

Stateline Wind Project: Wildlife Monitoring and Mitigation Plan

[REVISED MARCH 27, 2009]

1 This plan describes wildlife monitoring the certificate holders shall conduct during
2 operation¹ of the Stateline Wind Project (SWP) facility in Oregon. The monitoring objectives are
3 to 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. This plan addresses the facility as
5 permitted under the Oregon site certificate, as amended.

6 The SWP facility² consists of two parts:

- 7 • Stateline 1&2: 186 Vestas V47-660-kilowatt (kW) wind turbines, six permanent
8 meteorological (met) towers, access roads and other related or supporting
9 facilities.³
- 10 • Stateline 3: Up to 67 GE 1.5-MW wind turbines or up to 43 Siemens 2.3-MW
11 wind turbines, access roads, a 230-kV transmission line, a substation, an
12 operations and maintenance building and other related or supporting facilities.

13 Wildlife monitoring is necessary to determine whether operation of the facility results in
14 a net loss of habitat quality. For raptors, this will require that the certificate holders obtain a
15 reasonable estimate of the effect of the project on raptors in the context of local raptor
16 populations.

17 The certificate holders shall use properly trained personnel to conduct this monitoring,
18 subject to approval by the Oregon Department of Energy (Department) as to professional
19 qualifications. For all monitoring except FPL's Wildlife Response and Reporting System
20 (described below), the certificate holders shall hire independent third party investigators (not
21 employees of the certificate holder) to perform monitoring tasks.

22 The Wildlife Monitoring and Mitigation Plan for the SWP includes the following
23 components:

- 24 1) Fatality monitoring program involving:
 - 25 a) Removal trials
 - 26 b) Searcher efficiency trials
 - 27 c) Fatality search protocol
 - 28 d) Statistical analysis
- 29 2) Established monitoring transect searches
- 30 3) Raptor nesting surveys

¹ This plan does not address pre-construction wildlife surveys that FPL Energy carried out in support of its application for a site certificate for the Stateline project.

² As used herein, "SWP facility" includes Stateline 1, 2 and 3.

³ The Final Order on the Application authorized construction of 127 Stateline 1 turbines. However, only 126 were actually built. The Final Order described the four Stateline 1 permanent met towers as "guyed masts set in concrete foundations" (Final Order page 12). However, the certificate holder has built unguyed, concrete met towers for both Stateline 1 and 2. Nevertheless, if any permanent guyed met towers are used in the future, the certificate holder shall comply with the provisions in this plan that address guyed met towers.

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1 4) Burrowing owl surveys

2 5) FPL's "Stateline Wind Project Wildlife Response and Reporting System"

3 Following is a discussion of the components of the monitoring plan, statistical analysis
4 methods for fatality data and data reporting.

5 1. Definitions and Methods

6 Seasons

7 This plan uses the following dates for defining seasons:

Season	Dates
Spring Migration	March 16 to May 15
Summer/Breeding	May 16 to August 15
Fall Migration	August 16 to October 31
Winter	November 1 to March 15

8 Search Plot Selection

9 **Stateline 1&2**

10 Certificate holder FPL Energy Vansycle LLC (FPL Vansycle) is responsible for
11 implementing this plan as it applies to Stateline 1&2. The certificate holder shall conduct
12 standardized carcass searches within search plots. The certificate holder, in consultation with the
13 Oregon Department of Fish and Wildlife (ODFW), shall select search plots based on a
14 systematic sampling design (in general, every other plot is sampled in a monitoring year).
15 Turbine strings will be broken into rectangular search plots that contain two to four turbines
16 each. The edge of plots will be no closer than 63 meters from the nearest turbine or, if guyed
17 meteorological (met) towers are used, no closer than 63 meters from the nearest guyed met
18 tower. The certificate holder shall provide maps of the search plots to the Department of Energy
19 before beginning fatality monitoring at the facility. The certificate holder shall use the same
20 search plots for each search conducted during a monitoring year.

21 **Stateline 3**

22 Certificate holder FPL Energy Stateline II, Inc. (FPL Stateline) is responsible for
23 implementing this plan as it applies to Stateline 3. The certificate holder shall conduct
24 standardized carcass searches within search plots. The certificate holder, in consultation with
25 ODFW, shall select search plots based on a systematic sampling design. Each search plot will
26 contain one turbine. Search plots will be square or circular. Circular search plots will be centered
27 on the turbine location and will have a radius equal to the maximum blade tip height of the
28 turbine contained within the plot. "Maximum blade tip height" is the turbine hub-height plus
29 one-half the rotor diameter. Square search plots will be of sufficient size to contain a circular
30 search plot as described above. The certificate holder shall provide maps of the search plots to
31 the Department before beginning fatality monitoring at the facility. The investigators shall use
32 the same search plots for each search conducted during a single monitoring year.

33 Scheduling and Sampling Frequency

34 Certificate holder FPL Vansycle began standardized fatality monitoring in Oregon upon
35 the beginning of operation of the facility. For Stateline 1, the first "monitoring year" commenced

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1 January 1, 2002. For Stateline 2, the first monitoring year commenced January 1, 2003. FPL
2 Vansycle completed standardized fatality monitoring for Stateline 1&2 in 2006. For Stateline 3,
3 the first monitoring year will commence in the first calendar month following completion of
4 construction.

5 Within each monitoring year for Stateline 1 and 2, FPL Vansycle conducted standardized
6 carcass searches at the rates of frequency shown below. Over the course of each monitoring year,
7 FPL Vansycle conducted 16 searches. The total number of searches per season is based on
8 applying the rate to the number of months in the season (as defined above).

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

9 For Stateline 3, the certificate holder shall conduct one full year of fatality monitoring (16
10 searches), beginning in the first calendar month following completion of construction.

11 Sample Size for Standardized Carcass Searches

12 For the standardized carcass searches described below, the sample size is the number of
13 turbines searched per monitoring year. Because the number of turbines per search plot varies (as
14 described above), the number of search plots will be less than the sample size (total number of
15 turbines searched per year).

