

**Shepherds Flat SouthWind Farm: Wildlife Monitoring and Mitigation Plan**  
**[DATE JULY 25, 2008]**

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1 This plan describes wildlife monitoring that the certificate holder shall conduct during  
2 operation of ~~the~~ Shepherds Flat SouthWind Farm (SFSWF).<sup>1</sup> The monitoring objectives are to  
3 determine whether the facility causes significant fatalities of birds and bats and to determine  
4 whether the facility results in a loss of habitat quality.

5 ~~The~~ SFSWF consists of up to 120303 wind turbines, ~~twosix~~ non-guyed meteorological  
6 (met) towers, ~~atwo~~ substations and other related or supporting facilities as described in the site  
7 certificate. The permanent facility components occupy a combined area of up to 66184 acres.<sup>2</sup>  
8 The affected habitat lies within a micro-siting area of approximately 11,41121,919 acres.

9 The certificate holder shall use experienced and properly trained personnel (the  
10 “investigators”) to conduct the monitoring required under this plan. The professional  
11 qualifications of the investigators are subject to approval by the Oregon Department of Energy  
12 (Department). For all components of this plan, the certificate holder shall hire independent third  
13 party investigators (not employees of the certificate holder) to perform monitoring tasks. The  
14 monitoring will be performed in a manner that minimizes agricultural crop loss and interference  
15 with agricultural and ranching activities.

16 The Wildlife Monitoring and Mitigation Plan for ~~the~~ SFSWF has the following  
17 components:

- 18 1) Fatality monitoring program including:
  - 19 a) Removal trials
  - 20 b) Searcher efficiency trials
  - 21 c) Fatality search protocol
  - 22 d) Statistical analysis
- 23 2) Washington ground squirrel colony assessment
- 24 3) Raptor nest monitoring
- 25 4) Ongoing monitoring, reporting and handling of wildlife injuries and fatalities

26 Based on the results of the monitoring programs, mitigation of significant impacts may be  
27 required. The selection of the mitigation actions should allow for flexibility in creating  
28 appropriate responses to monitoring results that cannot be known in advance. If the Department  
29 determines that mitigation is needed, the certificate holder shall propose appropriate mitigation  
30 actions to the Department and shall carry out mitigation actions approved by the Department,  
31 subject to review by the Oregon Energy Facility Council (Council).

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<sup>1</sup> This plan is incorporated by reference in the site certificate for ~~the~~ Shepherds Flat SouthWind Farm and must be understood in that context. It is not a “stand-alone” document. This plan does not contain all mitigation required of the certificate holder.

<sup>2</sup> Estimates of the area that the facility components would occupy are shown in Tables 11 and 12 of the Final Order on ~~the~~ Amendment Application #1 for the Shepherds Flat Wind Farm (SFWF).

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1 **1. Fatality Monitoring**

2 (a) Definitions and Methods

3 Seasons

4 This plan uses the following dates for defining seasons:

Season	Dates and Duration
Spring	March 16 to May 15 (2 months)
Summer	May 16 to August 15 (3 months)
Fall Migration	August 16 to October 31 (2 ½ months)
Winter	November 1 to March 15 (4 ½ months)

5 Schedule

6 The investigators shall perform fatality monitoring for two years for each phase of  
7 construction. For each phase of construction, the first monitoring year will begin one month after  
8 the beginning of commercial operation of that phase; the second monitoring year will begin  
9 directly following the first year.

10 In each monitoring year, the investigators shall conduct fatality monitoring searches at  
11 the rates of frequency shown below. Over the course of one monitoring year, the investigators  
12 will conduct 16 searches, as follows:

Season	Frequency
Spring	2 searches per month (4 searches)
Summer	1 search per month (3 searches)
Fall	2 searches per month (5 searches)
Winter	1 search per month (4 searches)

13 Search Plots

14 The investigators shall conduct fatality monitoring within search plots. The certificate  
15 holder, in consultation with the investigators and the Oregon Department of Fish and Wildlife  
16 (ODFW), shall select search plots based on a systematic sampling design that ensures that the  
17 selected search plots are representative of the habitat conditions in different parts of the site.

18 Each search plot will contain one turbine. Search plots will be circular. Circular search  
19 plots will be centered on the turbine location and will have a radius equal to the maximum blade  
20 tip height of the turbine contained within the plot. “Maximum blade tip height” is the turbine  
21 hub-height plus one-half the rotor diameter. The certificate holder shall provide maps of the  
22 search plots to the Department before beginning fatality monitoring at the facility. The  
23 investigators shall use the same search plots for each search conducted during a single  
24 monitoring year.

