DOCKETED	
Docket Number:	23-OPT-01
Project Title:	Fountain Wind Project
TN #:	248305-1
Document Title:	2017 raptor nest survey report
Description:	N/A
Filer:	Caitlin Barns
Organization:	Stantec Consulting Services, Inc.
Submitter Role:	Applicant Consultant
Submission Date:	1/4/2023 10:49:07 AM
Docketed Date:	1/4/2023

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TECHNICAL MEMORANDUM

DATE: September 19, 2018

TO: Kristen Goland - Pacific Wind Development LLC

FROM: Joel Thompson - WEST, Inc.

RE: 2017 Raptor Nest Survey Report for the Fountain Wind Project, California

Introduction

Pacific Wind Development LLC (Pacific Wind) is developing the proposed Fountain Wind Project (Project) in Shasta County, California. To address potential impacts to nesting golden eagles (*Aquila chrysaetos*) and/or bald eagles (*Haliaeetus leucocephalus*), the U.S. Fish and Wildlife Service (USFWS) recommends conducting eagle nest surveys within survey areas that extend up to 10-miles (mi; 16-kilometer [km]) from proposed wind energy facilities prior to construction, with at least two rounds of surveys completed a minimum of 30 days apart during the nesting season (USFWS 2013). In addition to eagle nest surveys, the USFWS (2012) and California Department of Fish and Wildlife (CDFW; CEC and CDFG 2007) recommend conducting nest surveys for other nesting raptors within proposed wind energy projects and a surrounding buffer of at least one mi (1.6 km).

Western EcoSystems Technology, Inc. (WEST) was contracted to provide biological support for development of the Project, including aerial surveys for raptor nests within the Project and a surrounding 10-mi buffer for eagles, and 2-mi (3.2-km) buffer for other raptors that build large, conspicuous stick nests. To aid in planning eagle survey efforts, WEST gathered data on previously documented bald and golden eagle nests within the 10-mi Survey Area from the California Natural Diversity Database (CNDDB 2017) and CDFW (C. Battistone, personal communication). This memorandum provides a summary of the methods and results of aerial raptor nest surveys conducted by WEST in March and May 2017 in support of the Project.

Survey Areas

The Survey Areas included the Project Area, provided as Geographic Information System (GIS) data by Pacific Wind, which encompassed all possible areas under consideration of development at the time, plus 2- and 10-mi buffers of the Project Area. The 2- and 10-mi Survey Areas included the Project Area and surrounding buffers in Shasta County, California, west of the community of Burney (Figure 1). East-west running California State Route 299 bisects the Survey Areas. The Lassen National Forest extends into the southeastern portion of the Survey Areas, and parts of the Shasta -Trinity National Forest extend into the western and northern portions of the Survey Areas (Figure 1). The dominant vegetation type in the Survey Areas is Sierran mixed conifer forest (post-fire and unburned), with smaller amounts of mixed montane chaparral and mixed montane riparian forest/scrub. The primary land use within the Project Area, and much of the Survey Areas outside of the national forests, is commercial timber production, which has resulted in a highly fragmented landscape across much of the Survey Areas.

The Survey Areas fall within the Cascades Ecological Region (ecoregion; Griffith et al. 2016), an area generally marked by steep ridges as well as both active and dormant volcanoes. The Cascades Ecoregion is characterized by a mesic, temperate climate, which supports productive coniferous forests. Topography within the Survey Areas includes gently rolling hills that transition to relatively steep, low mountains. The Pit River is the most significant waterway within the Survey Areas; however, numerous smaller creeks and several small reservoirs also are present (Figure 1).

