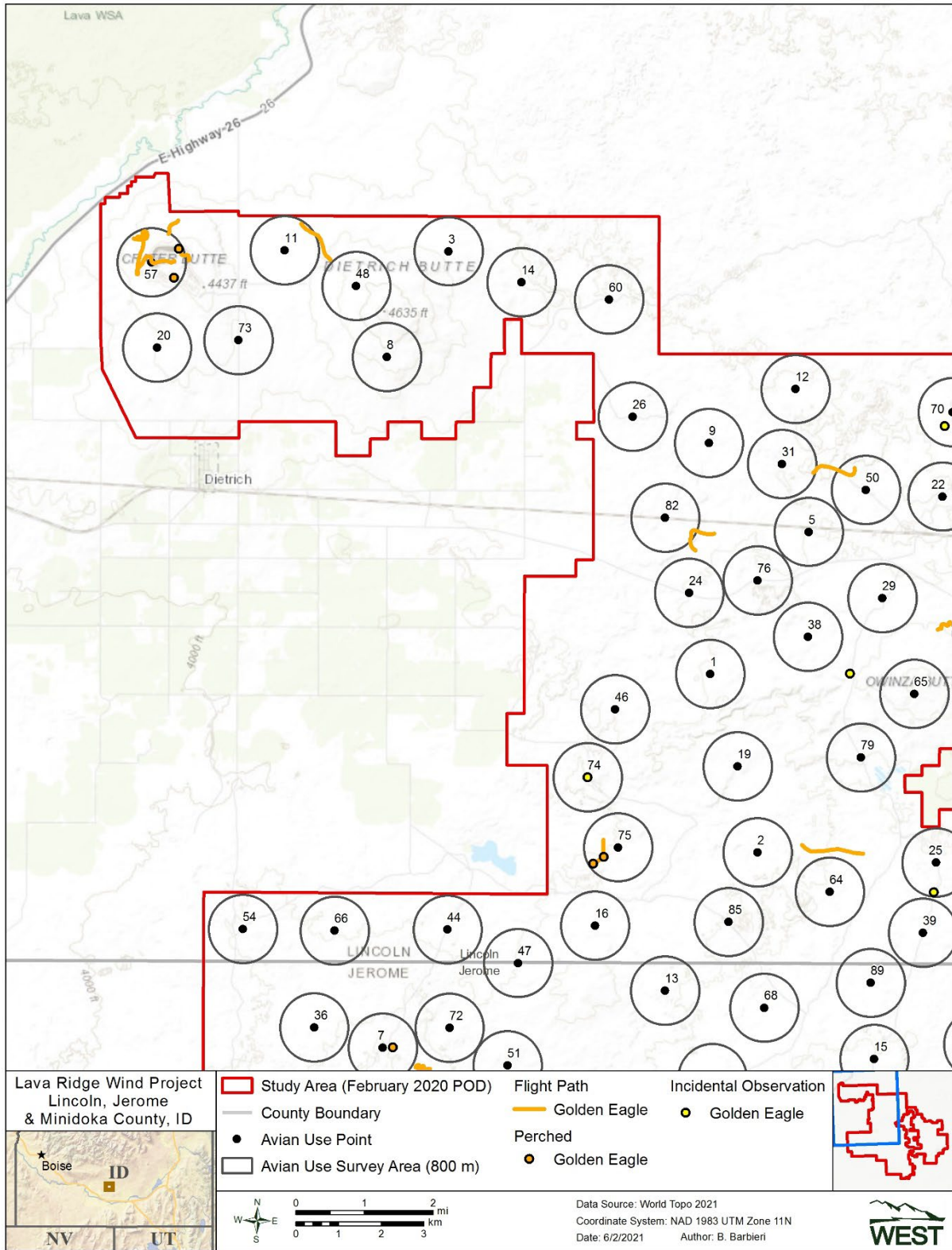


**Appendix C1. Mean use (number of birds/plot<sup>a</sup>/60-minute survey) by point for all bird groups and bird types observed during avian bird use surveys at the Lava Ridge Wind Project Study Area in Lincoln, Jerome, and Minidoka counties, Idaho from April 3, 2020 to March 31, 2021.**

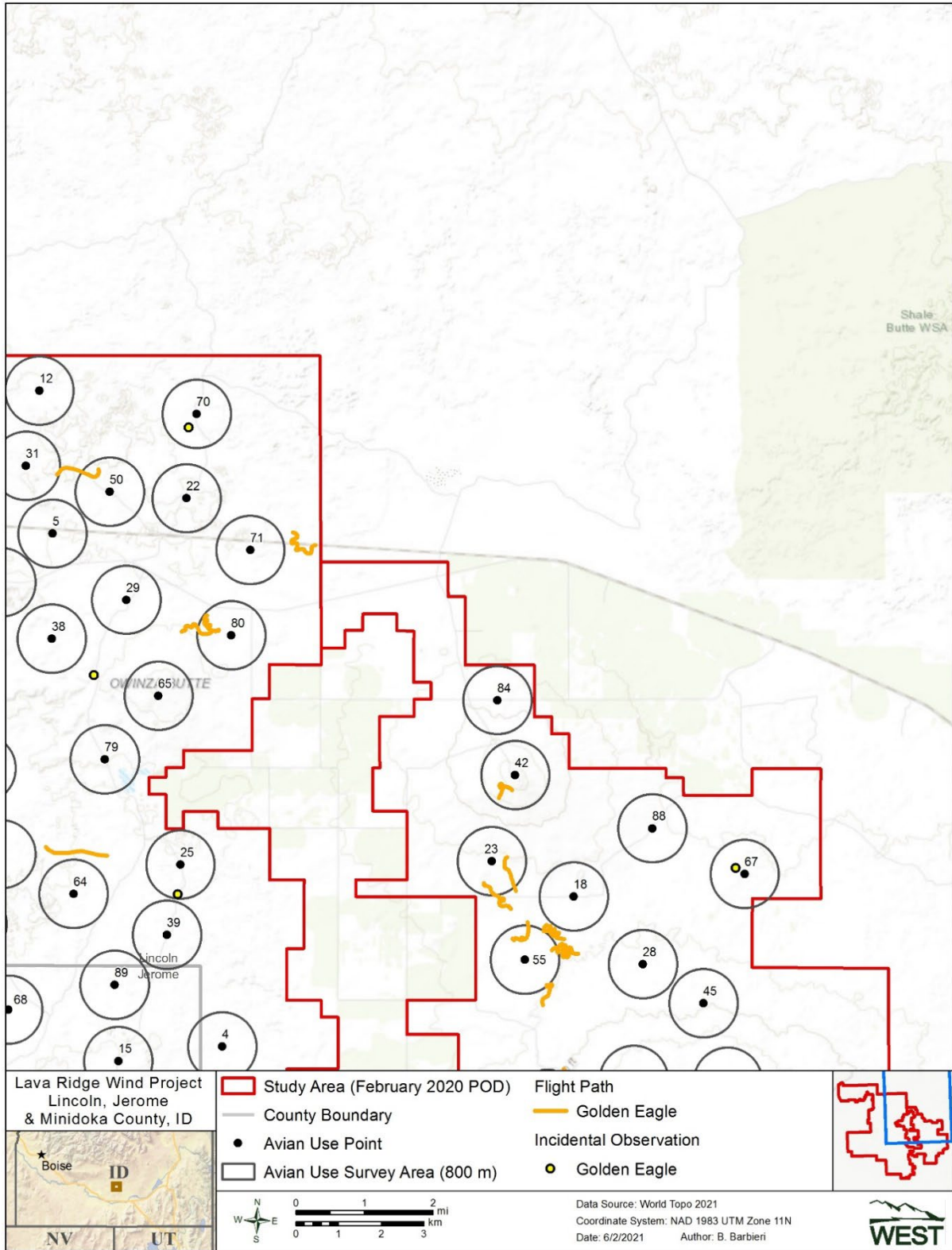
Bird Type	Survey Point									
	81	82	83	84	85	86	87	88	89	90
Waterbirds	0	0	0	0	0	0	0	0	0	0
Waterfowl	0	0	17.00	0.58	0	0	0	0.25	0	0
Shorebirds	0	0	0	0	0	0	0	0	0	0.08
Gulls/Terns	0	0	0	0	0	0	0.08	0	0.08	0
Diurnal Raptors	0.75	0.42	0.25	1.08	0.17	1.00	0.50	0.83	0.50	0.17
<i>Accipiters</i>	0	0	0	0.08	0	0	0.08	0	0	0
<i>Buteos</i>	0.25	0.33	0.17	0.17	0.08	0.58	0.08	0.25	0	0.08
<i>Northern Harrier</i>	0.50	0	0.08	0.75	0.08	0.25	0.33	0.58	0.33	0.08
<i>Eagles</i>	0	0.08	0	0	0	0	0	0	0	0
<i>Falcons</i>	0	0	0	0.08	0	0.17	0	0	0.17	0
<i>Other Raptors</i>	0	0	0	0	0	0	0	0	0	0
Owls	0	0	0	0	0	0	0	0	0.08	0
Vultures	0	0	0.25	0	0	0	0	0	0	0
Upland Game Birds	0	0	0	0	0	0	0	0	0	0
Doves/Pigeons	0	0	0	0	0	0	0	0.17	0	0
Large Corvids	2.17	3.92	1.08	4.75	1.08	1.58	3.08	1.33	1.00	2.42
Nightjars	0	0	0	0	0	0	0	0	0	0
<b>All Large Birds</b>	<b>2.92</b>	<b>4.33</b>	<b>18.58</b>	<b>6.42</b>	<b>1.25</b>	<b>2.58</b>	<b>3.67</b>	<b>2.58</b>	<b>1.67</b>	<b>2.67</b>
<b>All Small Birds</b>	<b>3.17</b>	<b>2.17</b>	<b>6.25</b>	<b>4.25</b>	<b>2.42</b>	<b>1.58</b>	<b>2.00</b>	<b>3.75</b>	<b>6.92</b>	<b>8.17</b>

