2013 Nest Surveys

Aerial raptor nest surveys were conducted for the CCSM Project on April 24-25, 2013, with follow-up ground surveys conducted at select red-tailed hawk nests between May 21 and July 26.

A total of 14 occupied non-eagle raptor nests (6 red-tailed hawk, 4 prairie falcon, 3 great horned owl, and 1 American kestrel) were located in the survey area primarily outside of the CCSM Project WDAs. One occupied red-tailed hawk nest was located in the Phase I portion of the Chokecherry WDA. One occupied red-tailed hawk nest and one occupied American kestrel nest were located in the Phase I portion of the Sierra Madre WDA. *See Figure 4.13 & Figure 4.14. .* No occupied ferruginous hawk nests were located in 2013. *See Appendix F*. Of the two red-tailed hawk nests in Phase I, one was determined to have failed, and the other's status could not be determined at the time of the final check. Detailed information on nesting attempts and productivity is included in Appendix F.

2014 Nest Surveys

Aerial raptor nest surveys were conducted for the CCSM Project May 1 and 14, 2014.

A total of 24 occupied non-eagle raptor nests (12 red-tailed hawk, 5 great horned owl, 4 prairie falcon, 2 Swainson's hawk, and 1 unidentified *Buteo*) were located in the survey area primarily outside of the CCSM Project WDAs. One occupied red-tailed hawk nest and one occupied great horned owl nest were located in the Phase I portion of the Sierra Madre WDA. *See Figure 4.15 and 4.16.* No occupied ferruginous hawk nests were located in 2014. *See Appendix F*.

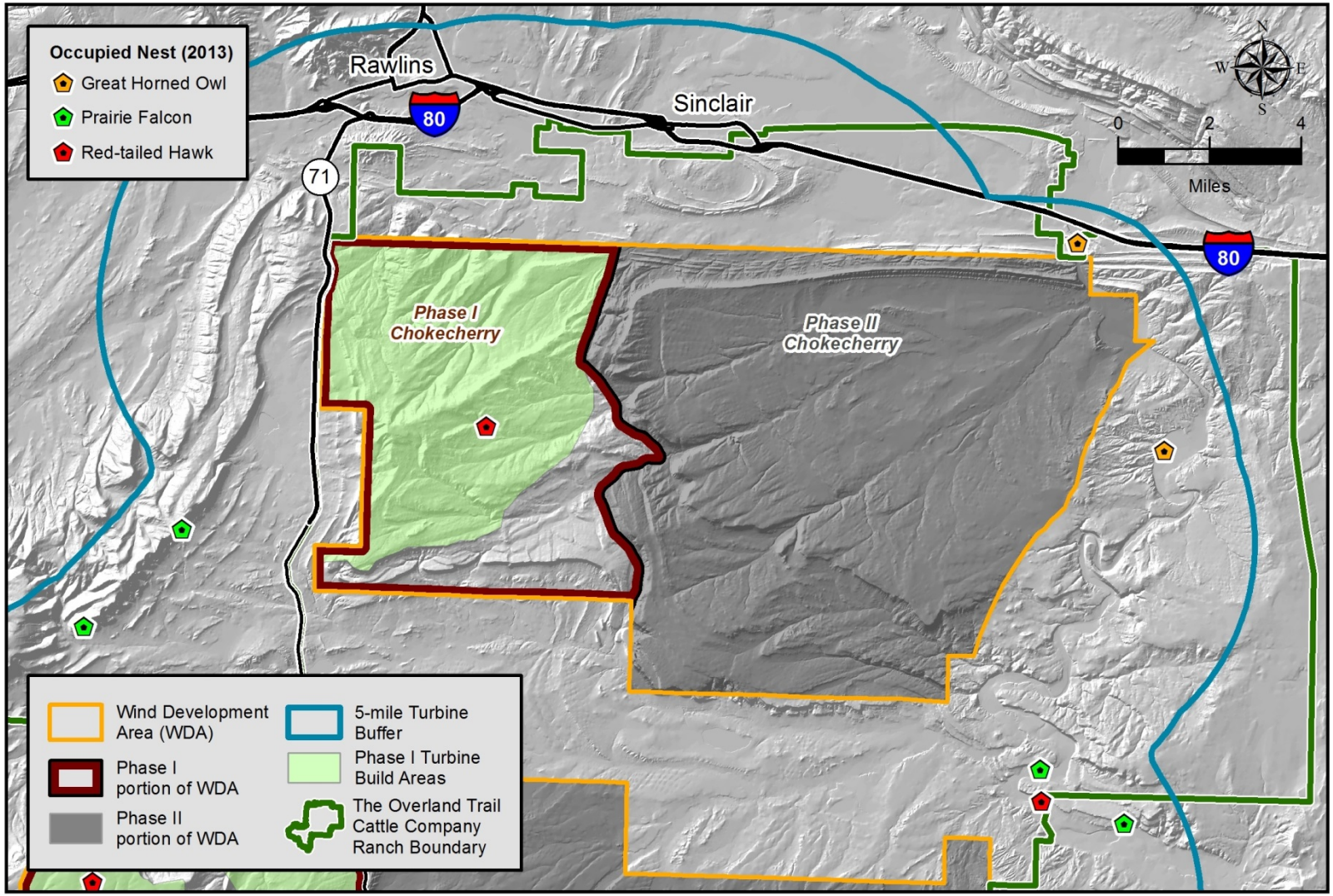


Figure 4.13. Chokecherry WDA Occupied Non-eagle Raptor Nests, 2013.

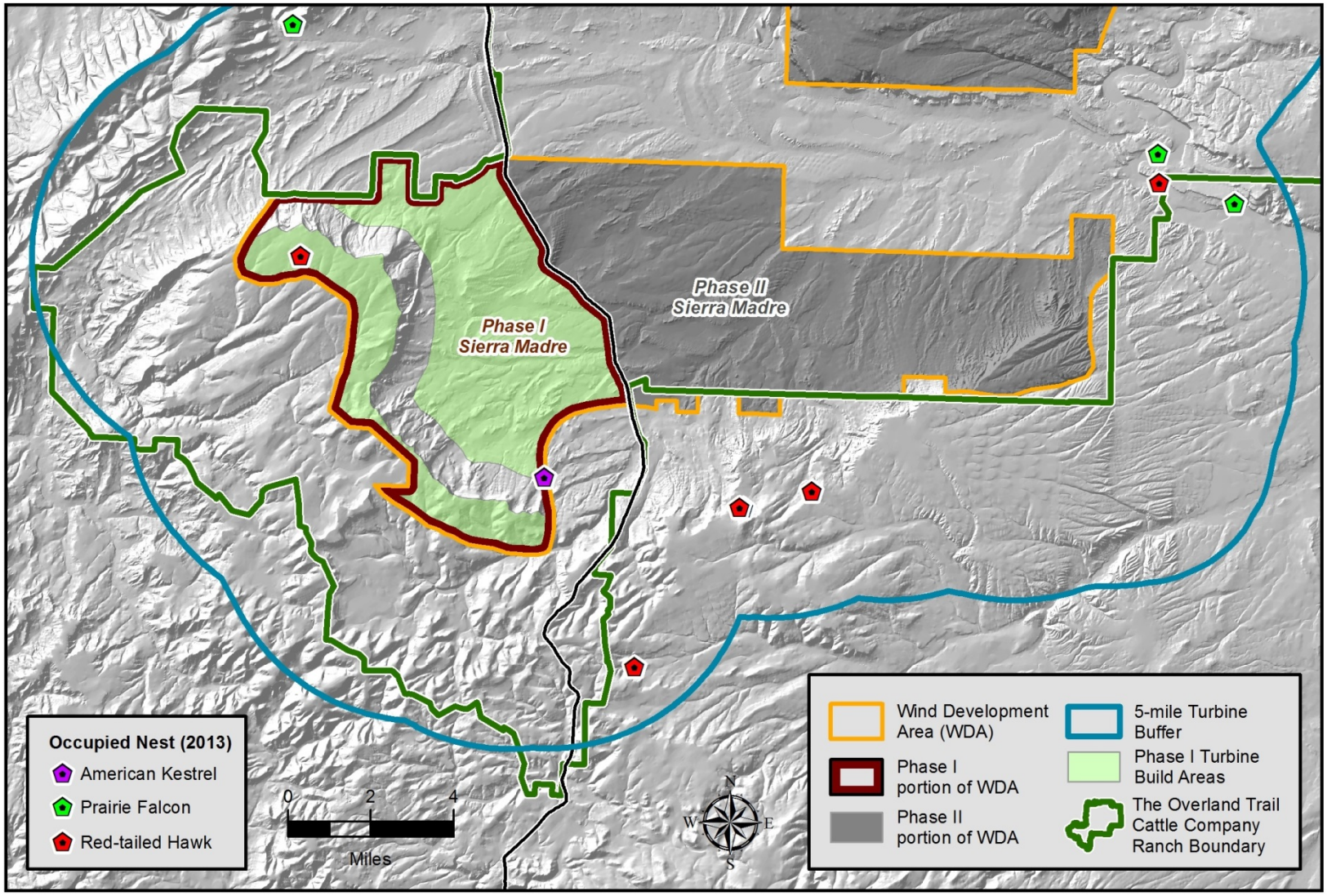


Figure 4.14. Sierra Madre WDA Occupied Non-eagle Raptor Nests, 2013.

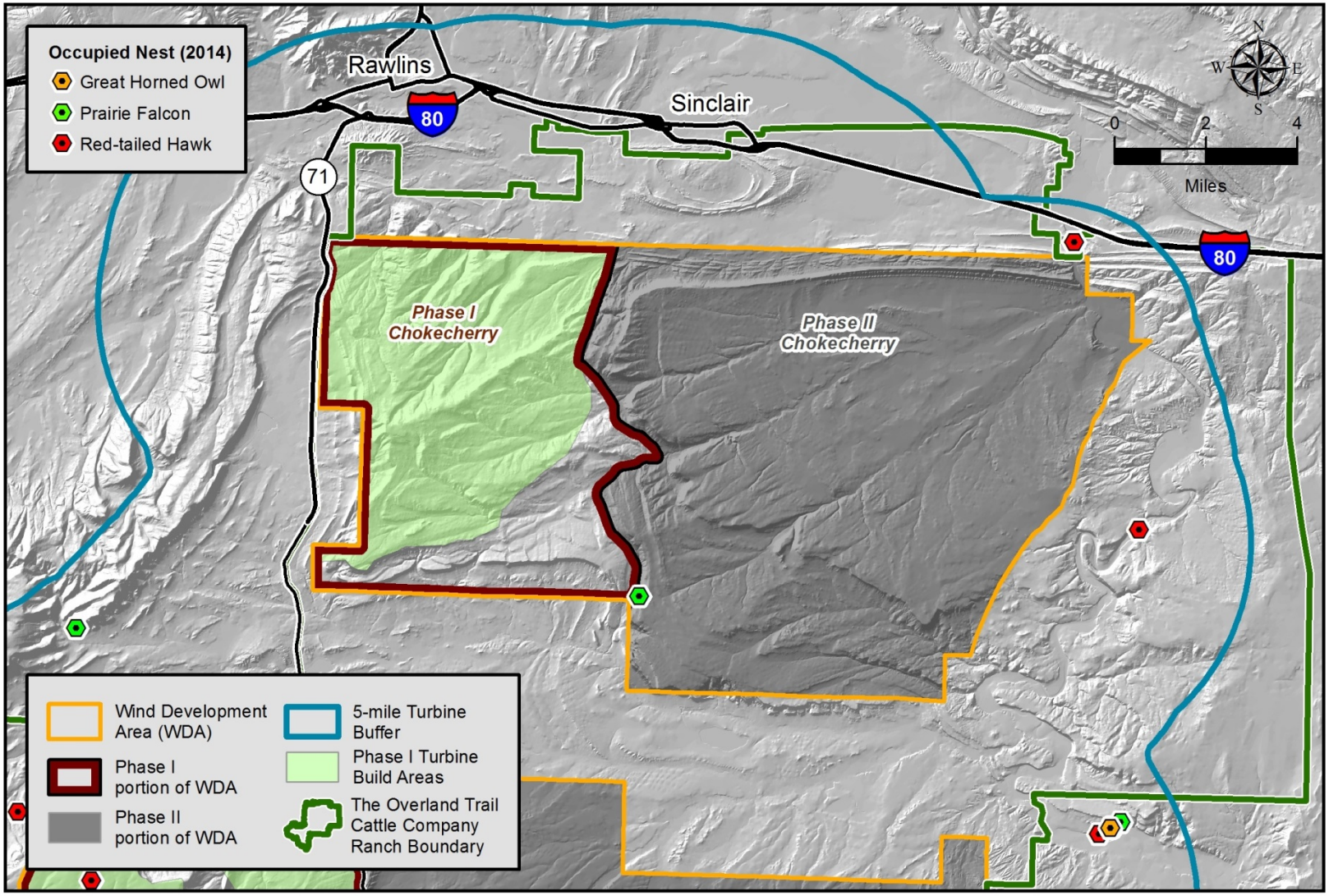


Figure 4.15. Chokecherry WDA Occupied Non-eagle Raptor Nests, 2014.

