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ENVIRONMENTAL & STATISTICAL CONSULTANTS

2725 NW Walnut Boulevard, Corvallis, OR 97330
Phone: 575-802-3959 ◆ www.west-inc.com

TECHNICAL MEMORANDUM

DATE: September 5, 2019

TO: John Kuba – ConnectGen Operating LLC

FROM: Joel Thompson and Andrea Chatfield – Western EcoSystems Technology, Inc.

RE: Results of the Year 2 Avian Use Study at the Fountain Wind Project – Addendum to the Year 1 Avian Use Study Report and Risk Assessment.

INTRODUCTION

The Fountain Wind Project (Project), is a proposed renewable wind energy generation project under development in eastern Shasta County, California by Fountain Wind LLC (Fountain Wind), a subsidiary of Avangrid Renewables LLC. In August 2019, ConnectGen Operating LLC (ConnectGen) entered into agreement with Fountain Wind LLC to lead the continued development of the Project. To address potential impacts of Project development on birds, Western EcoSystems Technology, Inc. (WEST) was contracted to develop and implement a 2-year avian use study at the proposed Project. The study was conducted following the tiered approach outlined in the US Fish and Wildlife Service (USFWS) *Land-Based Wind Energy Guidelines* (WEG; USFWS 2012) and the USFWS *Eagle Conservation Plan Guidance* (ECPG; USFWS 2013), while also collecting data to satisfy the intent of the more dated voluntary California Wind Energy Guidelines (California Energy Commission and California Department of Fish and Game 2007). The principle objectives of the avian use study were to assess the relative abundance and spatial and temporal distribution of birds throughout the Project area, and to evaluate the potential for significant adverse impacts to avian species, particularly eagles, other diurnal raptors, and species of regulatory or management concern.

WEST conducted the initial first-year study (Year 1) over a 14-month period, from April 2017 through May 2018, and prepared the *Avian Use Study Report and Risk Assessment* based on those surveys (Thompson et al. 2018). Following recommendations presented in the ECPG, WEST completed a second year (Year 2) of eagle/avian use surveys at the Project over a 10-month period from June 2018 through March 2019, resulting in a full 2-year survey effort extending from April 2017 – March 2019. The following report presents the results the Year 2 surveys, as well as a comparison of the results between the two study years. Additionally, the avian risk

assessment prepared as part of the Year 1 report was revisited, with a focus on potential risk to bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*), as well as any inter-annual variation in species composition or use documented during the Year 2 surveys that may influence the perceived risk to avian species at the Project based on the Year 1 study alone.

During Year 2 of the study, large and small bird surveys were conducted at the same 39 observation points surveyed in Year 1 (Figure 1). Field and statistical methods were also consistent between the two years of study; for a detailed description of the Project area and survey methods please refer to the Year 1 *Avian Use Study Report and Risk Assessment* (Thompson et al. 2018). While the Project layout has been modified several times between 2017 and 2019, these modifications, including the most recent September 2019 layout, fall entirely within the larger area evaluated during the Year 1 and Year 2 avian use surveys (i.e., “Project Boundary” in Figure 1).

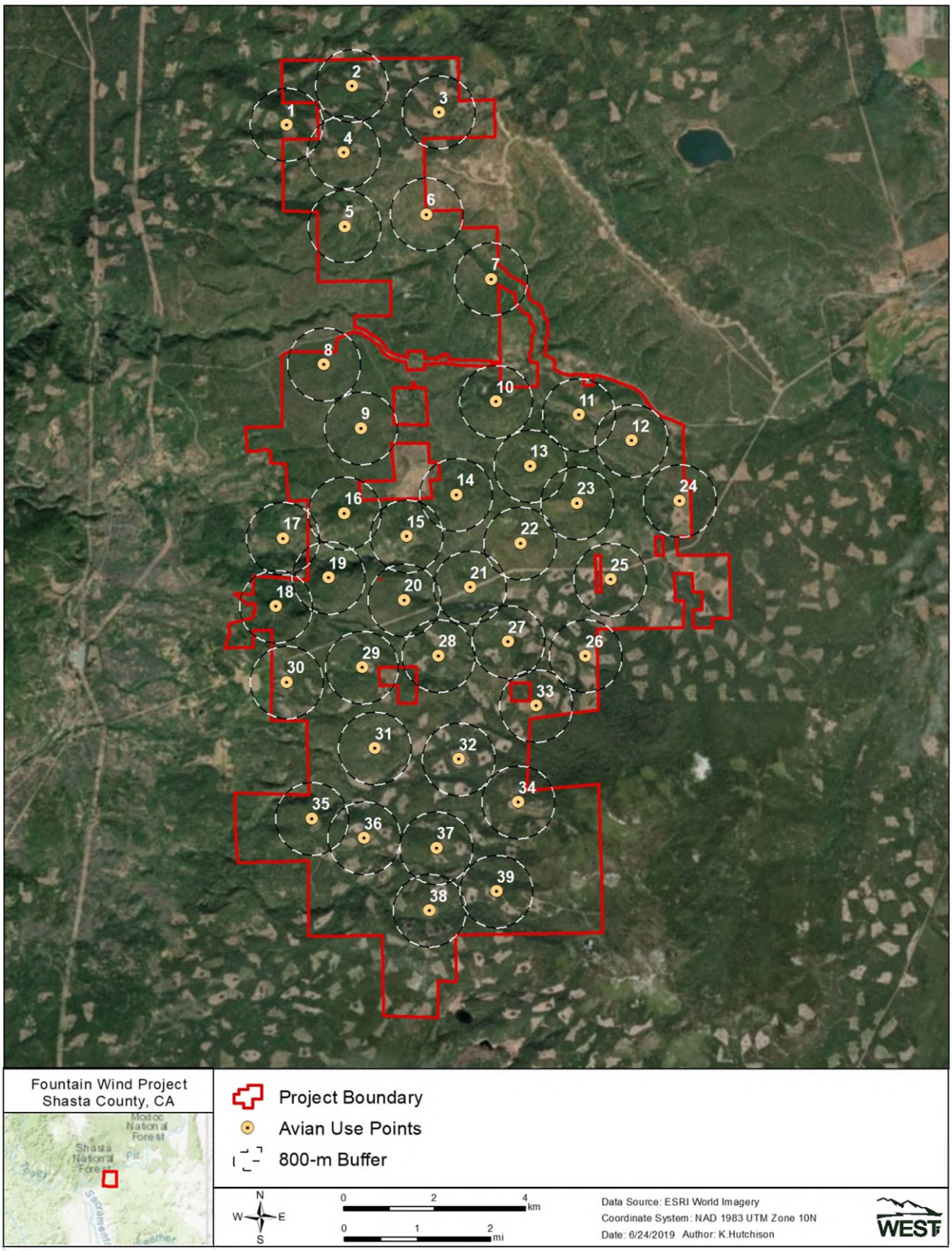


Figure 1. Location of survey plots used during fixed-point avian use surveys at the Fountain Wind Project, Shasta County, California, from 4 June 2018 – 31 March 2019.

YEAR 2 RESULTS

The Year 2 avian use surveys were conducted at the Project from 4 June 2018 through 31 March 2019. Results for large bird and small bird surveys are summarized in separate sections below, supplemented by appendices that present species-level detail on numbers of bird groups and observations observed during each season (Appendix A), species-level detail on seasonal use statistics (Appendix B), use by observation point for large and small bird types (Appendix C), and mapped flight paths for waterbirds, waterfowl, and diurnal raptor species (Appendix D).

Large Bird Surveys

During the Year 2 surveys, 383 60-minute (min) fixed-point large bird surveys were conducted at the Project over the course of 10 visits (Table 1). Not all points were surveyed each visit due to various constraints (e.g., inclement weather, limited access due to snow). Because the Year 1 survey period spanned approximately 14 months, the Year 2 surveys continued for a period of only 10 months, resulting in only a single visit completed in spring of Year 2.

Table 1. Summary of large bird species richness (species/800-meter plot/60-minute survey) and sample size by season and overall during large bird surveys at the Fountain Wind Project from 4 June 2018 – 31 March 2019.

Season	Number of Visits	Number of Surveys Conducted	Number of Species	Large Bird Species Richness
Summer	3	117	14	1.36
Fall	2	78	11	1.59
Winter	4	156	14	0.51
Spring	1	32	12	1.31
Overall	**10**	**383**	**22**	**1.08**

800 meters = 2,625 feet

Species Richness and Species Composition

During 60-min large bird surveys, 8,459 observations were recorded among 706 separate groups (defined as one or more individuals), regardless of distance from the observer (Appendix A1). This included documentation of 22 separate large bird species (Table 1). Large bird species richness (mean number of species per plot per survey) was highest during fall (1.59), followed by summer (1.36), spring (1.31), and winter (0.51; Table 1).

Among the large bird types, waterfowl (7,170 observations in 39 groups) accounted for 84.8% of all large bird observations during the study period (Appendix A1). Most (98.6%) waterfowl observations comprised just two species: greater white-fronted geese (*Anser albifrons*; 5,457 observations) primarily recorded in fall, and snow geese (*Chen caerulescens*; 1,616 observations) primarily recorded in winter (Appendix A1). Other large bird types observed during surveys included vultures (469 observations), waterbirds (366 observations), doves/pigeons (147 observations), diurnal raptors (144 observations), large corvids (143 observations), upland game birds (11 observations), and goatsuckers (nine observations; Appendix A1).

Eleven diurnal raptor species were recorded during large bird surveys, the most common being red-tailed hawk (*Buteo jamaicensis*; 79 observations), sharp-shinned hawk (*Accipiter striatus*; 26 observations), and Cooper's hawk (*A. cooperii*; 16 observations; Appendix A1). A total of seven eagle observations were recorded during surveys, including six bald eagle observations and one golden eagle observation. Bald eagles were recorded primarily in winter (four observations), with only one bald eagle observation in each of summer and spring. The single golden eagle observation was recorded in spring (Appendix A1).

Bird Use, Percent of Use, and Frequency of Occurrence

Mean large bird use (birds per 800-meter [2,625-foot; ft] plot per 60-min survey), percent of use, and frequency of occurrence were calculated by season for all large bird types and species (Appendix B1). The highest overall large bird use occurred in fall (70.10), followed by spring (24.00), winter (11.44), and summer (3.75).

