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TECHNICAL MEMORANDUM

DATE: October 22, 2018

TO: Kristen Goland, Pacific Wind Development LLC.

FROM: Joel Thompson, WEST, Inc.

RE: 2018 Foothill yellow-legged frog and Cascades frog habitat assessments and surveys, Fountain Wind Project, CA

INTRODUCTION

Pacific Wind Development LLC (Pacific Wind) has contracted Western EcoSystems Technology, Inc. (WEST) to provide biological support for development of the proposed Fountain Wind Project (Project). Foothill yellow-legged frog (FYLF; *Rana boylii*) and Cascades Frog (CF; *Rana cascadae*) are currently listed as candidates for listing under the California Endangered Species Act (CESA), and have been petitioned for listing under the Federal Endangered Species Act (ESA). Although neither species has been documented within the Project area, the California Wildlife Habitat Relationships (CWHR) database, maintained by the California Department of Fish and Wildlife (CDFW), indicates that potential habitat for both species may be present within the Project area, with the Project area defined in this report as all lands within the Project area boundary. As such, and at the request of CDFW, WEST conducted desktop assessments of potentially suitable habitat for both species and conducted visual encounter surveys (VES) for subadult FYLF in 2018 in the most suitable habitats identified within the Project area. This memorandum describes the methods and results of the habitat suitability assessments and the VES conducted in 2018.

PROJECT AND SURVEY AREAS

The Project is located on privately owned commercial timberlands in central Shasta County, California. The dominant vegetation type in and around the Project is mixed coniferous forest (post-fire and unburned), with smaller amounts of mixed montane chaparral and mixed montane riparian forest/scrub. The primary land use in this area is commercial timber production, which has resulted in a highly fragmented landscape across much of the area. Dominant overstory species include a combination of white fir (*Abies concolor*), Douglas fir (*Pseudotsuga menziesii*),

incense cedar (*Calocedrus decurrens*), ponderosa pine (*Pinus ponderosa*), sugar pine (*P. lambertiana*), and California black oak (*Quercus kelloggii*).

Vegetation communities identified during rare plant and vegetation community mapping efforts (Flaig et al. 2018) and considered potentially suitable for occurrence of special status FYLF in the Project area include mixed montane riparian forest (MMRF) and mixed montane riparian scrub (MMRS; Flaig et al. 2018). The MMRF community was documented primarily in the southern half of the Project area along perennial streams, but also occurred along intermittent streams in some locales. Plant species within the MMRF community included a variety of mid-story species such as bigleaf maple (*Acer macrophyllum*) and thinleaf alder (*Alnus incana* ssp. *tenuifolia*), with a shaded, woody understory of Rocky Mountain maple (*Acer glabrum*), vine maple (*Acer circinatum*), and other species. The MMRS community was primarily mapped throughout the northern half of the Project. Similar to the MMRF community type it occurred along perennial and intermittent drainages, but was distinguished from MMRF by the absence of a tree-dominated canopy and the presence of a shrub-dominated canopy that included several willow species (*Salix* spp.). Riparian species commonly observed along the immediate channel included arroyo willow (*Salix lasiolepis*), shining willow (*S. lucida*), scouler willow (*S. scouleriana*), thinleaf alder, and mountain dogwood (*Cornus nuttallii*).

An additional vegetation community identified in the Project area and considered potentially suitable for occurrence of special status amphibians was wet montane meadow (WMM). The majority of WMM communities identified were associated with streams, though a few areas were mapped adjacent to small ponds, springs, or seeps with high water tables. The WMM community was composed of a diversity of hydrophytic plant species including grasses, sedges, rushes, and perennial forbs (Flaig et al. 2018).

For the purpose of assessing FYLF and CF habitat and conducting field surveys, construction corridors were provided in a Geographic Information System (GIS) format by Pacific Wind (Figure 1). The construction corridors included areas within the larger Project area that could be subject to direct impacts during Project construction. The corridors varied in size and included buffers of all areas of proposed infrastructure that may be subject to ground disturbance (e.g., newly proposed roads, roads that may be expanded, turbine pads, and underground and overhead collection lines) to provide for some flexibility in final project design. The corridors provided by Pacific Wind were buffered by WEST by an additional 500 feet (ft; 152 meters [m]) to generate Survey Corridors used in the assessment of FYLF and CF habitat suitability and to guide field surveys efforts. The 500-ft buffer was used as van Hattem and Mantor (2018) recommend that surveys associated with disturbance projects be conducted within the project area (assumed to be the area of disturbance) and at least 500 ft upstream and downstream.