<sup>a</sup> 800-meter radius plot for large birds, 100-meter radius plot for small birds

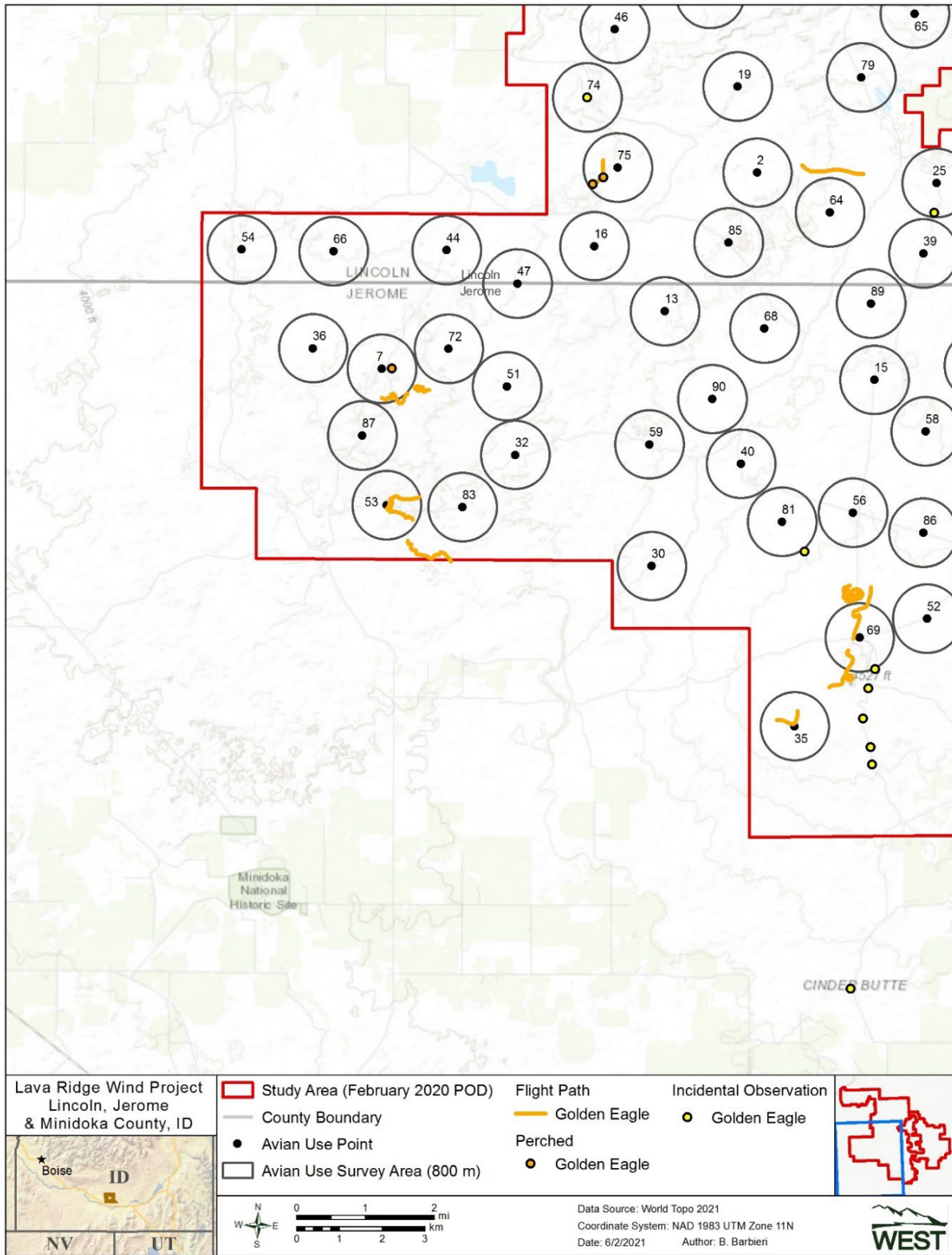
**Appendix D. Maps of Flight, Perch, and Incidental Observations of Golden Eagles  
Recorded during Avian Use Surveys at the Lava Ridge Wind Project Study Area from  
April 3, 2020 to March 31, 2021**



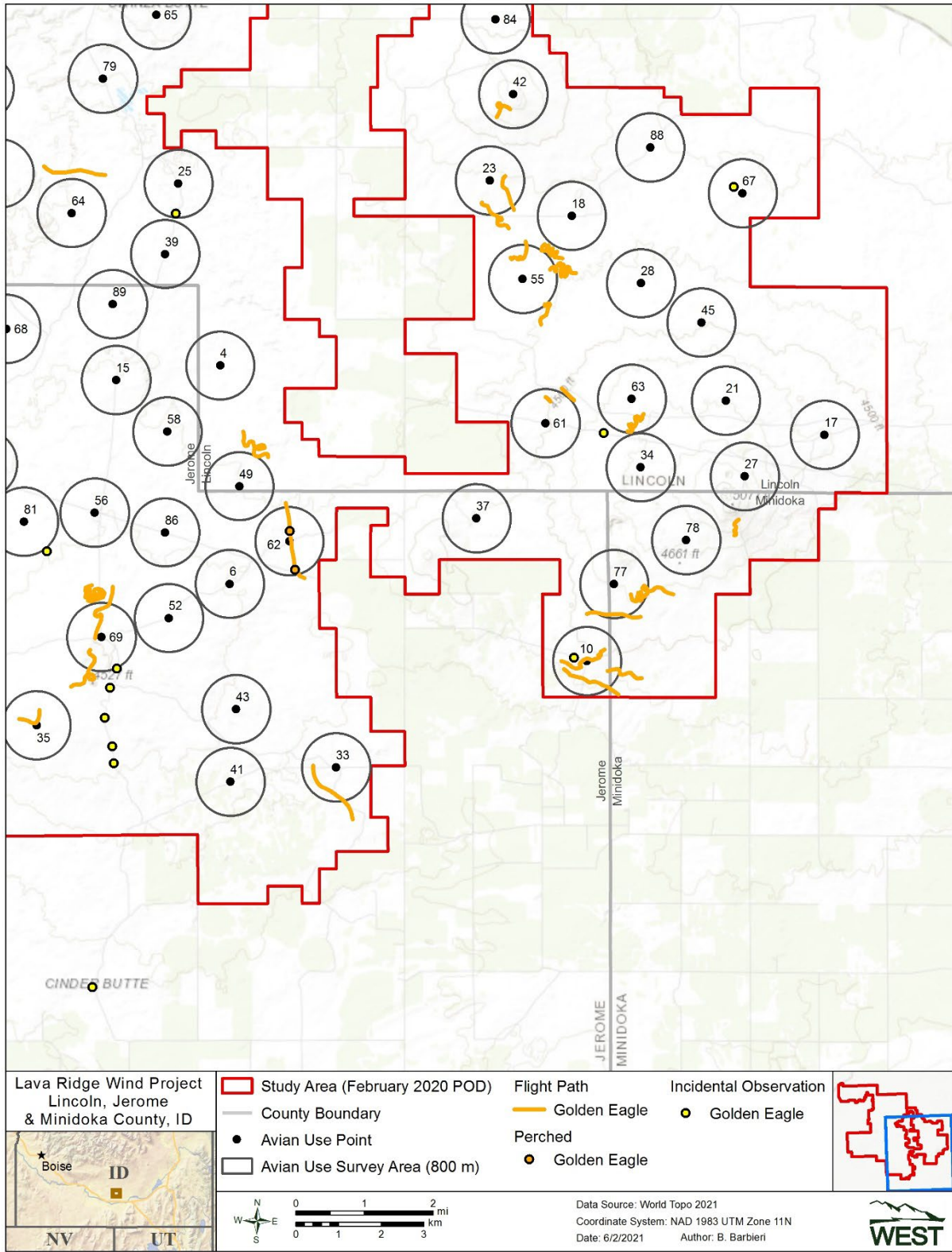
**Appendix D1. Flight, Perch, and Incidental Observations of Golden Eagles Recorded during Avian Use Surveys at the Lava Ridge Wind Project Study Area from April 3, 2020 to March 31, 2021.**



**Appendix D2. Flight, Perch, and Incidental Observations of Golden Eagles Recorded during Avian Use Surveys at the Lava Ridge Wind Project Study Area from April 3, 2020 to March 31, 2021.**