Methods

The initial survey utilized an intuitive controlled survey method that focused on identifying and searching specific habitat features within the Survey Areas that held the highest potential to support the target species. Within the 2-mi Survey Area, efforts focused on habitat features typically used by raptors that build large, conspicuous stick nests (e.g., eagles, osprey [*Pandion haliaetus]*, and red-tailed hawk [*Buteo jamaicensis*]), while search efforts beyond the 2-mi buffer out to 10 mi focused on eagle nests specifically. Key habitat features within the Survey Areas included cliffs, rock outcrops, incised drainages and canyons, powerline structures, and large/dominant trees.

The second survey was conducted as described above for areas within the 2-mi buffer (i.e., an intuitive controlled search of key habitat features throughout the area), while surveys beyond the 2-mi buffer primarily focused on confirming the status of previously documented eagle nests. However, some additional effort was spent searching for eagle nests in a few specific areas identified during the initial survey as being most suitable for supporting eagle nests (e.g., cliffs, transmission line and river corridors) and in the vicinity of historical eagle nest locations where nests were not located during the initial survey.

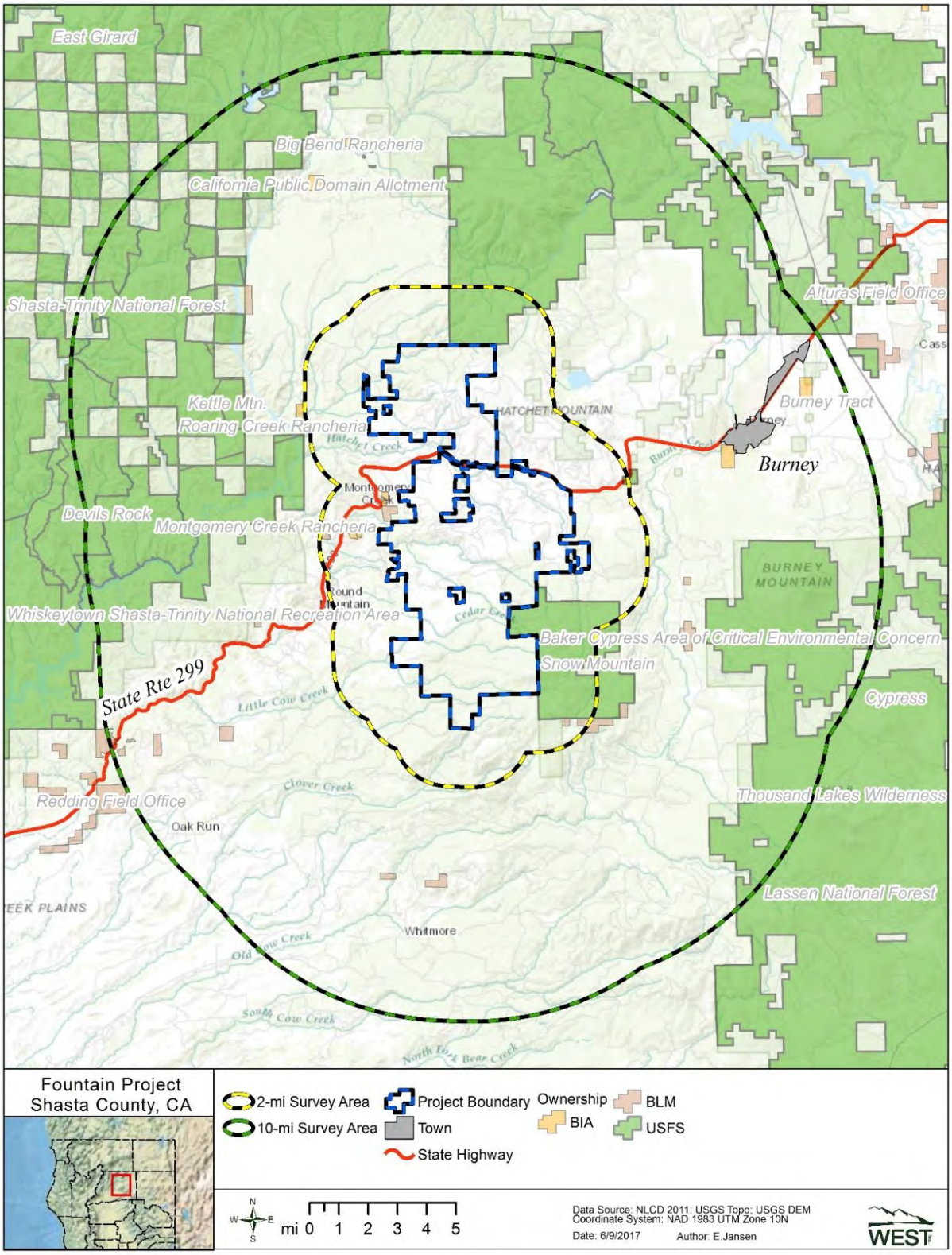

Figure 1. Overview of 2017 Fountain Wind Project raptor nest Survey Areas including 2-mile and 10-mile buffers (BIA = Bureau of Indian Affairs, BLM = Bureau of Land Management, USFS = U.S. Forest Service).

Two helicopter-based aerial nest surveys were conducted in 2017. The initial survey was conducted on March 20 and the second survey on May 9. Both surveys were conducted by two WEST biologists who have prior experience conducting similar surveys in California and elsewhere. The initial survey was conducted during a time period that overlapped the early reproductive period of eagles in northern California (e.g., nest initiation / early incubation), while the second survey was performed at a time when eagles and other raptor species would have been engaged in reproductive activities (e.g., incubating, brooding) at in-use nests.