16 The determination of the sample size is based primarily on the expected precision in the
17 fatality estimates for all Stateline wind turbines in Oregon and Washington.

18 Stateline 1 sample size: FPL Vansycle searched 64 Stateline 1 turbines during the
19 first monitoring year (plus 60 turbines in Washington) and 63 Stateline 1 during the
20 second monitoring year (plus 60 turbines in Washington). Over the first two monitoring
21 years, all 126 Stateline 1 turbines were searched for at least 12 months. Stateline 1 does
22 not include any guyed met towers.

23 Stateline 2 sample size: FPL Vansycle searched 30 Stateline 2 turbines in 2003
24 and 16 Stateline 2 turbines in 2006 (plus 23 turbines in Washington). Stateline 2 does not
25 include any guyed met towers .

26 Stateline 3 sample size: The certificate holder shall search 20 turbines in a single
27 monitoring year. The certificate holder shall select the turbines in consultation with
28 ODFW and the Department. Stateline 3 does not include any guyed met towers.

29 Duration of Fatality Monitoring

30 Stateline 1&2: FPL Vansycle completed standardized fatality monitoring for
31 Stateline 1&2 in 2006.

32 Stateline 3: The certificate holder may terminate the fatality monitoring of
33 Stateline 3 turbines after completing one monitoring year, subject to the approval of the
34 Department.

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1 For Stateline 3, the certificate holder shall use a worst-case analysis to resolve any
2 uncertainty in the results and to determine whether mitigation is required. In lieu of approving
3 the termination of the fatality monitoring program for Stateline 3 after one year, the Department
4 may require additional, targeted monitoring if the data indicate the potential for unexpected
5 impacts of a type that cannot be resolved appropriately by worst-case analysis and appropriate
6 mitigation.

7 **2. Removal Trials**

8 The objective of the removal trials is to estimate the length of time avian and bat
9 carcasses remain in the search area. Carcass removal studies will be conducted during each
10 season in the vicinity of the search plots. Estimates of carcass removal will be used to adjust
11 carcass counts for removal bias. “Carcass removal” is the disappearance of a carcass from the
12 search area due to predation, scavenging or other means such as farming activity.

13 FPL Vansycle conducted carcass removal trials within each of the seasons defined above
14 for Stateline 1 and 2 during the years in which fatality monitoring was done.⁴ This monitoring
15 plan does not require removal trials for Stateline 3. Instead, removal data from Stateline 1 and 2
16 will be used to adjust carcass counts for removal bias.

17 **3. Searcher Efficiency Trials**

18 The objective of searcher efficiency trials is to estimate the percentage of bird and bat
19 fatalities that searchers are able to find.

20 The certificate holder shall conduct searcher efficiency trials in the same area in which
21 carcass searches occur in both grassland/shrub-steppe and cultivated agriculture habitat types.
22 FPL Vansycle conducted searcher efficiency trials in each season for Stateline 1 and 2 in those
23 years in which fatality monitoring was done.⁵ FPL Stateline will conduct searcher efficiency
24 trials for Stateline 3 in each season of the year in which fatality monitoring is done. Searcher
25 efficiency will be estimated by habitat type and season. Estimates of searcher efficiency will be
26 used to adjust the number of carcasses found, correcting for detection bias.

27 For Stateline 3, the certificate holder shall conduct ten searcher efficiency trials: two in
28 the spring season, three in summer, two in fall and three in winter. Each season, approximately
29 10 carcasses of birds of two size classes (20 total carcasses) will be distributed in each of two
30 habitat types (grassland/shrub-steppe and cultivated agriculture).⁶ In each trial in the spring and
31 fall, at least five carcasses from each size class (10 total carcasses) will be placed in each of the
32 two habitat types. In each trial in the summer and winter, at least three carcasses from each size
33 class (6 total carcasses) will be placed in each of the two habitat types.

34 Personnel conducting searches will not know when trials are conducted; nor will they
35 know the location of the trial carcasses. If suitable trial carcasses are available, trials during the
36 fall season will include several small brown birds to simulate bat carcasses. Legally obtained bat
37 carcasses will be used if available.

⁴ Except that removal trials were not required in 2006 for Stateline 2.

⁵ Except that searcher efficiency trials were not required in 2006 for Stateline 2.

⁶ This means that approximately 160 trial carcasses would be used in searcher efficiency trials during one monitoring year.

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1 On the day of a standardized carcass search (described below) but before the beginning of
2 the search, efficiency trial carcasses will be placed at random locations within areas to be
3 searched. If scavengers appear attracted by placement of carcasses, the carcasses will be
4 distributed before dawn.

5 Efficiency trials will be spread over the entire season to incorporate effects of varying
6 weather and vegetation growth. Carcasses will be placed in a variety of postures to simulate a
7 range of conditions. For example, birds will be: 1) placed in an exposed posture (thrown over the
8 left shoulder), 2) hidden to simulate a crippled bird, and 3) partially hidden. Each carcass will be
9 discreetly secured at its location to discourage removal by scavengers.

10 Each non-domestic carcass will be discreetly marked so that it can be identified as an
11 efficiency trial carcass after it is found. The number and location of the efficiency trial carcasses
12 found during the carcass search will be recorded. The number of efficiency trial carcasses
13 available for detection during each trial will be determined immediately after the trial by the
14 person responsible for distributing the carcasses.

15 If new searchers are brought into the search team, additional detection trials will be
16 conducted to insure that detection rates incorporate searcher differences.

17 **4. Standardized Carcass Searches**

18 The objective of the standardized carcass searches (“fatality monitoring”) is to estimate
19 the number of bird and bat fatalities that are attributable to facility operation. The goal of bird
20 and bat fatality monitoring is to obtain a precise estimate of the fatality rate and associated
21 variances.

