B O N N E V I L L E   P O W E R   A D M I N I S T R A T I O N

Whistling Ridge Energy Project
Appendices C–F

Draft Environmental Impact Statement

May 2010

Cooperating Agency:
State of Washington, Energy Facility Site Evaluation Council

Appendix C

Wildlife Reports

C-1

Vegetation Technical Report: Saddleback Wind Project EIS, Skamania County, Washington

CH2M HILL

Vegetation Technical Report
Saddleback Wind Project EIS
Skamania County, Washington

Criteria and Methodology

The vegetation study area includes the area of a proposed substation, turbine strings, and their associated access roads, and existing secondary roads proposed for improvement. Vegetation was surveyed in a 300-ft corridor centered on proposed turbine strings and their associated access roads, in 50-foot corridors adjacent to existing roads proposed for improvement in conjunctions with this project, and in 25 additional acres in three locations proposed for staging areas and location of a substation (Figure 1).

Numerous vegetation classification systems are available for characterizing the plant communities across a landscape. The classification system used for this analysis was USDA Forest Service classification system (Brown 1985). It was selected for: (1) ability to address the variety of vegetation conditions in the study area; and (2) ability to interpret their function as wildlife habitat.

The aerial photographs are DNR orthophotos taken in January 2002 and were scaled to 1:600, and a. maximum 3-foot resolution.

The available color photo coverage was overlain with the project base map, and vegetation types within the study area were digitally mapped using scanned color aerial photographs and ER Mapper 6.3 software by Earth Resources. Photographic signatures were calibrated using field observations. Final maps of the approximate vegetation type boundaries were adjusted using field survey observations, field notes, field maps, and oblique photos. Areas

The USDI Fish and Wildlife Service (USFWS), and the Washington Natural Heritage Information System (WNHIS) were consulted for information on the existence of special status plant species and important habitats that would support special status species in the project vicinity.

Special status plant species are native species that have been accorded special legal or management protection because of concern for their continued existence. There are several categories of protection, depending on the magnitude of threat to continued existence, and existing knowledge of population levels. Any plant species that is in danger of extinction throughout all or a significant portion of its range is defined as "endangered." A "threatened" species is a species that is likely to become endangered in the foreseeable future. Species of concern are candidates for listing as endangered or threatened.

A search of the WNHIS database for records of listed or proposed threatened or endangered plant species was conducted. Records of special status species documented within two miles of the proposed project area were obtained. Also, species records for a large area surrounding the project vicinity were obtained to indicate potentially occurring species that may not been recorded because of a lack of detailed surveys for these species.

Affected Environment

Vegetation Communities

The project area is located in the Southern Washington Cascades Province (Franklin and Dyrness 1988). This area is characterized by generally accordant ridge crests separated by steep, deeply dissected valleys. The project falls within the *Abies grandis* and *Pseudotsuga menziesii* major vegetation zones (Franklin and Dyrness 1988). Climate is wet and cool, receiving a significant portion of its precipitation in the form of snow which accumulates in winter snowpacks as deep as 1 to 3 meters.

The project area is located specifically on Underwood Mountain northwest of White Salmon, Washington. Major drainages in the area include the White Salmon and the Little White Salmon River basins to the east and west of the site respectively. Both basins drain to the Columbia River south of the site, which drains to the Pacific Ocean.

Historically, the project area was dominated by coniferous species—grand fir (*Abies grandis*), and Douglas-fir (*Pseudotsuga menziesii*). Historical species dominance was dependent on elevation, aspect, underlying soil, and previous disturbance history (Franklin and Dyrness 1988). Mixed conifer and deciduous forest stands usually followed disturbances, but occasionally deciduous-dominated stands developed, depending on the disturbance type and physical environment. Typical deciduous species were alder (*Alnus rubra, A. sinuata*), Pacific dogwood (*Cornus nutallii*), and big-leaf maple (*Acer macrophyllum*).

The predominant land use in the surrounding area between Underwood Mountain and the Little White Salmon River is commercial forest production. Some land east of the Little White Salmon is zoned for 2-, 5-, and 10-acre residential use, but the land is currently in commercial timber production and is owned by SDS Lumber Company and Broughton Lumber Company, and the Washington Department of Natural Resources. The rural communities of Mill A and Willard are both located west of the Little White Salmon River. Mill A, the closer of the two communities, is approximately 1.5 miles from the nearest turbine site. Willard is approximately 2.25 miles north of the nearest turbine site in the A string.