During surveys, the helicopter was positioned to allow thorough visual inspection of appropriate habitat features. In general, the helicopter remained within a zone 100 feet (ft; 31 m) to 500 ft (152 m) above ground level (AGL) and moved at a relative air speed of approximately 50 mi per hour (80.5 km per hour). When nests were located, the helicopter reduced speed and adjusted flight to allow for a clear view of the nest for documentation and photographing. For each nest found, the location was recorded and nest attribute data were collected, including nest substrate, nest size, and nest condition, along with any comments useful in determining the nest status. Nest size was categorized as: small = small stick nest characteristic of corvids or accipiters (e.g., common raven [*Corvus corax*], sharp-shinned hawk [*Accipiter striatus*]); medium = medium stick nest characteristic of buteos and large owls (e.g., red-tailed hawk, great-horned owl [*Bubo virginianus*]); large = large stick nest that could support eagles, but may also be used by other large raptors (e.g., red-tailed hawk, great-horned owl, osprey); Very_Large = very large stick nest characteristic of eagle nests.

Nest suitability for eagles was also assessed. Bald eagle nests are usually placed in the top quarter of the tree, just below the crown, and against the trunk or in a fork of large branches near the trunk (Buehler 2000). On average, bald eagle nests are 5-6 ft (ft; 1.5-1.8 [m]) in diameter and 2-4 ft tall (0.6-1.2 m; Buehler 2000). Golden eagle nests are most commonly located on cliffs throughout most of North America, with trees nests more common in parts of Wyoming, Washington, and California (Kochert et al. 2002). Golden eagles tend to avoid building nests in dense stands of timber; however, when nesting in forested areas, nesting trees are usually the largest or one of the largest trees available, isolated or on the fringe of small stands of timber, and proximal (less than 0.3 mi [0.5 km]) to large openings (Kochert et al. 2002). Golden eagle nests are large, with nest size generally within the range of 3-8 ft (1.2–2.6 m) in diameter and 0.4-6.6 ft (0.13-2.0 m) tall (Kochert et al. 2002).