Foothill Yellow-legged Frog Survey Area

Foothill yellow-legged frog occur in the coast ranges of Oregon and California, as well as the more interior Sierra Nevada and Cascades ranges, where the species occupies riparian habitats immediately adjacent to perennial, flowing water with rocky substrates. The species has been documented at elevations up to approximately 6,300 feet (ft; 1,920 meters [m]; Hayes et al.

2016). According to the California Natural Diversity Database (CNDDB), there are no known occurrences of FYLF within or immediately adjacent to the Project; the closest known occurrences of FYLF are approximately 4.0 mi (6.4 km) to the north and south of the Project (CDFW 2018a; Figure 1). The CWHR includes information on both habitat suitability (i.e., predicted habitat; Figure 1) and habitat modeled as potentially important for connectivity (i.e., connectivity habitat; Figure 2) for FYLF (CDFW 2018b). Although the large majority of FYLF habitat within the Project area is classified as low likelihood of occurrence using the CWHR predicted habitat model, some locations are classified as medium to higher suitability for potential habitat connectivity (Figure 2). The predicted habitat and habitat connectivity models overlap with the Survey Corridors in some locations. Because the FYLF is most commonly associated with moving waters, stream corridors within areas of higher rated habitat connectivity that overlapped with Survey Corridors were the focus of FYLF habitat assessments and field surveys in 2018 (Figure 2).

Cascades Frog Survey Area

Cascades frog occupies mountain lakes, ponds, and adjacent wet meadows at elevations up to 8,200 ft (2,500 m) in the mountains of northern California and southern Oregon. Reproduction by CF occurs in shallow, still-water habitats that become exposed by snowmelt early in the spring and retain water long enough for egg and tadpole development (about three to four months; Pope et al. 2014). These habitats include shallow alcoves of lakes, ponds, potholes, flooded areas in meadows, and occasionally slow-moving streams or stream backwaters (Pope et al. 2014). Cascades frog has disappeared from much of its historical range due to predation from non-native and/or introduced fish species, and other threats (Pope et al. 2014).

Based on CWHR data, the southern Project area boundary is at the edge of the current range of CF, with all Survey Corridors located more than two mi from the known range (CDFW 2018b). The closest known occurrence of CF is approximately 1.2 mi (1.9 km) southeast of the Project area boundary; an additional known occurrence is approximately 6.3 mi (10.1 km) north of the Project (Figure 3, CDFW 2018a). No known occurrences of CF have been documented within the Project area (CDFW 2018a). The CWHR model of habitat suitability for CF indicates that only a small portion of low quality CF habitat is predicted to occur in the southernmost portion of the Project area (CDFW 2018b), well south of the construction corridors provided by Pacific Wind. This area of overlap was the focus of desktop and field evaluations of CF habitat in 2018.