22 After completing a full year of fatality monitoring for Stateline 3, the certificate holder
23 shall report an estimate of fatalities in six categories: (1) all birds, (2) small birds, (3) large birds,
24 (4) raptors, (5) bats, (6) grassland birds, (7) nocturnal migrants, and (8) State and federally listed
25 threatened and endangered species and State Sensitive Species listed under OAR 635-100-0040.
26 In addition, the certificate holder shall report fatalities of Washington ground squirrels, if any,
27 observed during the carcass searches and shall record and document detections of Washington
28 ground squirrels (scat, holes and live detections).

29 The certificate holder shall estimate the number of avian and bat fatalities attributable to
30 operation of the facility based on the number of avian and bat fatalities found at the facility site
31 whose death appears related to facility operation. All carcasses located within areas surveyed,
32 regardless of species, will be recorded and, if possible, a cause of death determined based on
33 blind necropsy results. The total number of avian and bat carcasses will be estimated by
34 adjusting for removal and searcher efficiency bias. If the cause of death is not apparent, the
35 mortality will be attributed to facility operation.

36 FPL Vansycle conducted two years of fatality monitoring for the Stateline 1 area and two
37 years of fatality monitoring for the Stateline 2 area. For Stateline 3, FPL Stateline shall conduct
38 one full year of fatality monitoring. If analysis of the fatality data indicates that a significant
39 impact on wildlife and wildlife habitat has occurred, the certificate holder shall implement
40 appropriate mitigation, subject to the approval of the Department. Mitigation is discussed in
41 Section 12 below.

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1 Personnel trained in proper search techniques (“the searchers”) will conduct the carcass
2 searches by walking parallel transects. The searchers will search rectangular search plots with the
3 long axis of the plot centered on the turbine string. All area within a minimum of 63 meters from
4 turbines or permanent guyed met towers will be searched. Transects will be initially set at 6
5 meters apart in the area to be searched. A searcher will walk at a rate of approximately 45 to 60
6 meters per minute along each transect searching both sides out to three meters for casualties.
7 Search area and speed may be adjusted by habitat type after evaluation of the first searcher
8 efficiency trial. It should take approximately 45 to 90 minutes to search each turbine (each search
9 plot contains multiple turbines), depending on the habitat type.

10 The searchers will record the condition of each carcass found, using the following
11 condition categories:

- 12 ▪ Intact – a carcass that is completely intact, is not badly decomposed and shows no
13 sign of being fed upon by a predator or scavenger
- 14 ▪ Scavenged – an entire carcass that shows signs of being fed upon by a predator or
15 scavenger, or portions of a carcass in one location (e.g., wings, skeletal remains,
16 legs, pieces of skin, etc.)
- 17 ▪ Feather Spot – 10 or more feathers at one location indicating predation or
18 scavenging

19 All carcasses (avian and bat) found during the standardized carcass searches will be
20 photographed, recorded and labeled with a unique number. Each carcass will be bagged and
21 frozen for future reference and possible necropsy. A copy of the data sheet for each carcass will
22 be kept with the carcass at all times. For each carcass found, searchers will record species, sex
23 and age when possible, date and time collected, location, condition (e.g., intact, scavenged,
24 feather spot) and any comments that may indicate cause of death. Searchers will photograph each
25 carcass as found and will map the find on a detailed map of the search area showing the location
26 of the wind turbines and associated facilities. The certificate holder shall coordinate collection of
27 state endangered, threatened or protected species with the ODFW. The certificate holder shall
28 coordinate collection of federal endangered, threatened or protected species with the U.S. Fish
29 and Wildlife Service (USFWS). The certificate holder shall obtain appropriate collection permits
30 from ODFW and USFWS.

31 The searchers might discover carcasses incidental to formal carcass searches (e.g., while
32 driving within the project area). If the incidentally discovered carcasses are found at turbines that
33 are not part of the formal search sample, the searchers will identify, photograph and collect the
34 carcasses as is done for carcasses within the formal search sample during scheduled searches. If
35 the incidentally discovered carcasses are within the formal search plots, the searchers will leave
36 the carcasses undisturbed, unless the carcass is a state or federally threatened or endangered
37 species. The certificate holder shall coordinate collection of state endangered, threatened or
38 protected species with ODFW. The certificate holder shall coordinate collection of federal
39 endangered, threatened or protected species with the USFWS. The searchers will record the
40 location of all incidentally discovered carcasses or injured birds on a detailed map of the study
41 area showing the location of wind turbines and associated facilities such as power lines and met
42 towers. Any injured native birds found will be carefully captured by a trained Project Biologist
43 or technician and transported to Blue Mountain Wildlife Center in Pendleton in a timely fashion.

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1 The certificate holder shall follow a protocol for handling injured birds that has been developed
2 with Lynn Thompkins of Blue Mountain Wildlife.

3 **5. Established Monitoring Transect Surveys**

4 Surveys of grassland transects were conducted for Stateline 1 only. The objective of
5 surveys of established monitoring transects is to determine whether the operation of the facility
6 results in a loss of habitat quality. A reduction in use by grassland/steppe avian species near the
7 facility would indicate a loss of habitat quality.

8 Stateline 1 transects: FPL Vansycle established 20 transects perpendicular to the
9 turbine strings in non-agricultural grassland steppe and CRP habitats.⁷ The survey
10 protocol for Stateline 1 was described in earlier versions of this plan.⁸

11 Stateline 2 transects: No additional transects could be established because the
12 turbine strings were located in cultivated land.

13 Stateline 3 transects: No additional transects could be established because of
14 insufficient suitable grassland and inability to conduct surveys in the available time
15 before the anticipated start of construction.

16 **6. Raptor Nest Surveys**

17 The objectives of raptor nest surveys are to estimate the size of the local breeding
18 populations of tree-nesting raptor species in the vicinity of the facility and to determine whether
19 operation of the facility results in a reduction of nesting activity or nesting success in the local
20 populations of “target raptor species”: Swainson’s hawk and ferruginous hawk. Certificate holder
21 FPL Vansycle is responsible for implementing this plan as it applies to Stateline 1&2. Certificate
22 holder FPL Stateline is responsible for implementing this plan as it applies to Stateline 3.