Nesting status was classified for the 2017 nesting season based on the recommended terminology of Steenhof et al. (2017), based on the most advanced level of nesting activity documented during the course of both surveys (i.e., status could change from unoccupied to occupied during subsequent surveys in a nesting season, but may not change from occupied to unoccupied in a season). A nest was considered “occupied” if it contained eggs, young, or an incubating eagle, or had a pair of eagles on or near it, or had been recently repaired or decorated (Steenhof et al. 2017). Occupied nests were further classified as “in-use” if eggs had been laid, as evidenced by the presence of an incubating bird, eggs, young, or any other indication that eggs had been laid in the current year (Steenhof et al. 2017). Nests not meeting the above criteria for “occupied” were classified as “unoccupied” if the nest had been visited at

least twice. A status of "unknown" was assigned to nests that could not be effectively monitored and therefore did not meet the criteria of occupied or unoccupied as described above.

Results and Discussion

Eleven occupied bald eagle nests were documented within the 10-mi Survey Area in 2017 (Figure 2, Table 1). Historical golden eagle nest locations provided by CDFW were surveyed, along with other suitable golden eagle nesting substrates; however, no golden eagle nests were documented. Of the 11 occupied bald eagle nests, nine were documented as in-use during at least one survey (Table 1). The two other occupied bald eagle nests showed no evidence of being used for egg-laying during the 2017 nesting season (Figure 2, Table 1). Six of the in-use bald eagle nests contained either one or two chicks estimated to be between 14 and 28 days of age as of the second survey on May 9. One additional in-use nest contained an incubating/brooding adult on May 9, but the number of eggs/young could not be determined (Table 1). Two other occupied nests that were in-use during the March survey apparently failed, showing no evidence of eggs or young during the May survey (Table 1). Two additional nests, both previously documented as historical bald eagle nests by CDFW, were located and determined to be unoccupied in 2017 (Table 1). All of the eagle nests documented were in good to excellent condition. Photographs of the 13 bald eagle nests are included in Appendix A.

Six of the 11 occupied bald eagle nests were located along the Pit River, while the closest occupied bald eagle nest to the Project was at Lake Margaret, approximately 2.9 mi (4.7 km) east of the Project Area boundary (Figure 2). The eagles at Lake Margaret are part of a USFWS movement study, and as such, are fitted with platform transmitting terminal (PTT) tags that help track their movements. Details on how the Lake Margaret pair utilizes the landscape may be available in the future; however data were not available for inclusion in this report. An adult was observed on the Lake Margaret nest (Nest 5; Figure 2, Table 1) in an incubating position during the March survey, but no evidence of continued use was observed during the follow-up survey in May, indicating the nesting attempt had failed. All other occupied bald eagle nests were more than 4.2 mi (6.8 km) from the Project Area boundary (Figure 2).

Nests of other raptor species identified during the aerial survey included two osprey nests (one occupied and one in-use) located within one mi of the Project Area boundary, one occupied red-tailed hawk nest located about 1.5 mi (2.4 km) from the Project Area boundary, and two unoccupied nests located within 1.3 mi (2.1 km) of the Project Area boundary (Figure 2, Table 1). These two unoccupied nests were of medium size and inconsistent with the characterization of bald eagle nests, as described in Buehler (2000).