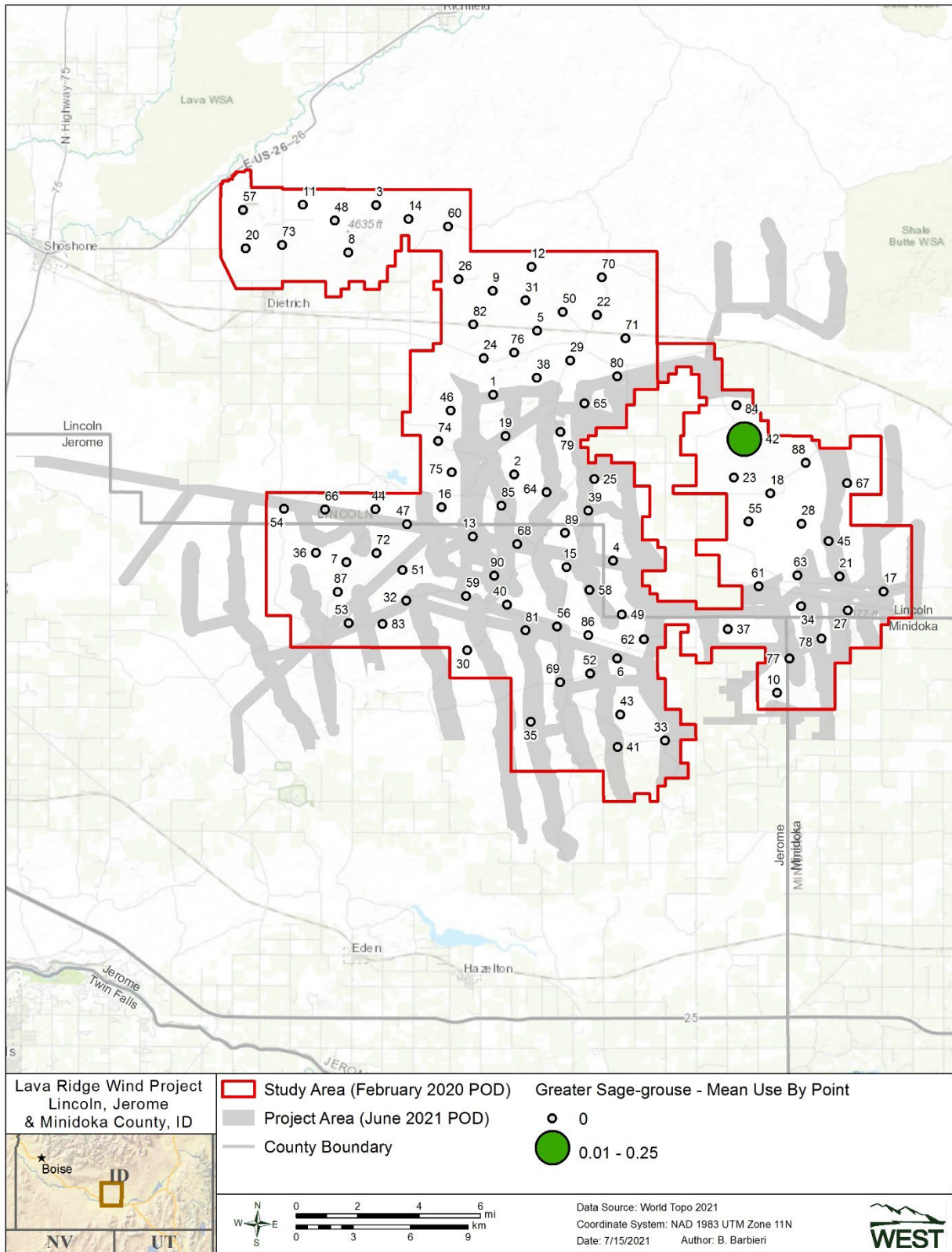


**Appendix D3. Flight, Perch, and Incidental Observations of Golden Eagles Recorded during Avian Use Surveys at the Lava Ridge Wind Project Study Area from April 3, 2020 to March 31, 2021.**



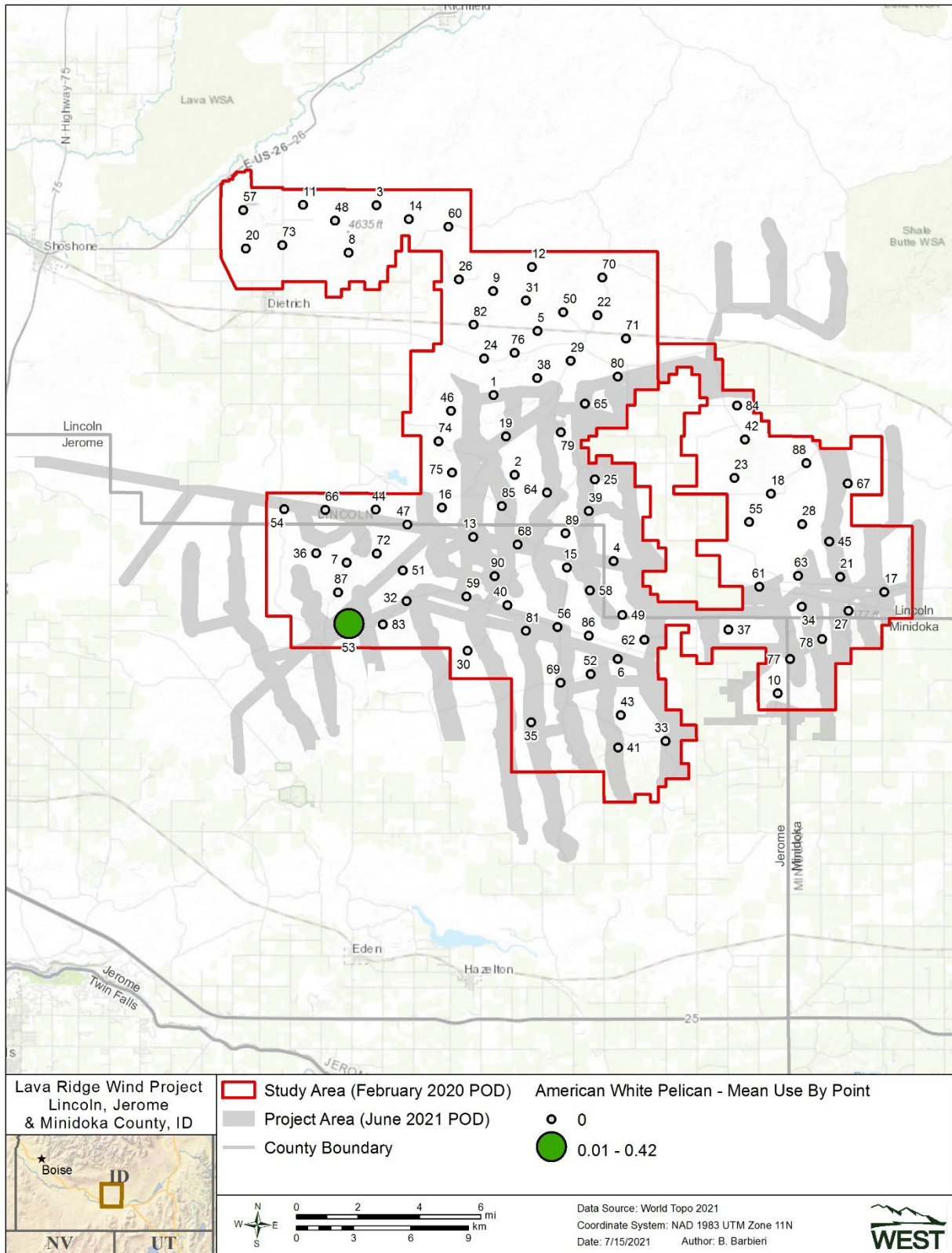
**Appendix D4. Flight, Perch, and Incidental Observations of Golden Eagles Recorded during Avian Use Surveys at the Lava Ridge Wind Project Study Area from April 3, 2020 to March 31, 2021.**

**Appendix E. Maps of Mean Use for Species of Concern Recorded during Avian Use  
Surveys at the Lava Ridge Wind Project Study Area from  
April 3, 2020 to March 31, 2021**