23 Aerial and ground surveys will be used to gather nest success statistics on active nests,
24 nests with young and young fledged. The certificate holder will share the data with state and
25 federal biologists.

26 During each survey year, the certificate holder shall conduct at least one helicopter
27 survey and additional surveys as described in this section. All nests will be given identification
28 numbers, and nest locations will be recorded on U.S. Geological Survey 7.5-minute quadrangle
29 maps. Global positioning system coordinates will be recorded for each nest. Locations of
30 inactive nests will also be recorded as they may become occupied during future years. All new
31 nests not previously mapped, whether active or inactive, will be given an identification number
32 and their locations (coordinates) will be recorded. Ground surveys are subject to access.

33 For Stateline 1, FPL Vansycle conducted aerial surveys between May 5 and 17, 2002,
34 and between June 8 and 28, 2002. Surveys were conducted within a 5-mile buffer of the Stateline
35 1 turbines. In addition, active ferruginous hawk and Swainson’s hawk nests within two miles of
36 Stateline 1 turbines were surveyed from the ground to determine nesting success.

⁷ The original Oregon Wildlife Monitoring Plan (9/14/01) required the certificate holder to survey 24 transects that had been established before construction of Stateline 1. However, due to changes in project layout between the initial monitoring plan and the final layout as shown in the site certificate and changes in habitat due to landowner uses, the number of suitable transects for this survey was reduced to 20.

⁸ See the Oregon Wildlife Monitoring Plan (Revised January 20, 2006).

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1 In 2003, FPL Vansycle conducted an aerial survey within a 2-mile buffer of Stateline 1
2 and 2 turbines to determine nest occupancy. In addition, FPL Vansycle conducted ground
3 surveys to determine species, number of young and nesting success. "Nesting success" means
4 that the young have successfully fledged (the young are independent of the core nest site). In the
5 ground survey, FPL Vansycle targeted Swainson's hawk and ferruginous hawk nests and any
6 nests of the target raptor species not observed during the aerial survey.

7 In 2006, FPL Vansycle conducted an aerial survey to determine nest occupancy and a
8 ground survey to determine species, number of young and nesting success. The survey area was
9 the area within a 2-mile buffer around Stateline 2 turbines. In the ground survey, FPL Vansycle
10 targeted Swainson's hawk and ferruginous hawk nests and any nests of the target raptor species
11 not observed during the aerial survey.

12 For Stateline 3, FPL Stateline shall conduct an aerial survey within a 1-mile buffer of
13 Stateline 3 turbines to determine nest occupancy by Swainson's hawks and ferruginous hawks. In
14 addition, one known ferruginous hawk nest located more than one mile from Stateline 3 turbines
15 will be surveyed. The certificate holder shall conduct a minimum of one ground survey of
16 Swainson's and ferruginous hawk nests to determine number of young and nesting success.

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

22 If analysis of the raptor nesting data indicates any reduction in nesting success by the
23 target raptor species within the survey areas, the certificate holder shall implement appropriate
24 mitigation, subject to the approval of the Department. At a minimum, if the surveys reveal that a
25 target raptor species has abandoned a nest or territory within ½ mile of the facility, or has not
26 fledged any young over any two survey years, the certificate holder shall assume the
27 abandonment or unsuccessful fledging is the result of the project unless another cause can be
28 demonstrated conclusively. Based on that assumption, the certificate holder shall implement
29 appropriate mitigation. In addition, if the data indicate clear evidence of displacement or
30 disturbance of target raptor nesting species between beyond ½ mile from the facility, the
31 certificate holder shall implement appropriate mitigation.

32 For ferruginous hawks, appropriate mitigation may include creation, maintenance and
33 monitoring of nesting platforms; specifically, eight nesting platforms would be created a
34 minimum of 2 miles away from turbines for every ferruginous hawk nest assumed or shown to
35 be affected.

36 Due to the difficulty in replacing nesting habitat for Swainson's hawks, appropriate
37 mitigation may include determining the status of the tree structures currently supporting
38 Swainson's hawks within three miles of the turbines and, with landowner approval,
39 implementing protection measures to retain those structures and to protect existing nest trees.
40 This may include fencing to protect existing trees or spraying black locust trees for insect
41 infestation. It may be appropriate to recruit native tree species.

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7. Burrowing Owl Surveys

The objectives of owl surveys are to estimate the size of the local breeding population of burrowing owls in the vicinity of the facility and to determine whether operation of the facility results in a reduction of nesting activity or nesting success in the local burrowing owl population.

Given the expected small sample size of active burrowing owl nests within 1,000 feet of the facility, impacts may have to be judged based on trends in the data, results from other wind energy facility monitoring studies and literature on what is known regarding the populations in the region. No burrowing owls were observed within 1,000 feet of the proposed Stateline 1 turbines during the 2001 spring pre-construction surveys. Therefore, there is no ability to make any statistical or descriptive inferences on burrowing owl displacement or disturbance impacts to burrowing owls in Oregon.

For Stateline 1 and 2 facilities, FPL Vansycle conducted burrowing owl surveys during the breeding season within suitable grassland habitat in association with the fatality monitoring described above in Section 4. For each monitoring year, FPL Vansycle conducted a minimum of two surveys for burrowing owls to obtain estimates of burrowing owl nest density near the turbines. For these surveys, FPL Vansycle followed a protocol developed in consultation with ODFW. Taped burrowing owl vocalizations were played to enhance the ability to detect burrowing owls. Two historic nest sites within the Oregon project area were checked for use. The burrow and an adjacent 100 meters were surveyed for sign of activity and alternate nest sites. During the burrowing owl surveys, observers recorded and documented detections of Washington ground squirrels (scat, holes and live detections).