Current vegetation conditions are heavily influenced by forest management activities over the last century. Land in the project area is privately owned, managed industrial forest. While forest management has not reduced tree species diversity, it has resulted in a shift in species dominance to the commercially valuable Douglas-fir and in changes to stand structure and complexity, patch size, and species distribution. Average stand age probably declined from relatively short stand rotation ages. Few large, old conifer trees occur in the project area and there are no known late-successional or “old-growth” stands within or adjacent to the project area, though small groups of big trees occur.

Common understory plants include sword fern (*Polystichum munitum*), vanilla leaf (*Achlys triphylla*), false Solomon's seal (*Smilacena racemosa*), western starflower (*Trientalis latifolia*), Columbia windflower (*Anemone deltoidea*), snowberry (*Symphoricarpos albus*), vine maple (*Acer circinatum*), Oregongrape (*Berberis nervosa*), red-flowering currant (*Ribes sanguineum*), and red elderberry (*Sambucus racemosa*). A list of all plant species observed within the project area is found in Table 1.

The vegetation communities within the project area are common within the region and maintained through forest management, and to a lesser extent natural disturbance. Because of private ownership, rugged landscape, and the value of high-volume timber producing land, these vegetation communities are expected to persist within the region during the foreseeable future

Five vegetation communities and wildlife habitats were identified within the project area:

- Grass-forb Stand (recent clearcuts)
- Brushfield/Shrub Stand
- Conifer-Hardwood Forest
- Conifer Forest
- Riparian - Deciduous

The approximate acreage of each habitat type within the study area by turbine string, road, and other proposed impact areas is shown in Table 2. The locations of the communities are shown in the vegetation community maps (Figure 2). These acreage figures and maps are based on June 2003 conditions. The locations and areas of plant communities will change over time through natural succession, forest development, and forest management.

GRASS-FORB STAND

Grass-forb Stands are found in the project vicinity in recently clearcut areas. Grass-forb is the stand condition in the USDA Forest Service classification system defined as areas where shrubs comprise less than 40 percent crown cover and are less than 5 feet tall (Brown, 1985). This stand type occurs when a disturbance such as timber harvest, fires, or wind has killed or removed most or all of the larger trees, or when brush fields are cleared for planting. These units may range from mainly devoid of vegetation to dominance by herbaceous species (grasses and forbs). Tree regeneration in these units is generally less than 5 feet tall and 40 percent crown cover.

In Grass-forb stands within the project vicinity vegetation is minimal and consists predominantly of weedy herbaceous species, including bull thistle (*Cirsium vulgare*), Canada thistle (*Cirsium arvense*), and dandelion (*Taraxacum officinale*). These areas generally consist of ubiquitous coarse woody material (CWM), occasional slash piles, and large areas of bare ground. Within the project's proposed impact area there are approximately 22.3 acres of grass-forb vegetation community.

TABLE 2 Vegetation Communities byTurbine String, Staging and Substation Areas, and Roads Proposed for Improvement
Saddleback Wind Project

VEGETATION COMMUNITIES	TURBINE STRINGS													
	A		B		C		D		E		F		G	
	Acreage	Percent	Acreage	Percent	Acreage	Percent	Acreage	Percent	Acreage	Percent	Acreage	Percent	Acreage	Percent
Grass-forb							9.7	0.17						
Brushfield/Shrub			3.9	0.12			5.2	0.09						
Conifer-Hardwood Forest	30.8	1.00	29.9	0.88	14	1.00	23.7	0.41			8.2	1.00		
Conifer Forest							18.8	0.33	17.5	1.00			15.1	1.00
Riparian Deciduous														
Subtotal	**30.8**	1.00	**33.8**	1.00	**14**	1.00	**57.4**	1.00	**17.5**	1.00	**8.2**	1.00	**15.1**	1.00

VEGETATION COMMUNITIES	STAGING AND SUBSTATION AREAS													
	Substation		Staging Area 1		Staging Area 2		Staging Area 3		Staging Area 4		Staging Area 5		Staging Area 6	
	Acreage	Percent	Acreage	Percent	Acreage	Percent	Acreage	Percent	Acreage	Percent	Acreage	Percent	Acreage	Percent
Grass-forb														
Brushfield/Shrub	15	1.00												
Conifer-Hardwood Forest			5	1.00			2	1.00	2	1.00				
Conifer Forest					5	1.00					2	1.00	2	1.00
Riparian Deciduous														
Subtotal	**15**	1.00	**5**	1.00	**5**	1.00	**2**	1.00	**2**	1.00	**2**	1.00	**2**	1.00