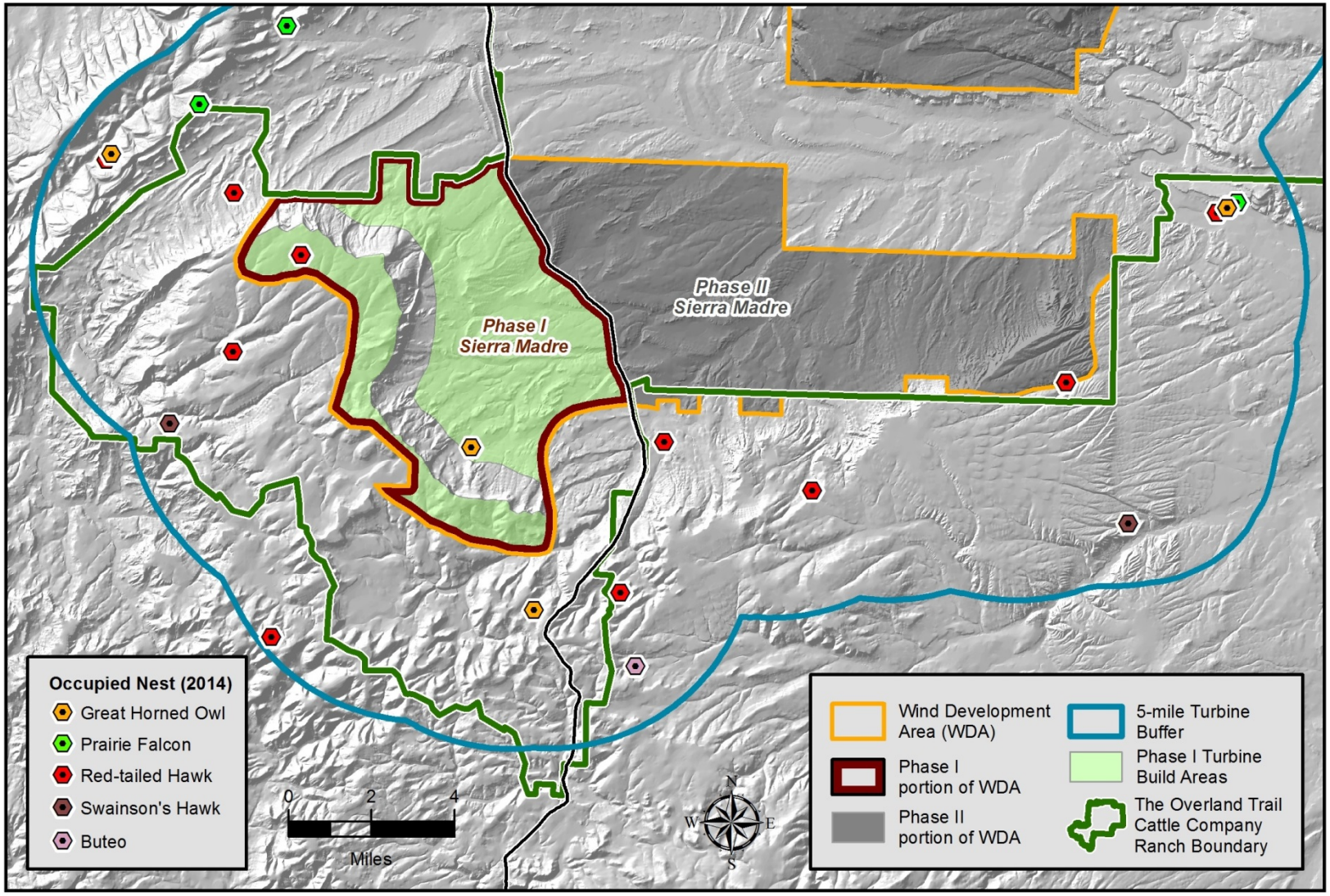


Figure 4.16. Sierra Madre WDA Occupied Non-eagle Raptor Nests, 2014.

Migratory Bird Surveys

Migratory bird surveys were conducted from April 2011 through March 2012 at survey locations identified in coordination with USFWS, BLM, and WGFD. During this time, PCW completed 295 migratory bird point count surveys at 15 locations across the CCSM Project Site with 136 surveys completed at the 7 locations within the Phase I Development Area. *See Figure 4.17.* Migratory bird point count surveys were completed in conjunction with long-watch raptor surveys using protocols developed in coordination with USFWS, BLM, and WGFD. *See "Long-watch Raptor Surveys."* Similar to the long-watch raptor surveys, the duration and frequency of the migratory bird point count surveys varied by season in accordance with the recommendations of the federal and state agencies. However, survey minutes were evenly distributed across all daylight hours and between sites within each season.

Migratory bird point count surveys were conducted for 20 minutes at each survey location. Migratory bird point count surveys were conducted in 200-meter radius plots strategically distributed across the two WDAs to maximize coverage for the purposes of determining diversity and relative abundance. Habitats surveyed were characteristic of Phase I and appropriate for assessment of migratory bird use within Phase I. The protocols used for the migratory bird point count surveys are included in Appendix D. Data collected for each observation included species, number of individuals, distance from observer, flight behavior, and general demographics. Variables used to characterize migratory bird use in Phase I include number of species, number of individuals, number of flocks, species frequency (the percentage of 20-minute surveys on which a species was observed), occurrence frequency (percentage of surveys with at least one bird detection), and mean use (average number of individuals per 20-minute survey).

From April 2011 to March 2012, 753 individuals in 453 flocks representing 34 species were recorded during the 136 migratory bird point count surveys in the Phase I Development Area.[28] There were no birds observed for 33 (24%) of those surveys. Across all seasons, mean observed migratory bird use was 5.6 individuals per 20-minute survey. Horned lark was the most commonly observed individual accounting for 401 individuals (53%) with a mean use of 2.9 individuals per 20-minute survey. Horned lark was also the most frequently encountered species with the species recorded during 85 surveys (63%). Following the horned lark, the most abundant species regularly recorded were Brewer's sparrow with 41 individuals recorded (14 surveys at 6 Phase I survey locations) and vesper sparrow with 34 individuals recorded (16 surveys at 7 Phase I survey locations). More American crows were observed than Brewer's sparrows or vesper sparrows. However, all 55 American crow recorded were from two large flocks observed in October 2011 during fall migration. The number of migratory birds observed per survey in the Phase I Development Area remained relatively consistent throughout the spring, summer, and fall survey periods. However, use in winter months was much lower than that observed in

[28] When combined with the point count information collected in 2008, April 2011 through March 2012 migratory bird survey data can be used to assess potential interannual variability of the diversity and relative abundance of migratory birds. Survey s were completed across all daylight hours and all habitats that occur in Phase I. While seasonal, inter-annual, or site-specific patterns of use may vary, the collective results of the survey efforts are suitable to characterize expected migratory bird patterns of use and relative abundance within Phase I.

the other three seasons with only 15 birds (12 horned larks, 2 common ravens, and 1 mountain bluebird) observed from December 1, 2011, through April 1, 2012. *See Table 4.6.*

Table 4.6. Migratory Birds Observations by Species, 2011-2012 Migratory Bird Surveys.

Species/Species Group	Spring 2011	Summer 2011	Fall 2011	Winter 2011-2012	Total
Corvids					
American Crow	0	0	55	0	**55**
Black-billed Magpie	3	0	2	0	**5**
Common Raven	9	0	3	2	**14**
Passerines					
American Goldfinch	0	2	2	0	**4**
American Robin	6	3	9	0	**18**
Brewer's Sparrow	23	14	4	0	**41**
Green-tailed Towhee	4	2	0	0	**6**
Horned Lark	131	61	197	12	**401**
Mountain Bluebird	2	6	5	1	**14**
Rock Wren	4	3	2	0	**9**
Sagebrush Sparrow	20	8	2	0	**30**
Sage Thrasher	15	3	1	0	**19**
Song Sparrow (*Melospiza melodia*)	3	1	0	0	**4**
Tree Swallow (*Tachycineta bicolor*)	1	4	0	0	**5**
Vesper Sparrow	24	9	1	0	**34**
Violet-green Swallow (*Tachycineta thalassina*)	3	1	0	0	**4**
Western Meadowlark	9	7	8	0	**24**
Other Passerines[1]	16	24	16	0	**56**

Species/Species Group	Spring 2011	Summer 2011	Fall 2011	Winter 2011-2012	Total
Non-Eagle Raptors, Owls, and Allies					
American Kestrel	1	1	3	0	**5**
Northern Harrier	1	0	0	0	**1**
Red-tailed Hawk	1	0	0	0	**1**
Other Birds					
Northern Flicker	2	0	0	0	**2**
Rufous Hummingbird (*Selasphorus rufus*)	0	1	0	0	**1**
Total	**278**	**150**	**310**	**15**	**753**

Notes:

1. Other passerines include unknown passerines that could not be identified to species level, as well as species that were observed fewer than 4 times during surveys, e.g. western kingbird (*Tyrannus verticalis*), Brewer's blackbird, dark-eyed junco, brown-headed cowbird (*Molothrus ater*), and savannah sparrow (*Passerculus sandwichensis*). Appendix B lists all passerine species that have been observed across the CCSM Project Site, including Phase I.

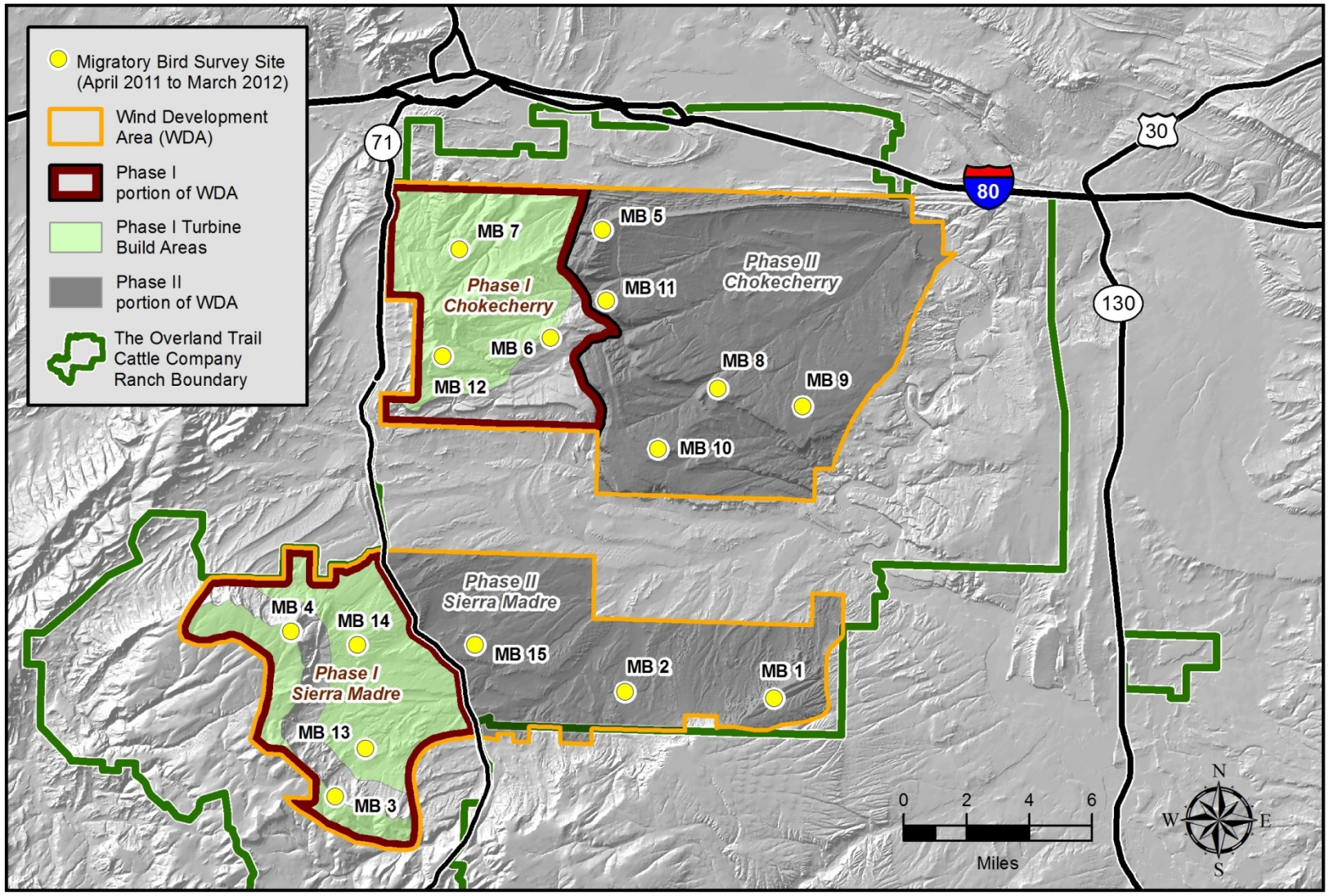


Figure 4.17. Migratory Bird Survey Locations, April 2011-March 2012.