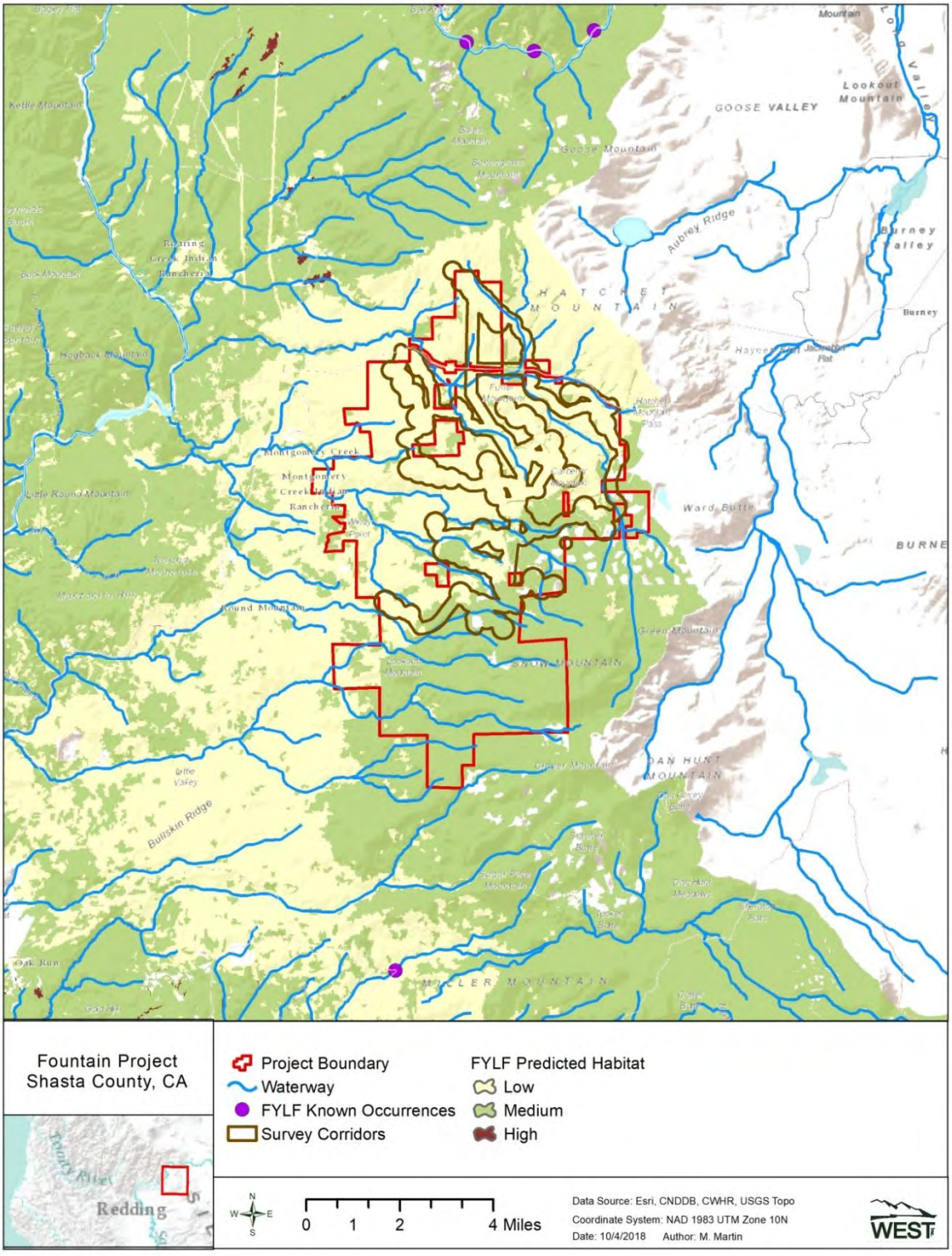

Figure 1. Foothill yellow-legged frog known occurrences and areas of predicted habitat as provided by the California Natural Diversity Database (CNDDB) and California Wildlife Habitat Relationships (CWHR) within the Fountain Wind Project area, Shasta County, California.