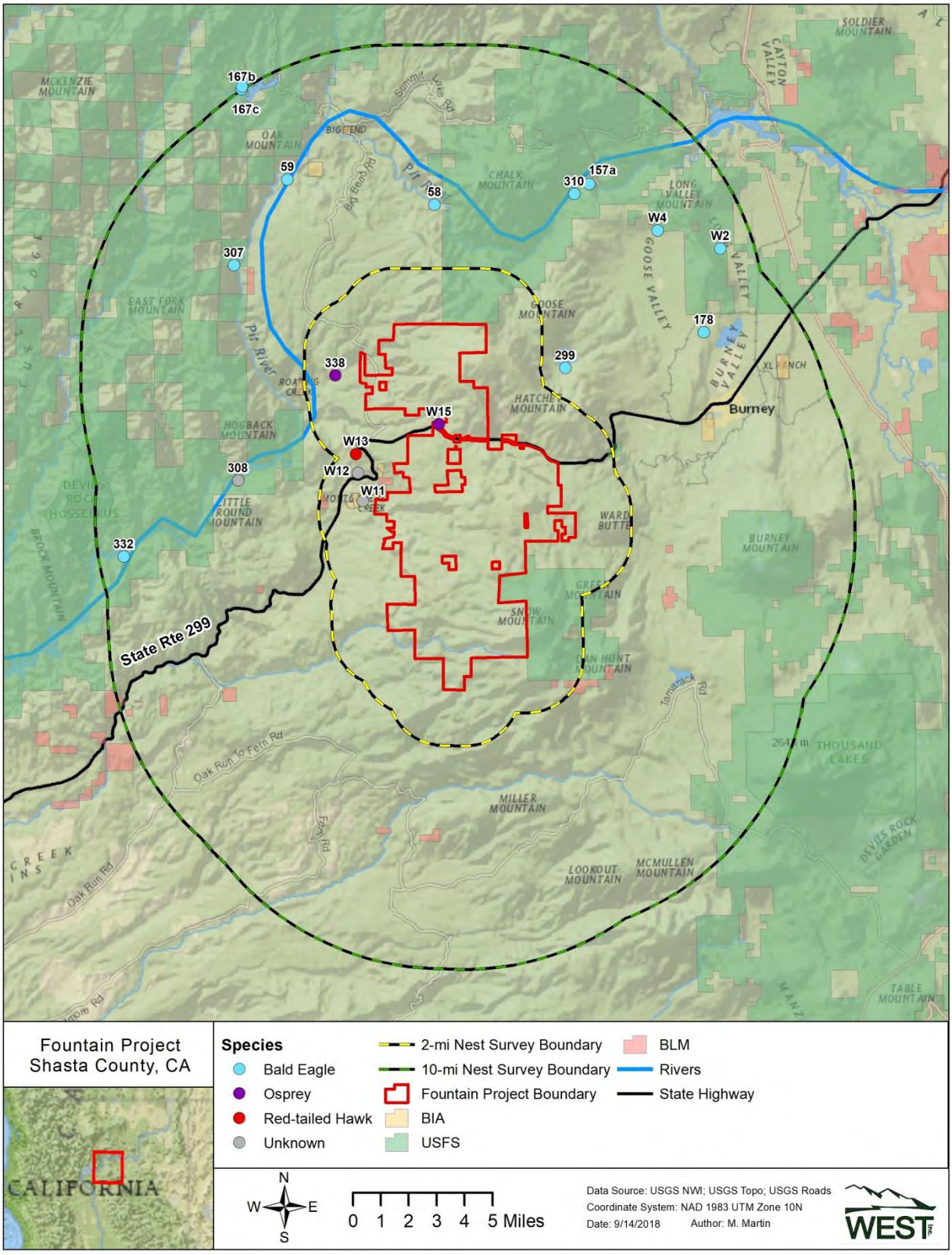

Figure 2. Eagle and other raptor nest locations documented during aerial surveys for the Fountain Wind Project, March 20 and May 9, 2017.

Table 1. Results of the 2017 eagle/raptor nest surveys conducted on March 20 and May 9 at the Fountain Wind Project in Shasta County, California.