Avian Radar Surveys

A DeTect Merlin avian radar system was used to map bird and bat use across the CCSM Project Site to identify bird and bat use areas. The radar was installed in March 2011 and operated through the end of March 2013 at nine different locations across the CCSM Project Site covering 100% of the Phase I wind turbine locations. *See Figure 4.18.* The radar is a trailer-mounted system with a 200-watt horizontal solid-state S-band radar and a 10-kilowatt vertically operating X-band open array radar. The horizontal scanning radar (HSR) has a range of up to 7.4 kilometers (4.6 miles) for raptors and other large targets in a 360-degree pattern around the unit. The HSR is able to record how targets use topographic features within the CCSM Project Site by collecting accurate location data for each target as it moves through the radar scanning area. The vertical scanning radar (VSR) has a 24-degree beam width and detects flight paths up to 3 kilometers (2 miles) or more for raptors and other large targets above the unit. The HSR does not collect altitudinal data for biological targets; however, the elevation of targets may be collected if they pass through the footprint of the VSR. These data are critical for determining the relative percentage of targets passing through the RSZ versus those flying above and below the RSZ, as well as annual, seasonal, and daily variability in those relative percentages. However, data cannot be used to quantify actual bird use of the CCSM Project Site due to limitations associated with radar technology. The radar ran continuously, collecting data for movements of birds and bats throughout the day and night. The relative numbers of birds and bats passing through the scanning area, as well as the relative size of each target, can be derived from the radar data.

Between March 2011 and March 2013, the radar collected more than 5,000 hours of data on birds and bats that crossed through the scanning radius of the HSR and/or VSR, whether they were individual targets, small flocks, or broad-front migratory movements. However, two primary factors limit the use of this avian radar data. First, radar technology cannot detect avian use when it occurs in close proximity to topographic relief that reflects the radar signature. Therefore, avian use can only be detected and recorded when there is a minimal amount of backscatter from the radar. For this reason, many of the topographic features commonly associated with raptor use (ridgelines, cliffs, etc.) cannot be mapped using the avian radar system. Second, current avian radar technology is unable to distinguish between different avian and bat species. Data for each target identified by the radar is recorded as a series of more than 60 variables based on different measures of recorded pixel size and shape. These variables can differ greatly within species and even for a single individual; therefore, it is not possible to definitively determine species from the dataset recorded by the radar system. Targets could be grouped based upon their relative size, but this can be problematic as well due to variance in individuals and overlap in variable values between species.

Due to limitations of radar technology, it is likely that not all targets were detected. Nonetheless, estimates of passage rates and flight heights are informative for comparing annual, seasonal, and daily patterns of avian and bat use. While the radar dataset has limitations, it was essential in the analysis of broad-front migratory bird movements across the CCSM Project Site, including Phase I. The data collected by the radar and analyzed by DeTect for the CCSM Project Site, including Phase I, consistently

demonstrated that the highest average number of targets per hour occurred at night during the spring, summer and fall seasons. This is consistent with expected migratory pulses passing through the area. *See Appendix G.* Radar data collected throughout the survey period also show that the mean and median height of these biological targets are well above the rotor height of the wind turbines indicating that the majority of the targets are not at risk of collision, as demonstrated by Figure 4.19.[29] *See Appendix G.* In fact, avian radar data from 2011-2012 demonstrate that 93% of targets were above rotor height during that period. *See Figure 4.20 through Figure 4.23.* Data also demonstrate that during migration events, migratory bird and bat species generally pass over the CCSM Project Site indicating that the area is not used as a stopover location. Data from the radar for the CCSM Project was analyzed by DeTect in two reports that are summarized below by season. *See Appendix G.* For purposes of comparison, the activity levels calculated from the avian radar survey data are reported in number of targets (birds or bats) within a 1-kilometer front per hour (targets per hour).[30] Targets per hour are further reported by the time of day using the following defined periods:

- **Dawn** – 30 minutes before sunrise to 30 minutes after sunrise
- **Day** – 30 minutes after sunrise to 30 minutes before sunset
- **Dusk** – 30 minutes before sunset to 30 minutes after sunset
- **Night** – 30 minutes after sunset to 30 minutes before sunrise

Spring Season Radar Summary

Results from the spring season radar surveys (April 1 to June 30) were generally consistent across 2011 and 2012. *See Table 4.7.* The highest activity levels occurred during mid- to late April and late May to early June, primarily at night. The highest number of targets detected by the VSR both years was during the night, averaging 86.7 targets per hour in 2011 and 86.3 targets per hour in 2012. In 2011, the activity levels, as indicated by the number of targets per hour, during the dawn, day and dusk periods remained relatively consistent, ranging from 15.6 to 20.8 targets per hour. However, the 2012 radar surveys showed a greater contrast in diurnal activity levels, with an average of 7.4 targets per hour at dawn, 26 targets per hour during the day, and 35.6 targets per hour at dusk.

The average mean target height during the spring season was highest at night for both 2011 and 2012 (432 meters [1,420 feet] in 2011 and 451 meters [1,480 feet] in 2012), with the lowest average mean target height occurring at dawn in 2011 (315 meters [1,030 feet]) and during the day in 2012 (407 meters [1,340 feet]). Target direction recorded by the HSR shows the bulk of targets recorded moving in a northwesterly direction during the dawn, dusk and night periods in 2011 and during dawn and night periods in 2012. The daytime period in 2011 and dusk period in 2012 showed no specific directional trend. Targets during the daytime period in 2012 generally moved in a northeasterly direction.

---

[29] The top rotor height for the Phase I wind turbines is 117 to 160 meters (383 to 525 feet). *See Figure 3.3 & Table 3.1.*

[30] Due to limitations of radar technology, it is likely that not all targets were detected. Nonetheless, targets per hour is informative as a relative index for comparing annual, seasonal, and daily patterns of avian and bat use.

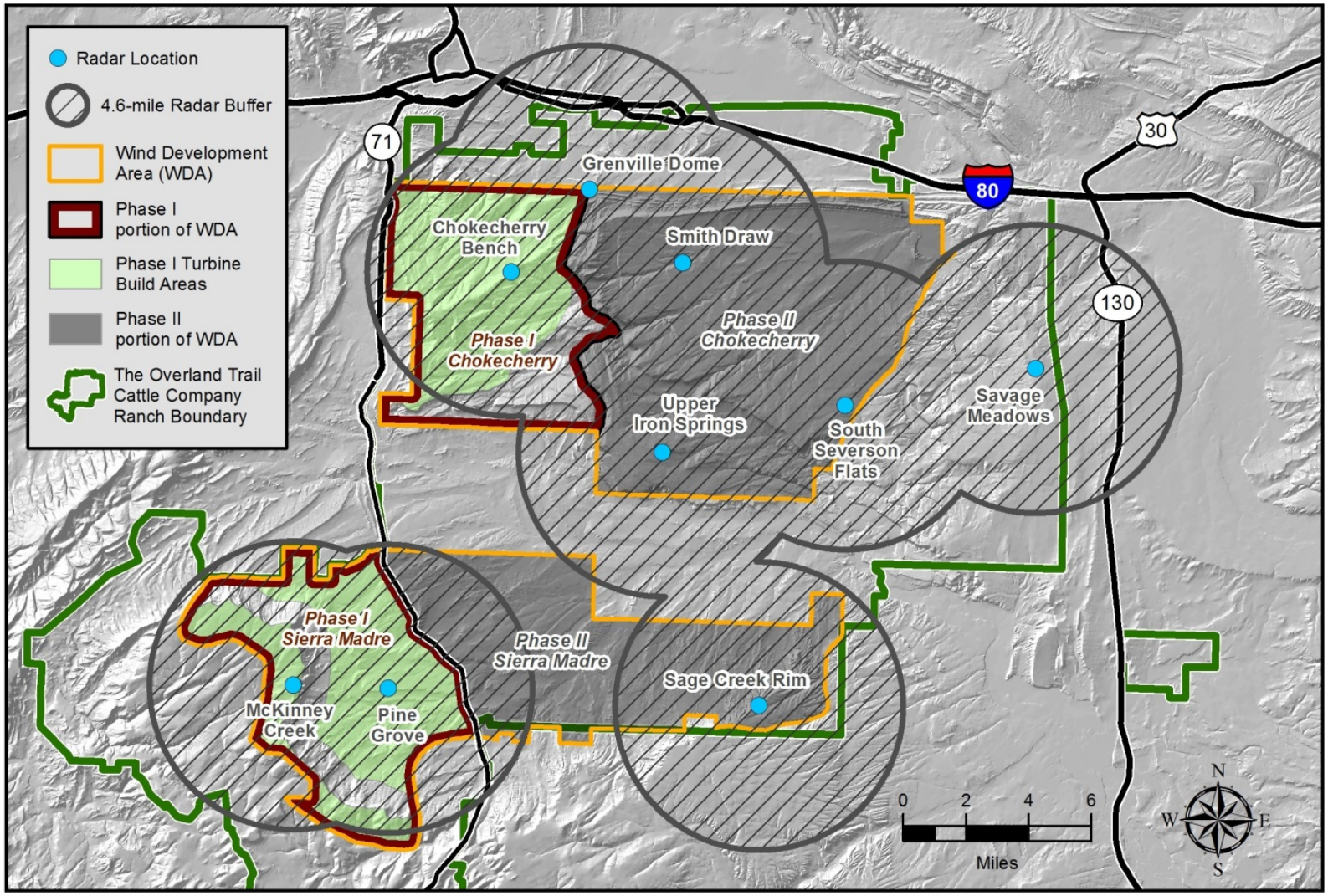
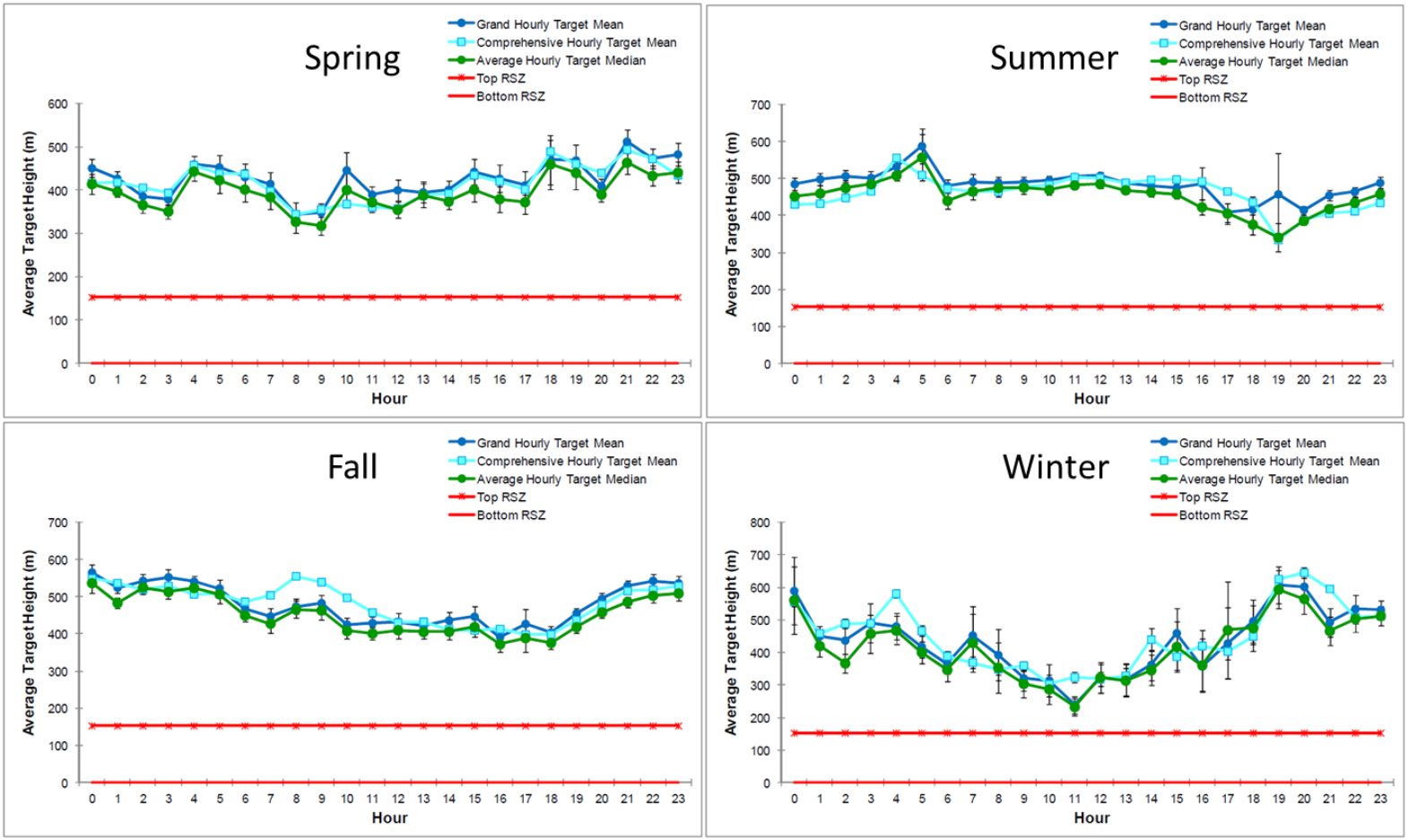


Figure 4.18. Avian Radar Locations, March 2011 to March 2013.