Waterbirds

Waterbird use, comprising two species, American white pelican (*Pelecanus erythrorhynchos*) and sandhill crane (*Antigone canadensis*), was highest in spring (9.88 birds/800-m plot/60-min survey), and much lower in fall (0.37) and winter (0.13); no waterbird use was recorded in summer (Appendix B1). Waterbirds accounted for 41.1% of overall large bird use in spring, all of which was attributed to sandhill crane. Waterbirds accounted for 1.2% of large bird use in winter and 0.5% in fall. Waterbirds were recorded during 9.4% of winter surveys, but only 2.6% and 1.3% of fall and winter surveys, respectively.

Waterfowl

Waterfowl use was highest in fall (65.71 birds/800-m plot/60-min survey), followed by spring (11.25), winter (10.69), and summer (0.15; Appendix B1). Use by four waterfowl species was documented during surveys, with greater white-fronted goose accounting for all (100%) waterfowl use in fall, and snow goose accounting for all (100%) waterfowl use in spring and the majority (75.3%) of use in winter. Other, less abundant waterfowl species recorded included Canada goose (*Branta canadensis*; summer and winter only) and tundra swan (*Cygnus columbianus*; winter only). Waterfowl accounted for over 90% of overall large bird use in fall and winter, and 46.9% in spring, but only 4.1% in summer. Waterfowl were observed most frequently during winter and fall (9.0% and 7.7% of surveys, respectively) and less often during spring and summer (3.1% and 0.9% of surveys, respectively; Appendix B1).

Diurnal Raptors

Diurnal raptor use was highest in fall (0.73 birds/800-m plot/60-min survey), followed by spring (0.53), summer (0.40), and winter (0.15; Appendix B1). Use by 11 diurnal raptor species was recorded during surveys, with red-tailed hawk having the highest use of any diurnal raptor species in all four seasons (range of 0.07 bird/800-m plot/60-min survey in winter to 0.35 in fall), accounting for 47.9% to 67.5% of diurnal raptor use in any given season. Among other diurnal raptor species, sharp-shinned hawk and Cooper's hawk had relatively higher use in fall (0.22 and

0.08 bird/800-m plot/60-min survey, respectively) and spring (0.06 and 0.09 bird/800-m plot/60-min survey, respectively). All other diurnal raptor species recorded during surveys had use estimates of 0.04 bird/800-m plot/60-min survey or less in any given season. Bald eagle use was 0.03 bird/800-m plot/60-min survey in both winter and spring, less than 0.01 in summer, and no use was reported in fall. Golden eagle use was recorded only in spring (0.03 bird/800-m plot/60-min survey). Diurnal raptors accounted for 10.7% of overall large bird use in summer, but only 1.0% to 2.2% in other seasons. Diurnal raptors were observed most frequently in fall (41.0% of fall surveys) and least frequently in winter (12.2% of winter surveys; Appendix B1).

Vultures

Use by vultures (i.e., turkey vulture [*Cathartes aura*]), was highest in summer (2.40 birds/800-m plot/60-min survey), followed by fall (1.90), spring (1.22), and winter (less than 0.01; Appendix B1). Vultures accounted for the majority (64.0%) of overall large bird use during summer, but less than 6.0% of large bird use in other seasons. Vultures were observed during 64.1% of summer surveys, 44.9% of fall surveys, 31.2% of spring surveys, and 0.6% of winter surveys (Appendix B1).

Upland Game Birds

Mountain quail (*Oreortyx pictus*) was the only upland game bird species observed during surveys (Appendix A1). Use by this species was recorded only in summer (0.09 bird/800-m plot/60-min survey) and spring (0.03; Appendix B1). Upland game birds accounted for 2.3% of overall large bird use in summer and 0.1% in spring, and were recorded during 7.7% of summer surveys and 3.1% of spring surveys (Appendix B1).

Doves/Pigeons

Band-tailed pigeon (*Patagioenas fasciata*) was the only dove/pigeon species recorded during surveys (Appendix A1). Use by this species was highest in fall (0.82 bird/800-m plot/60-min survey), followed by spring (0.66), summer (0.32), and winter (0.15). Doves/pigeons accounted for 8.7% of overall large bird use in summer, 2.7% in spring, 1.3% in winter, and 1.2% in fall. Doves/pigeons were recorded during 1.9% to 19.2% of surveys in any given season (Appendix B1).

Large Corvids

Common raven (*Corvus corax*) was the only large corvid species recorded during surveys (Appendix A1). Use by this species was highest in fall (0.58 bird/800-m plot/60-min survey), followed by spring (0.44), and summer and winter (each with 0.31). Large corvids accounted for 8.2% of overall large bird use in summer, but only 0.8% to 2.7% in other seasons. Large corvids were recorded during 15.4% to 23.1% of surveys in any given season (Appendix B1).

Goatsuckers

Use by goatsuckers (0.08 bird/800-m plot/60-min survey) was attributed to a single species, common nighthawk (*Chordeiles minor*), recorded only during summer (Appendix B1).

Goatsuckers accounted for 2.1% of overall large bird use in summer and were recorded during 3.4% of summer surveys (Appendix B1).

Flight Height Characteristics

Flight height characteristics, based on initial flight height observations and estimated use, were calculated for large bird types and raptor subtypes (Table 2). During the 60-min large bird surveys, 666 groups of large birds, totaling 8,411 observations, were observed flying within the 800-m radius plots. Overall, 9.9% of flying large birds were recorded within the rotor-swept heights (RSH) for turbine blades of 30-200 m (98-656 ft) above ground level, 89.3% were above the RSH, and 0.8% were below the RSH (Table 2). The large bird types most often recorded flying within the RSH were goatsuckers (100%), large corvids (96.7%), and vultures (77.1%; Table 2). Overall, diurnal raptors were recorded flying within the RSH during 71.8% of observations, with 23.2% recorded above the RSH and 4.9% below the RSH (Table 2). Among diurnal raptor subtypes, falcons were most often observed flying within the RSH (100%, but based only on a single observation), followed by accipiters 81.4%; Table 2). The majority of waterbirds and waterfowl were recorded above the RSH (74.6% and 99.1%, respectively; Table 2).

Table 2. Flight height characteristics by bird type and raptor subtype during large bird surveys at the Fountain Wind Project from 4 June 2018 – 31 March 2019.

Type	# Groups Flying	# Obs Flying	Mean Flight Height (m)	% Obs Flying	% within Flight Height Categories*		
					0 - 30 m	30 - 200 m**	> 200 m
Waterbirds	10	366	350.00	100	0	25.4	74.6
Waterfowl	39	7,170	511.79	100	0	0.9	99.1
Diurnal Raptors	139	142	172.10	98.6	4.9	71.8	23.2
Accipiters	*43*	*43*	*107.14*	*97.7*	*14.0*	*81.4*	*4.7*
Buteos	*77*	*80*	*194.74*	*98.8*	*1.2*	*68.8*	*30.0*
Northern Harrier	*6*	*6*	*236.67*	*100*	*0*	*50.0*	*50.0*
Eagles	*7*	*7*	*220.00*	*100*	*0*	*71.4*	*28.6*
Falcons	*1*	*1*	*30.00*	*100*	*0*	*100*	*0*
Osprey	*4*	*4*	*207.50*	*100*	*0*	*75.0*	*25.0*
Other Raptors	*1*	*1*	*500.00*	*100*	*0*	*0*	*100*
Vultures	362	468	168.55	99.8	1.5	77.1	21.4
Upland Game Birds	0	0	-	0	-	-	-
Doves/Pigeons	44	134	40.82	91.2	36.6	63.4	0
Large Corvids	69	123	87.10	86.0	2.4	96.7	0.8
Goatsuckers	3	8	70.00	88.9	0	100	0
Overall	**666**	**8,411**	**174.79**	**99.4**	**0.8**	**9.9**	**89.3**

* Sums may not total 100% due to rounding

**The likely "rotor-swept height" for potential collision with a turbine blade, or 30-200 meters (m; 98-656 feet) above ground level

Obs = observations

Spatial Use

Mean use by point for all large birds, large bird types, and diurnal raptor subtypes is included in Appendix C1. For all large bird species combined, use (birds/60-min survey) was substantially higher at points 26 and 17 (459.70 and 109.10, respectively; Appendix C1). Use at points 26 and 17 was dominated by waterfowl, which accounted for 98.9% and 95.6% of large bird use at these points, respectively. Overall large bird use at other points varied widely, ranging from 0.40 bird/60-min survey at Point 22 to 39.80 at Point 10 (Appendix C1).

Waterfowl were observed across the Project area, with use recorded at 18 of the 39 observation points (Appendices C1 and D1). Alternatively, waterbird use was concentrated within the central portion of the Project area, with use recorded at just six of the 39 observation points, ranging from 0.80 to 15.50 birds/60-min survey (Appendices C1 and D1).

Diurnal raptor use (birds/60-min survey) was relatively consistent across the Project area, ranging from zero at points 23 and 35 to 1.00 bird/60-min survey at points 5, 17, and 26 (Appendix C1). Eagle use was recorded at six points, with use estimates ranging from 0.10 to 0.20 bird/60-min survey (Appendix C1). Obvious areas of concentrated use by eagles or other diurnal raptors or consistent flight patterns were not observed (Appendix D2 and D3). Vulture use was recorded at all 39 observation points, with use estimates ranging from 0.20 to 3.40 birds/60-min survey (Appendix C1).

Eagle Risk Minutes

Six bald eagle observations and one golden eagle observation were recorded within the Project area during 383 hours of large bird survey effort in Year 2 (Table 3). Bald eagles were observed in flight for a total of 16 minutes (Table 3). Of the 16 bald eagle minutes recorded during the study, five eagle risk minutes were recorded within the 800-m plots at flight heights of 200 m or less AGL (Table 3). The majority (80.0%) of bald eagle risk minutes were recorded in winter, with only a single bald eagle risk minute recorded in spring and no risk minutes recorded in summer or fall (Table 3). Bald eagle risk minutes per minute of survey were highest during spring (0.0312), followed by winter (0.0256; Table 3). The single golden eagle recorded during surveys was observed in flight for a total of five minutes, which resulted in a total of two golden eagle risk minutes recorded in spring (Table 3).

Bald eagle risk minutes were recorded at four of the 39 observation points (points 8, 20, 29, and 36; Appendix D4). Most of the bald eagle risk minutes were recorded at Point 20 (two risk minutes), with points 8, 29, and 36 contributing an additional one risk minute each. The two golden eagle risk minutes were recorded at Point 29 (Appendix D4).

Table 3. Bald eagle and golden eagle observations and risk minutes* (min) documented during 60-minute large bird surveys conducted at the Fountain Wind Project from 4 June 2018 – 31 March 2019.