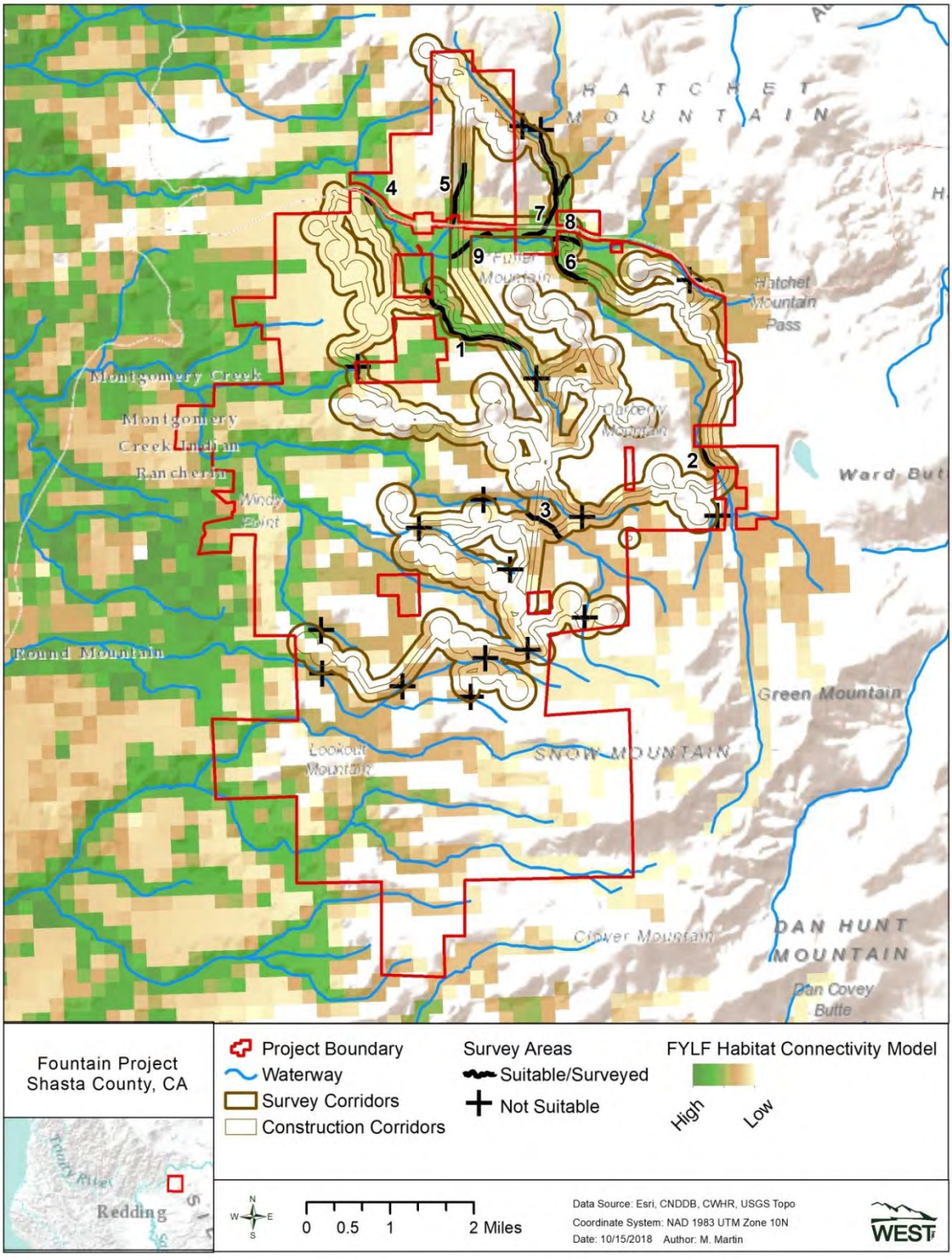

Figure 2. Foothill yellow-legged frog habitat assessment and survey areas within the Fountain Wind Project, Shasta County, California, based on modelled connectivity habitat obtained from the California Natural Diversity Database (CNDDB) and California Wildlife Habitat Relationships (CWHR).