25 Sample Size

26 The sample size for fatality monitoring is the number of turbines searched per phase per  
27 monitoring year. For each phase of construction, the investigators shall search a representative  
28 sample of the turbines that are built in that phase, according to the following schedule:

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Number of Turbines Built	Sample Size: First Year	Sample Size: Second Year
<del>167 or more</del>	<del>30% of the number built</del>	<del>30% of the number built</del>
50 to <del>120</del> 466	50	50
less than 50	all turbines	all turbines

1 ~~If 167 or more turbines are built in a phase, the investigators shall search a different~~  
2 ~~representative sample of turbines in the second year (excluding turbines searched during the first~~  
3 ~~year).~~ If 50 to ~~120~~466 turbines are built in a phase, the investigators shall search a different  
4 representative sample of 50 turbines in the second year, to the extent possible based on the total  
5 number of turbines built.

6 (b) Removal Trials

7 The objective of the removal trials is to estimate the length of time avian and bat  
8 carcasses remain in the search area. Estimates of carcass removal rates will be used to adjust  
9 carcass counts for removal bias. "Carcass removal" is the disappearance of a carcass from the  
10 search area due to predation, scavenging or other means such as farming activity.

11 The investigators shall conduct carcass removal trials within each of the seasons defined  
12 above during the years in which fatality monitoring occurs. For each trial, the investigators shall  
13 use 10 to 15 carcasses of small, medium and large-bodied species.<sup>3</sup> Trial carcasses shall be  
14 placed at least 1,000 feet from any search plots and distributed proportionately within habitat  
15 categories and subtypes similar to the search plots.

16 The investigators shall use game birds or other legal sources of avian species as test  
17 carcasses for the removal trials, and the investigators may use carcasses found in fatality  
18 monitoring searches. The investigators shall select species with the same coloration and size  
19 attributes as species found within the site boundary. If suitable trial carcasses are available, trials  
20 during the fall season will include several small brown birds to simulate bat carcasses. Legally  
21 obtained bat carcasses will be used if available.

22 Trial carcasses will be marked discreetly for recognition by searchers and other  
23 personnel. Carcasses will be placed in a variety of postures to simulate a range of conditions. For  
24 example, birds will be: 1) placed in an exposed posture (e.g., thrown over the shoulder), 2)  
25 hidden to simulate a crippled bird (e.g., placed beneath a shrub or tuft of grass) or 3) partially  
26 hidden. The planted carcasses will be located randomly within the carcass removal trial plots.  
27 Trial carcasses will be left at the location until the end of the carcass removal trial.

28 An approximate schedule for assessing removal status is once daily for the first 4 days,  
29 and on days 7, 10, 14, 21, 30 and 45. This schedule may be adjusted depending on actual carcass  
30 removal rates, weather conditions and coordination with the other survey work. The condition of  
31 scavenged carcasses will be documented during each assessment, and at the end of the trial all  
32 traces of the carcasses will be removed from the site. Scavenger or other activity could result in  
33 complete removal of all traces of a carcass in a location or distribution of feathers and carcass  
34 parts to several locations. This distribution will not constitute removal if evidence of the carcass  
35 remains within an area similar in size to a search plot and if the evidence would be discernable to  
36 a searcher during a normal survey.

<sup>3</sup> To reduce the combined number of carcasses used in the removal trials and searcher efficiency trials, these trials may be coordinated with similar trials for Shepherds Flat North and Shepherds Flat Central if the trials take place in the same year and after consultation with ODFW and approval by the Department.

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1 Before beginning removal trials for the second year of fatality monitoring, the certificate  
2 holder shall report the results of the first year removal trials to the Department and ODFW. In the  
3 report, the certificate holder shall analyze whether four removal trials per year, as described  
4 above, provides sufficient data to accurately estimate adjustment factors for carcass removal. The  
5 number of removal trials for the second year of fatality monitoring may be adjusted up or down,  
6 subject to the approval of the Department.

7 (c) Searcher Efficiency Trials

8 The objective of searcher efficiency trials is to estimate the percentage of bird and bat  
9 fatalities that searchers are able to find. The certificate holder shall conduct searcher efficiency  
10 trials on the fatality monitoring search plots in both grassland/shrub-steppe and cultivated  
11 agriculture habitat types. A pooled estimate of searcher efficiency will be used to adjust carcass  
12 counts for detection bias.

13 The investigators shall conduct searcher efficiency trials within each of the seasons  
14 defined above during the years in which the fatality monitoring occurs. Each trial will involve  
15 approximately 40 carcasses (approximately 160 carcasses per year). The searchers will not be  
16 notified of carcass placement or test dates. The investigators shall vary the number of trials per  
17 season and the number of carcasses per trial so that the searchers will not know the total number  
18 of trial carcasses being used in any trial.