Season	Survey Effort (Hours)	Observations	Total Flight Minutes	Risk Minutes	Risk Minutes per Minute Survey
Bald Eagle					
Summer (7/1 – 8/31)	117	1	6	0	0.0000
Fall (9/1 – 10/31)	78	0	0	0	0.0000
Winter (11/1 – 3/12)	156	4	9	4	0.0256
Spring (3/13 – 3/31)	32	1	1	1	0.0312
Total	**383**	**6**	**16**	**5**	**0.0131**
Golden Eagle					
Summer (7/1 – 8/31)	117	0	0	0	0.0000
Fall (9/1 – 10/31)	78	0	0	0	0.0000
Winter (11/1 – 3/12)	156	0	0	0	0.0000
Spring (3/13 – 3/31)	32	1	5	2	0.0625
Total	**383**	**1**	**5**	**2**	**0.0052**

* Risk minutes are defined as flying behavior at or below 200 meters (m; 656 feet [ft]) and within 800 m (2,625 ft) of the survey location.

Small Bird Surveys

During Year 2 surveys, 383 10-min fixed-point small bird surveys were completed at the Project during 10 visits, for a total of 63.8 hours of small bird survey effort (Table 4).

Table 4. Summary of small bird species richness (species/100-meter plot/10-minute survey), and sample size by season and overall during small bird surveys at the Fountain Wind Project from 4 June 2018 – 31 March 2019.

Season	Number of Visits	Number of Surveys Conducted	Number of Species	Small Bird Species Richness
Summer	3	117	42	2.69
Fall	2	78	30	2.27
Winter	4	156	26	1.39
Spring	1	32	22	2.22
Overall	**10**	**383**	**50**	**2.05**

Species Richness and Species Composition

During 10-min small bird surveys, 1,711 small bird observations were recorded within 851 separate groups comprising 50 species (Table 4, Appendix A2). Small bird species richness was highest during summer (2.69 species per 100-m ([328-ft] plot per 10-min survey), followed by fall (2.27), spring (2.22), and winter (1.39; Table 4). Most (93.2%) small birds recorded were passerines (1,595 observations in 748 groups), with the most commonly observed species comprising mountain chickadee (*Poecile gambeli*; 166 observations), red-winged blackbird (*Agelaius phoeniceus*; 165 observations); western bluebird (*Sialia mexicana*; 142 observations), and Steller's jay (*Cyanocitta stelleri*; 133 observations; Appendix A2). Other small bird types recorded included woodpeckers (91 observations) and hummingbirds (25 observations; Appendix A2).

Bird Use, Percent of Use, and Frequency of Occurrence

Mean small bird use (birds/100-m plot/10-min survey), percent of use, and frequency of occurrence were calculated by season for all small bird species (Appendix B2). The highest small bird use was recorded in fall (7.54 birds/100-m plot/10-min survey), followed by spring (4.88), summer (4.84), and winter (2.50). Use by small birds was dominated by passerines during all four seasons. Higher small bird use in fall was primarily attributed to several large groups of red-winged blackbirds, resulting in a fall use estimate for this species of 2.12 birds/100-m plot/10-min survey (Appendix B2). The passerine species with the highest use in spring was western bluebird (1.91 birds/100-m plot/10-min survey), while dark-eyed junco (*Junco hyemalis*) had the highest use in summer (0.52), and mountain chickadee had the highest use in winter (0.51; Appendix B2). Use by woodpeckers was highest in fall (0.45 bird/100-m plot/10-min survey), followed by spring (0.22), summer (0.20), and winter (0.15; Appendix B2). Northern flicker (*Colaptes auratus*) had the highest use of any woodpecker species in summer (0.08 bird/100-m plot/10-min survey), fall (0.18), and spring (0.19), while white-headed woodpecker (*Picoides albolarvatus*) had the highest use in winter (0.06; Appendix B2). Hummingbird use was attributed to two identified species: Anna's hummingbird (*Calypte anna*) and rufous hummingbird (*Selasphorus rufus*), which together resulted in seasonal use ranging from 0.01 bird/100-m plot/10-min survey in fall to 0.14 in summer (Appendix B2).

Bird Flight Height and Behavior

During 10-min small bird surveys, 274 groups (977 observations) were recorded flying within the 100-m radius survey plots (Table 5). Of these, 42.4% were observed flying at heights within the estimated RSH and 57.6% were observed below the RSH; none were observed flying above the RSH (Table 5). Passerines were the small bird type most often observed flying within the RSH (44.2%; Table 5).

Table 5. Flight height characteristics by bird type during small bird surveys at the Fountain Wind Project from 4 June 2018 – 31 March 2019.

Type	# Groups Flying	# Obs Flying	Mean Flight Height (m)	% Obs. Flying	% within Flight Height Categories		
					0 - 30 m	30 - 200 m*	> 200 m
Passerines	222	915	16.27	57.7	55.8	44.2	0
Swifts/Hummingbirds	24	25	12.00	100	92.0	8.0	0
Woodpeckers	28	37	19.00	42.0	78.4	21.6	0
Overall	**274**	**977**	**16.18**	**57.5**	**57.6**	**42.4**	**0**

*The likely "rotor-swept height" for potential collision with a turbine blade, or 30-200 meters (m; 98-656 feet) above ground level.

Obs = observations

Spatial Use

Small bird use varied among the 39 observation points. The highest small bird use was recorded at Point 32 (20.00 birds/10-min survey), while the lowest use was observed at points 34 and 15 (1.20 and 1.50, respectively). Small bird use at other points ranged from 1.60 to 9.22 birds/10-min survey (Appendix C2).

Incidental Observations

Twelve bird species and two mammal species were recorded incidentally during the Year 2 surveys (Table 6). Of the 12 bird species recorded incidentally, only three species, northern pygmy-owl (*Glaucidium gnoma*; one observation), wild turkey (*Meleagris gallopavo*; four observations), and mourning dove (*Zenaida macroura*; two observations), were not observed during standardized fixed-point surveys (Appendices A1 and A2).

Table 6. Summary of number of groups (grps) and observations (obs) of incidental wildlife observed while conducting surveys at the Fountain Wind Project from 4 June 2018 – 31 March 2019.

Species	Scientific Name	# grps	# obs
northern goshawk	*Accipiter gentilis*	1	1
red-tailed hawk	*Buteo jamaicensis*	9	11
northern pygmy-owl	*Glaucidium gnoma*	1	1
turkey vulture	*Cathartes aura*	79	103
wild turkey	*Meleagris gallopavo*	2	4
mountain quail	*Oreortyx pictus*	11	11
band-tailed pigeon	*Patagioenas fasciata*	18	29
mourning dove	*Zenaida macroura*	2	2
common raven	*Corvus corax*	23	31
common nighthawk	*Chordeiles minor*	4	4
northern flicker	*Colaptes auratus*	13	14
pileated woodpecker	*Dryocopus pileatus*	11	11
Bird Total	**12 Species**	**174**	**222**
bobcat	*Lynx rufus*	1	1
black bear	*Ursus americanus*	1	1
Mammal Total	**2 Species**	**2**	**2**

Sensitive Species Observations

Ten bird species considered sensitive at the state and/or federal level were recorded during the Year 2 avian use surveys or incidentally (Table 7). At the state level, this included one state-endangered species (bald eagle), one state fully-protected species (golden eagle), and five state species of special concern (SSC; American white pelican, northern goshawk [*Accipiter gentilis*], northern harrier [*Circus hudsonius*], olive-sided flycatcher [*Contopus cooperi*], and yellow warbler [*Setophaga petechia*]; California Department of Fish and Wildlife [CDFW] 2018; Table 7). Additionally, sandhill crane was recorded during surveys; however, these observations were not identified to the subspecies level. The two subspecies potentially occurring at the Project include *Antigone canadensis tabida*, a state threatened species, and *A. c. canadensis*, a SSC (Table 7).

At the federal level, four species recorded during surveys are considered federal birds of conservation concern in the Sierra Nevada Bird Conservation Region (bald eagle, Cassin's finch [*Haemorhous cassinii*], Lewis's woodpecker [*Melanerpes lewis*], and olive-sided flycatcher; USFWS 2008). In addition, bald and golden eagles receive protection under the federal Bald and Golden Eagle Protection Act of 1940.

Table 7. Summary of sensitive species observed at the Fountain Wind Project during large bird and small bird surveys (LB/SB) and as incidental wildlife observations (Inc.) from 4 June 2018 to 31 March 2019.

			LB/SB		Inc.		Total	
Species	**Scientific Name**	**Status**	**#grps**	**# obs**	**# rps**	**# obs**	**#grps**	**#obs**
American white pelican	*Pelecanus erythrorhynchos*	SSC	4	42	0	0	4	42
bald eagle	*Haliaeetus leucocephalus*	EA; BCC; SE; FP	6	6	0	0	6	6
Cassin's finch	*Haemorhous cassinii*	BCC	4	9	0	0	4	9
golden eagle	*Aquila chrysaetos*	EA; FP	1	1	0	0	1	1
Lewis's woodpecker	*Melanerpes lewis*	BCC	2	10	0	0	2	10
northern goshawk	*Accipiter gentilis*	SSC	1	1	1	1	2	2
northern harrier	*Circus cyaneus*	SSC	6	6	0	0	6	6
olive-sided flycatcher	*Contopus cooperi*	BCC; SSC	6	6	0	0	6	6
sandhill crane	*Antigone canadensis*	ST/SSC**	6	324	0	0	6	324
yellow warbler	*Setophaga petechia*	SSC	3	3	0	0	3	3
Total	**10 Species**		**39**	**408**	**1**	**1**	**40**	**409**

*EA = Bald and Golden Eagle Protection Act of 1940, BCC = federal bird of conservation concern (USFWS 2008); SE = state endangered, ST = state threatened, FP = state fully protected, SSC = state species of special concern (California Department of Fish and Wildlife 2018).

**Observations of sandhill crane were not identified to subspecies level; greater sandhill crane (*A. c. tabida*) is a state-threatened species, while lesser sandhill crane (*A. c. canadensis*) is a state species of special concern.

Grps = groups, obs = observations

DISCUSSION

Following the tiered approach outlined in the WEG and ECPG, and consistent with the survey effort and methodologies recommended specifically for eagles in the ECPG, two full years of avian use surveys were conducted at the Project. Following the Year 1 surveys, conducted from April 2017 to May 2018, WEST prepared an avian use study report that included a detailed risk assessment (see Thompson et al. 2018). This risk assessment was based on the results of the Year 1 surveys that were reviewed in the context of existing publicly available data from post-construction fatality studies at wind energy facilities in the California and Pacific Northwest regions of the US (Thompson et al. 2018). The results of the Year 2 surveys presented herein were compared with the results from Year 1 to determine whether inter-annual variations in species composition or use, particularly for eagles and other sensitive species, warranted an update to the risk assessment presented in the Year 1 report.