VEGETATION COMMUNITIES	EXISTING ROADS PROPOSED FOR IMPROVEMENT													
	1		2		3		4							
	Acreage	Percent	Acreage	Percent	Acreage	Percent	Acreage	Percent						
Grass-forb		0.00	6.9	0.18										
Brushfield/Shrub	26.3	0.49												
Conifer-Hardwood Forest	27.1	0.51	5.5	0.15	6.7	1.00	8	1.00						
Conifer Forest			25.4	0.67										
Riparian Deciduous														
Subtotal	**53.4**	1.00	**37.8**	1.00	**6.7**	1.00	**8**	1.00						

BRUSHFIELD/SHRUB STAND

Brushfields are defined as the shrub stand condition in the USDA Forest Service classification system (Brown 1985). They develop on land following clearcut tree harvesting or other disturbances that remove vegetation. In keeping with Washington Forest Practices Rules, Chapter 222 WAC, all harvest units are planted within 3 years after harvest or a period of from 1 to 10 years as determined by the department in the case of a natural regeneration plan and must maintain minimum stocking levels of 150 vigorous, well-distributed undamaged seedlings per acre of commercial tree species.

Thus the majority of brushfields are actually young plantations (typically Douglas-fir, although many landowners are now planting mixed species) that have not yet reached the closed canopy stage or shaded out the shrub species. The type may have large amounts of bare soil, and often has slash and other logging debris on the ground. Vegetation (other than planted conifers) often consists of remnants from the forest understory and early successional annuals. There are vine maple, Sitka alder, beaked hazelnut (*Corylus cornuta*), serviceberry (*Amelanchier alnifolia*), Himalayan blackberry (*Rubus discolor*), bracken fern (*Pteridium aquilinum*), sword fern, oceanspray (*Holodiscus discolor*), fireweed (*Epilobium angustifolium*), wooly yarrow (*Achillea millefollium*), pearly everlasting (*Anaphalis margaritacea*) and grasses as ground cover.

Vegetation control has occurred in conjunction with forest management and includes herbicide application, mechanical control, or both. These areas are visually and functionally different from areas where control has not occurred. Despite control efforts, or where they have not occurred, dense shrub thickets frequently occur, dominated by the native vine maple. Within the thickets are small alders and Douglas-fir that occasionally grow taller than the vine maple. These areas also may have patches of alder saplings, salmonberry (*Rubus spectabilis*), vine maple, red elderberry, oceanspray, lupine (*Lupinus* sp.), Oregon oxalis, and grass. Small diameter coarse woody material (CWM) is common. Within the project's proposed impact area there are approximately 45.8 acres of brushfield/shrub vegetation community.

CONIFER-HARDWOOD FOREST

Conifer-Hardwood Forest is found in the project vicinity in the closed sapling-pole stand condition, under the USDA Forest Service vegetation classification system (Brown 1985). The forest canopy in these stands is dominated by a mix of bigleaf maple and Douglas-fir, with some red alder. Canopy height typically ranges from 40 to 60 feet. Canopy closure is between 60 and 80 percent. Maple forms about 30 percent of the canopy cover with Douglas-fir forming most of the rest of the canopy. Stands may have distinct tree canopy layers with deciduous overtopping emerging conifer or remnant conifer over the deciduous component. Stands with shrub layers that merge with the canopy layers are found in the project vicinity. The shrub layer varies from open to dense and contains vine maple, salmonberry, thimbleberry (*Rubus parviflora*), red elderberry, beaked hazelnut, and Pacific dogwood (*Cornus nutallii*). The herbaceous layer contains sword fern, trailing blackberry, oxalis, grasses, and moss. Within the project's proposed impact area there are approximately 147.9 acres of conifer-hardwood vegetation community.

CWM is dependent on stand age, but is typically low to moderate. Deciduous snags out-number conifer snags, although depending on stand origin, short well decayed conifer snags may be present.

CONIFER FOREST

Coniferous Forest is found in the project area in closed sapling-pole-sawtimber stands and large sawtimber stands. Within the project area and most of the region, Coniferous Forests are dominated by Grand fir and Douglas-fir. The closed sapling-pole-sawtimber is a continuum of tree diameter sizes with saplings being relatively small, poles being in the 8-12 inch range, and sawtimber ranging from 12 to 23 inches. Important to these stand types is the closed canopy and relative short live crowns found in the pole and sawtimber stages. The closed canopy results in the exclusion of most shrub species and many herbs.