19 For each trial, the investigators shall use small, medium and large-bodied species. The  
20 investigators shall use game birds or other legal sources of avian species as test carcasses for the  
21 efficiency trials, and the investigators may use carcasses found in fatality monitoring searches.  
22 The investigators shall select species with the same coloration and size attributes as species  
23 found within the site boundary. If suitable test carcasses are available, trials during the fall  
24 season will include several small brown birds to simulate bat carcasses. Legally obtained bat  
25 carcasses will be used if available. The investigators shall mark the test carcasses to differentiate  
26 them from other carcasses that might be found within the search plot and shall use methods  
27 similar to those used to mark removal test carcasses as long as the procedure is sufficiently  
28 discreet and does not increase carcass visibility.

29 The certificate holder shall distribute trial carcasses in varied habitat in rough proportion  
30 to the habitat types within the facility site. On the day of a standardized fatality monitoring  
31 search (described below) but before the beginning of the search, investigators will place  
32 efficiency trial carcasses randomly within search plots (one to three trial carcasses per search  
33 plot) within areas to be searched. If scavengers appear attracted by placement of carcasses, the  
34 carcasses will be distributed before dawn.

35 Efficiency trials will be spread over the entire season to incorporate effects of varying  
36 weather and vegetation growth. Carcasses will be placed in a variety of postures to simulate a  
37 range of conditions. For example, birds will be: 1) placed in an exposed posture (thrown over the  
38 shoulder), 2) hidden to simulate a crippled bird or 3) partially hidden.

39 The number and location of the efficiency trial carcasses found during the carcass search  
40 will be recorded. The number of efficiency trial carcasses available for detection during each  
41 trial will be determined immediately after the trial by the person responsible for distributing the  
42 carcasses. Following plot searches, all traces of test carcasses will be removed from the site.

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1 If new searchers are brought into the search team, additional searcher efficiency trials  
2 will be conducted to ensure that detection rates incorporate searcher differences. The certificate  
3 holder shall include a discussion of any changes in search personnel and any additional detection  
4 trials in the reporting required under Section 5 of this plan.

5 Before beginning searcher efficiency trials for the second year of fatality monitoring, the  
6 certificate holder shall report the results of the first year efficiency trials to the Department and  
7 ODFW. In the report, the certificate holder shall analyze whether the efficiency trials as  
8 described above provides sufficient data to accurately estimate adjustment factors for carcass  
9 removal. The number of removal trials for the second year of fatality monitoring may be adjusted  
10 up or down, subject to the approval of the Department.

11 (d) Fatality Monitoring Search Protocol

12 The objective of fatality monitoring is to estimate the number of bird and bat fatalities  
13 that are attributable to facility operation as an indicator of the impact of the facility on habitat  
14 quality. The goal of bird and bat fatality monitoring is to estimate fatality rates and associated  
15 variances. The certificate holder shall conduct fatality monitoring using standardized carcass  
16 searches according to the schedule described above.

17 Personnel trained in proper search techniques (“the searchers”) will conduct the carcass  
18 searches by walking parallel transects approximately 20 feet apart within the search plots. A  
19 searcher will walk at a rate of approximately 45 to 60 meters per minute along each transect  
20 searching both sides out to three meters for casualties. Search area and speed may be adjusted by  
21 habitat type after evaluation of the first searcher efficiency trial.

22 Searchers shall flag all avian or bat carcasses discovered. Carcasses are defined as a  
23 complete carcass or body part, 10 or more feathers, or three or more primary feathers in one  
24 location. When parts of carcasses and feathers from the same species are found within a search  
25 plot, searchers shall make note of the relative positions and assess whether or not these are from  
26 the same fatality.

27 All carcasses (avian and bat) found during the standardized carcass searches will be  
28 photographed, recorded and labeled with a unique number. Searchers shall make note of the  
29 nearest two or three structures (turbine, power pole, fence, building or overhead line) and the  
30 approximate distance from the carcass to these structures. The species and age of the carcass will  
31 be determined when possible. Searchers shall make note of the extent to which the carcass is  
32 intact and an estimation of time since death. Searchers shall describe all evidence that might  
33 assist in determination of cause of death, such as evidence of electrocution, vehicular strike, wire  
34 strike, predation or disease, will be described. When assessment of the carcass is complete, all  
35 traces of it will be removed from the site.

36 Each carcass will be bagged and frozen for future reference and possible necropsy. A  
37 copy of the data sheet for each carcass will be kept with the carcass at all times. For each carcass  
38 found, searchers will record species, sex and age when possible, date and time collected,  
39 location, condition (e.g., intact, scavenged, feather spot) and any comments that may indicate  
40 cause of death. Searchers will photograph each carcass as found and will map the find on a  
41 detailed map of the search area showing the location of the wind turbines and associated  
42 facilities. The certificate holder shall coordinate collection of state endangered, threatened,  
43 sensitive or other state protected species with ODFW. The certificate holder shall coordinate

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1 collection of federally-listed endangered or threatened species and Migratory Bird Treaty Act  
2 protected avian species with the U.S. Fish and Wildlife Service (USFWS). The certificate holder  
3 shall obtain appropriate collection permits from ODFW and USFWS.