Notes:

1. Error bars represent one standard error for each hour.
2. Red lines represent the area between the ground and the maximum height of the rotor above the ground
3. Top RSZ shown on figure is 154.2 meters [500 feet].

Figure 4.19. Mean and Median Hourly Target Height by Season.

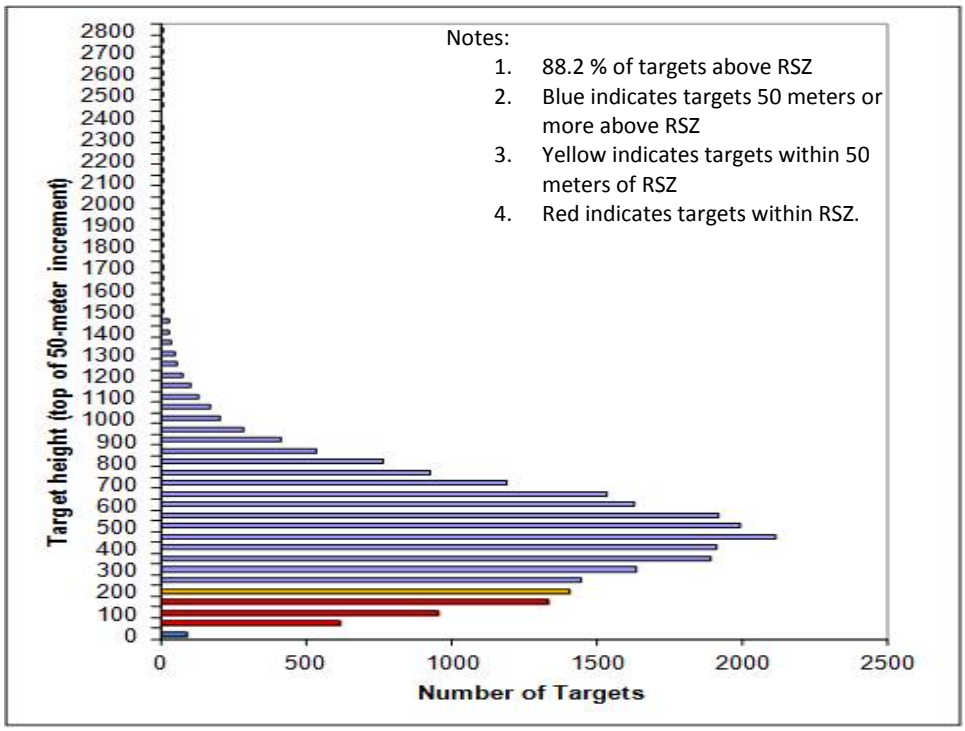


Figure 4.20. Target Height in 50-meter Increments, Spring 2011.

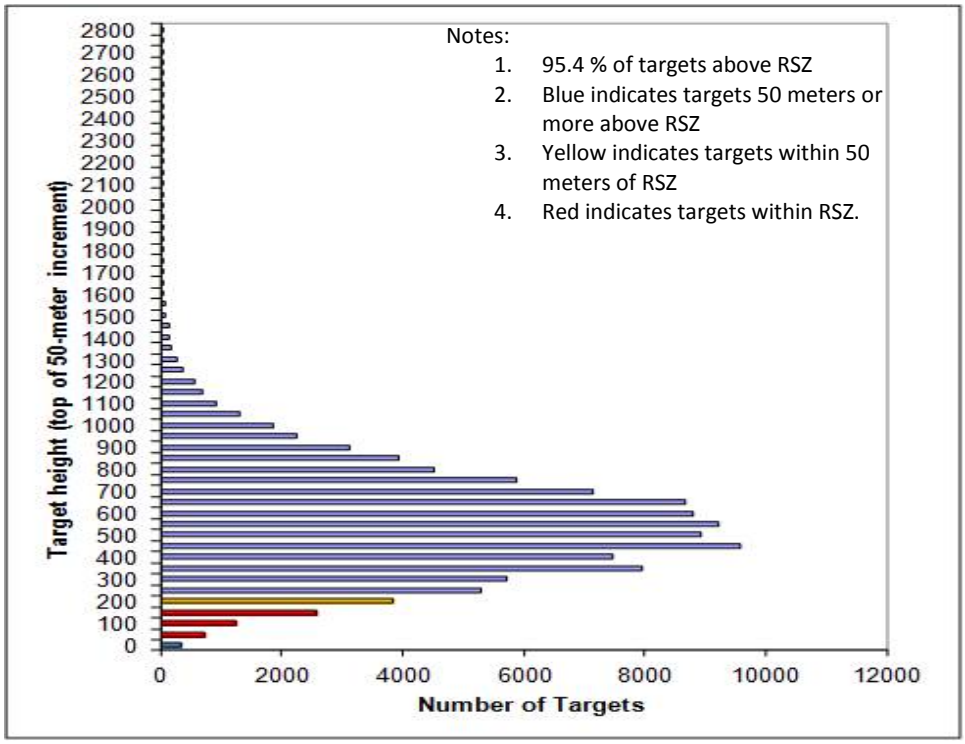


Figure 4.21. Target Height in 50-meter Increments, Summer 2011.

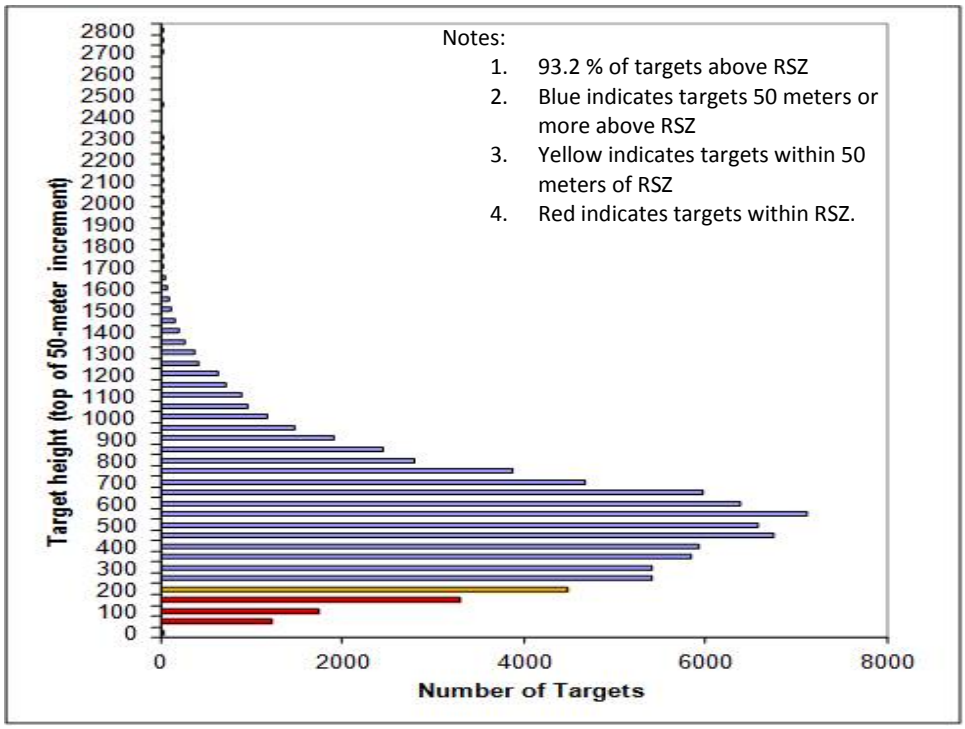


Figure 4.22. Target Height in 50-meter Increments, Fall 2011.

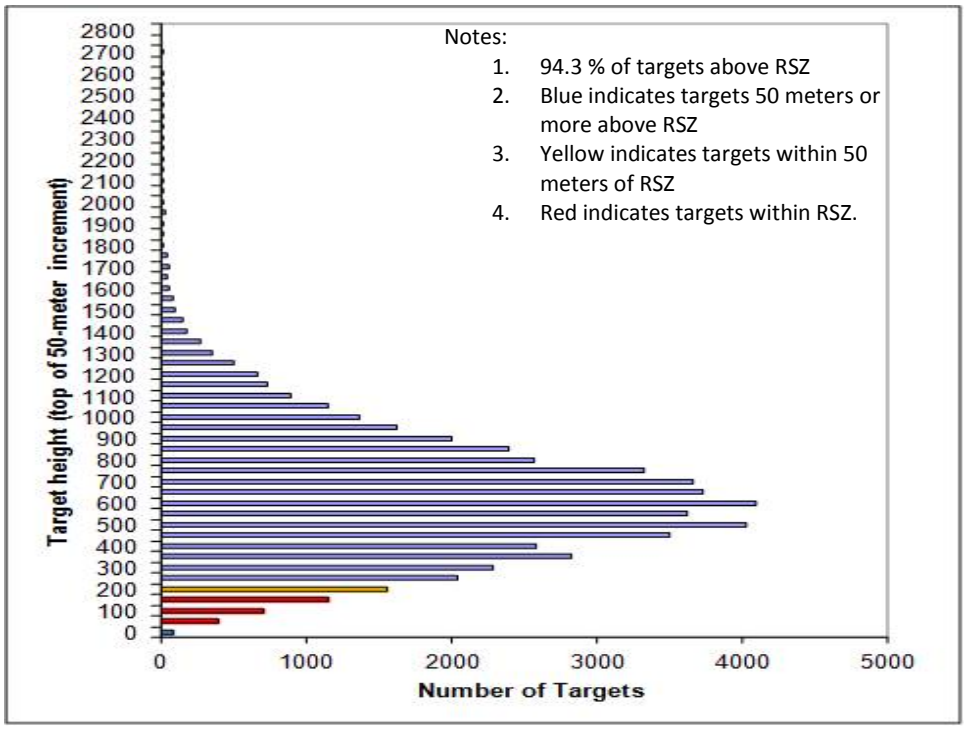


Figure 4.23. Target Height in 50-meter Increments, Winter 2011-2012.

Summer Season Radar Summary

During the summer season (July 1 to August 15), the highest number of targets detected by the VSR was during the night, averaging 233.2 targets per hour in 2011 and 298.5 targets per hour in 2012. *See Table 4.7.* Dawn and dusk target counts were significantly lower with a mean of 53.4 (dawn) and 37.6 (dusk) targets per hour in 2011 and 64.0 (dawn) and 60.3 (dusk) targets per hour in 2012. The highest activity levels occurred from the end of July to mid-August in 2011. In 2012 the highest activity level, as indicated by the number of targets recorded per hour, occurred in early July and from the end of July through mid-August.

In 2011 and 2012, the average mean target height during the summer season was highest at dawn (692 meters [2,270 feet] in 2011 and 587 meters [1,930 feet] in 2012) and was lowest at dusk (437 meters [1,430 feet] in 2011 and 355 meters [1,160 feet] in 2012). Hourly average target heights and mean target heights remained relatively consistent throughout the summer season in both years. Target direction recorded by the HSR showed a consistent southeasterly movement throughout the summer season in both years.