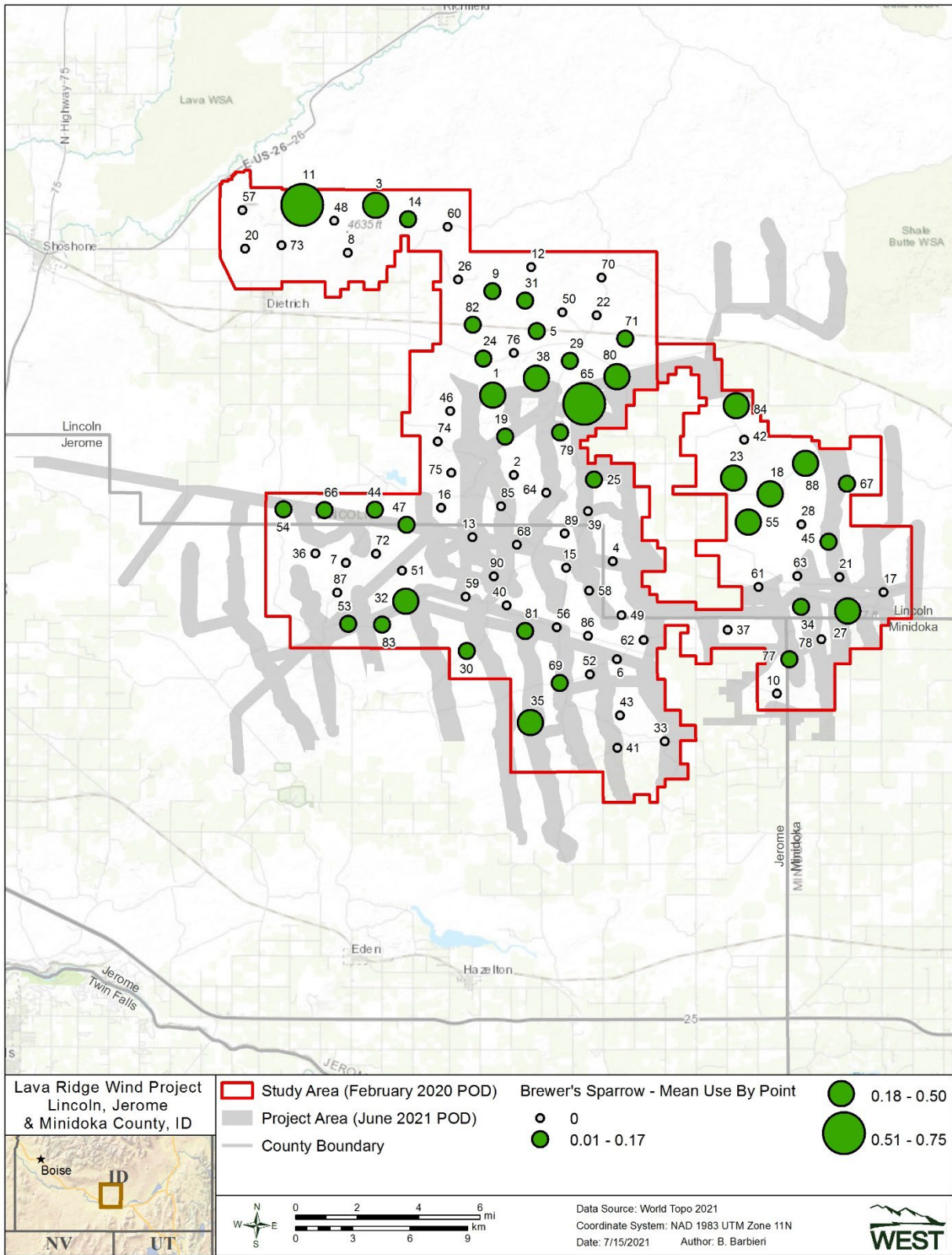


**Appendix E1. Mean use by point for greater sage grouse observed at the Lava Ridge Wind Project Study Area from April 3, 2020 to March 31, 2021.**

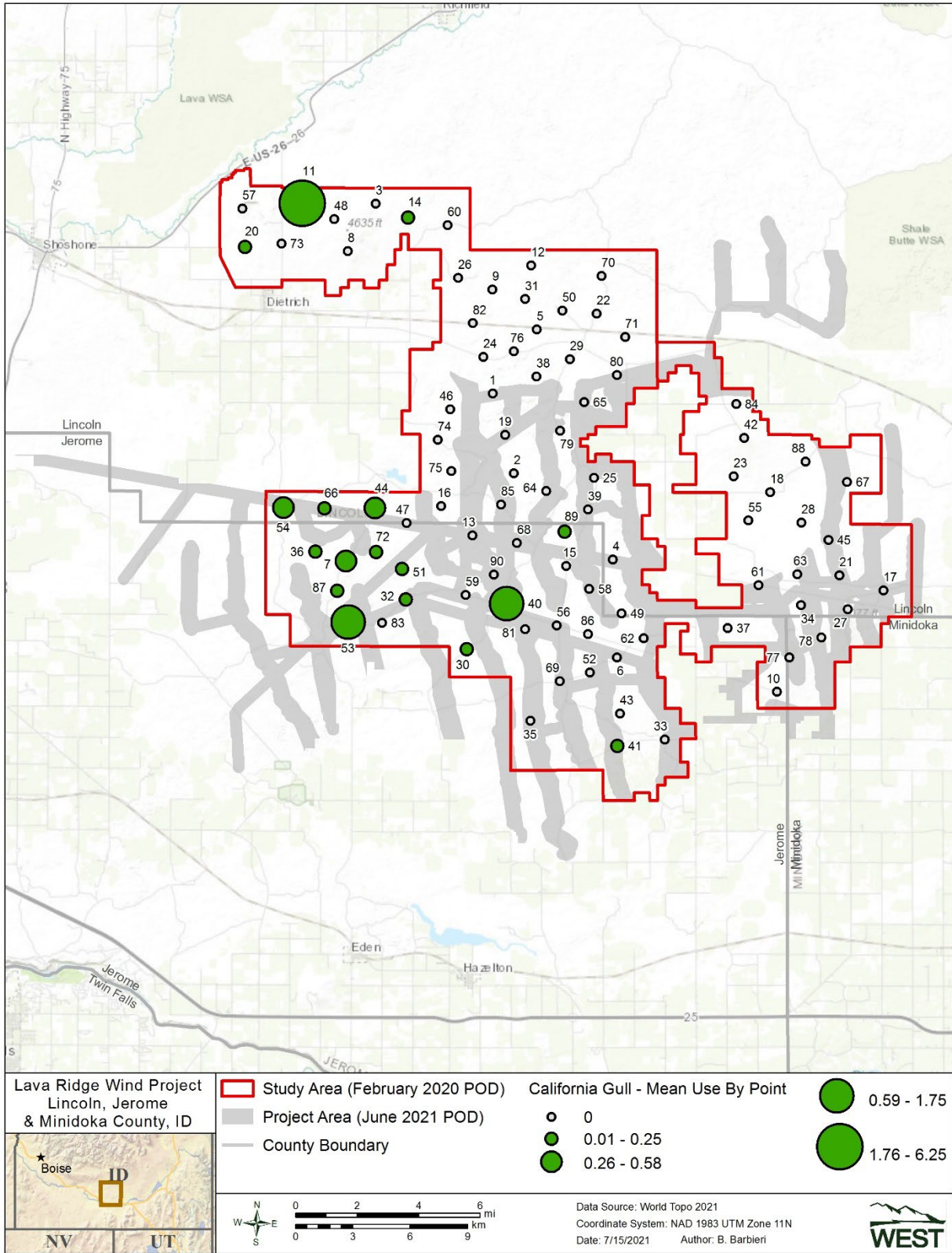




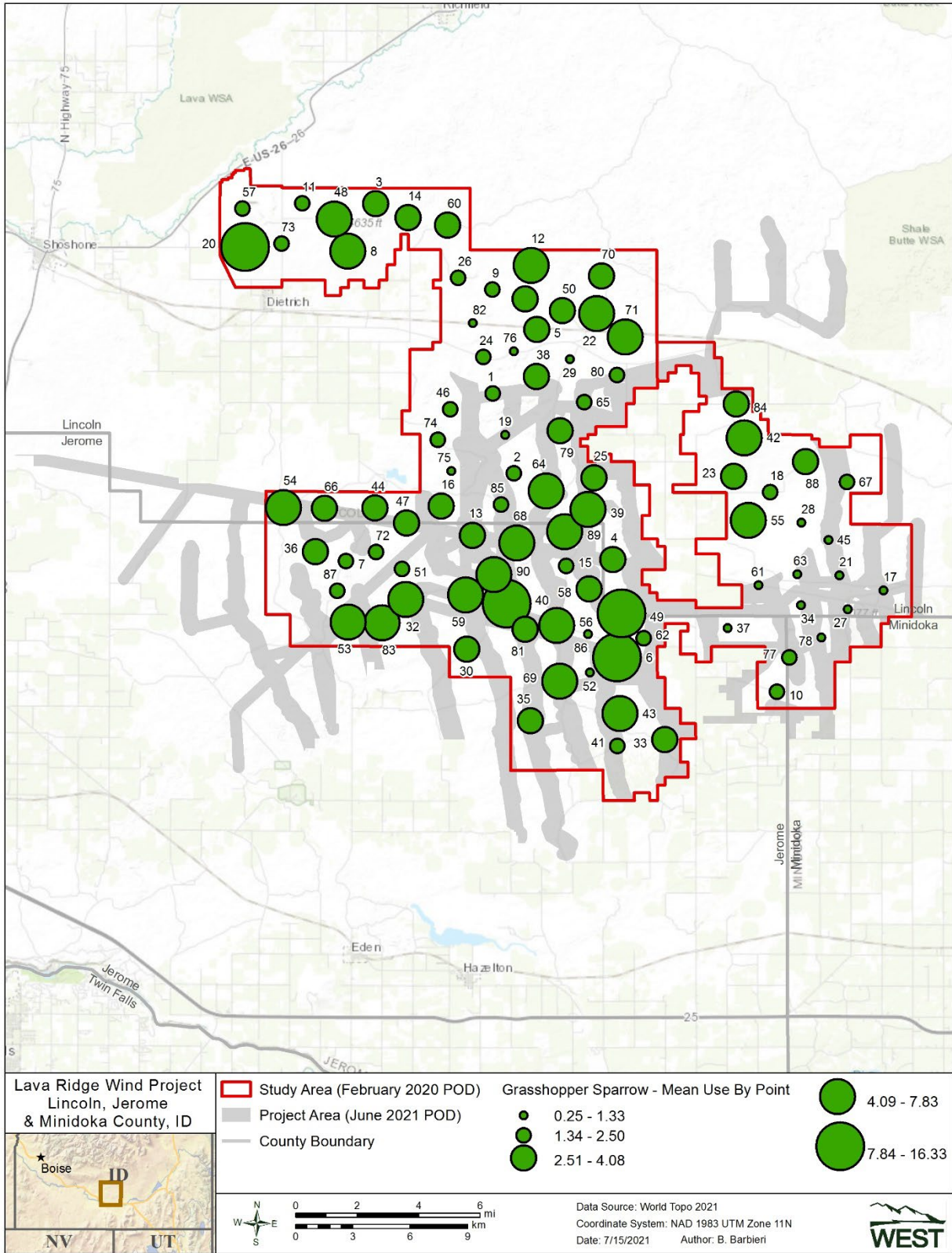
**Appendix E2. Mean use by point for American white pelican observed at the Lava Ridge Wind Project Study Area from April 3, 2020 to March 31, 2021.**