CWM in this stage is typically low and consists of remnants from previous stands. Snags are typically rare, although small diameter snags become more frequent in the pole and sawtimber stages as shading and resource competition kills subdominants.

Large sawtimber is considered to be at least 21 inches in DBH. Within-stand differentiation has begun and dominants are beginning to overtop and out-compete other tree species. Competition for space results in more light reaching the forest floor and shrub and herbaceous communities typically become more diverse. CWM and snags are generally rare, although the number of snags and amount of CWM may be variable amount stands, dependent on past harvest practices, stand management, and actual stand age.

These forests are used for commercial forestry, and are generally regenerated after harvest, although some may be the result of natural disturbance combined with commercial planting. They are subject to timber management activities including harvest, replanting, and stand improvement activities. These forests are widespread in the project vicinity. Within the project's proposed impact area there are approximately 85.8 acres of conifer vegetation community.

RIPARIAN DECIDUOUS FOREST

Natural and anthropogenic disturbances frequently result in domination by deciduous species in near-stream areas. Within the project area this type occurs in the area identified on the USGS topographic map as "Cedar Swamp." Historically this area was dominated by very large, old cedar, which have been logged. The area is now dominated by willow and cottonwood (*Populus balsamifera*) with scattered occurrences of young cedar.

The Cedar Swamp area consists of approximately 24 acres is located adjacent to the proposed impact area for Turbine String F.

Special Status Plants

Field Reconnaissance Surveys

Reconnaissance and inventory surveys were conducted for sensitive species on two occasions. The survey chronology is presented in Table 3.

TABLE 3
Field Survey Chronology for Sensitive Species
Saddleback Wind Project

Date	Primary Purpose
May 28-30, 2003	General habitat survey and survey for spring-blooming rare plant species
July 28-29	Survey for summer blooming rare plant species

The project study area for potential habitats included the following areas:

- 300-foot corridors centered on all proposed turbine strings and their associated access roads,
- 50-foot corridors on either side of existing all roads proposed for improvement in conjunction with the project,
- an approximately 5-acre plot for proposed substation construction, and
- one 15-acre and two five-acre areas identified as proposed construction staging areas.

Study area boundaries are shown in Figure 1. Field surveys were performed by CH2M HILL botanists and ecologists familiar with rare plant species of the region. Surveys were conducted on May 28-30 and July 28-29, 2003 during optimum time for identification of target species. Total survey area was approximately 302 acres. Potential habitats supporting rare species within the project study area were surveyed on foot at an intensity level sufficient to confirm the presence or absence of targeted rare plant species identifiable at the time of the surveys. The surveyors kept a list of all vascular plants encountered. Observations of plant associations, land use patterns, and unusual habitats were recorded.

Investigation Results

Sensitive Plant Species.

Pre-field Review. The search of the WNHIS database disclosed four rare plant populations documented as currently occurring within 2 miles of the project vicinity (Figure 3):

- branching montia (*Montia diffusa*),
- Suksdorf's desert parsley (*Lomatium suksdorfii*),
- Siskyou false hellebore (*Veratrum insolitum*), and
- golden chinquapin (*Chrysolepsis chrysophylla*).

Three rare plant populations are documented as historically occurring in the project vicinity:

- bolandra (*Bolandra oregana*),
- white-top aster (*Aster curtis*), and
- branching montia.

One plant community identified as a *Known High-Quality or Rare Plant Community and Wetland Ecosystem of Washington* (WNHIS 2003) is documented as occurring within 2 miles of the project site. It is an Oregon white oak/Idaho fescue (*Quercus garryana/Festuca idahoensis*) vegetation community and is located along the drainage of the White Salmon River, approximately ½ mile north of its confluence with the Columbia River.

In addition to the six plants species discussed above, twenty-three additional plant species were added to the survey list, based on the WNHIS list of rare plant species known to occur in Skamania County. Twenty-two of these species were documented by WNHP as occurring within 2 miles of the project site prior to 1977. Rare plant data collected prior to 1977 were vaguely mapped (a five-mile-diameter circle was used to map general location). Rare plant records collected since 1977 are more accurately mapped and have been included in this report. No rare plant species have been documented on the project site since 1977.

The list of potential rare plant species for the project area, identified through prefield review, is presented in Table 4.

Field Reconnaissance Surveys. Field reconnaissance surveys failed to locate any rare plant species or plant communities within the proposed project area.