4 The investigators shall calculate fatality rates using the statistical methods described in  
5 Section (f), except that the investigators may use different notation or methods that are  
6 mathematically equivalent with prior approval of the Department. In making these calculations,  
7 the investigators may exclude carcass data from the first search of each turbine (to eliminate  
8 possible counting of carcasses that were present before the turbine was operating).

9 The investigators shall estimate the number of avian and bat fatalities attributable to  
10 operation of the facility based on the number of avian and bat fatalities found at the facility site.  
11 All carcasses located within areas surveyed, regardless of species, will be recorded and, if  
12 possible, a cause of death determined based on blind necropsy results. If a different cause of  
13 death is not apparent, the fatality will be attributed to facility operation. The total number of  
14 avian and bat fatalities will be estimated by adjusting for removal and searcher efficiency bias.

15 On an annual basis, the certificate holder shall report an estimate of fatalities in eight  
16 categories: 1) all birds, 2) small birds, 3) large birds, 4) raptors, 5) grassland birds, 6) nocturnal  
17 migrants, 7) State Sensitive Species listed under OAR 635-100-0040 and 8) bats. The certificate  
18 holder shall report annual fatality rates on both a per-MW and per-turbine basis.

19 **(e) Incidental Finds and Injured Birds**

20 The searchers might discover carcasses incidental to formal carcass searches (e.g., while  
21 driving within the project area). For each incidentally discovered carcass, the searcher shall  
22 identify, photograph, record data and collect the carcass as would be done for carcasses within  
23 the formal search sample during scheduled searches. If the incidentally discovered carcass is  
24 found within a formal search plot, the fatality data will be included in the calculation of fatality  
25 rates. If the incidentally discovered carcass is found outside a formal search plot, the data will be  
26 reported separately. The certificate holder shall coordinate collection of incidentally discovered  
27 state endangered, threatened, sensitive or other state protected species with ODFW. The  
28 certificate holder shall coordinate collection of incidentally discovered federally-listed  
29 endangered or threatened species and Migratory Bird Treaty Act protected avian species with the  
30 USFWS.

31 The certificate holder shall develop and follow a protocol for handling injured birds. Any  
32 injured native birds found on the facility site will be carefully captured by a trained project  
33 biologist or technician and transported to a qualified rehabilitation specialist approved by the  
34 Department.<sup>4</sup> The certificate holder shall pay costs, if any, charged for time and expenses related  
35 to care and rehabilitation of injured native birds found on the site, unless the cause of injury is  
36 clearly demonstrated to be unrelated to the facility operations.

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<sup>4</sup> Approved specialists include Lynn Tompkins (wildlife rehabilitator) of Blue Mountain Wildlife, a wildlife rehabilitation center in Pendleton and the Audubon Bird Care Center in Portland. The certificate holder must obtain Department approval before using other specialists.

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### 1 (f) Statistical Methods for Fatality Estimates<sup>5</sup>

2 The estimate of the total number of wind facility-related fatalities is based on:

- 3 (1) The observed number of carcasses found during standardized searches during the  
4 two monitoring years for which the cause of death is attributed to the facility.<sup>6</sup>
- 5 (2) Searcher efficiency expressed as the proportion of planted carcasses found by  
6 searchers.
- 7 (3) Removal rates expressed as the estimated average probability a carcass is expected  
8 to remain in the study area and be available for detection by the searchers during  
9 the entire survey period.

#### 10 Definition of Variables

11 The following variables are used in the equations below:

12	$c_i$	the number of carcasses detected at plot $i$ for the study period of interest (e.g., one
13		year) for which the cause of death is either unknown or is attributed to the facility
14	$n$	the number of search plots
15	$k$	the number of turbines searched (includes the turbines centered within each
16		search plot and a proportion of the number of turbines adjacent to search plots to
17		account for the effect of adjacent turbines on the search plot buffer area)
18	$\bar{c}$	the average number of carcasses observed per turbine per year
19	$s$	the number of carcasses used in removal trials
20	$s_c$	the number of carcasses in removal trials that remain in the study area after 40
21		days
22	$se$	standard error (square of the sample variance of the mean)
23	$t_i$	the time (days) a carcass remains in the study area before it is removed
24	$\bar{t}$	the average time (days) a carcass remains in the study area before it is removed
25	$d$	the total number of carcasses placed in searcher efficiency trials
26	$p$	the estimated proportion of detectable carcasses found by searchers
27	$I$	the average interval between searches in days
28	$\hat{\pi}$	the estimated probability that a carcass is both available to be found during a
29		search and is found
30	$m_t$	the estimated annual average number of fatalities per turbine per year, adjusted
31		for removal and observer detection bias
32	$C$	nameplate energy output of turbine in megawatts (MW)

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<sup>5</sup> These statistical methods derive from the *Draft Avian and Bat Monitoring Plan for the Stateline Wind Project*, January 10, 2001 (prepared by FPL Energy, WEST Inc. and Northwest Wildlife Consultants). The present form of the description of statistical methods is based on revisions by the Council in the *Klondike III Wildlife Monitoring and Mitigation Plan*, June 30, 2006.