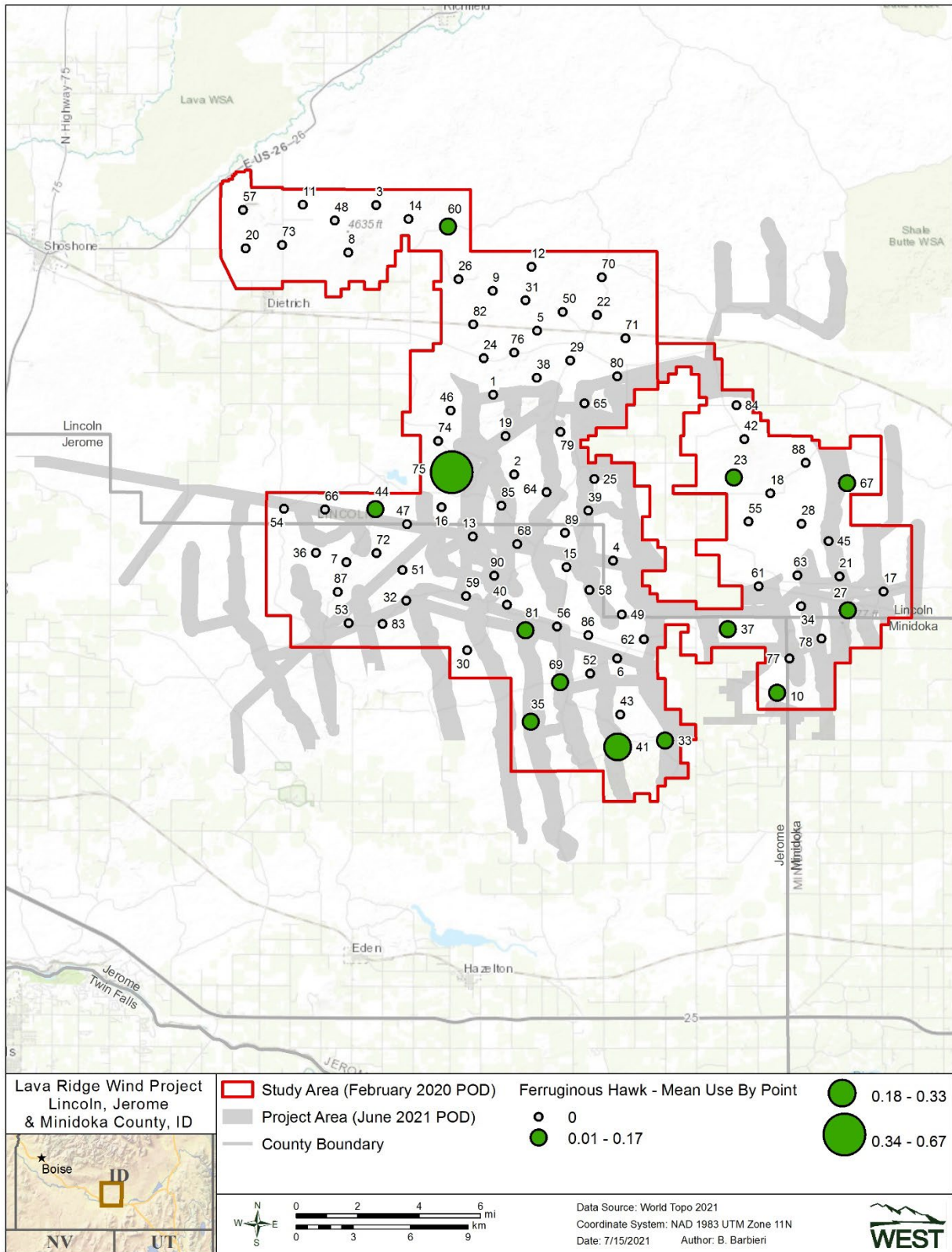
**Appendix E3. Mean use by point for Brewer's sparrow observed at the Lava Ridge Wind Project Study Area from April 3, 2020 to March 31, 2021.**



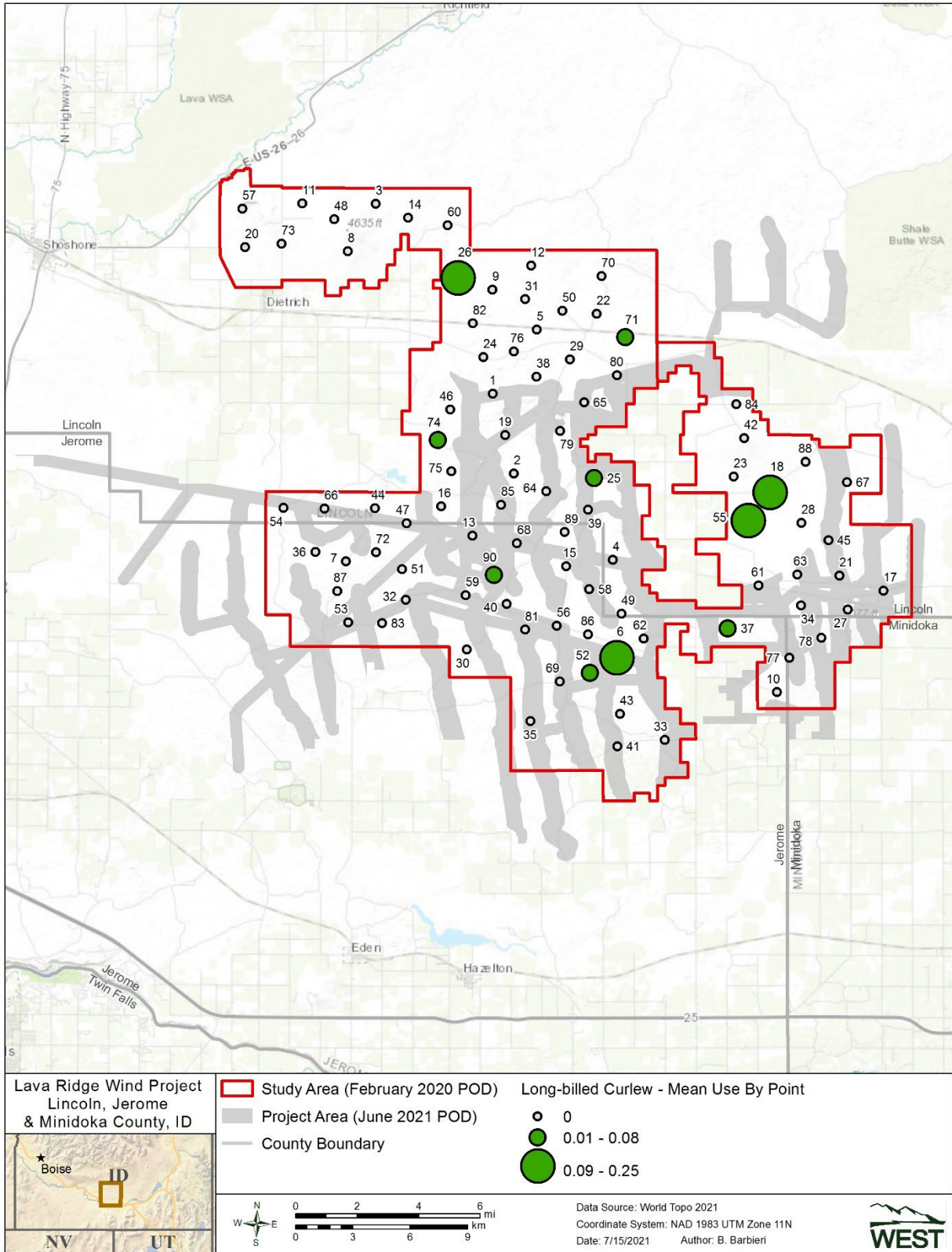
**Appendix E4. Mean use by point for California gull observed at the Lava Ridge Wind Project Study Area from April 3, 2020 to March 31, 2021.**