Environmental Consequences

No Build Alternative

The types and distribution of vegetation would be similar to the existing conditions because land use patterns would be about the same. The age and structure of vegetation in commercial timberland would change over time in a shifting mosaic. It is reasonable to assume that relatively small percentages of existing vegetation types would be affected by roadway maintenance and operations activities, and required modifications to maintain functionality of the roadway.

Build Alternative

See discussion of environmental consequences for the Build Alternative under the Wildlife section of this technical memorandum.

Mitigation Concepts

See discussion of mitigation concepts for the Build Alternative in the Wildlife section below.

References

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Niehaus, Theodore F. 1976. *A Field Guide to Pacific States Wildflowers: Washington, Oregon, and Adjacent Areas.* Houghton Mifflin Company, Boston, MA.

Whitney, Stephen R. 1983. *A Field Guide to the Cascades and Olympics.* The Mountaineers, 306 2nd Avenue West, Seattle, WA 98119.

TABLE 1 Plant Species Observed May 28-30 and July 28-29, 2003 Saddleback Wind Project

FAMILY	SCIENTIFIC NAME	COMMON NAME	NATIVE	NON-NATIVE
Aceraceae				
	Acer circinatum	vine maple	X	
	Acer macrophyllum	big leaf maple	X	
Apiaceae				
	Daucus carota	Queen Anne's lace		X
	Oenanthe sarmentosa	Pacific water -parsley	X	
	Osmorhiza chilensis	mountain sweet-cicely	X	
	Sanicula crassicaulis	Pacific sanicle	X	
Apocynaceae				
	Apocynum androsaemifolium	spreading dogbane	X	
Araliaceae				
	Oplopanax horridus	Devil's club	X	
Aristolochiaceae				
	Asarum caudatum	wild ginger		
Asteraceae				
	Achillea millefolium	wooly yarrow	X	
	Adenocaulon bicolor	pathfinder		
	Anaphalis margaritacea	pearly-everlasting	X	
	Antennaria luzuloides	woodrush pussytoes	X	
	Centaurea cyanus	bachelor's button		X
	Centaurea diffusa	diffuse knapweed		X
	Chrysanthemum leucanthemum	ox-eye daisy		X
	Cichorium intybus	chicory		X
	Cirsium arvense	Canada thistle		X
	Cirsium vulgare	bull thistle		X
	Gnaphalium palustre	marsh cudweed	X	
	Hieracium albiflorum	white-flowered hawkweed	X	
	Hieracium scouleri	wooly-weed	X	
	Lactuca serriola	prickly lettuce		X
	Taraxacum officinale	dandelion		X
	Tragopogon dubius	yellow salsify		X
Berberidaceae				
	Achlys triphylla	vanilla leaf	X	
	Berberis nervosa	Cascade Oregongrape	X	
	Vancouveria hexandra	white insideout flower	X	
Betulaceae				
	Alnus sinuata	Sitka alder	X	
	Corylus cornuta	beaked hazelnut	X	
Boraginaceae				
	Cryptantha flaccida	common cryptantha	X	
Brassicaceae				
	Erysimum occidentale	pale wallflower	X	
Campanulaceae				
	Campanula scouleri	Scouler's bluebell	X	

TABLE 1 Plant Species Observed May 28-30 and July 28-29, 2003 Saddleback Wind Project

FAMILY	SCIENTIFIC NAME	COMMON NAME	NATIVE	NON-NATIVE
Caprifoliaceae				
	Linnaea borealis	twin flower	X	
	Lonicera hispidula	hairy honeysuckle	X	
	Lonicera sp.	honesuckle	X	
	Sambucus racemosa	red elderberry	X	
	Symphoricarpos albus	snowberry	X	
Caryophyllaceae				
	Stellaria jamesiana	sticky chickweed		
Cornaceae				
	Cornus nutallii	Pacific dogwood	X	
Cupressaceae				
	Thuja plicata	western red cedar	X	
Cyperaceae				
	Eleocharis palustris	creeping spikerush	X	
Dryopteridaceae				
	Athyrium filix-femina	lady fern	X	
Equisitaceae				
	Equisetum arvense	field horsetail	X	
Ericaceae				
	Arctostaphylos patula	green-leaf manzanita	X	
	Chimaphylla menziesii	little pipsissewa	X	
	Chimaphylla umbellata	common pipsissewa	X	
	Pyrola picta	white vein pyrola	X	
	Vaccinium sp.	huckleberry	X	
Fabaceae				
	Cytisus scoparius	Scotch broom		X
	Lathyrus latifolius	everlasting peavine		X
	Lathyrus polyphyllus	leafy peavine	X	
	Lotus purshiana	spanish-clover	X	
	Lupinus caudatus	Kellog spurred lupine	X	
	Lupinus polyphyllus	large-leaf lupine	X	
	Lupinus sp.	lupine	X	
	Trifolium dubium	least hop clover		X
	Trifolium sp.	clover		
	Vicia sp.	vetch		
Grossulariaceae				
	Ribes sanguineum	red-flowering currant	X	
Hydrophyllaceae				
	Nemophila parviflora	small-flowered nemophila	X	
	Phacelia hastata	silver-leaf phacelia	X	
Hypericaceae				
	Hypericum perforatum	common St. John's-wort		X
Juncaceae				
	Juncus effusus	common rush	X	
	Luzula parviflora	small-flowered wood rush	X	