For Stateline 3 facilities, FPL Stateline shall conduct a burrowing owl survey in 2010 for known active or historic burrowing owl nests and any newly discovered nests within 1,000 feet of the Stateline 3 wind turbines. In addition to checking all known historic burrowing owl sites, the certificate holder will search a buffer of 1,000 feet around each site to look for auxiliary burrows, new burrows or other signs of activity. Two burrowing owl nests were found within the project boundary during pre-construction in 2008 and will be checked for activity during the construction monitoring in 2009.

8. Avian Use Surveys

During each standardized carcass search, as described in Section 4 above, observers will record birds detected in a ten-minute period at approximately one-third of the turbines within the carcass search plots (e.g., one point count station per carcass search plot which may consist of two to four turbines) using standard variable circular plot point count survey methods. Additional observations of species of concern (State and federally listed threatened and endangered species and State Sensitive Species listed under OAR 635-100-0040) will be recorded if observed during the carcass searches, but collecting this information is secondary to the actual searching for carcasses so the searchers are not distracted from their main task of finding carcasses.

For Stateline 3, while on site during carcass searches (including during travel between search plots), observers shall record observations of special status birds and mammals within the facility site. Observers shall record observations of birds perching on aboveground transmission line conductors and support structures in the vicinity of the turbines being searched. Observers shall report any fatalities observed below or near transmission lines.

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9. FPL’s Stateline Wind Project Wildlife Response and Reporting System

FPL’s “Stateline Wind Project Wildlife Response and Reporting System” is a monitoring program set up for searching for and handling avian and bat casualties found by maintenance personnel. A description of this system and associated data forms used for the Vansycle Ridge Wind Project are found in FPL’s application for a site certificate (Attachment P-6, Appendices B and C).

Construction and maintenance personnel will be trained in the methods. This monitoring program includes both reporting of carcasses discovered incidental to construction and maintenance operations (“incidental finds”) and reporting of carcasses discovered under a standardized search protocol for an area within approximately 50 meters of the turbines, measured from the base of the tower (“protocol searches”).

For Stateline 1, a sample of approximately 45 turbines not included in the standardized carcass searches was chosen to be included in protocol searches in each Stateline 1 monitoring year. FPL Vansycle selected this sample from the overall Stateline Wind Project in Oregon and Washington, with at least 13 of the sampled turbines located in Oregon.

For Stateline 2, FPL Vansycle selected a sample of seven Stateline 2 turbines not included in the standardized carcass searches to include in protocol searches in each Stateline 2 monitoring year.

For Stateline 3, FPL Stateline shall select a sample of approximately 15 percent of the Stateline 3 turbines that are not included in the standardized carcass searches.

All carcasses discovered by maintenance personnel will be photographed and recorded. If maintenance personnel find carcasses within the search plots for protocol searches, they will notify a project biologist who will collect the carcasses. If maintenance personnel discover incidental finds at turbines that are not within search plots for the standardized carcass searches described in Section 4, they will notify a project biologist who will collect the carcasses. If maintenance personnel discover carcasses within search plots for the standardized carcass searches described in Section 4, they will leave the carcasses undisturbed, unless the carcass is a state or federally threatened or endangered or otherwise protected species. The certificate holder shall coordinate collection of state endangered, threatened or protected species with ODFW. The certificate holder shall coordinate collection of federal endangered, threatened or protected species with the USFWS.

10. Statistical Analysis Methods for Fatality Data

The certificate holder shall calculate fatality rates using the statistical methods described below, except that the certificate holder may use different notation and methods that are mathematically equivalent with prior approval of the Department.

- (1) Observed number of carcasses found during standardized carcass searches for which the cause of death is either unknown or is attributed to the facility.
- (2) Searcher efficiency expressed as the proportion of planted carcasses found by searchers
- (3) Non-removal rates expressed as the length of time a carcass is expected to remain in the study area and be available for detection by the searchers

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Definition of Variables

The following variables are used in the equations below:

c_i the number of carcasses detected at plot i for the study period of interest for which the cause of death is either unknown or is attributed to the facility

n the number of search plots

k the number of turbines searched (includes the turbines centered within each search plot and a proportion of the number of turbines adjacent to search plots to account for the effect of adjacent turbines on the search plot buffer area)

\bar{c} the average number of carcasses observed per turbine per year

s the number of carcasses used in removal trials

s_c the number of carcasses in removal trials that remain in the study area after 40 days

se standard error (square of the sample variance of the mean)

t_i the time (days) a carcass remains in the study area before it is removed

\bar{t} the average time (days) a carcass remains in the study area before it is removed

d the total number of carcasses placed in searcher efficiency trials

p the estimated proportion of detectable carcasses found by searchers

I the interval between searches in days

$\hat{\pi}_i$ the estimated probability that a carcass is both available to be found during a search and is found ($i = 1$ and 2 ; two estimators)

m_i the estimated annual average number of fatalities per turbine per year, adjusted for removal and observer detection bias ($i = 1$ and 2 ; two estimators)

Observed Number of Carcasses

The estimated average number of carcasses (\bar{c}) observed per turbine (or guyed met tower) is:

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

The final estimate of \bar{c} and its standard error are to be calculated using bootstrapping (Manly *et al.* 1997⁹). Bootstrapping is a computer simulation technique that is useful for calculating point estimates, variances and confidence intervals for complicated test statistics. The certificate holder shall calculate the mean of at least 5000 bootstrap estimates. The standard deviation of the bootstrap estimates of \bar{c} is the estimated standard error of \bar{c} (that is, $se(\bar{c})$).

⁹ Manly, B.F.J., *Randomization, Bootstrap and Monte Carlo Methods in Biology* (2nd edition), Chapman and Hall, New York (1997).

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Estimation of Carcass Removal

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

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

This estimator is the maximum likelihood estimator assuming that the removal times follow an exponential distribution and that there is right-censoring of data. Any trial carcasses still remaining at 40 days are collected, yielding censored observations at 40 days. If all trial carcasses are removed before the end of the trial, then s_c is 0, and \bar{t} is just the arithmetic average of the removal times.