In general, the results of the Year 2 surveys are consistent with those documented during Year 1 of the study. Overall use by large birds was higher in Year 2; however, this discrepancy was mainly attributed to the number and timing of several large groups of waterbirds and waterfowl, though species composition between the two years was nearly identical. Higher waterbird use in Year 2, specifically in spring, was attributed to several comparatively large groups of sandhill cranes (five groups totaling 316 observations), while higher waterfowl use in Year 2 was attributed to several large flocks of greater white-fronted geese (13 groups totaling 5,125 observations) recorded in fall. As a result of this increase in fall goose observations, waterfowl composed a much higher percentage of overall large bird use in Year 2 (85%) than in Year 1 (63%). However,

as in Year 1, the majority of waterfowl observations (about 99%) were recorded flying at heights well above the estimated RSH, and therefore, not considered to be at risk of collision with Project turbines.

Seasonal trends in diurnal raptor use (raptors/800-m plot/60-min survey) were very similar between years, with fall and spring having the highest use during both years. During Year 1, diurnal raptor use ranged from 0.23 to 0.56 raptor/800-m plot/60-min survey across seasons (Thompson et al. 2018), while in Year 2, diurnal raptor use ranged from 0.15 to 0.73. Species composition of raptors, was also similar between years with red-tailed hawk having the highest use during each season and overall for both Year 1 and Year 2, and sharp-shinned hawk having the second highest overall use during both years. Bald eagle use was somewhat lower during Year 2 of the study. Over the course of 383 hours of survey effort, only six bald eagle observations were recorded during Year 2 surveys, resulting in a total of five bald eagle risk minutes. In Year 1, over the course of 531 survey hours, 16 bald eagle observations were recorded, resulting in 35 bald eagle risk minutes during that year. During both survey years, the majority of bald eagle observations and risk minutes were recorded during winter. Golden eagle use of the Project was very low during both years of study (two observations in Year 1 and one observation in Year 2) and was limited to spring during both years. Vulture use was also consistent between years, with the lowest use occurring in winter and highest use occurring in summer for both Year 1 and Year 2.

Small bird species composition and use were also very similar between survey years, with the highest small bird use (birds/100-m plot/10-min survey) recorded in fall (5.61 in Year 1 and 7.54 in Year 2) and the lowest use recorded in winter (2.79 in Year 1 and 2.50 in Year 2). Higher fall use in Year 2 was primarily due to several relatively large flocks of red-winged blackbirds, which were not recorded in Year 1. Small bird species composing the majority of use during both study years included dark-eyed junco, mountain chickadee, western bluebird, and Steller's jay. In Year 2, the only sensitive species (including both large and small birds) recorded during surveys that was not also seen in Year 1 was Lewis's woodpecker, which is a federal BCC.

CONCLUSION

The results of the Year 2 surveys at the Project presented herein are consistent with the results of the initial year of study, both in species composition and seasonal and spatial trends in use. The avian risk assessment prepared as part of the Year 1 Avian Use Study Report (Thompson et al. 2018), therefore, remains a valid assessment of the potential impacts to avian species, including eagles and other special-status species, resulting from the development of the Project.

REFERENCES

Bald and Golden Eagle Protection Act (BGEPA). 1940. 16 United States Code (USC) Section (§) 668-668d. Bald Eagle Protection Act of 1940, June 8, 1940, Chapter 278, § 2, 54 Statute (Stat.) 251; Expanded to include the related species of the golden eagle October 24, 1962, Public Law (PL) 87-884, 76 Stat. 1246. [as amended: October 23, 1972, PL 92-535, § 2, 86 Stat. 1065; November 8, 1978, PL 95-616, § 9, 92 Stat. 3114.].

California Department of Fish and Wildlife (CDFW). 2018. Special Animals List. California Natural Diversity Database. November 2018. Available online: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109406&inline

California Energy Commission (CEC) and California Department of Fish and Game (CDFG). 2007. California Guidelines for Reducing Impacts to Birds and Bats from Wind Energy Development. Commission Final Report. CEC, Renewables Committee, and Energy Facilities Siting Division, and CDFG, Resources Management and Policy Division. CEC-700-2007-008-CMF.

ESRI. 2019. World Imagery and Aerial Photos. (World Topo). ArcGIS Resource Center. Environmental Systems Research Institute (ESRI), producers of ArcGIS software. Redlands, California. Information online: http://www.arcgis.com/home/webmap/viewer.html?useExisting=1

North American Datum (NAD). 1983. NAD83 Geodetic Datum.

Thompson, J., A. Chatfield, and Q. Hays. 2018. Year 1 Avian Use Study Report and Risk Assessment for the Fountain Wind Project, Shasta County, California. Prepared for Pacific Wind Development LLC, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Corvallis, Oregon. October 2018.

US Fish and Wildlife Service (USFWS). 2008. Birds of Conservation Concern 2008. December 2008. Division of Migratory Bird Management, Arlington, Virginia. Available online: https://www.fws.gov/migratorybirds/pdf/grants/BirdsofConservationConcern2008.pdf

US Fish and Wildlife Service (USFWS). 2012. Land-Based Wind Energy Guidelines. March 23, 2012. 82 pp. Available online: http://www.fws.gov/cno/pdf/Energy/2012_Wind_Energy_Guidelines_final.pdf

US Fish and Wildlife Service (USFWS). 2013. Eagle Conservation Plan Guidance: Module 1 - Land-Based Wind Energy, Version 2. US Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management. April 2013. Executive Summary and frontmatter + 103 pp. Available online: https://www.fws.gov/migratorybirds/pdf/management/eagleconservationplan guidance.pdf

Appendix A. All Bird Types and Species Observed at the Fountain Wind Project during Fixed-Point Bird Use Surveys from 4 June 2018 – 31 March 2019

Appendix A1. Summary of number of groups (grps) and observations (obs) by bird type and species for 60-minute large bird surveys at the Fountain Wind Project* from 4 June 2018 – 31 March 2019.

		Summer		Fall		Winter		Spring		Total	
Type/Species	**Scientific Name**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
Waterbirds		**0**	**0**	**3**	**29**	**2**	**21**	**5**	**316**	**10**	**366**
American white pelican	*Pelecanus erythrorhynchos*	0	0	3	29	1	13	0	0	4	42
sandhill crane	*Antigone canadensis*	0	0	0	0	1	8	5	316	6	324
Waterfowl		**1**	**18**	**13**	**5,125**	**24**	**1,667**	**1**	**360**	**39**	**7,170**
Canada goose	*Branta canadensis*	1	18	0	0	2	36	0	0	3	54
greater white-fronted goose	*Anser albifrons*	0	0	13	5,125	7	332	0	0	20	5,457
snow goose	*Chen caerulescens*	0	0	0	0	13	1,256	1	360	14	1,616
tundra swan	*Cygnus columbianus*	0	0	0	0	2	43	0	0	2	43
Diurnal Raptors		**45**	**47**	**56**	**57**	**23**	**23**	**17**	**17**	**141**	**144**
Accipiters		*9*	*9*	*24*	*24*	*6*	*6*	*5*	*5*	*44*	*44*
Cooper's hawk	*Accipiter cooperii*	4	4	6	6	3	3	3	3	16	16
northern goshawk	*Accipiter gentilis*	1	1	0	0	0	0	0	0	1	1
sharp-shinned hawk	*Accipiter striatus*	4	4	17	17	3	3	2	2	26	26
unidentified accipiter	*Accipiter* spp.	0	0	1	1	0	0	0	0	1	1
Buteos		*32*	*34*	*26*	*27*	*11*	*11*	*9*	*9*	*78*	*81*
ferruginous hawk	*Buteo regalis*	1	1	0	0	0	0	0	0	1	1
red-tailed hawk	*Buteo jamaicensis*	30	32	26	27	11	11	9	9	76	79
rough-legged hawk	*Buteo lagopus*	1	1	0	0	0	0	0	0	1	1
Northern Harrier		*0*	*0*	*3*	*3*	*2*	*2*	*1*	*1*	*6*	*6*
northern harrier	*Circus hudsonius*	0	0	3	3	2	2	1	1	6	6
Eagles		*1*	*1*	*0*	*0*	*4*	*4*	*2*	*2*	*7*	*7*
bald eagle	*Haliaeetus leucocephalus*	1	1	0	0	4	4	1	1	6	6
golden eagle	*Aquila chrysaetos*	0	0	0	0	0	0	1	1	1	1
Falcons		*0*	*0*	*1*	*1*	*0*	*0*	*0*	*0*	*1*	*1*
merlin	*Falco columbarius*	0	0	1	1	0	0	0	0	1	1
Osprey		*3*	*3*	*1*	*1*	*0*	*0*	*0*	*0*	*4*	*4*
osprey	*Pandion haliaetus*	3	3	1	1	0	0	0	0	4	4
Other Raptors		*0*	*0*	*1*	*1*	*0*	*0*	*0*	*0*	*1*	*1*
unidentified raptor		0	0	1	1	0	0	0	0	1	1
Vultures		**225**	**281**	**114**	**148**	**1**	**1**	**23**	**39**	**363**	**469**
turkey vulture	*Cathartes aura*	225	281	114	148	1	1	23	39	363	469

Appendix A1. Summary of number of groups (grps) and observations (obs) by bird type and species for 60-minute large bird surveys at the Fountain Wind Project* from 4 June 2018 – 31 March 2019.

		Summer		Fall		Winter		Spring		Total	
Type/Species	**Scientific Name**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
Upland Game Birds		**9**	**10**	**0**	**0**	**0**	**0**	**1**	**1**	**10**	**11**
mountain quail	*Oreortyx pictus*	9	10	0	0	0	0	1	1	10	11
Doves/Pigeons		**20**	**38**	**22**	**64**	**3**	**24**	**6**	**21**	**51**	**147**
band-tailed pigeon	*Patagioenas fasciata*	20	38	22	64	3	24	6	21	51	147
Large Corvids		**26**	**36**	**20**	**45**	**35**	**48**	**7**	**14**	**88**	**143**
common raven	*Corvus corax*	26	36	20	45	35	48	7	14	88	143
Goatsuckers		**4**	**9**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**9**
common nighthawk	*Chordeiles minor*	4	9	0	0	0	0	0	0	4	9
Overall		**330**	**439**	**228**	**5,468**	**88**	**1,784**	**60**	**768**	**706**	**8,459**

* Regardless of distance from observer.