<sup>6</sup> If a different cause of death is not apparent, the fatality will be attributed to facility operation.

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1 Observed Number of Carcasses

2 The estimated average number of carcasses ( $\bar{c}$ ) observed per turbine per year is:

3 
$$\bar{c} = \frac{\sum_{i=1}^n c_i}{k} . \quad (1)$$

4 Estimation of Carcass Removal

5 Estimates of carcass removal are used to adjust carcass counts for removal bias. Mean  
6 carcass removal time ( $\bar{t}$ ) is the average length of time a carcass remains at the site before it is  
7 removed:

8 
$$\bar{t} = \frac{\sum_{i=1}^s t_i}{s - s_c} . \quad (2)$$

9 This estimator is the maximum likelihood estimator assuming the removal times follow  
10 an exponential distribution and there is right-censoring of data. Any trial carcasses still  
11 remaining at 40 days are collected, yielding censored observations at 40 days. If all trial  
12 carcasses are removed before the end of the trial, then  $s_c$  is 0, and  $\bar{t}$  is just the arithmetic average  
13 of the removal times. Removal rates will be estimated by carcass size (small and large), habitat  
14 type and season.

15 Estimation of Observer Detection Rates

16 Observer detection rates (i.e., searcher efficiency rates) are expressed as  $p$ , the proportion  
17 of trial carcasses that are detected by searchers. Observer detection rates will be estimated by  
18 carcass size, habitat type and season.

19 Estimation of Facility-Related Fatality Rates

20 The estimated per turbine annual fatality rate ( $m_t$ ) is calculated by:

21 
$$m_t = \frac{\bar{c}}{\hat{\pi}} , \quad (3)$$

22 where  $\hat{\pi}$  includes adjustments for both carcass removal (from scavenging and other means) and  
23 observer detection bias assuming that the carcass removal times  $t_i$  follow an exponential  
24 distribution. Under these assumptions, this detection probability is estimated by:

25 
$$\hat{\pi} = \frac{\bar{t} \cdot p}{I} \cdot \left[ \frac{\exp\left(\frac{I}{\bar{t}}\right) - 1}{\exp\left(\frac{I}{\bar{t}}\right) - 1 + p} \right] . \quad (4)$$

26 The estimated per MW annual fatality rate ( $m$ ) is calculated by:

27 
$$m = \frac{m_t}{C} . \quad (5)$$

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1 The final reported estimates of  $m$ , associated standard errors and 90% confidence  
2 intervals will be calculated using bootstrapping (Manly 1997). Bootstrapping is a computer  
3 simulation technique that is useful for calculating point estimates, variances and confidence  
4 intervals for complicated test statistics. For each iteration of the bootstrap, the plots will be  
5 sampled with replacement, trial carcasses will be sampled with replacement and  $\bar{c}$ ,  $\bar{t}$ ,  $p$ ,  $\hat{\pi}$  and  
6  $m$  will be calculated. A total of 5,000 bootstrap iterations will be used. The reported estimates  
7 will be the means of the 5,000 bootstrap estimates. The standard deviation of the bootstrap  
8 estimates is the estimated standard error. The lower 5<sup>th</sup> and upper 95<sup>th</sup> percentiles of the 5000  
9 bootstrap estimates are estimates of the lower limit and upper limit of 90% confidence intervals.

10 Nocturnal Migrant and Bat Fatalities

11 Differences in observed nocturnal migrant and bat fatality rates for lit turbines, unlit  
12 turbines that are adjacent to lit turbines and unlit turbines that are not adjacent to lit turbines will  
13 be compared graphically and statistically.

14 (g) Mitigation

15 The certificate holder shall use a worst-case analysis to resolve any uncertainty in the  
16 results and to determine whether the data indicate that additional mitigation should be  
17 considered. The Department may require additional, targeted monitoring if the data indicate the  
18 potential for significant impacts that cannot be addressed by worst-case analysis and appropriate  
19 mitigation.