The certificate holder shall use bootstrapping to calculate the final estimate of \bar{t} , the estimated standard error and 90% confidence limits. At least 5000 bootstrap iterations will be used. The standard deviation of the bootstrap estimates of \bar{t} is the estimated standard error of \bar{t} (that is, $se(\bar{t})$). Removal rates will be estimated by major habitat, carcass size (large and small) and season.

Estimation of Searcher Efficiency

Searcher efficiency rates (that is, the rate of observer detection) are expressed as p , the proportion of trial carcasses that are detected by searchers. The standard error (square of variance of mean) and 90% confidence limits will be calculated by bootstrapping. At least 5000 bootstrap iterations will be used. Observer detection rates will be estimated by major habitat, carcass size and season.

Estimation of Total Number of Facility-Related Fatalities

The certificate holder shall provide two estimators for the mean number of fatalities per turbine per year. Both estimators adjust the observed number of fatalities by dividing the number of observed carcasses by an estimate of the probability that a carcass is available to be picked up during a fatality search (i.e., the probability the carcass is not removed by a scavenger) and is observed (the probability of detection).

The first estimator of total number of annual facility-related fatalities (m_1) is calculated by:

$$m_1 = \frac{\bar{c}}{\hat{\pi}_1}$$

where

$$\hat{\pi}_1 = \begin{cases} \frac{\bar{t} * p}{I} & \text{if } I > \bar{t} \\ p & \text{if } I \leq \bar{t} \end{cases}$$

This first estimator appears to provide an underestimate of true mortality when the interval between searches is similar to the mean carcass removal time. For this reason, the

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1 certificate holder shall calculate the mean number of fatalities per turbine per year using a second
2 estimator, as follows:

$$3 \quad m_2 = \frac{\bar{c}}{\hat{\pi}_2} \text{ where } \hat{\pi}_2 \text{ includes adjustments for both observer detection and scavenging bias}$$

4 and assuming that the carcass removal times t_i follow an exponential distribution.

5 This second estimator does not underestimate true mortality when the mean removal time
6 is similar to or larger than the interval between searches. This estimator will be used when
7 comparisons are made to determine if mitigation should be implemented as described in Section
8 12.

9 For Stateline 3, the certificate holder shall calculate and report fatality rates (per turbine
10 and per megawatt) for each of eight categories: (1) all birds, (2) small birds, (3) large birds, (4)
11 raptors, (5) bats, (6) grassland birds, (7) nocturnal migrants, and (8) State and federally listed
12 threatened and endangered species and State Sensitive Species listed under OAR 635-100-
13 0040.¹⁰ The certificate holder shall calculate the “all birds” estimate and the “small birds”
14 estimate for all species and, separately, for only those species protected by law. Modifications to
15 these estimates will be made to incorporate the varying search efforts by season (monthly in
16 winter and summer, twice monthly in fall and spring). In addition, the certificate holder shall
17 estimate the number of facility-related fatalities separately for turbines that are located on land
18 that does not support grassland steppe or low shrub/shrub steppe habitat and for turbines that are
19 located on land that does support grassland steppe or low shrub/shrub steppe habitat. Additional
20 modifications may be made, subject to approval by the Department.

21 The variance of m is difficult to estimate due to the products and ratios of random
22 variables in the equation above. The certificate holder may estimate the variance and confidence
23 intervals using the computer intensive technique of bootstrapping (Manly 1997, Barnard 2000).

24 **11. Data Reporting**

25 The certificate holder will report the monitoring data and analysis to the Council. This
26 report may be included in the annual report required under OAR 345-026-0080 or may be
27 submitted as a separate document at the same time the annual report is submitted. In addition, the
28 certificate holder shall provide to the Council any data or record generated in carrying out this
29 monitoring plan upon request by the Council.

30 The certificate holder shall notify USFWS and ODFW immediately in the event that any
31 federal or state endangered or threatened species are taken.

32 The public will have an opportunity to receive information about monitoring results and
33 to offer comment. Within 30 days after receiving the final annual report of monitoring results,
34 the Department will give reasonable public notice via the Internet and make the report available
35 to the public. The notice will specify a time in which the public may submit comments to the

¹⁰ Grassland nesting species include grasshopper sparrow, savannah sparrow, vesper sparrow, short-eared owl, burrowing owl, northern harrier, horned lark, western meadowlark, long-billed curlew, ring-necked pheasant, Hungarian partridge, chukar partridge, California quail and any other resident grassland nesting bird species that is found in the area.

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1 Department. The Technical Advisory Committee established under the Walla Walla County
2 conditional use permit may offer comments about the results of monitoring programs in Oregon.

3 **12. Mitigation**

4 The selection of the mitigation actions that the certificate holder may be required to
5 implement under this plan should allow for flexibility in creating appropriate responses to
6 monitoring results that cannot be known in advance. If mitigation is needed, the certificate holder
7 shall propose appropriate mitigation actions to the Department and shall carry out mitigation
8 actions approved by the Department. In addition to mitigation described above, possible
9 mitigation actions include but are not limited to the measures discussed in this section. No later
10 than December 31, 2010, the Department and the certificate holder shall review this plan and
11 assess whether modification of the required mitigation is appropriate.

12 Grassland Nesting Species

13 Grassland nesting species include all native bird species that rely on grassland habitat and
14 that are either resident species occurring year round or species that nest in the area, excluding
15 horned lark, burrowing owl and northern harrier. The certificate holder shall determine
16 significant impact to grassland nesting species based on the fatality monitoring program
17 discussed above. For Stateline 1&2, if the average annual fatality rate is greater than 1.25
18 fatalities per turbine or guyed met tower per year for all species combined or if the average
19 annual fatality rate is greater than 0.5 fatalities per turbine or guyed met tower per year for a
20 single grassland nesting bird species, then the certificate holder shall assume that a significant
21 impact on habitat has occurred and shall implement appropriate mitigation. For Stateline 3, if the
22 average annual fatality rate is greater than the threshold of concern (0.59 fatalities per megawatt)
23 for grassland species as a group, then the certificate holder shall assume that a significant impact
24 on habitat has occurred and shall implement appropriate mitigation.¹¹ The certificate holder shall
25 include in this estimate any grassland nesting species fatality that is observed, even if it is
26 observed during the non-nesting period. The certificate holder shall include in the estimate all
27 carcasses unidentified as to species and for which there is no evidence to rule out the carcass as
28 one of the grassland species listed above.