Appendix A2. Summary of number of groups (grps) and observations (obs) by bird type and species for 10-minute small bird surveys at the Fountain Wind Project* from 4 June 2018 – 31 March 2019.

		Summer		Fall		Winter		Spring		Total	
Type/Species	**Scientific Name**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
Passerines		**314**	**533**	**161**	**553**	**206**	**364**	**67**	**145**	**748**	**1,595**
American robin	*Turdus migratorius*	12	28	3	6	12	46	0	0	27	80
Bewick's wren	*Thryomanes bewickii*	4	4	3	3	1	1	1	1	9	9
black-headed grosbeak	*Pheucticus melanocephalus*	1	1	0	0	0	0	0	0	1	1
black-tailed gnatcatcher	*Polioptila melanura*	1	1	0	0	0	0	0	0	1	1
black-throated gray warbler	*Setophaga nigrescens*	3	3	0	0	0	0	0	0	3	3
bushtit	*Psaltriparus minimus*	3	43	2	11	1	3	1	5	7	62
California scrub-jay	*Aphelocoma californica*	2	2	8	29	3	3	2	2	15	36
California towhee	*Melozone crissalis*	3	5	0	0	0	0	0	0	3	5
Cassin's finch	*Haemorhous cassinii*	0	0	1	1	1	1	2	7	4	9
Cassin's vireo	*Vireo cassinii*	4	4	0	0	0	0	0	0	4	4
Clark's nutcracker	*Nucifraga columbiana*	1	15	0	0	0	0	0	0	1	15
dark-eyed junco	*Junco hyemalis*	40	62	9	30	15	28	4	5	68	125
dusky flycatcher	*Empidonax oberholseri*	3	3	1	1	0	0	0	0	4	4
evening grosbeak	*Coccothraustes vespertinus*	1	7	1	25	0	0	0	0	2	32
fox sparrow	*Passerella iliaca*	10	11	0	0	1	1	1	1	12	13
golden-crowned kinglet	*Regulus satrapa*	1	1	10	17	26	43	6	17	43	78
green-tailed towhee	*Pipilo chlorurus*	1	1	0	0	0	0	0	0	1	1
hermit thrush	*Catharus guttatus*	2	2	1	1	1	1	0	0	4	4
Hutton's vireo	*Vireo huttoni*	2	2	0	0	3	4	1	1	6	7
lazuli bunting	*Passerina amoena*	3	4	0	0	0	0	0	0	3	4
lesser goldfinch	*Spinus psaltria*	2	5	0	0	0	0	0	0	2	5
mountain chickadee	*Poecile gambeli*	31	44	14	24	40	80	13	18	98	166
Nashville warbler	*Oreothlypis ruficapilla*	1	4	0	0	0	0	0	0	1	4
oak titmouse	*Baeolophus inornatus*	0	0	1	2	2	5	0	0	3	7
olive-sided flycatcher	*Contopus cooperi*	6	6	0	0	0	0	0	0	6	6
purple finch	*Haemorhous purpureus*	4	8	1	50	1	2	1	1	7	61
red-breasted nuthatch	*Sitta canadensis*	28	33	17	17	30	32	9	9	84	91
red-winged blackbird	*Agelaius phoeniceus*	0	0	3	165	0	0	0	0	3	165
ruby-crowned kinglet	*Regulus calendula*	0	0	5	5	10	13	1	1	16	19
song sparrow	*Melospiza melodia*	0	0	0	0	1	1	0	0	1	1
spotted towhee	*Pipilo maculatus*	30	31	10	10	6	6	1	1	47	48
Steller's jay	*Cyanocitta stelleri*	37	44	33	36	38	46	7	7	115	133
Townsend's solitaire	*Myadestes townsendi*	3	3	0	0	1	3	1	1	5	7
unidentified passerine		3	6	1	1	0	0	0	0	4	7
unidentified swallow		8	68	1	30	0	0	0	0	9	98

Appendix A2. Summary of number of groups (grps) and observations (obs) by bird type and species for 10-minute small bird surveys at the Fountain Wind Project* from 4 June 2018 – 31 March 2019.

		Summer		Fall		Winter		Spring		Total	
Type/Species	**Scientific Name**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
unidentified warbler		1	1	0	0	0	0	0	0	1	1
violet-green swallow	*Tachycineta thalassina*	0	0	1	20	0	0	1	4	2	24
western bluebird	*Sialia mexicana*	4	14	8	30	6	37	12	61	30	142
western tanager	*Piranga ludoviciana*	17	17	0	0	0	0	0	0	17	17
western wood-pewee	*Contopus sordidulus*	11	11	0	0	0	0	0	0	11	11
white-crowned sparrow	*Zonotrichia leucophrys*	0	0	1	1	0	0	0	0	1	1
wrentit	*Chamaea fasciata*	7	7	5	5	7	8	3	3	22	23
yellow warbler	*Setophaga petechia*	3	3	0	0	0	0	0	0	3	3
yellow-rumped warbler	*Setophaga coronata*	21	29	21	33	0	0	0	0	42	62
Swifts/Hummingbirds		**16**	**16**	**1**	**1**	**3**	**4**	**4**	**4**	**24**	**25**
Anna's hummingbird	*Calypte anna*	9	9	1	1	3	4	2	2	15	16
rufous hummingbird	*Selasphorus rufus*	0	0	0	0	0	0	2	2	2	2
unidentified hummingbird		7	7	0	0	0	0	0	0	7	7
Woodpeckers		**23**	**25**	**28**	**36**	**21**	**23**	**7**	**7**	**79**	**91**
northern flicker	*Colaptes auratus*	10	10	14	14	7	7	6	6	37	37
downy woodpecker	*Dryobates pubescens*	4	6	1	1	1	1	0	0	6	8
hairy woodpecker	*Dryobates villosus*	4	4	6	6	3	4	1	1	14	15
pileated woodpecker	*Dryocopus pileatus*	1	1	0	0	0	0	0	0	1	1
acorn woodpecker	*Melanerpes formicivorus*	0	0	1	1	0	0	0	0	1	1
Lewis's woodpecker	*Melanerpes lewis*	0	0	2	10	0	0	0	0	2	10
white-headed woodpecker	*Picoides albolarvatus*	3	3	3	3	9	10	0	0	15	16
red-breasted sapsucker	*Sphyrapicus ruber*	1	1	1	1	0	0	0	0	2	2
unidentified woodpecker		0	0	0	0	1	1	0	0	1	1
Overall		**353**	**574**	**190**	**590**	**230**	**391**	**78**	**156**	**851**	**1,711**

* Regardless of distance from observer.

Appendix B. Mean Use, Percent of Use, and Frequency of Occurrence for Large Birds and Small Birds Observed during Fixed-Point Bird Use Surveys at the Fountain Wind Project from 4 June 2018 – 31 March 2019

Appendix B1. Mean large bird use (number of large birds/800-meter plot/60-minute survey), percent of total use (%), and frequency of occurrence (%) for each large bird type and species by season during large bird surveys at the Fountain Wind Project from 4 June 2018 – 31 March 2019.

	Mean Use				% of Use				% Frequency			
Type/Species	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**
Waterbirds	**0**	**0.37**	**0.13**	**9.88**	**0**	**0.5**	**1.2**	**41.1**	**0**	**2.6**	**1.3**	**9.4**
American white pelican	0	0.37	0.08	0	0	0.5	0.7	0	0	2.6	0.6	0
sandhill crane	0	0	0.05	9.88	0	0	0.4	41.1	0	0	0.6	9.4
Waterfowl	**0.15**	**65.71**	**10.69**	**11.25**	**4.1**	**93.7**	**93.4**	**46.9**	**0.9**	**7.7**	**9.0**	**3.1**
Canada goose	0.15	0	0.23	0	4.1	0	2.0	0	0.9	0	1.3	0
greater white-fronted goose	0	65.71	2.13	0	0	93.7	18.6	0	0	7.7	3.8	0
snow goose	0	0	8.05	11.25	0	0	70.4	46.9	0	0	4.5	3.1
tundra swan	0	0	0.28	0	0	0	2.4	0	0	0	1.3	0
Diurnal Raptors	**0.40**	**0.73**	**0.15**	**0.53**	**10.7**	**1.0**	**1.3**	**2.2**	**26.5**	**41.0**	**12.2**	**31.2**
Accipiters	*0.08*	*0.31*	*0.04*	*0.16*	*2.1*	*0.4*	*0.3*	*0.7*	*6.0*	*25.6*	*3.2*	*12.5*
Cooper's hawk	0.03	0.08	0.02	0.09	0.9	0.1	0.2	0.4	3.4	7.7	1.9	9.4
northern goshawk	<0.01	0	0	0	0.2	0	0	0	0.9	0	0	0
sharp-shinned hawk	0.03	0.22	0.02	0.06	0.9	0.3	0.2	0.3	2.6	20.5	1.3	6.2
unidentified accipiter	0	0.01	0	0	0	<0.1	0	0	0	1.3	0	0
Buteos	*0.29*	*0.35*	*0.07*	*0.28*	*7.7*	*0.5*	*0.6*	*1.2*	*21.4*	*26.9*	*7.1*	*21.9*
red-tailed hawk	0.27	0.35	0.07	0.28	7.3	0.5	0.6	1.2	19.7	26.9	7.1	21.9
rough-legged hawk	<0.01	0	0	0	0.2	0	0	0	0.9	0	0	0
ferruginous hawk	<0.01	0	0	0	0.2	0	0	0	0.9	0	0	0
Northern Harrier	*0*	*0.04*	*0.01*	*0.03*	*0*	*<0.1*	*0.1*	*0.1*	*0*	*3.8*	*1.3*	*3.1*
northern harrier	0	0.04	0.01	0.03	0	<0.1	0.1	0.1	0	3.8	1.3	3.1
Eagles	*<0.01*	*0*	*0.03*	*0.06*	*0.2*	*0*	*0.2*	*0.3*	*0.9*	*0*	*2.6*	*3.1*
bald eagle	<0.01	0	0.03	0.03	0.2	0	0.2	0.1	0.9	0	2.6	3.1
golden eagle	0	0	0	0.03	0	0	0	0.1	0	0	0	3.1
Falcons	*0*	*0.01*	*0*	*0*	*0*	*<0.1*	*0*	*0*	*0*	*1.3*	*0*	*0*
merlin	0	0.01	0	0	0	<0.1	0	0	0	1.3	0	0
Osprey	*0.03*	*0.01*	*0*	*0*	*0.7*	*<0.1*	*0*	*0*	*2.6*	*1.3*	*0*	*0*
osprey	0.03	0.01	0	0	0.7	<0.1	0	0	2.6	1.3	0	0
Other Raptors	*0*	*0.01*	*0*	*0*	*0*	*<0.1*	*0*	*0*	*0*	*1.3*	*0*	*0*
unidentified raptor	0	0.01	0	0	0	<0.1	0	0	0	1.3	0	0
Vultures	**2.40**	**1.90**	**<0.01**	**1.22**	**64.0**	**2.7**	**<0.1**	**5.1**	**64.1**	**44.9**	**0.6**	**31.2**
turkey vulture	2.40	1.90	<0.01	1.22	64.0	2.7	<0.1	5.1	64.1	44.9	0.6	31.2

Appendix B1. Mean large bird use (number of large birds/800-meter plot/60-minute survey), percent of total use (%), and frequency of occurrence (%) for each large bird type and species by season during large bird surveys at the Fountain Wind Project from 4 June 2018 – 31 March 2019.