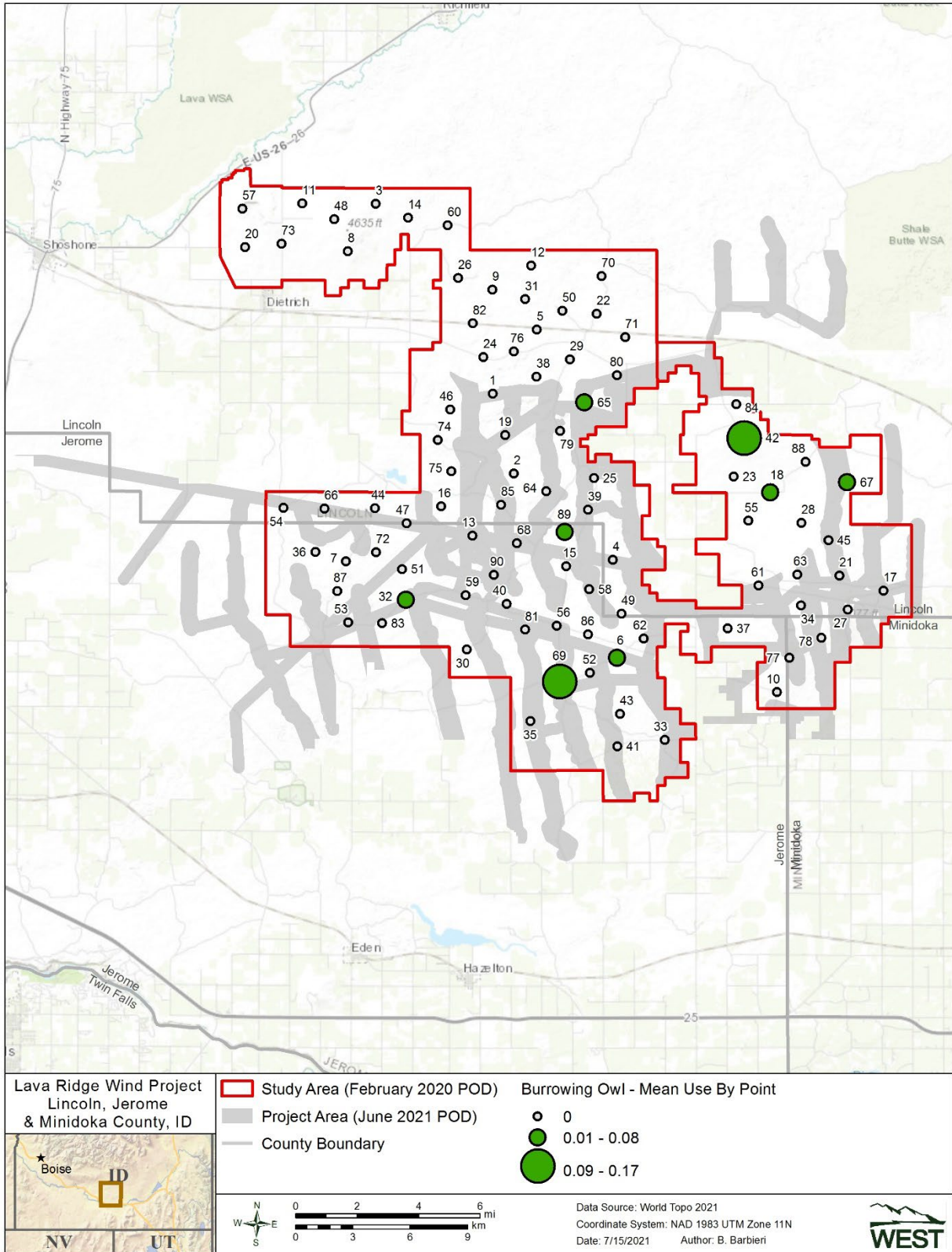
**Appendix E5. Mean use by point for grasshopper sparrow observed at the Lava Ridge Wind Project Study Area from April 3, 2020 to March 31, 2021.**



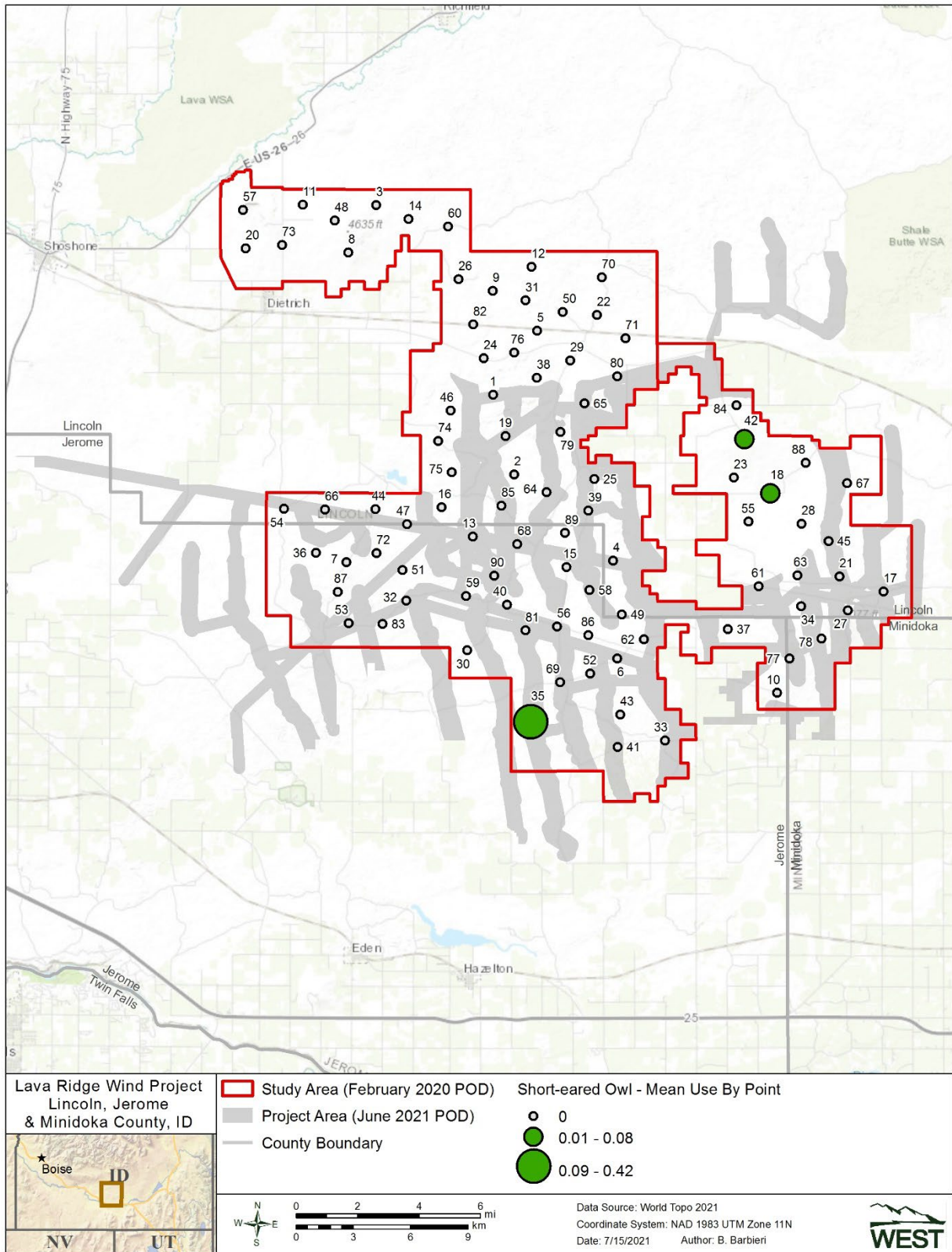
**Appendix E6. Mean use by point for ferruginous hawk observed at the Lava Ridge Wind Project Study Area from April 3, 2020 to March 31, 2021.**



**Appendix E7. Mean use by point for long-billed curlew observed at the Lava Ridge Wind Project Study Area from April 3, 2020 to March 31, 2021.**