20 Mitigation may be appropriate if fatality rates exceed a “threshold of concern.”<sup>7</sup> For the  
21 purpose of determining whether a threshold has been exceeded, the certificate holder shall  
22 calculate the average annual fatality rates for species groups after two years of monitoring. Based  
23 on current knowledge of the species that are likely to use the habitat in the area of the facility, the  
24 following thresholds apply to ~~the SFSWF~~:

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<sup>7</sup> The Council adopted “thresholds of concern” for raptors, grassland species and state sensitive avian species in the Final Order on the Application for the Klondike III Wind Project (June 30, 2006) and for bats in the Final Order on the Application for the Biglow Canyon Wind Farm (June 30, 2006). As explained in the Klondike III order: “Although the threshold numbers provide a rough measure for deciding whether the Council should be concerned about observed fatality rates, the thresholds have a very limited scientific basis. The exceeding of a threshold, by itself, would not be a scientific indicator that operation of the facility would result in range-wide population level declines of any of the species affected. The thresholds are provided in the WMMP to guide consideration of additional mitigation based on two years of monitoring data.”

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Species Group	Threshold of Concern (fatalities per MW)
Raptors (All eagles, hawks, falcons and owls, including burrowing owls.)	0.09
Raptor species of special concern (Swainson's hawk, ferruginous hawk, peregrine falcon, golden eagle, bald eagle, burrowing owl and any federal threatened or endangered raptor species.)	0.06
Grassland species (All native bird species that rely on grassland habitat and are either resident species occurring year round or species that nest in the area, excluding horned lark, burrowing owl and northern harrier.)	0.59
State sensitive avian species listed under OAR 635-100-0040 (Excluding raptors listed above.)	0.2
Bat species as a group	2.5

1 If the data show that a threshold of concern for a species group has been exceeded, the  
2 certificate holder shall implement additional mitigation if the Department determines that  
3 mitigation is appropriate based on analysis of the data, consultation with ODFW and  
4 consideration of any other significant information available at the time. In addition, the  
5 Department may determine that mitigation is appropriate if fatality rates for individual avian or  
6 bat species (especially State Sensitive Species) are higher than expected and at a level of  
7 biological concern. If the Department determines that mitigation is appropriate, the certificate  
8 holder, in consultation with the Department and ODFW, shall propose mitigation measures  
9 designed to benefit the affected species. The certificate holder shall implement mitigation as  
10 approved by the Department, subject to review by the Council. The Department may recommend  
11 additional, targeted data collection if the need for mitigation is unclear based on the information  
12 available at the time. The certificate holder shall implement such data collection as approved by  
13 the Council.

14 Mitigation should be designed to benefit the affected species group. Mitigation may  
15 include, but is not limited to, protection of nesting habitat for the affected group of native species  
16 through a conservation easement or similar agreement. Tracts of land that are intact and  
17 functional for wildlife are preferable to degraded habitat areas. Preference should be given to  
18 protection of land that would otherwise be subject to development or use that would diminish the  
19 wildlife value of the land. In addition, mitigation measures might include: enhancement of a  
20 protected tract that is degraded by weed removal and control; increasing the diversity of native  
21 grasses and forbs; planting sagebrush or other shrubs; constructing and maintaining artificial nest  
22 structures for raptors; improving wildfire response; and conducting or making a contribution to  
23 research that will aid in understanding more about the affected species and its conservation needs  
24 in the region.

## 25 2. Washington Ground Squirrel Assessment

26 A qualified professional biologist (investigator) will assess the status of that portion of  
27 the Washington ground squirrel (WGS) colony located within the site boundary.<sup>8</sup> The colony

<sup>8</sup> The site certificate application for the SFWF included a baseline assessment of the WGS colony. Weisskopf et al., *Shepherds Flat Washington Ground Squirrel and Burrowing Owl Surveys*, May 27, 2007 (App Supp, Exhibit P, Attachment P-5a).

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1 located on-site represents a small outpost of the larger complex off-site. It may expand or  
2 contract over the survey years as rainfall and vegetation affect the total population of the  
3 complex. There should be sufficient data collected before facility components are installed in the  
4 colony's vicinity for the investigator to assess natural colony fluctuation.

5 The investigator shall assess the status of the WGS colony when the squirrels are active  
6 (approximately mid-March through May) beginning in the first active period after the effective  
7 date of the site certificate for ~~the SFWFSFS~~. The colony will be assessed annually thereafter  
8 through the second year after the turbines closest to the WGS colony become commercially  
9 operational.

10 During each assessment, the investigator shall monitor WGS activity to determine the  
11 extent of the on-site colony and estimate the number of squirrels present. The investigator shall  
12 examine the surroundings for evidence of project-caused conditions that might increase erosion  
13 or result in a decline in vegetation quality and adversely affect the colony.

### 14 3. Raptor Nest Monitoring

15 The objectives of raptor nest surveys are: (1) to estimate the size of the local breeding  
16 populations of raptor species that nest on the ground or aboveground in trees or other  
17 aboveground nest locations in the vicinity of the facility; and (2) to determine whether operation  
18 of the facility results in a reduction of nesting activity or nesting success in the local populations  
19 of the following raptor species: Swainson's hawk, golden eagle, ferruginous hawk and burrowing  
20 owl.