	Mean Use				% of Use				% Frequency			
Type/Species	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**
Upland Game Birds	**0.09**	**0**	**0**	**0.03**	**2.3**	**0**	**0**	**0.1**	**7.7**	**0**	**0**	**3.1**
mountain quail	0.09	0	0	0.03	2.3	0	0	0.1	7.7	0	0	3.1
Doves/Pigeons	**0.32**	**0.82**	**0.15**	**0.66**	**8.7**	**1.2**	**1.3**	**2.7**	**12.8**	**19.2**	**1.9**	**18.8**
band-tailed pigeon	0.32	0.82	0.15	0.66	8.7	1.2	1.3	2.7	12.8	19.2	1.9	18.8
Large Corvids	**0.31**	**0.58**	**0.31**	**0.44**	**8.2**	**0.8**	**2.7**	**1.8**	**15.4**	**23.1**	**21.8**	**18.8**
common raven	0.31	0.58	0.31	0.44	8.2	0.8	2.7	1.8	15.4	23.1	21.8	18.8
Goatsuckers	**0.08**	**0**	**0**	**0**	**2.1**	**0**	**0**	**0**	**3.4**	**0**	**0**	**0**
common nighthawk	0.08	0	0	0	2.1	0	0	0	3.4	0	0	0
Overall*	**3.75**	**70.10**	**11.44**	**24.00**	**100**	**100**	**100**	**100**				

* Sums may not total values shown due to rounding.

Appendix B2. Mean small bird use (number of small birds/100-meter plot/10-minute survey), percent of total use (%), and frequency of occurrence (%) for each small bird type and species by season during small bird surveys at the Fountain Wind Project from 4 June 2018 – 31 March 2019.

	Mean Use				% of Use				% Frequency			
Type/Species	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**
Passerines	**4.50**	**7.08**	**2.33**	**4.53**	**93.1**	**93.9**	**93.1**	**92.9**	**91.5**	**80.8**	**64.7**	**75.0**
American robin	0.23	0.08	0.29	0	4.8	1	11.8	0	8.5	3.8	7.7	0
Bewick's wren	0.03	0.03	<0.01	0.03	0.7	0.3	0.3	0.6	3.4	2.6	0.6	3.1
black-headed grosbeak	<0.01	0	0	0	0.2	0	0	0	0.9	0	0	0
black-tailed gnatcatcher	<0.01	0	0	0	0.2	0	0	0	0.9	0	0	0
black-throated gray warbler	0.03	0	0	0	0.5	0	0	0	2.6	0	0	0
bushtit	0.37	0.14	0.02	0.16	7.6	1.9	0.8	3.2	2.6	2.6	0.6	3.1
California scrub-jay	0.02	0.37	0.02	0.06	0.4	4.9	0.8	1.3	1.7	9	1.3	6.2
California towhee	0.04	0	0	0	0.9	0	0	0	2.6	0	0	0
Cassin's finch	0	0.01	<0.01	0.22	0	0.2	0.3	4.5	0	1.3	0.6	6.2
Cassin's vireo	0.03	0	0	0	0.7	0	0	0	3.4	0	0	0
Clark's nutcracker	0.13	0	0	0	2.7	0	0	0	0.9	0	0	0
dark-eyed junco	0.52	0.38	0.18	0.16	10.8	5.1	7.2	3.2	29.1	11.5	9	12.5
dusky flycatcher	0.03	0.01	0	0	0.5	0.2	0	0	2.6	1.3	0	0
evening grosbeak	0.06	0.32	0	0	1.2	4.3	0	0	0.9	1.3	0	0
fox sparrow	0.09	0	<0.01	0.03	1.9	0	0.3	0.6	6.8	0	0.6	3.1
golden-crowned kinglet	<0.01	0.22	0.28	0.53	0.2	2.9	11	10.9	0.9	12.8	16	18.8
green-tailed towhee	<0.01	0	0	0	0.2	0	0	0	0.9	0	0	0
hermit thrush	0.02	0.01	<0.01	0	0.4	0.2	0.3	0	0.9	1.3	0.6	0
Hutton's vireo	0.02	0	0.03	0.03	0.4	0	1	0.6	1.7	0	1.9	3.1
lazuli bunting	0.03	0	0	0	0.7	0	0	0	2.6	0	0	0
lesser goldfinch	0.04	0	0	0	0.9	0	0	0	1.7	0	0	0
mountain chickadee	0.38	0.31	0.51	0.56	7.8	4.1	20.5	11.5	23.9	16.7	25	34.4
Nashville warbler	0.03	0	0	0	0.7	0	0	0	0.9	0	0	0
oak titmouse	0	0.03	0.03	0	0	0.3	1.3	0	0	1.3	1.3	0
olive-sided flycatcher	0.05	0	0	0	1.1	0	0	0	5.1	0	0	0
purple finch	0.07	0.64	0.01	0.03	1.4	8.5	0.5	0.6	3.4	1.3	0.6	3.1
red-breasted nuthatch	0.27	0.22	0.21	0.28	5.7	2.9	8.2	5.8	23.1	21.8	17.3	25
red-winged blackbird	0	2.12	0	0	0	28.1	0	0	0	2.6	0	0
ruby-crowned kinglet	0	0.06	0.08	0.03	0	0.9	3.3	0.6	0	6.4	5.8	3.1
song sparrow	0	0	<0.01	0	0	0	0.3	0	0	0	0.6	0
spotted towhee	0.26	0.13	0.04	0.03	5.5	1.7	1.5	0.6	22.2	11.5	3.2	3.1
Steller's jay	0.35	0.46	0.29	0.22	7.2	6.1	11.5	4.5	26.5	37.2	22.4	18.8
Townsend's solitaire	0.03	0	0.02	0.03	0.5	0	0.8	0.6	2.6	0	0.6	3.1
unidentified passerine	0.05	0.01	0	0	1.1	0.2	0	0	2.6	1.3	0	0

Appendix B2. Mean small bird use (number of small birds/100-meter plot/10-minute survey), percent of total use (%), and frequency of occurrence (%) for each small bird type and species by season during small bird surveys at the Fountain Wind Project from 4 June 2018 – 31 March 2019.

	Mean Use				% of Use				% Frequency			
Type/Species	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**
unidentified swallow	0.58	0.38	0	0	12	5.1	0	0	6.8	1.3	0	0
unidentified warbler	<0.01	0	0	0	0.2	0	0	0	0.9	0	0	0
violet-green swallow	0	0.26	0	0.12	0	3.4	0	2.6	0	1.3	0	3.1
western bluebird	0.12	0.38	0.24	1.91	2.5	5.1	9.5	39.1	3.4	10.3	3.8	34.4
western tanager	0.15	0	0	0	3	0	0	0	12.8	0	0	0
western wood-pewee	0.09	0	0	0	1.9	0	0	0	9.4	0	0	0
white-crowned sparrow	0	0.01	0	0	0	0.2	0	0	0	1.3	0	0
wrentit	0.06	0.06	0.05	0.09	1.2	0.9	2.1	1.9	5.1	5.1	4.5	6.2
yellow warbler	0.03	0	0	0	0.5	0	0	0	2.6	0	0	0
yellow-rumped warbler	0.25	0.42	0	0	5.1	5.6	0	0	15.4	24.4	0	0
Swifts/Hummingbirds	**0.14**	**0.01**	**0.03**	**0.12**	**2.8**	**0.2**	**1.0**	**2.6**	**12.8**	**1.3**	**1.3**	**12.5**
Anna's hummingbird	0.08	0.01	0.03	0.06	1.6	0.2	1.0	1.3	7.7	1.3	1.3	6.2
rufous hummingbird	0	0	0	0.06	0	0	0	1.3	0	0	0	6.2
unidentified hummingbird	0.06	0	0	0	1.2	0	0	0	6.0	0	0	0
Woodpeckers	**0.20**	**0.45**	**0.15**	**0.22**	**4.1**	**6.0**	**5.9**	**4.5**	**12.8**	**30.8**	**12.8**	**18.8**
northern flicker	0.08	0.18	0.04	0.19	1.6	2.4	1.8	3.8	6.8	17.9	4.5	15.6
downy woodpecker	0.05	0.01	<0.01	0	1.1	0.2	0.3	0	3.4	1.3	0.6	0
hairy woodpecker	0.03	0.08	0.03	0.03	0.7	1.0	1.0	0.6	3.4	7.7	1.9	3.1
pileated woodpecker	<0.01	0	0	0	0.2	0	0	0	0.9	0	0	0
Lewis's woodpecker	0	0.13	0	0	0	1.7	0	0	0	2.6	0	0
white-headed woodpecker	0.02	0.04	0.06	0	0.4	0.5	2.6	0	1.7	3.8	5.8	0
red-breasted sapsucker	<0.01	0.01	0	0	0.2	0.2	0	0	0.9	1.3	0	0
unidentified woodpecker	0	0	<0.01	0	0	0	0.3	0	0	0	0.6	0
Overall*	**4.84**	**7.54**	**2.50**	**4.88**	**100**	**100**	**100**	**100**				

* Sums may not total values shown due to rounding.

Appendix C. Mean Use by Point for All Birds, Major Bird Types, and Diurnal Raptor Subtypes during Fixed-Point Surveys at the Fountain Wind Project from 4 June 2018 – 31 March 2019

Appendix C1. Mean use (number of birds/800-meter plot/60-minute survey) by point for all large birds, major bird types, and diurnal raptor subtypes observed at the Fountain Wind Project during large bird surveys from 4 June 2018 – 31 March 2019.