TABLE 1 Plant Species Observed May 28-30 and July 28-29, 2003
Saddleback Wind Project

FAMILY	SCIENTIFIC NAME	COMMON NAME	NATIVE	NON-NATIVE
Lamiaceae				
	Stachys cooleyae	Cooley's hedge-nettle	X	
Liliaceae				
	Clintonia uniflora	bead lily	X	
	Disporum hookeri	Hooker's fairy-bell	X	
	Lilium columbianum	Columbia lily	X	
	Smilacina racemosa	western false Solomon's seal	X	
	Smilacina stellata	star-flowered false Solomon's	X	
	Trillium ovatum	western trillium	X	
Onagraceae				
	Epilobium angustifolium	fireweed		X
	Epilobium sp.	epilobium		
	Oenothera strigosa	common evening-primrose	X	
Orchidaceae				
	Calypso bulbosa	fairy-slipper	X	
	Corallorhiza maculata	spotted coral-root	X	
	Corallorhiza mertensiana	Merten's coral-root	X	
	Corallorhiza striata	striped coral-root	X	
Pinaceae				
	Abies grandis	grand fir	X	
	Pseudotsuga menziesii	Douglas-fir	X	
	Tsuga heterophylla	western hemlock	X	
Plantaginaceae				
	Plantago lanceolata	English plantain	X	
	Plantago major	common plantain	X	
Poaceae				
	Bromus tectorum	cheat grass		X
Polemoniaceae				
	Microsteris gracilis	midget phlox	X	
Polygonaceae				
	Rumex acetosella	sheep sorrel		X
	Rumex occidentalis	western dock	X	
Polypodiaceae				
	Adiantum pedatum	maidenhair fern	X	
	Polystichum munitum	sword fern	X	
	Pteridium aquilinum	bracken fern	X	
Portulacaceae				
	Claytonia perfoliata	miner's lettuce	X	
	Claytonia siberica	Siberian spring beauty	X	
Primulaceae				
	Trientalis latifiolia	western starflower	X	
Ranunculaceae				
	Actaea rubra	baneberry	X	
	Anemone deltoidea	Columbia wind flower	X	

TABLE 1 Plant Species Observed May 28-30 and July 28-29, 2003 Saddleback Wind Project

FAMILY	SCIENTIFIC NAME	COMMON NAME	NATIVE	NON-NATIVE
Rhamnaceae				
	Ceanothus integerrimus	deerbrush	X	
	Ceanothus sanguineus	redstem ceanothus	X	
	Ceanothus velutinus	tobacco-brush	X	
Rosaceae				
	Aruncus sylvester	goatsbeard	X	
	Fragaria virginiana	wild strawberry	X	
	Holodiscus discolor	oceanspray	X	
	Prunus emarginata	bitter cherry	X	
	Prunus virginiana	common chokecherry	X	
	Rosa gymnocarpa	baldhip rose	X	
	Rosa woodsii	Wood's rose	X	
	Rubus leucodermis	blackcap	X	
	Rubus parviflora	thimbleberry	X	
	Rubus ursinus	blackberry	X	
Rubiacea				
	Galium aparine	cleavers	X	
Salicaceae				
	Populus balsamifera	black cottonwood	X	
	Salix lasiandra	Pacific willow	X	
	Salix scouleriana	Scouler's willow	X	
	Salix sitchensis	Sitka willow	X	
Saxifragaceae				
	Mitella diversifolia	varied-leaved mitrewort	X	
	Tellima grandiflora	fringecup	X	
	Tiarella trifoliata	foamflower	X	
Scrophulariaceae				
	Linaria dalmatica	dalmatian toadflax		X
	Penstemon sp.	penstemon	X	
	Penstemon subserratus	fine-toothed penstemon	X	
	Verbascum thapsus	wooly mullein	X	
	Veronica scutellata	marsh speedwell	X	
Valerianaceae				
	Plectritis macrocera	white plectritis	X	
Violaceae				
	Viola glabella	stream violet	X	