21 The certificate holder shall conduct short-term and long-term monitoring. The certificate  
22 holder's qualified investigators will use aerial and ground surveys to evaluate nest success by  
23 gathering data on active nests, on nests with young and on young fledged. The investigators will  
24 analyze the data as described in Section 3(c) and will share the data with state and federal  
25 biologists.

#### 26 (a) Short-Term Monitoring

27 Short-term monitoring will be done in two monitoring seasons. The first monitoring  
28 season will be in the first raptor nesting season after completion of construction of ~~the SFSWF~~.  
29 The second monitoring season will be in the fourth year after construction is completed. The  
30 investigators will analyze two years of data after the second monitoring season.

#### 31 Survey Protocol for Raptor Species that Nest Aboveground

32 During each monitoring season, the investigators will conduct a thorough ground survey  
33 for raptor nests in late May or early June and additional surveys as described in this section. The  
34 survey area is the area within the ~~SFSWF~~ site and a 2-mile buffer around the site. All nests  
35 discovered during pre-construction surveys and any nests discovered during post-construction  
36 surveys, whether active or inactive, will be given identification numbers. Nest locations will be  
37 recorded on U.S. Geological Survey 7.5-minute quadrangle maps. Global positioning system  
38 coordinates will be recorded for each nest. Locations of inactive nests will be recorded because  
39 they could become occupied during future years.

40 Determining nest *occupancy* will likely require at least two visits to each nest. For  
41 occupied nests, the certificate holder will determine nesting *success* by a minimum of one

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1 ground visit to determine species, number of young and young fledged. “Nesting success” means  
2 that the young have successfully fledged (the young are independent of the core nest site). Nests  
3 that cannot be monitored due to the landowner denying access will be checked from a distance  
4 where feasible.

5 Survey Protocol for Burrowing Owls

6 The investigators will monitor burrowing owl nests according to the following protocol.  
7 The investigators will monitor all nests discovered during pre-construction surveys and any  
8 additional burrowing owl nest sites that are discovered during any wildlife monitoring tasks  
9 conducted under this plan. All nests will be given identification numbers. Nest locations will be  
10 recorded on U.S. Geological Survey 7.5-minute quadrangle maps. Global positioning system  
11 coordinates will be recorded for each nest site. Coordinates for ancillary burrows used by one  
12 nesting pair or a group of nesting pairs will also be recorded. Locations of inactive nests will be  
13 recorded because they could become occupied during future years.

14 For occupied nests, the certificate holder will determine nesting *success* by a minimum of  
15 one ground visit to determine species, number of young and young fledged. “Nesting success”  
16 means that the young have successfully fledged (the young may or may not be independent of  
17 the core nest site). Three visits to the nest sites may be necessary to determine outcome. Nests  
18 that cannot be monitored due to the landowner denying access will be checked from a distance  
19 where feasible.

20 (b) Long-Term Monitoring

21 In addition to the two years of post-construction raptor nest surveys described above, the  
22 certificate holder will conduct long-term raptor nest surveys at five-year intervals for the life of  
23 the facility.<sup>9</sup> Investigators will conduct the first long-term raptor nest survey in the raptor nesting  
24 season of the ninth year after construction is completed and will repeat the survey at five-year  
25 intervals thereafter. In conducting long-term surveys, the investigators will follow the same  
26 survey protocols as described above in Section 3(a) unless the investigators propose alternative  
27 protocols that are approved by the Department. In developing an alternative protocol, the  
28 investigators will consult with ODFW. The investigators will analyze the data after each year of  
29 long-term raptor nest surveys.

30 (c) Analysis

31 The investigators will analyze the raptor nesting data to determine whether a reduction in  
32 either nesting success or nest use has occurred in the survey area. If the analysis indicates a  
33 reduction in nesting success or nest use by Swainson’s hawks, golden eagles, ferruginous hawks  
34 or burrowing owls, then the certificate holder will propose appropriate mitigation for the affected  
35 species as described in Section 3(d) and will implement mitigation as approved by the  
36 Department, subject to review by the Council

37 Any reduction in nesting success or nest use could be due to operation of ~~the SFSWF~~ or  
38 some other cause. The investigators will attribute the reduction to operation of ~~the SFSWF~~ unless  
39 the investigators demonstrate, and the Department agrees, that the reduction was due to a

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<sup>9</sup> As used in this plan, “life of the facility” means continuously until the facility site is restored and the site certificate is terminated in accordance with OAR 345-027-0110.

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1 different cause. At a minimum, if the analysis shows that a Swainson's hawk, golden eagle,  
2 ferruginous hawk or burrowing owl has abandoned a nest territory within the facility site or  
3 within ½ mile of the facility site or has not fledged any young over two successive surveys  
4 within that same area, the investigators will assume the abandonment or unsuccessful fledging is  
5 due to operation of the facility unless another cause can be demonstrated convincingly.