29 If the analysis of turbine fatality data indicates that mitigation for grassland nesting
30 species is required, the certificate holder shall enhance sufficient habitat to support the number of
31 grassland nesting birds affected. For Stateline 3, the number of birds affected includes the
32 number of fatalities above the threshold of concern. The certificate holder shall protect that
33 enhanced habitat for the life of the facility. The certificate holder shall propose the amount of
34 habitat enhancement based on expected densities and habitat requirements of these species as
35 described in the literature and studies of the Stateline facility and other wind energy facilities in
36 the Northwest.

¹¹ 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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1 For Stateline 3, if the average annual fatality rate for a State Sensitive avian species listed
2 under OAR 635-100-0040 is greater than the threshold of concern (0.2 fatalities per megawatt),
3 the Department may require the certificate holder to implement mitigation for that species.

4 FPL Vansycle reported the average annual fatality rates for grassland bird species in
5 *Stateline Wind Project Wildlife Monitoring Final Report: July 2001 - December 2003*. This
6 report analyzed two years of monitoring data collected between January 1, 2002, and December
7 31, 2003. Based on the data, the average annual fatality rate for all grassland bird species as a
8 group was 1.28 fatalities per turbine. The average annual fatality rate for horned larks was 0.89
9 fatalities per turbine, and no other single grassland species had an annual fatality rate greater than
10 0.13 fatalities per turbine per year. The reported fatality rates exceeded the “all species”
11 mitigation threshold for Stateline 1&2 of 1.25 fatalities per turbine per year and the “single
12 species” threshold of 0.5 fatalities per turbine per year.

13 As of January 20, 2006, the Council determined that additional mitigation for facility
14 impacts to grassland species was not required pending analysis of additional data from future
15 monitoring. The basis for this determination was that the reported fatality rates were very close
16 to target levels and the most common species affected was horned lark, a species that is abundant
17 in the area and whose survival is not at risk.

18 In 2006, FPL Vansycle conducted fatality monitoring for 16 turbines in the Stateline 2
19 area and reported the results in *Stateline Wind Project Wildlife Monitoring Annual Report:
20 January - December 2006*. The average annual fatality rate for all grassland bird species as a
21 group was 0.45 fatalities per turbine.¹² Single-species fatality rates were not reported.¹³
22 Accordingly, additional mitigation for impacts to grassland species is not warranted as of the
23 date of this plan.

24 Raptors

25 For Stateline 1&2, the certificate holder shall determine significant impact to raptors
26 (excluding burrowing owls, short-eared owls and northern harriers, which are considered under
27 grassland nesting species) based on the fatality monitoring program data and any other raptor
28 fatalities found. If more than an average of two raptor fatalities are found per year, then the
29 certificate holder shall assume that a significant impact on raptor habitat has occurred and shall
30 implement appropriate mitigation.

31 For Stateline 3, the certificate holder shall determine significant impact to raptors (all
32 eagles, hawks, falcons and owls, including burrowing owls) based on the fatality monitoring
33 program data and any other raptor fatalities found. If the average annual fatality rate for raptors
34 is greater than the threshold of concern (0.09 fatalities per megawatt) or the average annual
35 fatality rate for raptor species of special concern is greater than the threshold of concern (0.06

¹² *Stateline Wind Project Wildlife Monitoring Annual Report: January - December 2006* (September 4, 2007),
Table 5.

¹³ Horned lark fatalities accounted for 50-percent of fatalities found in the Oregon survey area in 2006. The “all-
birds” fatality rate was 0.81 fatalities per turbine. Thus, the single-species threshold of 0.5 fatalities/turbine/year was
not exceeded.

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1 fatalities per megawatt), then the certificate holder shall assume that a significant impact on
2 raptor habitat has occurred and shall implement appropriate mitigation.¹⁴

3 FPL Vansycle reported the number of raptor fatalities in *Stateline Wind Project Wildlife*
4 *Monitoring Final Report: July 2001 - December 2003*. This report analyzed two years of
5 monitoring data collected between January 1, 2002, and December 31, 2003. Seven raptor
6 fatalities were discovered during standardized fatality searches in Oregon and one additional
7 raptor fatality was found in Oregon under the WRRS monitoring program in the two-year period.
8 Therefore, the annual average was four raptor fatalities found per year.

9 On January 20, 2006, the Council determined that additional mitigation was appropriate.
10 To mitigate the effects of the facility on raptors, the certificate holder shall implement the
11 following:

12 (a) Artificial nest structures (ANS) for ferruginous hawks: FPL Vansycle provided
13 funding for the construction, monitoring and maintenance of not less than three ANS.
14 FPL Vansycle, in consultation with ODFW and the Department, determined suitable
15 locations for the ANS and obtained landowner permission to construct the ANS. Suitable
16 locations are locations within the Columbia Basin Physiographic Province in proximity to
17 the Stateline project and on land that is expected to remain in stable ownership for the life
18 of the Stateline facility. Suitable locations are locations that have adequate prey base for
19 ferruginous hawks and that are remote from human activity. If the site chosen for an ANS
20 is on public land or land managed by The Nature Conservancy, FPL Vansycle shall work
21 out an appropriate agreement with the land management entity for the maintenance and
22 monitoring of the site.