			Nest Attributes		
Nest ID[1]	Species	2017 Nest Status[2]	Substrate	Size[3]	Comments
310	Bald eagle	Occupied / In-use	Tree	Very large	One chick in nest estimated to be 28 days old on May 9
178	Bald eagle	Occupied / In-use	Tree	Very large	Two chicks in nest estimated to be 21-28 days old on May 9
58	Bald eagle	Occupied / In-use	Tree	Very large	Two chicks in nest estimated to be 21-28 days old on May 9
59	Bald eagle	Occupied / In-use	Tree	Very large	One chick in nest estimated to be 21 days old on May 9
307	Bald eagle	Occupied / In-use	Tree	Very large	One chick in nest estimated to be 14 days old on May 9
157a	Bald eagle	Occupied / In-use	Tree	Very large	One chick in nest estimated to be 21 days old on May 9
W4	Bald eagle	Occupied / In-use	Tree	Very large	Adult in incubating/brooding position during May survey. No of young/eggs unknown
332	Bald eagle	Occupied / In-use	Tree	Very large	Adult observed in incubating position in March; no evidence of nesting in May indicate failed nesting attempt
299	Bald eagle	Occupied / In-use	Tree	Very large	Adult in incubating position in March; no sign of nesting in May indicate failed nesting attempt
W2	Bald eagle	Occupied	Tree	Very large	Adult observed tending nest in March; no evidence of nesting in May
167b	Bald eagle	Occupied	Tree	Very large	Adult observed tending nest in March; no evidence of nesting in May
167c	Bald Eagle	Unoccupied	Tree	Very large	Historical bald eagle nest in good condition; no evidence of use
308	Bald eagle	Unoccupied	Tree	Very large	Historical bald eagle nest in good condition; no evidence of use
W15	Osprey	Occupied / In-use	Tree	Large	Three eggs observed in nest during May survey
338	Osprey	Occupied	Powerline	Very large	Adult osprey observed tending nest in March; no evidence of nesting in May
W13	Red-tailed hawk	Occupied	Powerline	Medium	Medium-sized nest in good condition
W11	Unknown raptor	Unoccupied	Powerline	Medium	Medium-sized nest in good condition
W12	Unknown raptor	Unoccupied	Powerline	Medium	Medium-sized nest in good condition

[1] IDs preceded by W indicate nests newly discovered by WEST during surveys. All other IDs are consistent with historical IDs provided by California Department of Fish and Wildlife.

[2] Highest level of reproductive status determined for the current breeding season: **Occupied** = contained eggs, young, or an incubating eagle, or had a pair of eagles on or near it, or had been recently repaired or decorated. **In-use** = an occupied nest in which eggs were laid, as evidenced by the presence of an incubating bird, eggs, young, or any other indication that eggs had been laid in the current year. **Unoccupied** = no sign of nesting or territory occupancy in the current nesting season, based on at least two visits. **Unknown** = nest was not located or status as occupied/unoccupied could not be confirmed as defined herein.

[3] **Small** = small stick nest characteristic of corvids or accipiters; **Medium** = medium stick nest characteristic of buteos and large owls.; **Large** = large stick nest that could support eagles, but may also be used by other large buteos, osprey, large owls; **Very Large** = very large stick nest characteristic of eagle nests

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Appendix A: Photographs of Bald Eagle Nests Documented During Nest Surveys Conducted in 2017 at the Fountain Wind Project, Shasta County, California.

Nest 310, located approximately 5.5 miles northeast of the Fountain Wind Project.

Nest W2, located approximately 8.8 miles northeast of the Fountain Wind Project.

Nest 178, located approximately 6.0 miles east of the Fountain Wind Project.

Nest W4, located approximately 6.7 miles northeast of the Fountain Wind Project.

Nest 299, located approximately 2.9 miles east of the Fountain Wind Project.

Nest 58, located approximately 4.2 miles north of the Fountain Wind Project.

Nest 59, located approximately 6.5 miles northeast of the Fountain Wind Project.

Nest 307, located approximately 5.5 miles northeast of the Fountain Wind Project.

Nest 332, located approximately 9.1 miles west of the Fountain Wind Project.

Nest 157, located approximately 6.2 miles northeast of the Fountain Wind Project.

Nest 308, located approximately 5.0 mi (8.0 km) west of the Fountain Wind Project.

Nest 167c, located approximately 10.1 mi (16.3 km) north of the Fountain Wind Project.

Nest 167b, located approximately 10.1 mi (16.3 km) north of the Fountain Wind Project.