

Shepherds Flat South: Wildlife Monitoring and Mitigation Plan

[SEPTEMBER 11, 2009]

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

5 SFS consists of up to 120 wind turbines, two non-guyed meteorological (met) towers, a
6 substation and other related or supporting facilities as described in the site certificate. The
7 permanent facility components occupy a combined area of up to 66 acres.² The affected habitat
8 lies within a micro-siting area of approximately 11,411 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 SFS has the following components:

17 1) Fatality monitoring program including:

- 18 a) Removal trials
- 19 b) Searcher efficiency trials
- 20 c) Fatality search protocol
- 21 d) Statistical analysis

22 2) Washington ground squirrel colony assessment

23 3) Raptor nest monitoring

24 4) Ongoing monitoring, reporting and handling of wildlife injuries and fatalities

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

¹ This plan is incorporated by reference in the site certificate for Shepherds Flat South 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.

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

Shepherds Flat South: Wildlife Monitoring and Mitigation Plan
[SEPTEMBER 11, 2009]

1. Fatality Monitoring

(a) Definitions and Methods

Seasons

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)

Schedule

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

In each monitoring year, the investigators shall conduct fatality monitoring searches at the rates of frequency shown below. Over the course of one monitoring year, the investigators 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)

Search Plots

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

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

Sample Size

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

Shepherds Flat South: Wildlife Monitoring and Mitigation Plan

[SEPTEMBER 11, 2009]

Number of Turbines Built	Sample Size: First Year	Sample Size: Second Year
50 to 120	50	50
less than 50	all turbines	all turbines

1 If 50 to 120 turbines are built in a phase, the investigators shall search a different
2 representative sample of 50 turbines in the second year, to the extent possible based on the total
3 number of turbines built.

4 (b) Removal Trials

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

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

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

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

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

35 Before beginning removal trials for the second year of fatality monitoring, the certificate
36 holder shall report the results of the first year removal trials to the Department and ODFW. In the

³ 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.

Shepherds Flat South: Wildlife Monitoring and Mitigation Plan

[SEPTEMBER 11, 2009]

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

5 (c) Searcher Efficiency Trials

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

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

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

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

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

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

41 If new searchers are brought into the search team, additional searcher efficiency trials
42 will be conducted to ensure that detection rates incorporate searcher differences. The certificate

Shepherds Flat South: Wildlife Monitoring and Mitigation Plan

[SEPTEMBER 11, 2009]

1 holder shall include a discussion of any changes in search personnel and any additional detection
2 trials in the reporting required under Section 5 of this plan.

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

9 (d) Fatality Monitoring Search Protocol

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

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

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

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

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

Shepherds Flat South: Wildlife Monitoring and Mitigation Plan

[SEPTEMBER 11, 2009]

1 protected avian species with the U.S. Fish and Wildlife Service (USFWS). The certificate holder
2 shall obtain appropriate collection permits from ODFW and USFWS.

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

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

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

18 (e) Incidental Finds and Injured Birds

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

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

⁴ 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.

Shepherds Flat South: Wildlife Monitoring and Mitigation Plan
[SEPTEMBER 11, 2009]

1 (f) Statistical Methods for Fatality Estimates⁵

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.⁶
- 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)

⁵ 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.

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

Shepherds Flat South: Wildlife Monitoring and Mitigation Plan
[SEPTEMBER 11, 2009]

1 Observed Number of Carcasses

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

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

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
$$\bar{t} = \frac{\sum_{i=1}^s t_i}{s - s_c} . \tag{2}$$

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
$$m_t = \frac{\bar{c}}{\hat{\pi}} , \tag{3}$$

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

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

27
$$m = \frac{m_t}{C} . \tag{5}$$

Shepherds Flat South: Wildlife Monitoring and Mitigation Plan
[SEPTEMBER 11, 2009]

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 5th and upper 95th 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.”⁷ 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 SFS:

⁷ 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.”

Shepherds Flat South: Wildlife Monitoring and Mitigation Plan
[SEPTEMBER 11, 2009]

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.⁸ The colony

⁸ 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).

Shepherds Flat South: Wildlife Monitoring and Mitigation Plan

[SEPTEMBER 11, 2009]

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 SFS. The colony will be assessed annually thereafter through the
8 second year after the turbines closest to the WGS colony become commercially operational.

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

13 3. Raptor Nest Monitoring

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

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

25 (a) Short-Term Monitoring

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

30 Survey Protocol for Raptor Species that Nest Aboveground

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

39 Determining nest *occupancy* will likely require at least two visits to each nest. For
40 occupied nests, the certificate holder will determine nesting *success* by a minimum of one
41 ground visit to determine species, number of young and young fledged. "Nesting success" means

Shepherds Flat South: Wildlife Monitoring and Mitigation Plan

[SEPTEMBER 11, 2009]

1 that the young have successfully fledged (the young are independent of the core nest site). Nests
2 that cannot be monitored due to the landowner denying access will be checked from a distance
3 where feasible.

4 Survey Protocol for Burrowing Owls

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

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

19 (b) Long-Term Monitoring

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

29 (c) Analysis

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

36 Any reduction in nesting success or nest use could be due to operation of SFS or some
37 other cause. The investigators will attribute the reduction to operation of SFS unless the
38 investigators demonstrate, and the Department agrees, that the reduction was due to a different
39 cause. At a minimum, if the analysis shows that a Swainson’s hawk, golden eagle, ferruginous

⁹ 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.

Shepherds Flat South: Wildlife Monitoring and Mitigation Plan

[SEPTEMBER 11, 2009]

1 hawk or burrowing owl has abandoned a nest territory within the facility site or within ½ mile of
2 the facility site or has not fledged any young over two successive surveys within that same area,
3 the investigators will assume the abandonment or unsuccessful fledging is due to operation of the
4 facility unless another cause can be demonstrated convincingly.

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

10 (d) Mitigation

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

22 **4. Ongoing Reporting and Handling of Wildlife Injuries and Fatalities**

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

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

Shepherds Flat South: Wildlife Monitoring and Mitigation Plan

[SEPTEMBER 11, 2009]

1 federally-listed endangered or threatened species and Migratory Bird Treaty Act protected avian
2 species with the USFWS.

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

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

12 **5. Data Reporting**

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

23 **6. Amendment of the Plan**

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