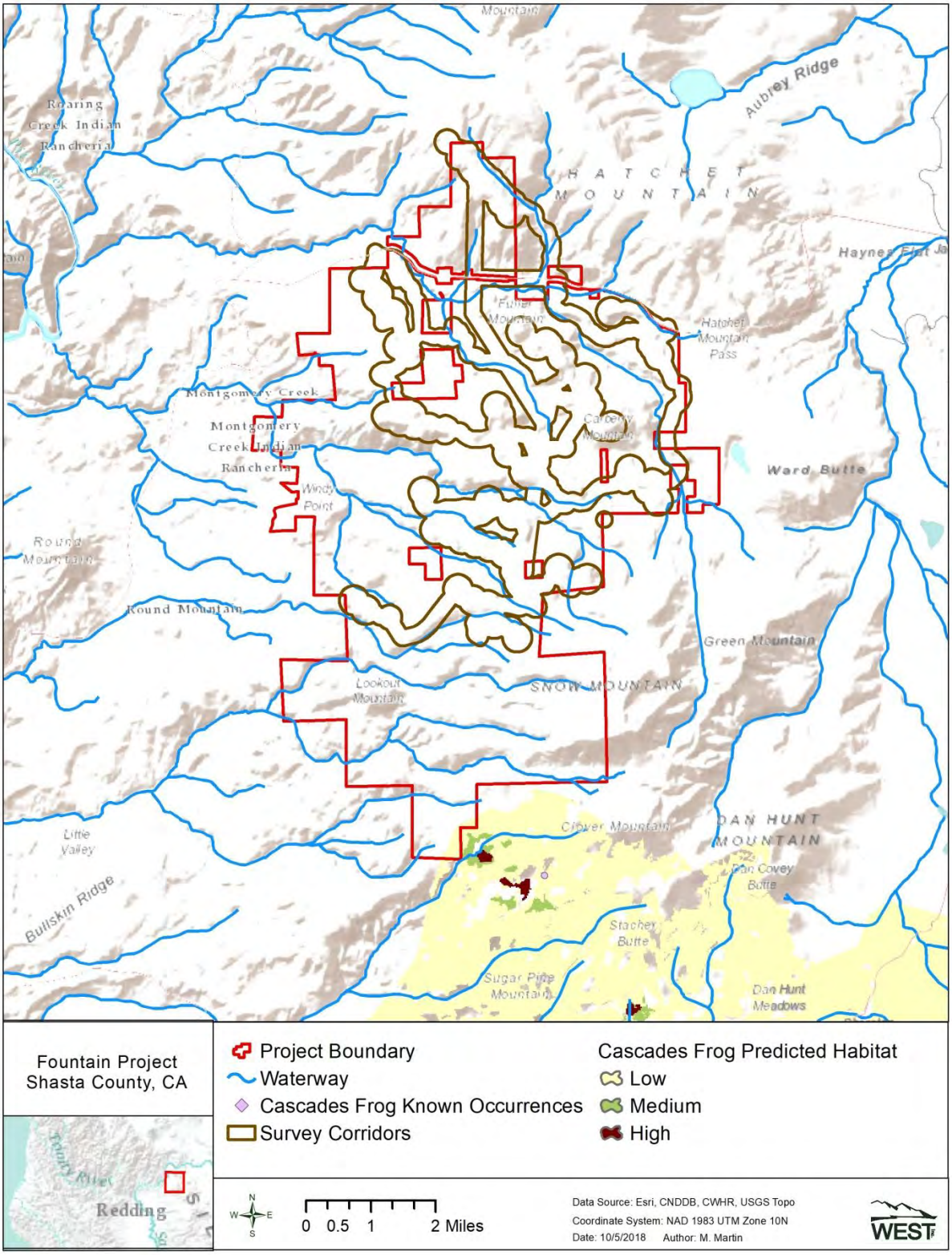

Figure 3. Cascades frog known occurrences and areas of predicted habitat as provided by the California Natural Diversity Database (CNDDB) and California Wildlife Habitat Relationships (CWHR) within the Fountain Wind Project, Shasta County, California.

METHODS

Foothill Yellow-legged Frog

Geographic information system (GIS) data from the CWHR and examination of aerial imagery were used to conduct a desktop review of potential FYLF habitat overlap with the Survey Corridors. The CWHR's GIS-based habitat model analyzes and compiles several remotely sensed GIS coverages to predict habitat suitability. A WEST biologist with training in FYLF survey methods conducted a field assessment of modeled FYLF habitat at the Project to verify habitat suitability and identify potential FYLF habitat not predicted by CWHR models. During the field assessment, the biologist visited areas of modelled habitat that overlapped with the Survey Corridors. Criteria considered during the field assessment for consideration as potential habitat, as defined by the CWHR models, included cover component (i.e., vegetation canopy closure from 20 - 90%), proximity to water (i.e., FYLF typically occur within 40 ft [12 m] of flowing, low-gradient perennial streams), elevation (below 6,562 ft [2,000 m]) and species range (i.e., known species occurrences; Hayes et al. 2016).

VES for FYLF were conducted in areas identified as suitable FYLF habitat in early September 2018. VES conducted in late summer have a high probability of detecting FYLF and are often the easiest method for determining FYLF presence, as subadult (and sometimes adults) FYLF are often observed along stream margins (van Hattem and Mantor 2018). VES were completed by walking all stretches of suitable habitat identified during the field assessment. The field surveyor walked up one side of the stream in stretches of suitable habitat visually searching for subadult and adult frogs, then returned on the opposite bank while continuing to visually search for FYLF. Each stretch of suitable habitat was given a survey area identifier and the date, survey time, air and water temperature, and vegetative cover were recorded for each survey. Survey routes were mapped with a handheld geographic positioning system unit and transferred to a GIS for later reference.

Cascades Frog

A desktop review for CF habitat suitability and occurrences within the Survey Corridors was conducted using a combination of range maps, CNDDB known occurrence data, CWHR predicted suitable habitat, and aerial imagery. These data were used in combination with site-specific field data collected during rare plant surveys (Flaig et al. 2019), to determine the likelihood of occurrence of suitable CF habitat within the Survey Corridors.

RESULTS AND DISCUSSION

Foothill Yellow-legged Frog

Results from a desktop analysis of potential habitat within the Survey Corridors yielded 15 areas where FYLF had potential to occur. Field assessments of habitat suitability within the 15 areas resulted in nine stream reaches that appeared to be suitable for FYLF. Habitat characteristics were identified as unsuitable for FYLF at 16 other stream crossings (see Figure 2). VES for

subadult and adult FYLF were conducted from September 1-4 in the nine areas identified as potentially suitable habitat.