23 FPL Vansycle completed construction of the three ANS, using a design appropriate to
24 attract ferruginous hawks, in early 2007. If an ANS is vandalized or destroyed (by fire or
25 other cause) during the first five years after construction, FPL Vansycle shall pay the full
26 cost of replacement. The Department shall determine the need for ongoing maintenance
27 of the ANS beyond the first five years based on the monitoring data on the success of the
28 ANS in attracting raptor use.

29 FPL Vansycle shall monitor the ANS and report annually to the Department regarding
30 the actual use of the ANS by raptor species. Annual monitoring of all ANS shall continue
31 for at least 10 years after construction of the ANS in 2006. If there has been no use of an
32 ANS by raptors during the first five years, the Department may require FPL Vansycle to
33 relocate the ANS or construct an ANS at an alternative suitable site.

34 (b) Riparian and upland habitat fencing: FPL Vansycle contributed \$9,000 to the Birch
35 Creek Project for fencing of riparian and upland habitat. The Birch Creek project is a
36 partnership between a private landowner and other interested organizations to improve
37 upland and riparian wildlife habitat at a site that is within the Columbia Basin
38 Physiographic Province about 30 miles south of the Stateline facility. The project site is
39 near an area of historic nesting sites for ferruginous hawks, and it is likely that improved
40 range conditions may enhance foraging habitat quality for the species, especially during
41 the nesting and juvenile dispersal period. It is expected that other raptor species will

¹⁴ Raptor species of special concern include Swainson's hawk, ferruginous hawk, peregrine falcon, golden eagle, bald eagle, burrowing owl and any federal threatened or endangered raptor species.

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1 benefit as well, including red-tailed hawks and American kestrels that may nest in
2 deciduous or coniferous trees and forage in the uplands. FPL Vansycle shall provide
3 periodic reports to the Department on the progress of the Birch Creek project. At a
4 minimum, the certificate holder shall report on the project in the annual reports on the
5 Stateline facility.

6 The Birch Creek project enclosed about 5,000 acres of Columbia Basin grassland and
7 riparian and upper Birch Creek conifer/grassland. Approximately 15 miles of new high-
8 tensile, wildlife-friendly fencing were built. The goal is to exclude cattle from riparian
9 zones and upland habitats so the areas can recover from past grazing pressure. The
10 fencing encloses uplands for raptor foraging and deciduous trees and shrubs for potential
11 raptor nesting, perching and roosting.

12 (c) Contributions to the Blue Mountain Wildlife Rehabilitation Center: The Blue
13 Mountain Wildlife Rehabilitation Center near Pendleton is a non-profit organization that
14 provides treatment and care to orphaned, injured or sick native wildlife to enable their
15 return to their natural habitat. To support the work of the Center in the rehabilitation of
16 raptors, FPL Vansycle contributed \$3,000 to the Center in 2006 and \$1,500 in 2007 and
17 2008. The certificate holders shall make annual contributions of \$1,500 each in 2009 and
18 2010. The certificate holders shall request that the funds be dedicated to paying for food
19 and other supplies necessary for raptor rehabilitation. FPL Vansycle and the Department
20 shall assess ongoing mitigation activities no later than December 31, 2010, and shall
21 determine the amount of further contributions to the Center.

22 FPL Vansycle reported four raptor fatalities in Oregon in 2006.¹⁵ This result matched the
23 annual average of four raptor fatalities per year, based on the data for 2002 and 2003. If
24 Stateline 3 turbines are built, the certificate holder will conduct standardized searches for one
25 year in the Stateline 3 area. The Wildlife Response and Reporting System will be in place for the
26 life of the facility and will include reporting of any incidental raptor fatalities found by
27 maintenance personnel. If the threshold of concern is not exceeded but fatalities of a sensitive
28 raptor species, such as ferruginous hawk or Swainson's hawk are at a level of concern, the
29 Department may require the certificate holder to implement mitigation for that species.

30 Other Bird Species and Bats

31 Mitigation measures for grassland nesting birds and for raptors, if implemented, would
32 also benefit other bird species and bats. For Stateline 1&2, there was no mitigation threshold for
33 these species. For Stateline 3, the threshold of concern for bats as a group is 2.5 fatalities per
34 megawatt. If fatalities to these species exceed the threshold of concern or are higher than
35 expected and are at a level of biological concern, the Department may require the certificate
36 holder to implement mitigation for these species.

37 The monitoring data presented in *Stateline Wind Project Wildlife Monitoring Final*
38 *Report: July 2001 - December 2003* show that fatality rates for other bird species and bats were
39 not higher than expected. The overall bat fatality rate was 1.7 fatalities per megawatt, which is

¹⁵ *Stateline Wind Project Wildlife Monitoring Annual Report: January - December 2006* (September 4, 2007), Table 2.

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1 below the U.S. average rate of 2.1 fatalities per megawatt.¹⁶ The data collected in 2006 on
2 turbines in the Stateline 2 area resulted in lower fatality rates for both birds and bats, compared
3 to the larger Stateline sample studied in 2002 and 2003.¹⁷ Pending analysis of additional data
4 from future monitoring, the Council determined that additional mitigation for facility impacts to
5 other bird species and bats was not required as of January 20, 2006.

6 **13. Amendment of the Plan**

7 This Wildlife Monitoring and Mitigation Plan may be amended from time to time by
8 agreement of the certificate holders and the Council. Such amendments may be made without
9 amendment of the site certificate. The Council authorizes the Department to agree to
10 amendments to this plan and to mitigation actions that may be required under this plan. The
11 Department shall notify the Council of all amendments and mitigation actions, and the Council
12 retains the authority to approve, reject or modify any amendment of this plan or mitigation action
13 agreed to by the Department.

¹⁶ The overall bird fatality rate of 2.9 fatalities per megawatt was “slightly below the average for new generation wind projects in the U.S.” (3.05 fatalities per megawatt). *Stateline Wind Project Wildlife Monitoring Final Report: July 2001 - December 2003* (December 2004), p. 26.

¹⁷ *Stateline Wind Project Wildlife Monitoring Annual Report: January - December 2006* (September 4, 2007), Table 5.