TABLE 4 Special Status Plant Species Potentially Occurring Within the Project Area Saddleback Wind Project

Family	Scientific Name	Common Name	WA State Status	Federal Status
Asteraceae				
	Balsamorhiza deltoidea	Puget balsamroot	Review	
	Erigeron howellii	Howell's daisy	Threatened	SC
	Erigeron oreganus	Gorge daisy	Threatened	SC
	Microseris borealis	northern microseris	Sensitive	
Boraginaceae				
	Hackelia diffusa var. diffusa	Diffuse stickseed	Sensitive	
Brassicaceae				
	Rorippa columbiae	persistentsepal	Threatened	SC
Campanulaceae				
	Githopsis specularioides	common blue-cup		
Caryophyllaceae				
	Silene douglasii var. monantha	Douglas' silene	Review	
Cyperaceae				
	Carex macrochaeta	large-awn sedge	Sensitive	
Fagaceae				
	Chrysolepsis chrysophylla	golden chinquapin	Sensitive	
Fumiariaceae				
	Corydalis aquae-gelidae	Clackamas corydalis	Threatened	SC
Iridaceae				
	Sisyrinchium sarmentosum	Pale blue-eyed grass	Threatened	SC
Juncaceae				
	Juncus howellii	Howell's rush	Review	
Lentibulariaceae				
	Utricularia intermedia	Flat-leaved bladderwort	Sensitive	
Lycopodiaceae				
	Lycopodiella inundata	bog clubmoss	Sensitive	
Ophioglossaceae				
	Botrychium lunaria	moonwort	Sensitive	
	Botrychium minganense	Victorian's grape-fern	Review	
	Botrychium pinnatum	St. John's moonwort	Sensitive	
Orchidaceae				
	Cypripedium fasciculatum	Clustered lady's slipper	Threatened	SC
	Plantathera sparsifolia	canyon bog-orchid	Sensitive	
	Spiranthes porrifolia	Western ladies-tresses	Sensitive	
Polemoniaceae				
	Polemonium carneum	great polemonium	Threatened	
Portulacaceae				
	Montia diffusa	Branching montia	Sensitive	

TABLE 4 Special Status Plant Species Potentially Occurring Within the Project Area Saddleback Wind Project

Family	Scientific Name	Common Name	WA State Status	Federal Status
Ranunculaceae				
	Cimicifuga elata	Tall bugbane	Threatened	
Saxifragaceae				
	Bolandra oregana	Bolandra	Sensitive	
	Parnassia fimbriata var.	fringed	Sensitive	
	Sullivantia oregana	Oregon sullivantia	Threatened	SC
Scrophulariaceae				
	Collinsia sparsiflora var.	Few-flowered collinsia		
	Penstemon barrettiae	Barrett's beardtongue	Threatened	SC

C-2

Wetland Delineation Report: Saddleback Wind Project, Skamania County, Washington.

CH2M HILL (Peggy O'Neill). 2007

Wetland Delineation Report Saddleback Wind Energy Project Skamania County, Washington

PREPARED FOR: Dana Peck/Horizon Wind Energy LLC

PREPARED BY: Joel Shaich /CH2M HILL/PDX

REVIEWED BY: Peggy O'Neill/CH2M HILL/PDX

COPIES: Mike Pappalardo/CH2M HILL/CVO

DATE: January 9, 2007

Summary

CH2M HILL conducted a delineation of potentially jurisdictional wetlands and waters of the State/U.S. and a determination of potential county-required buffer widths adjacent to wetlands and waters within the proposed project areas for the Saddleback Wind Energy Project. The investigation was conducted in the vicinity of Underwood Mountain, approximately 7 miles northwest of the City of White Salmon, in an unincorporated area of Skamania County, Washington (Figure 1). The project area is situated adjacent to, but entirely outside of, the Columbia Gorge National Scenic Area.

Study area boundaries are shown in Figure 2. The project study area for potential wetlands and waters included:

- 300-foot corridors centered on all proposed turbine strings and their associated access roads;
- 50-foot corridors on either side of all existing roads proposed for improvement in conjunction with the project; and
- an approximately 15-acre plot for proposed substation construction, and two 5-acre and five 2-acre areas identified as proposed construction staging areas.