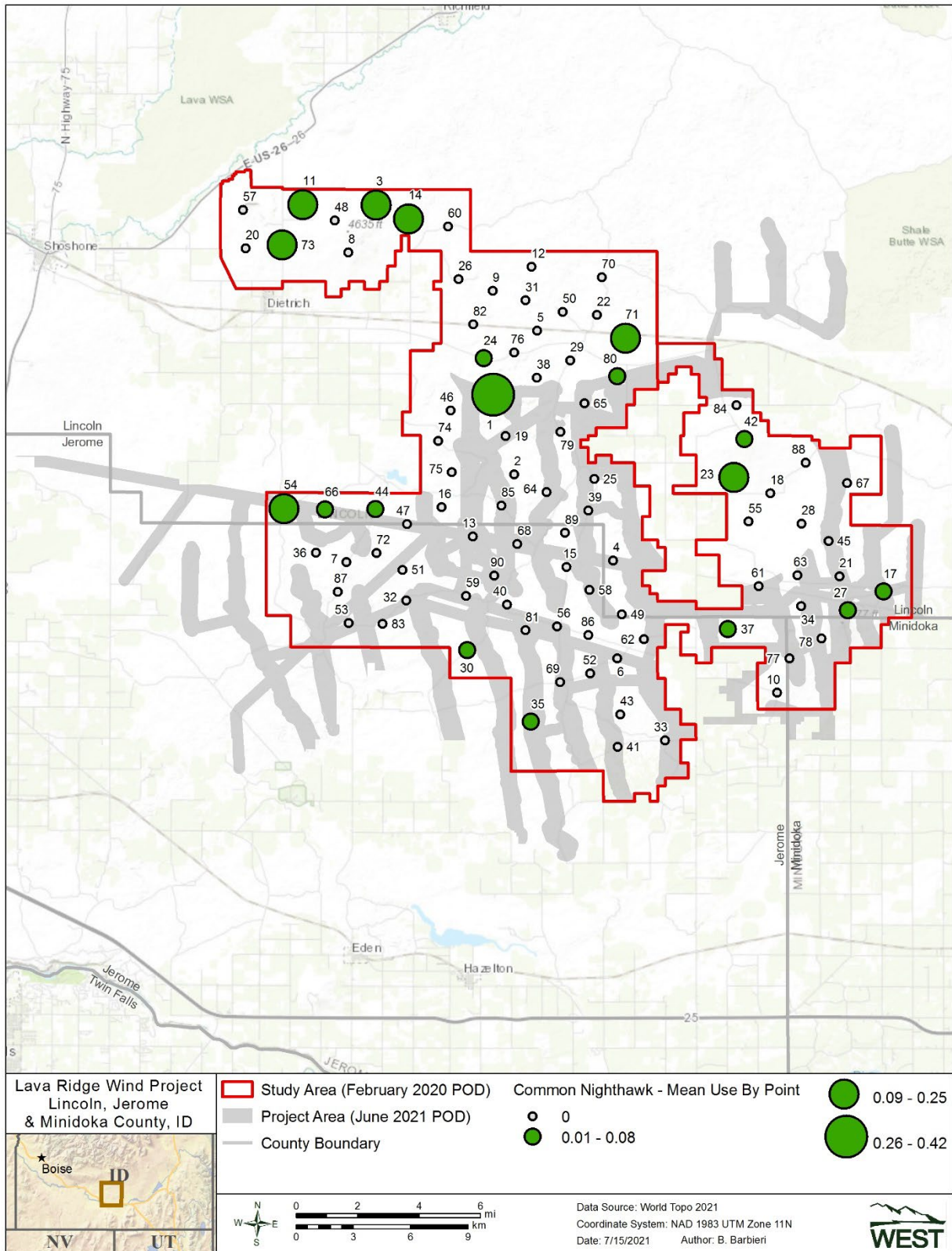


**Appendix E8. Mean use by point for burrowing owl observed at the Lava Ridge Wind Project Study Area from April 3, 2020 to March 31, 2021.**

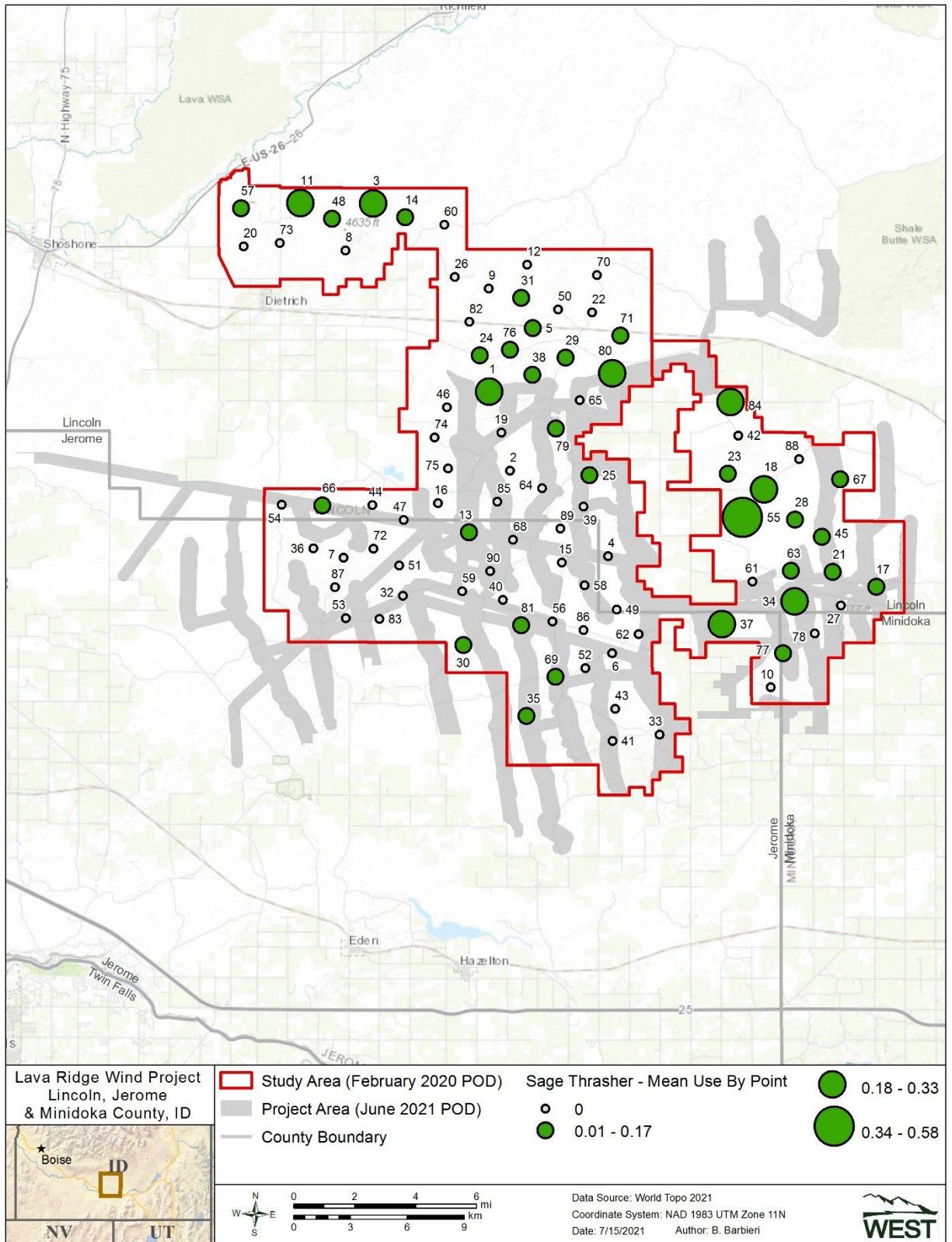


**Appendix E9. Mean use by point for short-eared owl observed at the Lava Ridge Wind Project Study Area from April 3, 2020 to March 31, 2021.**