Obs. Pt.	Waterbirds	Waterfowl	Diurnal Raptors	*Accipiters*	*Buteos*	*Northern Harrier*	*Eagles*	*Falcons*	*Osprey*	Other Raptors	Vultures	Upland Game Birds	Doves/ Pigeons	Large Corvids	Goatsuckers	All Large Birds*
1	0	0	0.22	*0.11*	*0*	*0*	*0.11*	*0*	*0*	0	0.78	0	0.33	0.22	0	**1.56**
2	0	0	0.22	*0*	*0.22*	*0*	*0*	*0*	*0*	0	0.67	0	0	0.78	0	**1.67**
3	0	22.44	0.33	*0*	*0.22*	*0.11*	*0*	*0*	*0*	0	0.33	0	0	0	0	**23.11**
4	0	0	0.22	*0.11*	*0.11*	*0*	*0*	*0*	*0*	0	0.44	0	0.22	0.22	0.11	**1.22**
5	0	3.33	1.00	*0.56*	*0.33*	*0*	*0*	*0*	*0.11*	0	1.33	0	0.67	0.44	0	**6.78**
6	0	0	0.33	*0.11*	*0.22*	*0*	*0*	*0*	*0*	0	0.56	0	1.22	0.44	0	**2.56**
7	0	0	0.11	*0*	*0.11*	*0*	*0*	*0*	*0*	0	0.67	0	0	0.56	0	**1.33**
8	0	0	0.10	*0*	*0*	*0*	*0.10*	*0*	*0*	0	0.40	0	0.10	0	0	**0.60**
9	0	5.70	0.30	*0.10*	*0.20*	*0*	*0*	*0*	*0*	0	0.70	0	0.10	0.30	0	**7.10**
10	0	38.20	0.20	*0*	*0.20*	*0*	*0*	*0*	*0*	0	1.00	0	0	0.40	0	**39.80**
11	0	4.00	0.30	*0.10*	*0.20*	*0*	*0*	*0*	*0*	0	1.60	0	0.10	0.40	0.20	**6.60**
12	0	1.50	0.10	*0*	*0.10*	*0*	*0*	*0*	*0*	0	1.10	0	0	0.20	0	**2.90**
13	0	0	0.20	*0*	*0.20*	*0*	*0*	*0*	*0*	0	0.50	0.10	1.00	0.30	0	**2.10**
14	0	0	0.40	*0*	*0.40*	*0*	*0*	*0*	*0*	0	1.10	0	0	0.30	0	**1.80**
15	0	0	0.40	*0.20*	*0.10*	*0.10*	*0*	*0*	*0*	0	1.00	0	0.80	0.50	0	**2.70**
16	0	0	0.10	*0*	*0.10*	*0*	*0*	*0*	*0*	0	0.70	0.20	1.50	0.10	0	**2.60**
17	0	104.30	1.00	*0.60*	*0.40*	*0*	*0*	*0*	*0*	0	3.40	0	0	0.40	0	**109.10**
18	0	2.00	0.50	*0.20*	*0.30*	*0*	*0*	*0*	*0*	0	3.30	0.10	1.10	0.30	0	**7.30**
19	0	0	0.50	*0*	*0.50*	*0*	*0*	*0*	*0*	0	0.80	0	0	0	0	**1.30**
20	0	0	0.60	*0.10*	*0.30*	*0.10*	*0.10*	*0*	*0*	0	0.60	0.10	0.70	0.30	0	**2.30**
21	0	1.80	0.10	*0.10*	*0*	*0*	*0*	*0*	*0*	0	2.90	0.20	0.10	0.20	0.20	**5.50**
22	0	0	0.20	*0.10*	*0.10*	*0*	*0*	*0*	*0*	0	0.20	0	0	0	0	**0.40**
23	0	7.40	0	*0*	*0*	*0*	*0*	*0*	*0*	0	0.80	0	1.00	0.10	0	**9.30**
24	0	14.40	0.40	*0.30*	*0.10*	*0*	*0*	*0*	*0*	0	2.70	0	0.10	0.80	0	**18.40**
25	0.80	3.10	0.50	*0.10*	*0.20*	*0.10*	*0.10*	*0*	*0*	0	1.90	0	0	0.70	0	**7.00**
26	0	454.80	1.00	*0.60*	*0.40*	*0*	*0*	*0*	*0*	0	3.00	0	0	0.90	0	**459.70**
27	0	36.00	0.20	*0.10*	*0.10*	*0*	*0*	*0*	*0*	0	0.90	0	0.80	0.40	0	**38.30**
28	4.00	16.30	0.40	*0.10*	*0.10*	*0*	*0*	*0*	*0.20*	0	0.90	0	0	0.10	0	**21.70**
29	12.30	0	0.50	*0*	*0.30*	*0*	*0.20*	*0*	*0*	0	1.40	0	0.30	0.20	0	**14.70**
30	2.70	0	0.50	*0.20*	*0.30*	*0*	*0*	*0*	*0*	0	2.00	0.30	0.40	0.30	0	**6.20**
31	1.30	0.80	0.10	*0*	*0.10*	*0*	*0*	*0*	*0*	0	0.80	0	0.30	0.20	0	**3.50**
32	15.50	0	0.70	*0*	*0.70*	*0*	*0*	*0*	*0*	0	0.90	0	0.40	0.20	0	**17.70**

Appendix C1. Mean use (number of birds/800-meter plot/60-minute survey) by point for all large birds, major bird types, and diurnal raptor subtypes observed at the Fountain Wind Project during large bird surveys from 4 June 2018 – 31 March 2019.

Obs. Pt.	Waterbirds	Waterfowl	Diurnal Raptors	*Accipiters*	*Buteos*	*Northern Harrier*	*Eagles*	*Falcons*	*Osprey*	Other Raptors	Vultures	Upland Game Birds	Doves/ Pigeons	Large Corvids	Goatsuckers	All Large Birds*
33	0	0	0.30	*0.10*	*0.20*	*0*	*0*	*0*	*0*	0	0.70	0	0	0.30	0.40	**1.70**
34	0	0	0.80	*0.30*	*0.40*	*0.10*	*0*	*0*	*0*	0	0.90	0	0.40	0.20	0	**2.30**
35	0	0	0	*0*	*0*	*0*	*0*	*0*	*0*	0	1.30	0	0.50	0.20	0	**2.00**
36	0	2.30	0.10	*0*	*0*	*0*	*0.10*	*0*	*0*	0	1.70	0.10	0.20	0.10	0	**4.50**
37	0	1.20	0.60	*0.10*	*0.30*	*0*	*0*	*0.10*	*0.10*	0	0.90	0	0.20	0.40	0	**3.30**
38	0	0	0.80	*0.10*	*0.60*	*0*	*0*	*0*	*0*	0.10	0.90	0	2.40	1.80	0	**5.90**
39	0	0	0.30	*0.10*	*0.10*	*0.10*	*0*	*0*	*0*	0	1.60	0	0	1.30	0	**3.20**

Obs. Pt. = observation point.

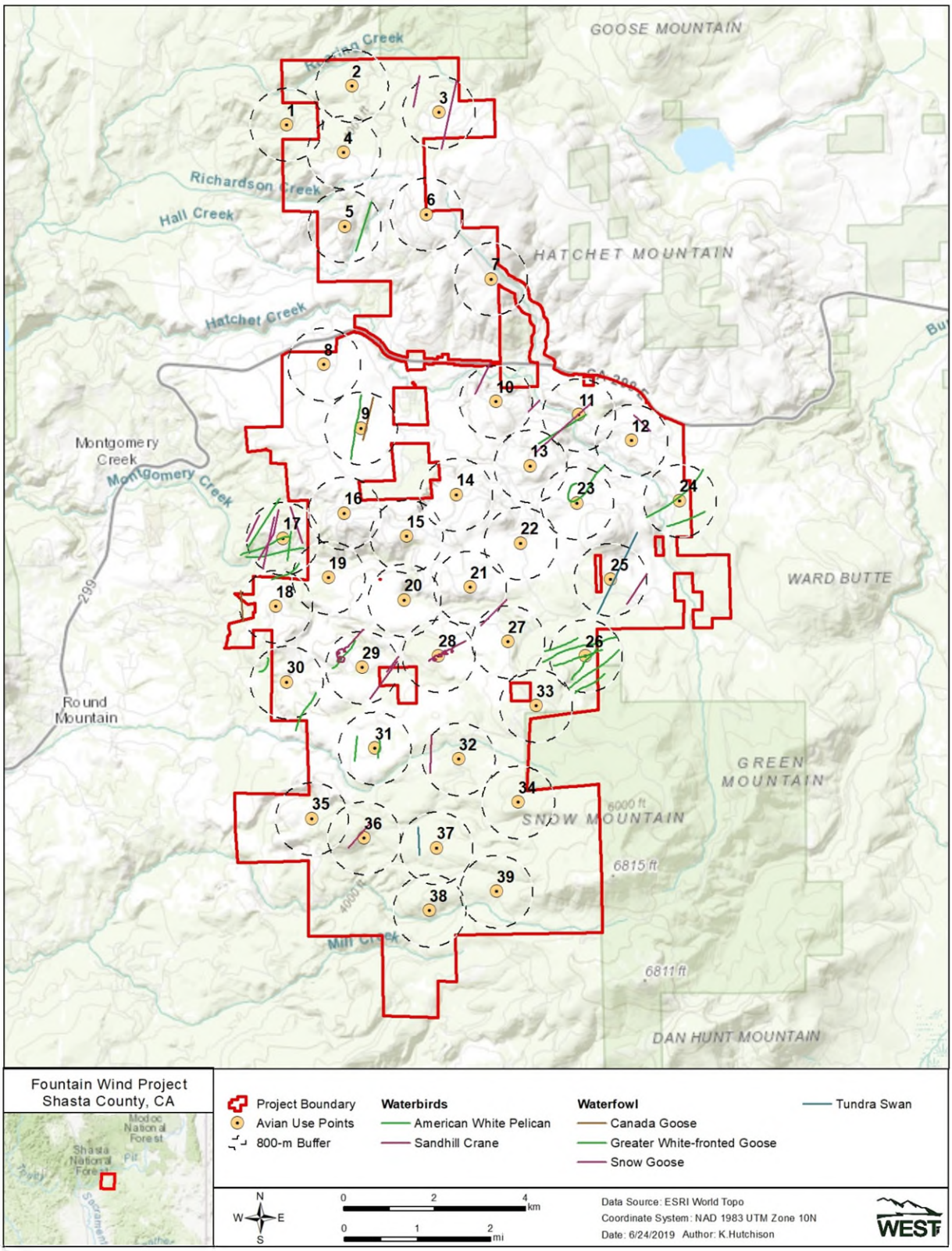
* Sums may not total values shown due to rounding.