Fall Season Radar Summary

Similar to the spring and summer seasons, the highest number of targets detected in the fall (August 15 to November 14) was during the night, averaging 148.1 targets per hour in 2011 and 117.1 targets per hour in 2012. The average number of targets during the dawn and day periods remained relatively consistent (77.3 [dawn] and 83.8 [day] targets per hour in 2011 and 67.7 [dawn] and 57.2 [day] targets per hour in 2012), with dusk being the lowest activity period at 52.2 targets per hour in 2011 and 29.2 targets per hour in 2012. *See Table 4.7.* In both years, the majority of the activity, as indicated by the number of targets recorded per hour, occurred between mid-August and early-October, which is consistent with the end of fall southerly migratory movements. After early-October, the average number of targets per hour dropped substantially.

The average mean target height was highest at dawn (592 meters [1,940 feet] in 2011 and 526 meters [1,730 feet] in 2012). However, there was little variation in target height for all day and night periods combined; the average mean target height ranged between 461 meters (1,510 feet) and 592 meters (1,940 feet) in 2011 and between 428 meters (1,400 feet) and 526 meters (1,730 feet) in 2012. Hourly average target heights also remained relatively consistent throughout the fall season in both years. Target direction recorded by the HSR were consistent between 2011 and 2012, showing southeasterly movement throughout the dawn, dusk, and night periods, while daytime movements shifted to a more easterly direction.

Winter Season Radar Summary

Radar data collected during the winter season (November 16 – March 31) in 2011-2012 and 2012-2013 demonstrates that overall bird use in the CCSM Project Site is extremely low relative to other seasons. *See Table 4.7.* Patterns of low use begin in mid-October at the end of seasonal migration and remain low through early to mid-March when spring migration activities begin. *See Appendix G*. Similar to other seasons, activity during winter months was highest during the nighttime period but was 94-99% lower than the use observed in other seasons. The average number of targets across all parts of the day was very low in winter months (3.5 [dawn], 2.8 [day], 2.9 [dusk], and 5.6 [night] targets per hour in 2011-2012 and 1.6 [dawn], 1.2 [day], 0.6 [dusk], and 2.8 [night] targets per hour in 2012-2013). *See Table 4.7*

The average mean target height during the winter season was highest during nighttime in 2011-2012 (486 meters [1,590 feet]) and the dusk period in 2012-2013 (362 meters [1,190 feet]). The average mean target height was lowest during the day (220 meters [720 feet] in 2011-2012 and 255 meters [837 feet] in 2012-2013). Target direction recorded by the HSR showed a tendency towards northerly and easterly movements throughout all hours in both years. However, strong directional movement patterns were not as evident during winter months.

Table 4.7. Average Targets per Hour and Target Height Summary.

Season	Targets Per Hour (targets/km/hr)				Average Target Height (meters)			
	Dawn	Day	Dusk	Night	Dawn	Day	Dusk	Night
Spring 2011	15.6	20.8	18.8	86.7	315.3	417.8	416.6	432.2
Summer 2011	53.4	139.1	37.6	233.2	691.7	530.7	436.5	551.7
Fall 2011	77.3	83.8	52.2	148.1	592.2	461.0	478.1	567.4
Winter 2011-2012	3.5	2.8	2.9	5.6	442.0	274.8	366.9	524.8
Spring 2012	7.4	26.0	35.6	86.3	421.0	407.0	408.2	450.6
Summer 2012	64.0	83.8	60.3	298.5	586.9	479.8	354.9	484.7
Fall 2012	67.7	57.2	29.2	117.1	434.1	427.8	444.8	525.7
Winter 2012-2013	1.6	1.2	0.6	2.8	312.8	221.1	286.1	437.8

Breeding Bird Density Surveys

Breeding bird density surveys were completed at 15 survey grids across the CCSM Project Site, with 9 of the survey grids located within the Phase I Development Area. *See Figure 4.24.* Each survey grid consisted on 16 sampling points for a total of 240 point counts across the CCSM Project Site, with 144 of these point counts occurring within the Phase I Development Area. Breeding bird density surveys were conducted following the grid survey protocols published by the Rocky Mountain Bird Observatory. *See Hanni et al. 2010.* Survey locations were selected using a generalized random tessellation stratified design to ensure spatially balanced sampling stratified within each WDA and across major vegetation and habitat types within the CCSM Project Site. Breeding bird density surveys were conducted at each survey grid between June 7 and June 30, 2011, all within five hours of sunrise. *See Appendix D.*

Each survey grid consisted of 16 point count locations arranged in a 4 x 4 grid, with 250 meter spacing between each of the 16 points in the 4 x 4 grid. Surveys were initiated within 30 minutes of sunrise and were completed within approximately 4 hours. Surveys were completed at each of the 16 points within a survey grid for six minutes. Data collected at each point included species, number of individuals, distance from observer, flight behavior, and general demographics. Variables used to characterize breeding bird use in Phase I include number of species, number of individuals, number of flocks, species frequency (the percentage of surveys on which a species was observed), occurrence frequency (percentage of surveys with at least one bird detection), and mean use (average number of individuals per survey). Vegetation and general habitat data were also collected for each point count location to assist in the analysis of breeding bird habitats. Observations of species of concern were recorded if those species were detected during travel between the 16 point count locations in each survey grid. *See Table 1.1.*

Each of the 9 survey grids within the Phase I Development Area consisted of 16 sampling locations for a total of 144 individual point counts. For all Phase I breeding bird point counts combined, 1,118 individuals representing more than 50 species were recorded. The most common species, based on total number of individuals recorded and frequency of detection, was horned lark (219 individuals, 100% occurrence on the 9 grids, and 88% occurrence on the 144 sampling points). Following horned lark, Brewer's sparrow (152 individuals, 100% grid occurrence, 77% sampling point occurrence), vesper sparrow (148 individuals, 89% grid occurrence, 77% sampling point occurrence), green-tailed towhee (76 individuals, 89% grid occurrence, 48% sampling point occurrence), and sage thrasher (71 individuals, 67% grid occurrence, 51% sampling point occurrence) were the next most common species. These five species combined accounted for 666 individuals or 60% of all detections in the Phase I Development Area. *See Appendix D*. *See Table 4.8.*

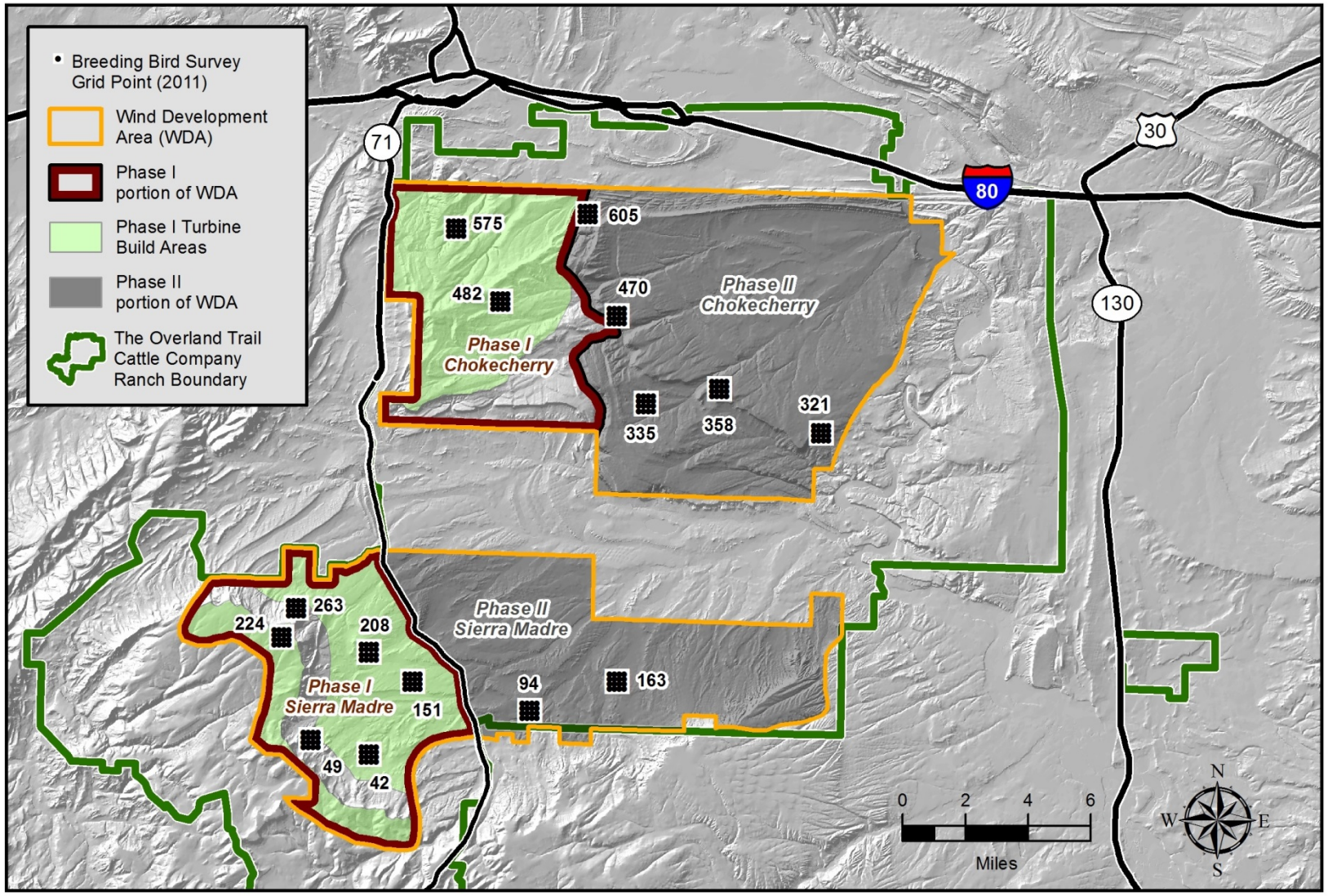


Figure 4.24. Breeding Bird Grid Survey Locations.

Table 4.8. Phase I Observations, Breeding Bird Density Surveys.

Species/Species Group	Number Observed
Corvids	
Common Raven	28
Passerines	
American Goldfinch	14
American Robin	30
Brewer's Sparrow	152
Brown-headed Cowbird	27
Chipping Sparrow	13
Common yellowthroat (*Geothlypis trichas*)	4
Dusky Flycatcher (*Empidonax oberholseri*)	11
Green-tailed Towhee	76
Horned Lark	219
House Wren	22
MacGillivray's Warbler (*Geothlypis tolmiei*)	15
Mountain Bluebird	13
Orange-crowned Warbler (*Oreothlypis celata*)	9
Red-winged Blackbird (*Agelaius phoeniceus*)	7
Rock Wren	50
Sage Sparrow	41
Sage Thrasher	71
Savannah Sparrow	7
Say's phoebe (*Sayornis saya*)	4
Tree swallow	4
Vesper Sparrow	148

Species/Species Group	Number Observed
Warbling Vireo (*Vireo gilvus*)	21
Western Meadowlark	11
Yellow Warbler (*Setophaga petechia*)	12
Other Passerines[1]	47
Non-eagle Raptors, Owls, and Allies	
American Kestrel	1
Northern Harrier	2
Red-tailed Hawk	7
Waterfowl, Waterbirds, and Wading Birds	
Common Merganser (*Mergus merganser*)	2
Killdeer	5
Sora (*Porzana carolina*)	9
Wilson's Snipe (*Gallinago delicata*)	4
Other Birds	
Broad-tailed Hummingbird (*Selasphorus platycercus*)	4
Common Nighthawk	15
Common Poorwill (*Phalaenoptilus nuttallii*)	1
Mourning Dove	5
Northern Flicker	7
Total	**1,118**

Notes:

1. Other passerines include unknown passerines that could not be identified to species level, as well as species that were observed fewer than 4 times during surveys, e.g. ruby-crowned kinglet *(Regulus calendula*), western wood-peewee (*Contopus sordidulus*), lark sparrow (*Chondestes grammacus*), and yellow-rumped warbler (*Setophaga coronata*). Appendix B lists all passerine species that have been observed across the CCSM Project Site, including Phase I.

Waterbird/ Waterfowl Surveys

Waterbird/waterfowl surveys were conducted in 2011 during spring (April 26–May 4), summer (August 23–24), and fall (October 20–21) at each of the four major reservoirs (Kindt, Rasmussen, Sage Creek, and Teton) near the CCSM Project Site. *See Figure 3.4. See Appendix D.* Surveys were conducted using spotting scopes to maximize coverage from an optimal number of viewing locations, as well as to facilitate species identification. In addition, care was taken not to double-count individuals if more than one location was necessary to survey a reservoir. Along with standard survey information (e.g., date, location, observer, time, weather conditions), species-specific data collected included species, age, sex, and number of individuals. While waterbird/waterfowl surveys were conducted only across three seasons in one year and cannot be used to assess interannual variability, the survey data provide a useful index to evaluate waterbird/waterfowl species use and to assess spatiotemporal abundance across the four reservoirs.