No FYLF were detected during 2018 subadult VES (Table 1). In general, habitat for FYLF within the Survey Corridors was marginal due to limited or nonexistent surface water and/or excessive vegetative cover that greatly limited sun exposure.

Table 1. Results of visual encounter surveys conducted for Foothill yellow-legged frogs from September 1 – 4, 2018 at the Fountain Wind Project, Shasta County, California.

Survey Area	Survey Date	Survey Time (minutes)	Air Temp (°F)	Water Temp (°F)	Vegetation Cover		Detections
					Right Bank (%)	Left Bank (%)	
1	9/1/18	246	52	58	98	100	0
2	9/1/18	65	70	54	90	90	0
3	9/1/18	56	67	48	90	95	0
4	9/1/18	34	86	58	97	95	0
5	9/1/18	154	94	54	98	98	0
6	9/2/18	131	91	56	100	99	0
7	9/3/18	285	79	49	95	100	0
8	9/3/18	97	95	59	95	95	0
9	9/4/18	124	82	60	95	95	0

Cascades Frog

Based on range maps, the current range of CF overlaps with only a small area at the southern extent of the Project area. A desktop analysis of CWHR's potentially suitable CF habitat indicated approximately 75 acres (30 hectares) of low quality habitat potentially exists in the southern portion of the Project area (see Figure 3; CDFW 2018b). Results from field-based habitat mapping of this area verified that this predicted low quality habitat does not currently include the habitat components necessary to support CF (e.g., ponds or wet meadows; Flaig et al. 2018). Because the Survey Corridors are entirely outside the CF range and the modeled low-quality potential habitat that occurs within the larger Project area was confirmed as non-suitable, no formal surveys for CF were conducted.

CONCLUSION

VES for subadult FYLF conducted in late summer (i.e., late August to early October), immediately following the breeding season, yield the highest likelihood of detection for FYLF as both adults and subadults should be active during this period (van Hattem and Mantor 2018). However, no FYLF were detected during 2018 subadult VES conducted within the best habitats present within the Survey Corridors. The lack of FYLF detections during the 2018 VES surveys was consistent with results of past stream surveys conducted (primarily for fish) in support of timber management activities within the Project area by the landowners (R. Klug, Resource Planning Manager, LandVest Timberlands, personal communication).

Although some areas within the Survey Corridors were modeled as medium suitability for FYLF and some areas as having moderate to high connectivity, several of these areas were field-verified to be marginal or unsuitable habitat based on FLYF preferred habitat characteristics. Areas deemed marginal or unsuitable were either dry and/or the vegetative cover was inappropriate (i.e., too much canopy cover precluding sun exposure; Table 1). Based on the generally poor quality of FYLF habitat identified in the Survey Corridors, the lack of FLYF detections during VES conducted in 2018 in the highest quality habitats identified, and lack of historical FYLF detections documented by landowners during past stream surveys, it is unlikely that FYLF occur in the Project area. Additionally, according to the CWHR habitat connectivity model, connectivity between the closest known FYLF occurrence locations and the Project area are essentially non-existent (see Figure 2), suggesting that FYLF are not likely to immigrate into the Project area from other known occurrence areas. The data available from historical work in support of timber management activities within the Project area, and 2018 habitat assessments and surveys for FYLF, suggest that FYLF do not currently occur in, nor will they likely colonize the generally low-quality habitats present in the Project Survey Corridors; therefore, no impacts to FYLF are expected as a result of the Project.

Results from the desktop review of potential CF habitat at the Project indicated that the Project is largely outside the range of CF and only limited low quality habitat could potentially exist at the southern edge of the Project area. Habitat mapping conducted in this area during rare plant and natural community survey efforts (Flaig et al. 2018) indicated a lack of suitable habitat for CF (i.e., lack of WMM) in this area. Because this was the only area identified as potentially suitable habitat based on the CWHR model, but was identified as non-habitat during field surveys and did not overlap the Survey Corridors, no formal surveys were conducted for CF. Given the lack of habitat within the range of the CF and the lack of overlap among construction corridors and CF range, it is unlikely that CF occurs in areas that will be disturbed during Project construction; therefore no impacts to CF are expected as a result of the Project.

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