Appendix C2. Mean use (number of birds/100-meter plot/10-minute survey) by point for all small birds and major small bird types observed at the Fountain Wind Project during small bird surveys from 4 June 2018 – 31 March 2019.

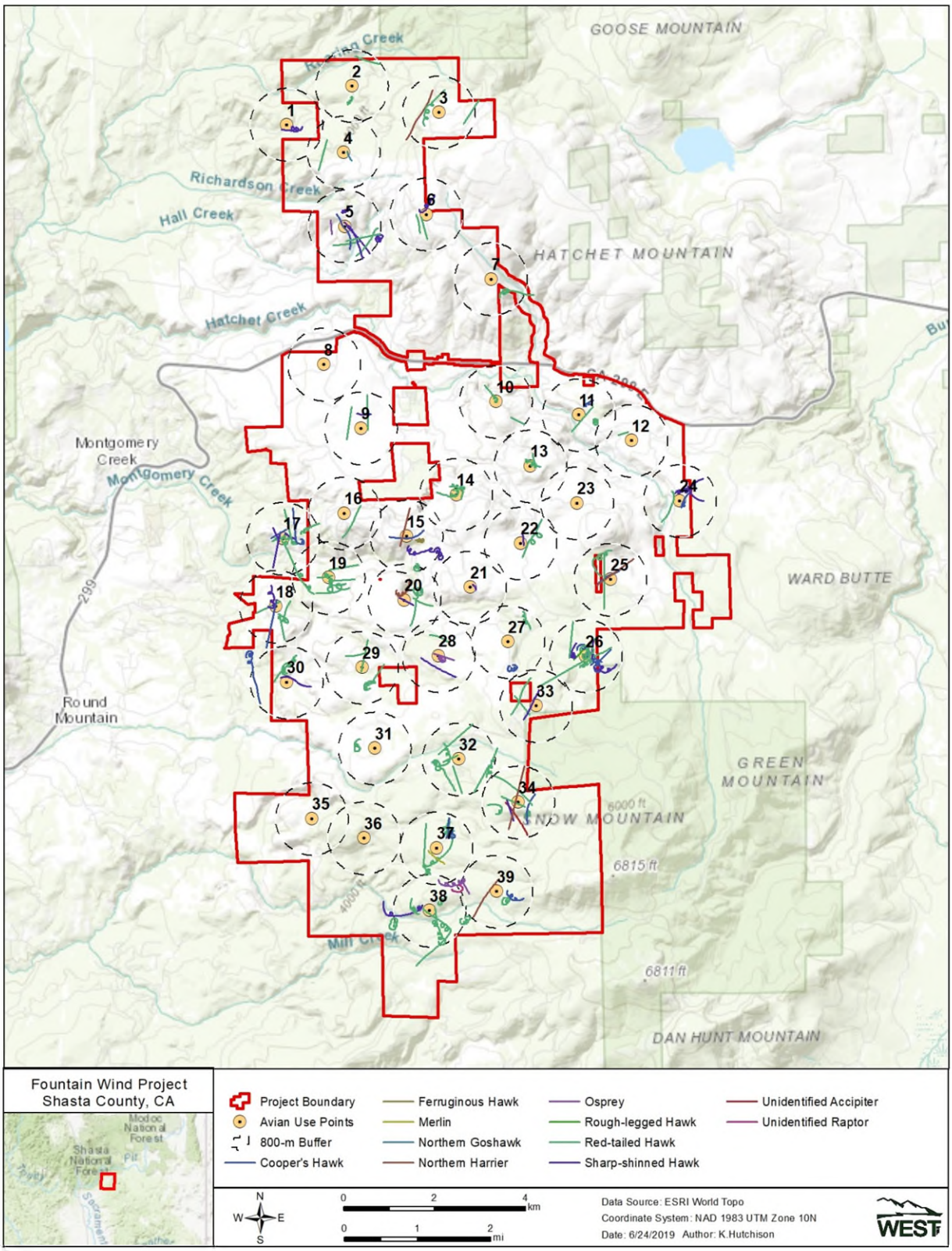
Observation Point	Passerines	Swifts/ Hummingbirds	Woodpeckers	All Small Birds*
1	3.89	0	0.11	**4.00**
2	2.56	0.11	0.22	**2.89**
3	6.33	0.22	0.56	**7.11**
4	8.56	0	0.67	**9.22**
5	7.56	0.44	0.56	**8.56**
6	2.00	0.22	0	**2.22**
7	2.44	0	0.11	**2.56**
8	2.20	0.10	0	**2.30**
9	4.40	0	0.10	**4.50**
10	6.00	0	0	**6.00**
11	3.90	0.20	0.30	**4.40**
12	2.60	0	0.20	**2.80**
13	2.60	0	0.20	**2.80**
14	2.20	0	0	**2.20**
15	1.40	0.10	0	**1.50**
16	3.20	0.10	0.20	**3.50**
17	8.00	0.30	0.30	**8.60**
18	3.00	0	0.20	**3.20**
19	3.10	0	0	**3.10**
20	4.80	0	0.10	**4.90**
21	3.40	0	0.30	**3.70**
22	1.60	0	0	**1.60**
23	3.00	0	0.20	**3.20**
24	5.60	0	0.10	**5.70**
25	3.10	0.10	0.20	**3.40**
26	7.30	0	0.30	**7.60**
27	3.50	0	0.70	**4.20**
28	5.50	0	0.30	**5.80**
29	1.30	0.10	0.30	**1.70**
30	2.70	0.30	0.60	**3.60**
31	2.80	0.10	0.30	**3.20**
32	19.70	0	0.30	**20.00**
33	2.80	0	0.30	**3.10**
34	1.10	0	0.10	**1.20**
35	4.40	0.10	0.40	**4.90**
36	5.20	0	0.30	**5.50**
37	3.90	0	0.50	**4.40**
38	2.50	0	0	**2.50**
39	1.90	0.10	0	**2.00**

* Sums may not total values shown due to rounding.

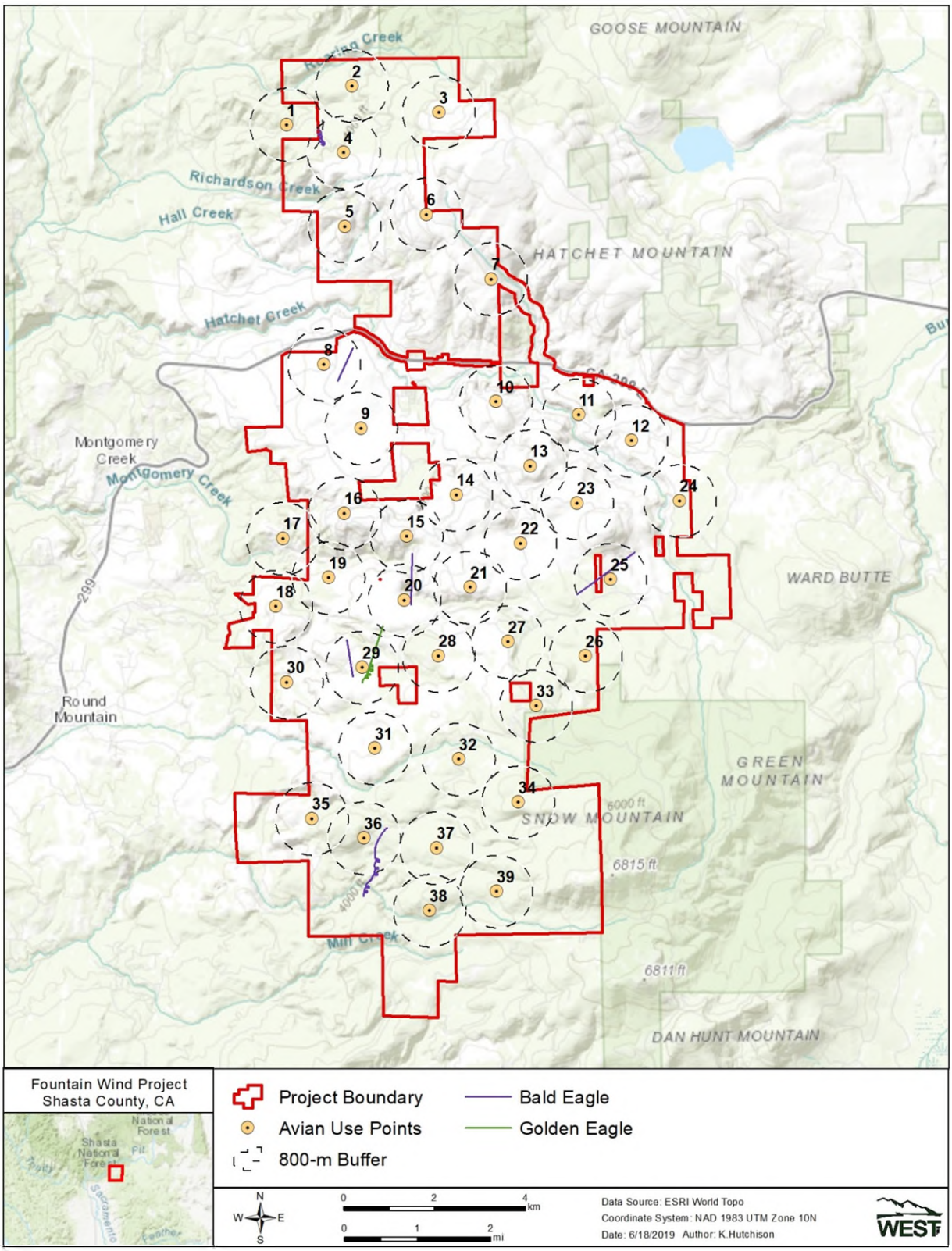
Appendix D. Flight Paths of Waterbirds, Waterfowl, Diurnal Raptors (Non-Eagle), and Eagles Recorded during Fixed-Point Avian Use Surveys at the Fountain Wind Project from 4 June 2018 – 31 March 2019



Appendix D1. Waterbird and waterfowl flight paths recorded during large bird surveys at the Fountain Wind Project from 4 June 2018 – 31 March 2019.



Appendix D2. Diurnal raptor (non-eagle) flight paths recorded during large bird surveys at the Fountain Wind Project from 4 June 2018 – 31 March 2019.



Appendix D3. Eagle flight paths recorded during large bird surveys at the Fountain Wind Project from 4 June 2018 – 31 March 2019.