Spring waterbird/ waterfowl surveys resulted in a total count of 1,417 individuals representing 35 species. American coot (*Fulica americana*) was the most abundant species accounting for 364 individuals (26% of total count). Lesser and greater scaup (*Scaup* sp.), western and Clark's grebes (*Aechmophorus* sp.), and eared grebe (*Podiceps nigricollis*) were the next most abundant species with 351, 209, and 113 individuals, respectively. Collectively, the above four species accounted for 1,037 individuals or 73% of all birds detected. More species and individuals were counted at Kindt Reservoir (25 species, 808 individuals) than the other three reservoirs. The fewest species and number of individuals (12 species, 165 individuals) were recorded at Sage Creek Reservoir during spring surveys. *See Appendix D. See Table 4.9.*

During summer waterbird/ waterfowl surveys, 1,708 individuals representing 29 species were recorded. Redhead duck (*Aythya americana*) had the highest number of individuals (815) accounting for 48% of all birds detected during summer surveys. Lesser scaup (*Aythya affinis*), mallard (*Anas platyrhynchos*), and American coot were the next most abundant species with 157, 149, and 99 individuals, respectively. Collectively, the above four species accounted for 1,221 individuals or 71% of all birds detected. The highest number of individuals (920) was recorded at Rasmussen Reservoir, where 89% (780 individuals) were redheads. Nearly all of the season's redheads (780 of 815) were recorded at Rasmussen Reservoir. Despite the high number of birds recorded at Rasmussen Reservoir, biologists recorded the fewest number of species (12) at that location. *See Appendix D. See Table 4.9.*

Waterbird/ waterfowl surveys during fall, including fall migration, recorded 11,473 individuals representing 29 species. Similar to spring waterbird/ waterfowl surveys, American coot accounted for a majority of the individuals during fall surveys (8,024, 70% of total individuals). A total of 1,692 American wigeon (*Anas americana*) were also recorded. Combined, American coot and American wigeon accounted for 9,716 individuals (85% of all individuals). More individuals (8,773) and species (22) were recorded at Kindt Reservoir during fall surveys than at other reservoirs. Of the 8,024 American coots and 1,692 American wigeons recorded at all reservoirs combined, the survey at Kindt Reservoir accounted for 5,810 coots (66%) and 1,690 wigeons (99%). *See Appendix D. See Table 4.9.*

Table 4.9. Waterbird/ Waterfowl Survey Summary Data.

Species	Spring 2011	Summer 2011	Fall 2011	Total Observations
Aechmophorus sp.	71	---	---	**71**
American Avocet (*Recurvirostra americana*)	8	25	8	**41**
American Coot	364	99	8,024	**8,487**
American White Pelican	6	24	---	**30**
American Wigeon	6	11	1,692	**1,709**
Black-crowned Night-Heron	---	7	---	**7**
Blue-winged Teal (*Anas discors*)	---	20	---	**20**
Bufflehead (*Bucephala albeola*)	10	---	3	**13**
Calidris sp.	3	---	---	**3**
California Gull (*Larus californicus*)	2	2	---	**4**
Canada Goose (*Branta canadensis*)	5	28	43	**76**
Canvasback (*Aythya valisineria*)	4	---	6	**10**
Cinnamon Teal (*Anas cyanoptera*)	3	---	---	**3**
Clark's Grebe (*Aechmophorus clarkii*)	1	---	---	**1**
Common Loon (*Gavia immer*)	5	2	2	**9**
Common Merganser	74	17	70	**161**
Double-crested Cormorant (*Phalacrocorax auritus*)	6	11	---	**17**
Eared Grebe (*Podiceps nigricollis*)	113	50	110	**273**
Gadwall (*Anas strepera*)	32	36	577	**645**
Great Blue Heron (*Ardea herodias*)	---	2	---	**2**
Greater Scaup (*Aythya marila*)	4	---	---	**4**
Greater Yellowlegs (*Tringa melanoleuca*)	2	---	4	**6**

Species	Spring 2011	Summer 2011	Fall 2011	Total Observations
Green-winged Teal (*Anas crecca*)	14	68	87	**169**
Herring Gull (*Larus argentatus*)	---	3	3	**6**
Hooded Merganser (*Lophodytes cucullatus*)	---	---	3	**3**
Horned Grebe (*Podiceps auritus*)	1	---	34	**35**
Killdeer	22	10	---	**32**
Least Sandpiper (*Calidris minutilla*)	1	---	---	**1**
Lesser Scaup	103	157	24	**284**
Lesser Yellowlegs (*Tringa flavipes*)	1	---	---	**1**
Long-billed Dowitcher (*Limnodromus scolopaceus*)	---	---	4	**4**
Mallard	6	149	152	**307**
Marbled Godwit (*Limosa fedoa*)	8	---	---	**8**
Northern Pintail (*Anas acuta*)	3	10	57	**70**
Northern Shoveler (*Anas clypeata*)	8	---	13	**21**
Pectoral Sandpiper (*Calidris melanotos*)	---	---	1	**1**
Pied-billed Grebe (*Podilymbus podiceps*)	1	10	9	**20**
Redhead	85	815	359	**1,259**
Ring-billed Gull (*Larus delawarensis*)	2	6	28	**36**
Ring-necked Duck (*Aythya collaris*)	26	---	84	**110**
Ruddy Duck (*Oxyura jamaicensis*)	9	9	34	**52**
Scaup sp.	244	---	---	**244**
Snowy Egret (*Egretta thula*)	---	1	---	**1**
Spotted Sandpiper (*Actitis macularius*)	---	4	---	**4**

Species	Spring 2011	Summer 2011	Fall 2011	Total Observations
Surf Scoter (*Melanitta perspicillata*)	---	---	6	**6**
Unknown dabbling duck	---	47	---	**47**
Unknown gull	---	14	---	**14**
Western Grebe (*Aechmophorus occidentalis*)	137	67	33	**237**
White-faced Ibis (*Plegadis chihi*)	3	---	---	**3**
White-winged Scoter (*Melanitta fusca*)	---	---	3	**3**
Willet (*Tringa semipalmata*)	21	1	---	**22**
Wilson's Phalarope (*Phalaropus tricolor*)	3	3	---	**6**
Total Observations	**1,417**	**1,708**	**11,473**	**14,598**
Total Number of Species	**35**	**29**	**29**	**52**

Acoustic Bat Surveys

Similar to 2008 acoustic bat surveys, AnaBat detection systems manufactured by Titley Electronics were used for acoustic bat surveys conducted on the CCSM Project Site during 2011 and 2012. *See Section 4.3.1.* For acoustic bat surveys conducted on the CCSM Project Site in 2011 and 2012, a standard index of bat activity was generated by counting the number of bat passes per detector-night at each survey location. *See Hayes 1997; Kunz et al. 2007.* All bat passes were categorized through assessment of both qualitative (e.g., shape) and quantitative (e.g., characteristic frequency) qualities as demonstrated by Weller and Baldwin (2012). Bat passes were classified as pertaining to low (≤25 kHz), mid (~30-40 kHz), and high (≥40 kHz) frequency groups. Further refinement in the dataset in 2011 and 2012 was intended to provide more differentiation as to what species may be represented in the low frequency group. The low frequency category in the 2008 dataset may also have included some bat species with a characteristic frequency around 30 kHz, such as long-eared myotis, fringed myotis, Townsend's big-eared bat, and pallid bat. *See Griscom et al. 2012; Keinath undated.* Diagnostic call sequences in the datasets were labeled only for hoary bats as that species has a unique call pattern easily distinguished from other bat species.

The 2011 and 2012 acoustic bat surveys were coupled with radar surveys. The survey approach was developed in coordination with the USFWS, BLM, and WGFD to characterize bat use and potentially aid in the evaluation of radar datasets. Acoustic bat monitoring was completed from June 15 to October 20, 2011, and June 27 to August 29, 2012, at five locations co-located with the radar system (Chokecherry Bench, Smith Draw, Upper Iron Springs, McKinney Creek, and Pine Grove) to characterize patterns of

nightly bat activity. *See Figure 4.18.* Collectively, sites were surveyed for 95 detector-nights in 2011 and 62 detector-nights in 2012. In total, 185 and 134 bat passes were recorded in 2011 and 2012, respectively, for an average of 2.0 bat passes/detector-night across years, similar to the 1.9 bat passes/detector-night observed in 2008. *See Section 4.3.1. See Appendix E.*

Activity levels were variable during the 2011 and 2012 survey periods. There was an increase in the number of bat passes on July 24, 2011, (26 total bat passes) and over the nights of July 11, 2012, (17 bat passes) and July 12, 2012 (15 bat passes). These peaks in activity are similar in timing to a spike in activity noted in the 2008 survey data on July 27. *See Section 4.3.1.*

In 2011, activity levels decreased in mid-August and remained low from September 23 to October 20 averaging less than 1 bat pass/detector-night. This low activity is similar to that reported for the September to October period in 2008. *See Section 4.3.1.* The 2011 surveys recorded more mid- and high-frequency bat passes (156; 84% of all bat passes) than low-frequency (29; 16%) bat passes. Hoary bat comprised 4% of all bat passes and was identified on four nights (July 30 and August 12-14). Surveys in 2012 had a similar trend with mid- and high-frequency bat passes accounting for 115 (86%) of the 134 total bat passes. Ten bat passes were attributable to hoary bat (7% of all bat passes) evenly spaced across seven nights between July 26 and August 29, 2012. While the survey protocols developed in coordination with USFWS, BLM, and WGFD were not intended to result in datasets covering the entire CCSM Project Site across all months in which bats may be present, these bat survey data provide a useful index to assess bat patterns of use.

4.4.2 Field Study and Impact Prediction Questions

As detailed above, in compliance with Tier 3 of the USFWS Wind energy Guideline and Tier 2 of the WGFC Wind Energy Recommendations, PCW conducted additional site-specific field studies for the CCSM Project Site, including Phase I, since the 2008-2009 site characterization process described in section 4.3. These additional field studies were designed in coordination with USFWS, BLM, and WGFD to assess the potential risk of the CCSM Project, including Phase I, to migratory bird and bat species and to inform appropriate measures to avoid and minimize that risk. PCW's response to the field study and impact prediction questions and its risk assessment are based on the analysis conducted during the site evaluation and site characterization processes, as well as the field study data currently available for the CCSM Project, including Phase I.

The USFWS Wind Energy Guidelines identify the need to consider the duration, scope, and intensity of an impact to determine significance of risks and note the need for consistency in evaluating significance over time. *See USFWS 2012 at p. 63.* PCW has considered these factors in the evaluation of potential risks to migratory bird and bat species. To provide a consistent and reasoned approach, the significance criteria identified for fisheries and wildlife resources in the BLM FEIS are used throughout this Phase I BBCS. *See BLM 2012b at p. 4.14-6*. According to the BLM FEIS, significant impacts would occur if: 1) Substantial loss of habitat function or disruption of life history requirements of a species or population segment that would make them eligible for listing under the ESA; 2) Decreased viability or increased

mortality of threatened and endangered, proposed and candidate species, or reduction or alteration of their critical habitats; 3) Management actions that result in substantial disruption or irreplaceable loss of vital and high value habitats, as defined in the WGFD (2004b) Mitigation Policy; 4) Substantial loss of habitat function or disruption of life history requirements of special status species that would preclude improvement of their status; or 5) Actions preclude attainment of conservation goals, as stated in conservation plans and strategies for special status species. *See BLM 2012b at p. 4.14-6*

USFWS Wind Energy Guidelines

1. *Do field studies indicate that species of concern[31] are present on or likely to use the proposed site?*

   As discussed in section 1.2, PCW has identified 117 species of migratory birds within the CCSM Project Site, including Phase I. *See Appendix B, USFWS 2016a.* In addition, 13 bat species have been observed, acoustically detected, or documented in the vicinity of the CCSM Project. *See Orabona et al. 2012; BLM 2012b.* Based on existing data and pre-construction surveys for the CCSM Project, PCW identified 22 migratory bird and 9 bat special status species that occur or have the potential to occur on the CCSM Project Site, including Phase I. *See Table 1.1 & Table 1.2.* These species include migratory bird and bat species listed on the BLM Wyoming Sensitive Species Policy and List or included in the Wyoming SWAP as SGCN. *See BLM 2012b; PCW 2014a at App. S*; *WGFD 2010*.