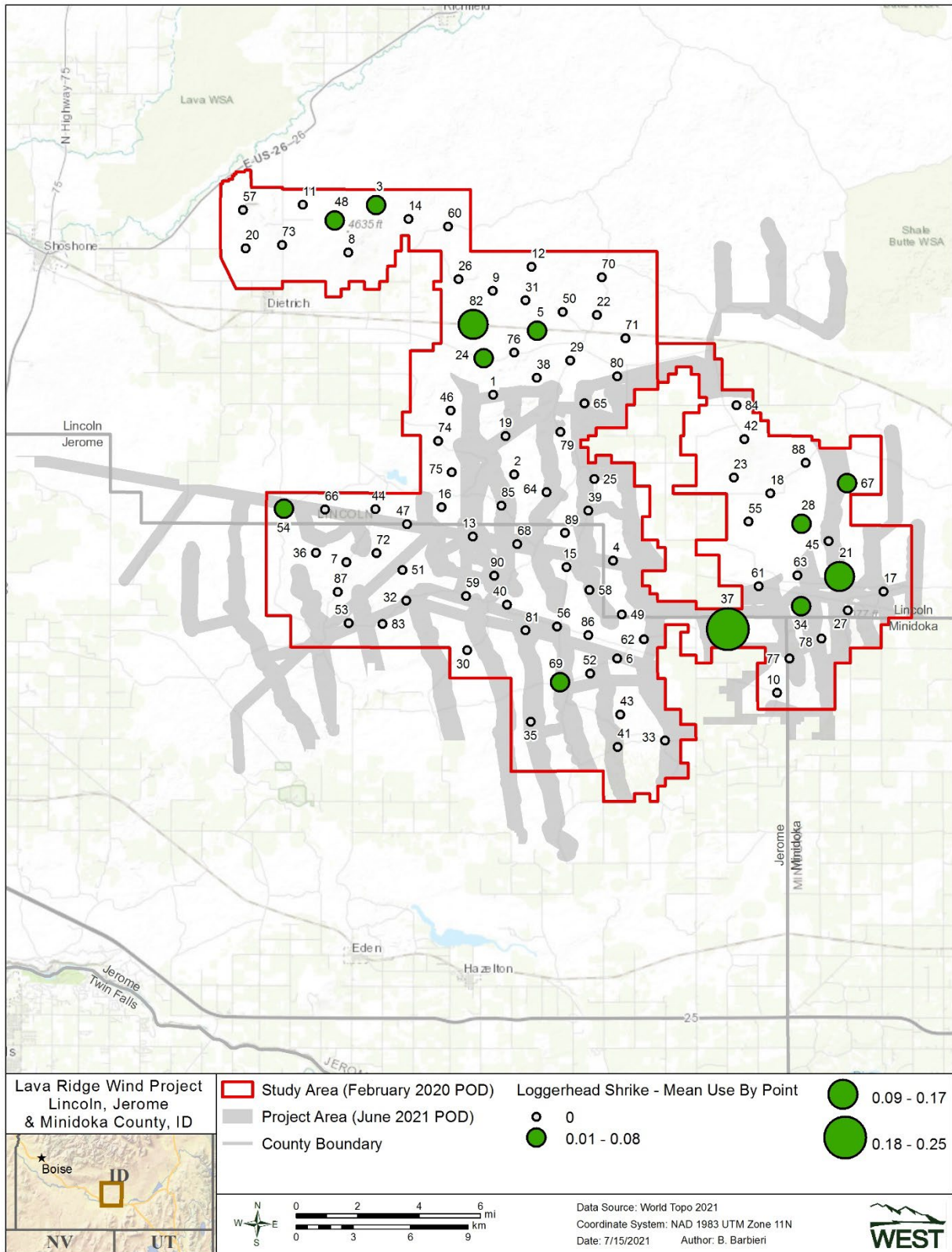




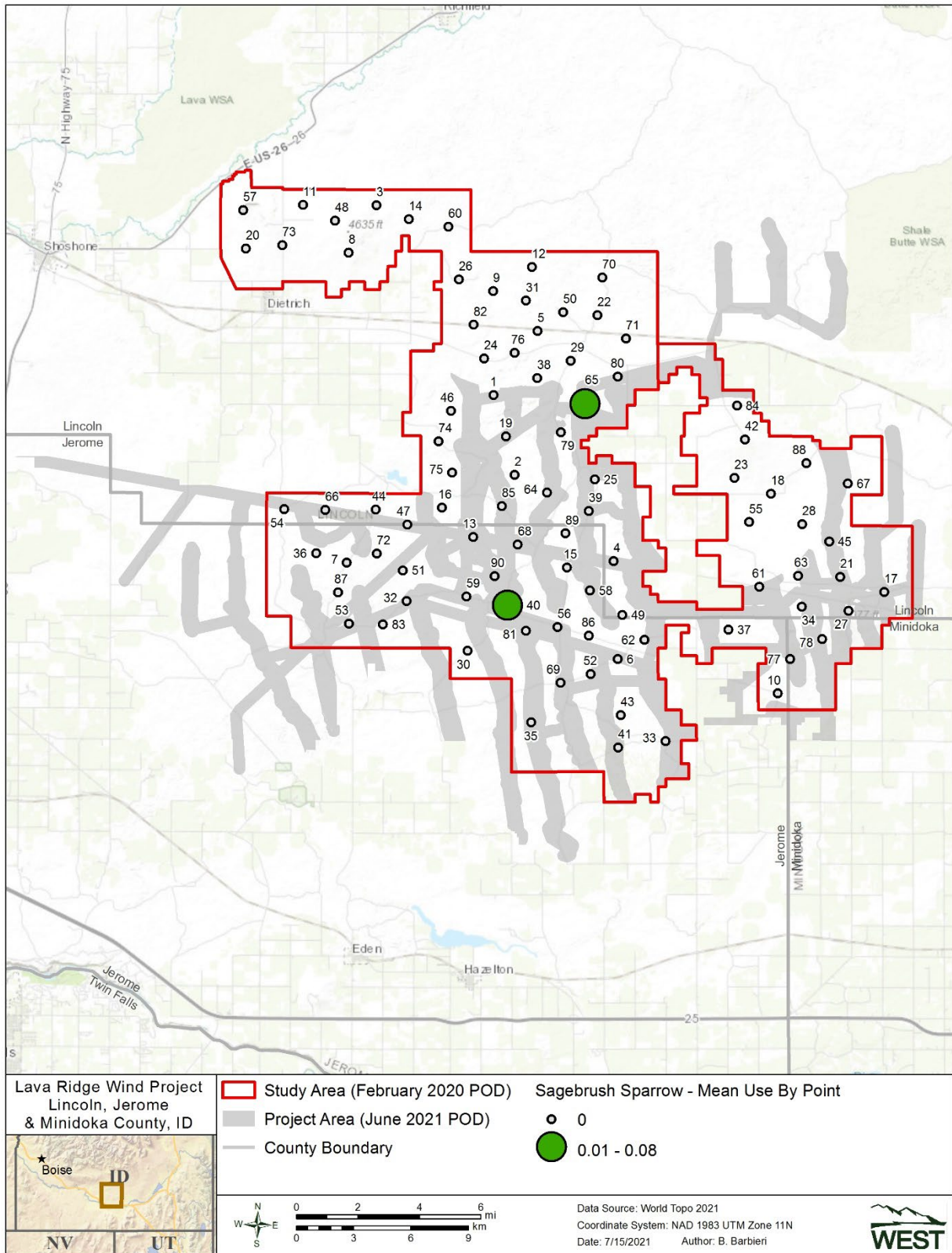
**Appendix E10. Mean use by point for common nighthawk observed at the Lava Ridge Wind Project Study Area from April 3, 2020 to March 31, 2021.**



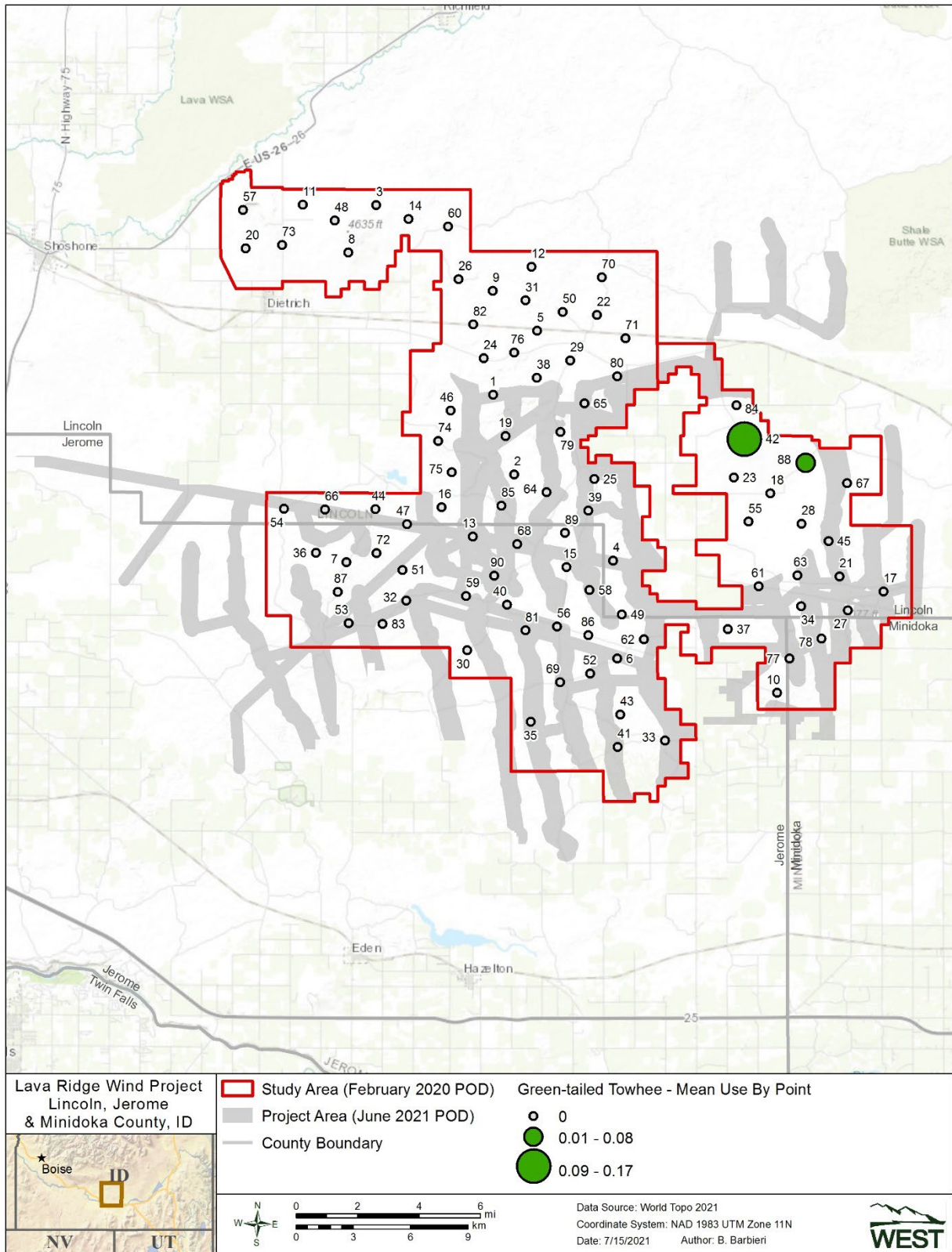
**Appendix E11. Mean use by point for sage thrasher observed at the Lava Ridge Wind Project Study Area from April 3, 2020 to March 31, 2021.**



**Appendix E12. Mean use by point for loggerhead shrike observed at the Lava Ridge Wind Project Study Area from April 3, 2020 to March 31, 2021.**



**Appendix E13. Mean use by point for sagebrush sparrow observed at the Lava Ridge Wind Project Study Area from April 3, 2020 to March 31, 2021.**



**Appendix E14. Mean use by point for green-tailed towhee observed at the Lava Ridge Wind Project Study Area from April 3, 2020 to March 31, 2021.**