6 Given the low raptor nesting densities in the area, statistical power to detect a relationship  
7 between distance from a wind turbine and nesting parameters (e.g., number of fledglings per  
8 reproductive pair) will be very low. Therefore, impacts may have to be judged based on trends in  
9 the data, results from other wind energy facility monitoring studies and literature on what is  
10 known regarding the populations in the region.

### 11 (d) Mitigation

12 The certificate holder will propose mitigation for the affected species in consultation with  
13 the Department and ODFW and will implement mitigation as approved by the Council. In  
14 proposing appropriate mitigation, the certificate holder will advise the Department if any other  
15 wind project in the area is obligated to provide mitigation for a reduction in raptor nesting  
16 success at the same nest site. Mitigation should be designed to benefit the affected species or  
17 contribute to overall scientific knowledge and understanding of what causes nest abandonment or  
18 nest failure. Mitigation may be designed to proceed in phases over several years. It may include,  
19 but is not limited to, additional raptor nest monitoring, protection of natural nest sites from  
20 human disturbance or cattle activity (preferably within the general area of the facility) or  
21 participation in research projects designed to improve scientific understanding of the needs of the  
22 affected species.

## 23 4. Ongoing Reporting and Handling of Wildlife Injuries and Fatalities

24 The certificate holder will implement an ongoing monitoring program for avian and bat  
25 casualties found during operation of the facility. The certificate holder will train facility  
26 personnel in the methods and practices needed to carry out this program. Facility personnel shall  
27 monitor the areas around all facility structures that may present a collision risk to avian and bat  
28 species, including turbine towers, meteorological towers, aboveground transmission lines, [the](#)  
29 [substations](#) and [the](#) field workshops. The monitoring program will include initial response,  
30 handling and reporting of bird and bat carcasses discovered incidental to maintenance operations  
31 ("incidental finds"). Maintenance personnel will follow the certificate holder's protocol for  
32 handling injured birds as described in Section 1(d).

33 All avian and bat carcasses discovered by maintenance personnel will be photographed  
34 and data will be recorded as would be done for carcasses within the formal search sample during  
35 scheduled searches as described in Section 1(d). Maintenance personnel will notify a project  
36 biologist of incidental finds. The project biologist must be a qualified independent professional  
37 biologist who is not an employee of the certificate holder. The project biologist (or the project  
38 biologist's experienced wildlife technician) will collect the carcass or will instruct maintenance  
39 personnel to have an on-site carcass handling permittee collect the carcass. The certificate  
40 holder's on-site carcass handling permittee must be a person who is listed on state and federal  
41 scientific or salvage collection permits and who is available to process (collect) the find on the  
42 day it is discovered. The find must be processed on the same day as it is discovered. The  
43 certificate holder shall coordinate collection of state endangered, threatened, sensitive or other

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1 state protected species with ODFW. The certificate holder shall coordinate collection of  
2 federally-listed endangered or threatened species and Migratory Bird Treaty Act protected avian  
3 species with the USFWS.

4 During the years in which fatality monitoring occurs, if there are incidental finds outside  
5 the search plots for the fatality monitoring searches, the data will be reported separately from  
6 fatality monitoring data. Data on incidental finds within search plots will be included in the  
7 calculation of fatality rates.

8 The Department may determine that mitigation is appropriate if avian or bat fatalities are  
9 higher than expected and at a level of biological concern. If the Department determines that  
10 mitigation is appropriate, the certificate holder, in consultation with the Department and ODFW,  
11 shall propose mitigation measures designed to benefit the affected species. The certificate holder  
12 shall implement mitigation as approved by the Department, subject to review by the Council.

13 **5. Data Reporting**

14 The certificate holder will report wildlife monitoring data and analysis to the Department.  
15 The certificate holder shall notify USFWS and ODFW immediately if any federal or state  
16 endangered or threatened species are killed or injured on the facility site. The certificate holder  
17 shall report fatality monitoring program data, WGS colony assessment information, raptor nest  
18 monitoring data and data on avian and bat casualties found by facility personnel. The certificate  
19 holder may include the reporting of wildlife monitoring data and analysis in the annual report  
20 required under OAR 345-026-0080 or submit this information as a separate document at the  
21 same time the annual report is submitted. In addition, the certificate holder shall provide to the  
22 Department any data or record generated by the investigators in carrying out this monitoring plan  
23 upon request by the Department.

24 **6. Amendment of the Plan**

25 This Wildlife Monitoring and Mitigation Plan may be amended from time to time by  
26 agreement of the certificate holder and the Council. Such amendments may be made without  
27 amendment of the site certificate. The Council authorizes the Department to agree to  
28 amendments to this plan and to mitigation actions that may be required under this plan. The  
29 Department shall notify the Council of all amendments and mitigation actions, and the Council  
30 retains the authority to approve, reject or modify any amendment of this plan or mitigation action  
31 agreed to by the Department.