2. *Do field studies indicate the potential for significant adverse impacts on affected population of species of habitat fragmentation concern?*

   USFWS identified habitat fragmentation as a potential impact that could occur as a result of construction and operation of Phase I. *See USFWS 2016a*. However, they did not identify any specific species of habitat fragmentation concern. PCW has evaluated the findings from site characterization and site evaluation studies and determined that sagebrush obligate species (sagebrush sparrow, sage thrasher, and Brewer's sparrow) are potential species of habitat fragmentation concern for Phase I. This is consistent with the findings of the Wyoming Basin Ecoregional Assessment. *See Carr and Melcher 2015*. No other species of habitat fragmentation concern have been identified in the CCSM Project Site, including Phase I[32]. The site-specific data collected during field studies indicate that Brewer's sparrow, sagebrush sparrow, and sage

[31] This Phase I BBCS adopts the definition of species of concern from the USFWS Wind Energy Guidelines. However, in recognition of agency management priorities, discussions of species of concern are primarily focused on special status species that have been identified by federal and state agencies. *See Section 1.2.*

[32] The USFWS and other federal agencies have yet to designate species of habitat fragmentation concern for Wyoming. It is possible that there are other species of habitat fragmentation concern in Phase I. However, as they have not been identified, they cannot be specifically addressed in this BBCS. If additional species of habitat fragmentation concern are identified by the agencies, they may be addressed through the adaptive management process described in Section 8, as appropriate.

thrasher are among the most common migratory bird species within Phase I. This is a result of the availability of sagebrush steppe habitat in Phase I as well as the availability of this habitat throughout southern Wyoming. *See Carr and Melcher 2015*

Localized risks may be present to some individual sagebrush obligates from Phase I, generally due to surface disturbance and human presence; however, it is anticipated these impacts would be temporary, primarily during construction, and surrounding areas would generally be available for use by these species. Some indirect impacts including displacement or barrier effects may occur though the life of the project. Further, Phase I has been designed to minimize overall surface disturbance. This will reduce long-term fragmentation of habitats used by sagebrush obligates resulting in lower risks to the species. Finally, sagebrush habitats are available throughout southern Wyoming as well as large areas of the remainder of the western United States and the abundance of these species throughout that area make it unlikely that the risk of adverse impacts resulting from the construction and operation of Phase I would result in population level declines. These findings are consistent with the site characterization findings and the analyses presented in the BLM FEIS that concluded there would be no significant impacts to sagebrush obligate species from the CCSM Project. *See Section 4.3.2. See BLM 202b at p. 4.14-25.*

3. *What is the distribution, relative abundance, behavior, and site use of species of concern identified in Tiers 1 or 2, and to what extent do these factors expose these species to risk from the proposed wind energy project?*

Patterns of abundance and site use of the potential migratory bird species of concern identified in Table 1.1 are evaluated in Table 4.10. Consistent with the USFWS DEIS and BLM FEIS, PCW has identified that passerines are the group of migratory birds likely to have the greatest overall risk for impacts from Phase I. *See BLM 2012b, USFWS 2016a*. Generally, while localized risk from Phase I may be present for these and other migratory bird species, the risk has been avoided and minimized through the Phase I design process and the application of the measures identified in chapter 5.0. The risks to the potential migratory bird species of concern described in Table 4.10 are also characteristic of the potential risk to other migratory bird species that might occur in Phase I of the CCSM Project; however, due to the large number of other migratory bird species, only the potential species of concern are addressed individually. *See Appendix B.*

Based on site characterization and field study data, overall bat use of Phase I is relatively low; therefore, risks to the bat species listed in Table 1.2 from Phase I are anticipated to be low. While the species in Table 1.2 may use Phase I for migration or foraging, most are not commonly present. Consistent with the site evaluation for Phase I and BLM's FEIS, there is a low risk to the three BLM sensitive bat species (long-eared myotis, fringed myotis, and Townsend's big-eared bat) due to their limited occurrence in Phase I. *See Section 4.2.2.* Hoary bats are known to be uncommon in Phase I. However, fatalities of hoary bats are expected and, as disclosed in the USFWS DEIS, may be higher than indicated by pre-construction survey efforts. *See USFWS 2016a*. Of all bat species, it is likely that little brown bat, big brown bat, and silver-haired bat would have the greatest risk for impacts resulting from Phase I because they have the highest probability of occurrence and are known to be at risk for collision with wind turbines. *See BLM 2012b at p. 4.14-17; USFWS 2016a*. However, the avoidance, minimization, and conservation measures described in chapter 5.0 will avoid and minimize these risks to the extent practicable.

Table 4.10. Potential Risk to Migratory Bird and Bat Special Status Species of Concern[33].

Common Name	Phase I Occurrence	Assessment of Risk[34]
Passerines		
Brewer's Sparrow	Common across Phase I and southern Wyoming in sagebrush habitats.	Localized risk associated with habitat fragmentation and possible collision with wind turbines. Site evaluation and characterization found that impacts would not be significant.
Lark Bunting	Rare in Phase I. Phase I is on edge of species range and does not provide suitable habitat.	Very low risk. Species and its habitats are uncommon in Phase I. Site evaluation and characterization found that impacts would not be significant.
Loggerhead Shrike	Uncommon in Phase I.	Localized risk from habitat fragmentation and collision with wind turbines. Site evaluation and characterization found that impacts would not be significant.
Sagebrush Sparrow	Common across Phase I and southern Wyoming in sagebrush habitats.	Localized risk associated with habitat fragmentation and possible collision with wind turbines. Site evaluation and characterization found that impacts would not be significant.
Sage Thrasher	Common across Phase I and southern Wyoming in sagebrush habitats.	Localized risk associated with habitat fragmentation and possible collision with wind turbines. Site evaluation and characterization found that impacts would not be significant.
Raptors		
Burrowing Owl	Uncommon in Phase I. Limited occurrence in white-tailed prairie dog colonies.	Low potential for risk to migrating individuals. Low potential for collision with wind turbines. Site evaluation and characterization found that impacts would not be significant.
Ferruginous Hawk	Uncommon in Phase I. No occupied nests in more than 5 years of monitoring.	Low potential for risk to migrating individuals or non-breeding individuals that infrequently visit Phase I.
Merlin	Uncommon in Phase I. No occupied nests in more than 5 years of monitoring.	Low potential for risk to migrating individuals that infrequently visit Phase I. Site evaluation and characterization found that impacts would not be significant.

[33] This Phase I BBCS adopts this definition of species of concern from the USFWS Wind Energy Guidelines. However, in recognition of agency management priorities, this Phase I BBCS is primarily focused on special status species that have been identified by federal and state agencies. *See Section 1.2.*

[34] To provide a consistent and reasoned approach to determining significance, this Phase I BBCS adopts the significance criteria identified for fisheries and wildlife resources in the BLM FEIS. *See Section 4.4.2 at p.4-73.*

Common Name	Phase I Occurrence	Assessment of Risk[34]
Northern Goshawk	Uncommon in Phase I. No occupied nests in more than 5 years of monitoring. Very limited suitable habitat within 5 miles of the CCSM Project.	Low potential for risk to migrating individuals that infrequently visit Phase I. Site evaluation and characterization found that impacts would not be significant.
Peregrine Falcon	Uncommon in Phase I. Suitable nesting habitat does not occur.	Low potential for risk to migrating individuals that infrequently visit Phase I. Site evaluation and characterization found that impacts would not be significant.
Prairie Falcon	Common in Phase I. Nesting locations known in both Chokecherry and Sierra Madre WDAs.	Risk to species is associated with potential collision with wind turbines during migration and foraging. No Phase I wind turbines are located within suitable nesting habitat. Site evaluation and characterization found that impacts would not be significant.
Swainson's Hawk	Common in Phase I. Nesting locations known in the vicinity of the CCSM Project Site.	Risk to species is associated with potential collision with wind turbines during migration and foraging. No Phase I wind turbines are located within suitable nesting habitat. Site evaluation and characterization found that impacts would not be significant.
Waterbirds/ Waterfowl		
Black-crowned Night-heron	Uncommon in Phase I.	Low risk for impacts. Habitats used by black-crowned night are not common in Phase I. Site evaluation and characterization found that impacts would not be significant.
Canvasback	Uncommon in Phase I. Generally occur in proximity to reservoirs during spring and fall migration periods.	Low risk for impacts. Low potential for collision during migration because wind turbines are not located near reservoirs. Site evaluation and characterization found that impacts would not be significant.
Clark's Grebe	Uncommon in Phase I. Generally occur in proximity to reservoirs during spring and fall migration periods.	Low risk for impacts. Low potential for collision during migration because wind turbines are not located near reservoirs. Site evaluation and characterization found that impacts would not be significant.
Lesser Scaup	Uncommon in Phase I. Generally occur in proximity to reservoirs during spring and fall migration periods.	Low risk for impacts. Low potential for collision during migration because Phase I wind turbines are not located near reservoirs. Site evaluation and characterization found that impacts would not be significant.

Common Name	Phase I Occurrence	Assessment of Risk[34]
Long-billed Curlew	Uncommon in Phase I. Several individuals have been observed in grassland habitats in the central basin between the WDAs.	Low risk for impacts. Minimal risk to individuals because of lack of suitable grassland habitat and infrequent use of Phase I. Site evaluation and characterization found that impacts would not be significant.
Mountain Plover	Uncommon in Phase I. Several individuals have been observed in upland grassland and barren habitats in the Phase I.	Low potential for risk to this ground-based species. Some potential for collision with wind turbines as individuals migrate to and from Phase I. Risk highest in saltbush communities upland grasslands in Lower Miller Hill within the Phase I portion of the Sierra Madre WDA. Site evaluation and characterization found that impacts would not be significant.
Northern Pintail	Uncommon in Phase I. Generally occur in proximity to reservoirs during spring and fall migration periods.	Low risk for impacts. Low potential for collision during migration because Phase I wind turbines are not located near reservoirs. Site evaluation and characterization found that impacts would not be significant.
Redhead	Seasonally common in proximity to reservoirs during spring and fall migration periods.	Low risk for impacts. Low potential for collision during migration because Phase I wind turbines are not located near reservoirs. Site evaluation and characterization found that impacts would not be significant.
Sandhill Crane	Uncommon in Phase I. Only one individual seen in the Sierra Madre WDA near wetland habitat.	Low risk for impacts. Phase I is not a known breeding or migration area for the species and habitat availability is limited. Site evaluation and characterization found that impacts would not be significant.
White-faced Ibis	Uncommon in Phase I. Generally occur in proximity to reservoirs.	Low risk for impacts. Low potential for collision because Phase I wind turbines are not located near reservoirs. Site evaluation and characterization found that impacts would not be significant.

4. *What are the potential risks of adverse impacts of the proposed wind energy project to individuals and local populations of species of concern*[35] *and their habitats? (In the case of rare or endangered species, what are the possible impacts to such species and their habitats?)*

There are no known occurrences of threatened or endangered migratory bird or bat species in the CCSM Project Site, including Phase I, or in the surrounding areas. In addition, no rare migratory bird or bat species of concern were identified during Phase I site-specific survey efforts. As such, no impacts will occur to rare, threatened, or endangered species or their habitats.

Based on the site characterization and field study data and as described below, it is also unlikely that any population level impacts would occur to any species of concern because the species most commonly observed in Phase I are ubiquitous in Phase I, the CCSM Project Site, and the Ranch. *See USFWS 2016a, BLM 2012b*. The species and their habitat are also common across much of the Wyoming Basin and surrounding states. *See Carr and Melcher 2015*. It has been documented by some studies that there is little or no relationship between pre-construction avian survey results and the actual mortality risk resulting from wind projects. *See Ferrer et al. 2012; Erickson et al. 2014.* However, it has also been shown that passerines are among the most common fatalities observed at operational wind facilities (Erickson et al. 2002a,b, 2001; Johnson and Stephens 2011) because passerines were the most common order of birds observed in the Phase I area PCW has assumed that fatalities would be proportional to the pre-construction relative abundance for each species for purposes of evaluating risks.

Assuming that fatalities would be proportional to species-specific abundance of non-corvids observed as part of migratory bird point counts in Phase I, horned lark would make up approximately 60% of all fatalities. Sagebrush obligates (sagebrush sparrow, Brewer's sparrow, sage thrasher,) would make up 14% of all fatalities with sagebrush sparrow and Brewer's sparrow being most impacted among the four species in this guild. As described in sections 4.2.2 and 4.3.2, analyses completed as part of the site evaluation and characterization process found that impacts to sagebrush obligates are not expected to be significant. Vesper sparrow (5% of expected fatalities), western meadowlark (4%), and American robin (3%) make up the remainder of the species most likely to be impacted; none of which are special status species. The remaining 15% of fatalities would be expected to be associated with the species using Phase I in proportion to their abundance. For non-eagle raptors, it is expected that fatalities would most commonly be associated with American kestrel, red-tailed hawk, and prairie falcon.

[35] This Phase I BBCS adopts this definition of species of concern from the USFWS Wind Energy Guidelines. However, in recognition of agency management priorities, this Phase I BBCS is primarily focused on special status species that have been identified by federal and state agencies. *See Section 1.2.*

The potential impacts to migratory birds and bats from the CCSM Project, including Phase I, were analyzed in the BLM FEIS. The BLM FEIS identifies direct impacts consisting of fatalities and loss of habitat, as well as indirect impacts associated with habitat loss, modification, and displacement. *See BLM 2012b at pp.4.14-15 & 4.14-18.* Impacts to migratory birds and bats were estimated in BLM's FEIS based on pre-construction bird and bat use of the original Application Area and fatality estimates at other wind energy facilities in the western U.S., assuming there is a linear relationship between observed pre-construction use and post-construction mortality on a per MW basis.

The impacts estimated in BLM's FEIS are for the CCSM Project as a whole. BLM recognizes that "[t]he magnitude of these impacts depends upon the number of wind turbines and other infrastructure constructed for each alternative and the amount of direct and indirect habitat lost due to construction and operation of the project." *See BLM 2012b at p. 4.14-18.* Given that Phase I consists of half the wind turbines and a subset of the total disturbance for the CCSM Project, the impacts from Phase I will be substantially less than those estimated in the FEIS. Further, the BLM fatality estimates are based on pre-construction bird and bat use of the original Application Area and fatality estimates at other wind energy facilities in the western U.S., many of which did not develop avian and bat protection plans or other avoidance, minimization and mitigation measures to reduce mortalities while designing and operating the projects. *See Section 5.1.1*.

Predicting avian risk from pre-construction point count data is difficult and can result in estimates of mortality that do not match post-construction monitoring results. It has been documented by some studies that there is little or no relationship between pre-construction avian survey results and the actual mortality risk resulting from wind projects. *See Ferrer et al. 2012; Erickson et al. 2014*. Rather, levels of project risk are associated with site-specific characteristics around wind turbines and associated infrastructure. *See Ferrer et al. 2012*. Given the limitations of the existing fatality estimation methods to account for the substantial redesign of the CCSM Project and the micrositing process, PCW has not updated the migratory bird and bat fatality estimates for the CCSM Project or Phase I and has instead focused its efforts on avoiding and minimizing impacts to migratory birds and bats to the extent practicable, as described in chapter 5.0, and the development of a robust post-construction monitoring program to evaluate impacts and monitor conservation measure effectiveness, as described in chapter 6.0. As discussed in chapter 5.0, the measures included in this Phase I BBCS to avoid and minimize impacts to migratory birds and bats will likely result in observed impacts below those originally predicted by BLM. *See BLM 2012b at pp. 4.14-16 & 4.14-22.*

5. *How can developers mitigate identified significant adverse impacts?*

   Using the site-specific data for the CCSM Project, the USFWS Wind Energy Guidelines, and the WGFC Wind Energy Recommendations, PCW has worked cooperatively with USFWS, BLM, and WGFD to develop and apply appropriate avoidance, minimization, and mitigation measures to the CCSM Project, including Phase I, as described in chapter 5.0. *See USFWS 2016a*. These measures are designed to avoid and minimize impacts to migratory birds and bats from the CCSM Project, including Phase I, to the extent practicable.

6. *Are there studies that should be initiated at this stage that would be continued in post-construction?*

   PCW has coordinated with USFWS, BLM and WGFD to identify appropriate post-construction monitoring for migratory birds and bats to evaluate impacts and monitor conservation measure effectiveness. The migratory bird and bat post-construction monitoring program for Phase I is described in chapter 6.0 of this Phase I BBCS.

WGFC Wind Energy Recommendations

1. *Does pre-construction monitoring indicate that SGCN are present on or likely to use the proposed site?*

   Based on existing data and pre-construction surveys for the CCSM Project, PCW identified 22 migratory bird and 9 bat special status species that have the potential to occur on the CCSM Project Site, including Phase I. *See Table 1.1 & Table 1.2.* These species include migratory bird and bat species listed on the BLM Wyoming Sensitive Species Policy and List or included in the Wyoming SWAP as SGCN. *See BLM 2012b; PCW 2014a at App. S*; *WGFD 2010*. See response to questions 1 through 4 above under USFWS Wind Energy Guidelines.

2. *Does monitoring indicate the potential for adverse impacts on the wildlife species or habitat?*

   The potential impacts to migratory birds and bats from the CCSM Project, including Phase I, were analyzed in the BLM FEIS. The BLM FEIS identifies direct impacts consisting of fatalities and loss of habitat, as well as indirect impacts associated with habitat loss, modification, and displacement. *See BLM 2012b at pp. 4.14-15 & 4.14-18.* See response to questions 1 through 4 above under USFWS Wind Energy Guidelines.

3. *If adverse impacts are predicted to a species or habitat, can these impacts be avoided (preferable) or mitigated?*

   PCW has developed measures to avoid and minimize impacts to migratory birds and bats from the CCSM Project, including Phase I, to the extent practicable, as described in chapter 5.0. See response to question 5 above under USFWS Wind Energy Guidelines.

4. *Is monitoring needed for construction and post-construction?*

   The migratory bird and bat post-construction monitoring program for Phase I is described in chapter 6.0 of this Phase I BBCS. See response to question 6 above under USFWS Wind Energy Guidelines.

4.4.3 Field Study and Impact Prediction Risk Assessment

This Phase I field study and impact prediction risk assessment is the culmination of data collected and analyses completed in accordance with the tiered process set forth in the USFWS Wind Energy Guidelines and WGFC Wind Energy Recommendations. As such, it reflects data collected and analyzed since 2006 resulting in a thorough evaluation of potential risks to migratory bird and bat species from Phase I. The results of these risk assessments informed the development and application of the avoidance, minimization, and conservation measures presented in chapter 5.0 and the post-construction monitoring program described in chapter 6.0 of this Phase I BBCS.

The field study and impact prediction questions concluded that there are no threatened or endangered migratory birds or bat species present on the CCSM Project Site. However, it was determined that migratory bird or bat species of concern[36] are be present and that these species may be adversely affected by Phase I. *See Appendix B.* The majority of these impacts are likely to be localized rather than at a population-level. Risks to migratory birds and bats from Phase I include collision with operating wind turbines, collision with project-area vehicle traffic, loss of habitat associated with impacts from Phase I , and behavioral avoidance by some species during construction and operation of Phase I. Due to differences in patterns of use and potential risks from Phase I, separate risk assessments have been completed for non-eagle raptors, other migratory birds, and bats.

[36] This Phase I BBCS adopts this definition of species of concern from the USFWS Wind Energy Guidelines. However, in recognition of agency management priorities, this Phase I BBCS is primarily focused on special status species that have been identified by federal and state agencies. *See Section 1.2.*

Migratory Birds

Impacts to non-raptor migratory birds are expected to be seasonal and primarily occur during spring, summer, and fall months when migratory birds regularly use habitats within Phase I. Species-specific risk to migratory birds was evaluated using data for non-corvid migratory birds because impacts to larger corvids (common raven, black-billed magpie, American crow) from Phase I are assumed to be very low due to a high-level of avoidance. *See Sterner et al. 2007; Devereux et al. 2008*. Assuming that risk to other migratory bird species is proportional to observed species abundance, horned lark would be most at risk from Phase I (60% of occurrences). Based on Phase I survey data, sagebrush obligates (sagebrush sparrow, Brewer's sparrow, and sage thrasher) would also be at risk (14% of all occurrences) with risks to sagebrush sparrow and Brewer's sparrow being most prevalent. However, as described earlier, detailed analyses completed for the BLM FEIS found that impacts to sagebrush obligates are not expected to be significant. *See BLM 2012b at p. 4.14-25.* The remainder of the migratory bird species most likely to be at risk from Phase I include common species such as vesper sparrow (5% of occurrences), western meadowlark (4%), and American robin (3%). During winter months (November to March), direct and indirect impacts are expected to be less than in other seasons because of the low migratory bird activity on site.

Non-eagle Raptors

Risks to non-eagle raptors are anticipated be less than those to other migratory birds due to their relatively low abundance on-site. Further, non-eagle raptors use different habitats and have different patterns of use than other migratory birds. Risks to non-eagle raptors from Phase I are expected to be seasonal and similar to migratory birds are anticipated to be roughly proportional to the abundance of each species observed during Phase I surveys. Risks to non-eagle raptors are expected during spring, summer, and fall months when non-eagle raptors regularly use habitats in Phase I. During winter months, non-eagle raptor use is extremely low indicating a low overall risk.

Data collected across Phase I indicate that American kestrel, red-tailed hawk, and prairie falcon are at the greatest risk for impact. While Northern harrier was among the most abundant non-eagle raptor observed in Phase I, the species nests on the ground and forages by flying very close to the ground. Therefore, risks to northern harrier are expected to be less than risks to red-tailed hawk, American kestrel, and prairie falcon. American kestrel, red-tailed hawk, and prairie falcon species are known to nest and forage in Phase I portions of both the Chokecherry and Sierra Madre WDAs. The combination of their resident nesting status and foraging behavior is expected to increase their risk when compared to other non-eagle raptors species that are not as common or have more specific habitat requirements. However, red-tailed hawks and American kestrels are known to be more tolerant of human presence and disturbance than some raptor species indicating they may be less at risk of disturbance from human activities. *See Chace and Walsh 2006.*

Bats

Impacts to bats are anticipated to be seasonal. As described in the BLM FEIS, it is expected that risk to bats are greatest during late summer and early fall during migration and foraging activities. *See BLM 2012b at p. 4.14-16.* In Phase I, there is minimal risk to bats from late fall through early spring based on the expected lack of bat activity during this winter period. Based on the evaluation of the Phase I data, there is low risk to the three BLM sensitive bat species (long-eared myotis, fringed myotis, and Townsend's big-eared bat) due to the fact that they have never been documented among the 2,285 bat fatalities recorded from 21 wind energy facilities in the western United States. *See BLM 2012b.* Further, risks to the hoary bats are expected to be low as they are known to be uncommon in the CCSM Project Site (only 7% of all bat detections were attributed to the hoary bats). It is likely silver-haired bat would have the greatest risk for impacts from Phase I because they are likely to occur in the CCSM Project Site and are known to be at risk for collision with wind turbines in the western United States. *See BLM 2012b at p. 4.14-17.* Little brown bat and big brown bat may also be at risk for impacts because they are known to infrequently collide with wind turbines in the United States and are likely to occur in the CCSM Project Site. *See Appendix D.* However, because ground-level bat activity measured using passive acoustic monitoring on the CCSM Project Site was relatively low during the period over which data were collected and the flight heights of any potential migrating bats or avian species recorded by the avian radar are well above the rotor swept zone, impacts to bat species are expected to be minimal for the CCSM Project, including Phase I.

Overall Risk Assessment

Throughout the development of the CCSM Project, PCW has worked cooperatively with USFWS, BLM and WGFD to evaluate risks to migratory birds and bats, collecting progressively more detailed site-specific data using state-of-the-art surveys. PCW has shared the data collected during the CCSM Project and Phase I field studies with USFWS, BLM, and WGFD to facilitate the development of appropriate measures to avoid and minimize impacts to migratory birds and bats from Phase I. Consistent with the USFWS Wind Energy Guidelines and WGFC Wind Energy Recommendations, PCW has evaluated the detailed site-specific data collected for the CCSM Project and has determined that development Phase I is consistent with the USFWS Wind Energy Guidelines based on the extensive avoidance, minimization and mitigation measures incorporated into Phase I and the robust post-construction monitoring proposed for the site. *See Chapters 5.0 & 6.0.*

The BLM FEIS analyzes the potential impacts of the CCSM Project on migratory birds and bats based on the original Application Area. *See BLM 2012a.* Since publication of the BLM FEIS, PCW has continued to work cooperatively with USFWS, BLM, and WGFD to use the migratory bird and bat data to substantially redesign the CCSM Project and to microsite Phase I to avoid and minimize impacts, including identifying over 105,000 acres of the Ranch as wind turbine avoidance areas and proposing extensive conservation measures for areas that would be developed. *See Chapter 5.0.* As a result of this continued collaboration, the additional data collection, the substantial project redesign, and the measures described in chapter 5.0 to avoid and minimize risk, PCW has determined that advancement of Phase I is consistent with the USFWS Wind Energy Guidelines.

Chapter 5.0 of this Phase I BBCS describes the extensive avoidance, minimization and conservation measures PCW has developed for Phase I in cooperation with USFWS, BLM, and WGFD. Chapter 6.0 of this Phase I BBCS describes the post-construction monitoring program developed by PCW to evaluate impacts to migratory birds and bats, as well as to evaluate the effectiveness of the Phase I conservation measures.