No jurisdictional wetlands or waters of the State/U.S. were observed in the study area. Five sites were identified as potential "drainageways having short periods of spring or storm runoff" that would be subject to county buffer requirements. The five drainageways appear to meet criteria as Type V streams subject to a 25 foot buffer requirement.

This delineation represents the best professional judgment and conclusions of CH2M HILL. It is considered a preliminary jurisdictional determination; final authority for jurisdictional determinations for regulatory permitting rests with the U.S. Army Corps of Engineers and Skamania County Department of Planning and Community Development.

Results

Office Review

USGS Topographic Map

The USGS topographic map shows an intermittent pond identified as "Cedar Swamp" mapped within the general project area but outside of the study areas/proposed project facilities. Three unnamed perennial streams (Cedar Swamp tributaries) are mapped as crossing an existing road that is proposed to be widened to 20 feet. A proposed underground collector line will also follow the road. An unnamed perennial stream is mapped beginning at the western edge of the proposed 15 acre staging area (Figure 2).

National Wetland Inventory (NWI) Map

The National Wetland Inventory map shows one wetland in the general project area (Figure 3). The wetland is classified as a *palustrine unconsolidated bottom, semipermanently flooded, diked/impounded* (PUBFh) wetland and corresponds with the "Cedar Swamp" mapped on the USGS topographic map. It is outside the study areas.

Washington Department of Natural Resources (DNR) Forest Practices Stream Mapping

The Washington Department of Natural Resources Forest Practices Stream Mapping shows ten stream segments that are located within project study areas (Figure 3). These included the streams on the USGS map as well as additional streams. The streams at sites B-1, B-2 and B-3 are unnamed drainages that flow toward the Little White Salmon River. The other streams are unnamed tributaries of Little Buck Creek.

Skamania County Area Soil Survey

A review of the *Soil Survey of Skamania County Area, Washington* (Haagen, 1990) shows six soil series and 13 types or phases mapped within the project area (Figure 4). None are listed as hydric according the *Hydric Soils List for the Skamania County Area, Washington* (NRCS, 2001) and none are listed as containing inclusions of hydric soils.

Field Investigation

Wetlands

No wetlands were observed within the study areas. All of the potential stream crossing sites examined for the delineation were dominated by upland species. No wetland hydrology indicators were observed on the surface. Due to the lack of wetland vegetation or hydrology indicators on the surface no sample pits were dug.

Waters of the State/U.S.

Ten sites with potential stream crossings of proposed project facilities were documented in the field delineation and determination of potential buffer widths (Table 1; Figure 3). Site photos are in the Appendix. None of the crossings appear to have waters of the U.S./State present. They did not contain channels or other characteristics of waters.

TABLE 1
Site Summary

Site ID	Site Characteristics	Water of the State/U.S.	Skamania County Critical Area	Buffer Width (feet)
B-1	plateau; west edge is steep forested slope with broad swale; upland vegetation; no channel, scour or other indicators of a drainageway	NO	NO	0
B-2	gully in forest; upland vegetation; no channel, culvert, scour or other indicators of a drainageway	NO	NO	0
B-3	gully in forest and clearcut; upland vegetation; no channel, culvert, scour or other indicators of a drainageway	NO	NO	0
D-2	very subtle broad forested swale; upland vegetation; no channel, culvert, scour or other indicators of a drainageway	NO	NO	0
D-3	narrow forested gully; upland vegetation; 12" culvert under road; no channel; isolated areas of scour upstream of road; 12" wide scour path extends downstream of road approximately 100', then ends	NO	Class V stream	25
D-4	broad, shallow forested gully; upland vegetation; 12" culvert under road; no channel or scour	NO	Class V stream	25
D-5	very subtle broad forested swale; upland vegetation; no channel, culvert, scour or other indicators of a drainageway	NO	NO	0
D-6	broad, shallow forested gully; upland vegetation; 12" culvert under road; no channel or scour	NO	Class V stream	25
F-1	broad gully in recent clearcut; upland vegetation; 12" culvert under road; no channel; isolated areas of scour	NO	Class V stream	25
F-2	gentle slope in recent clearcut; upland vegetation; water from snow melt flowing across the ground; no culvert, channel or scour	NO	Class V stream	25

Figure 1

Vicinity Map

Wetland Delineation
Saddleback Wind Project

CH2MHILL

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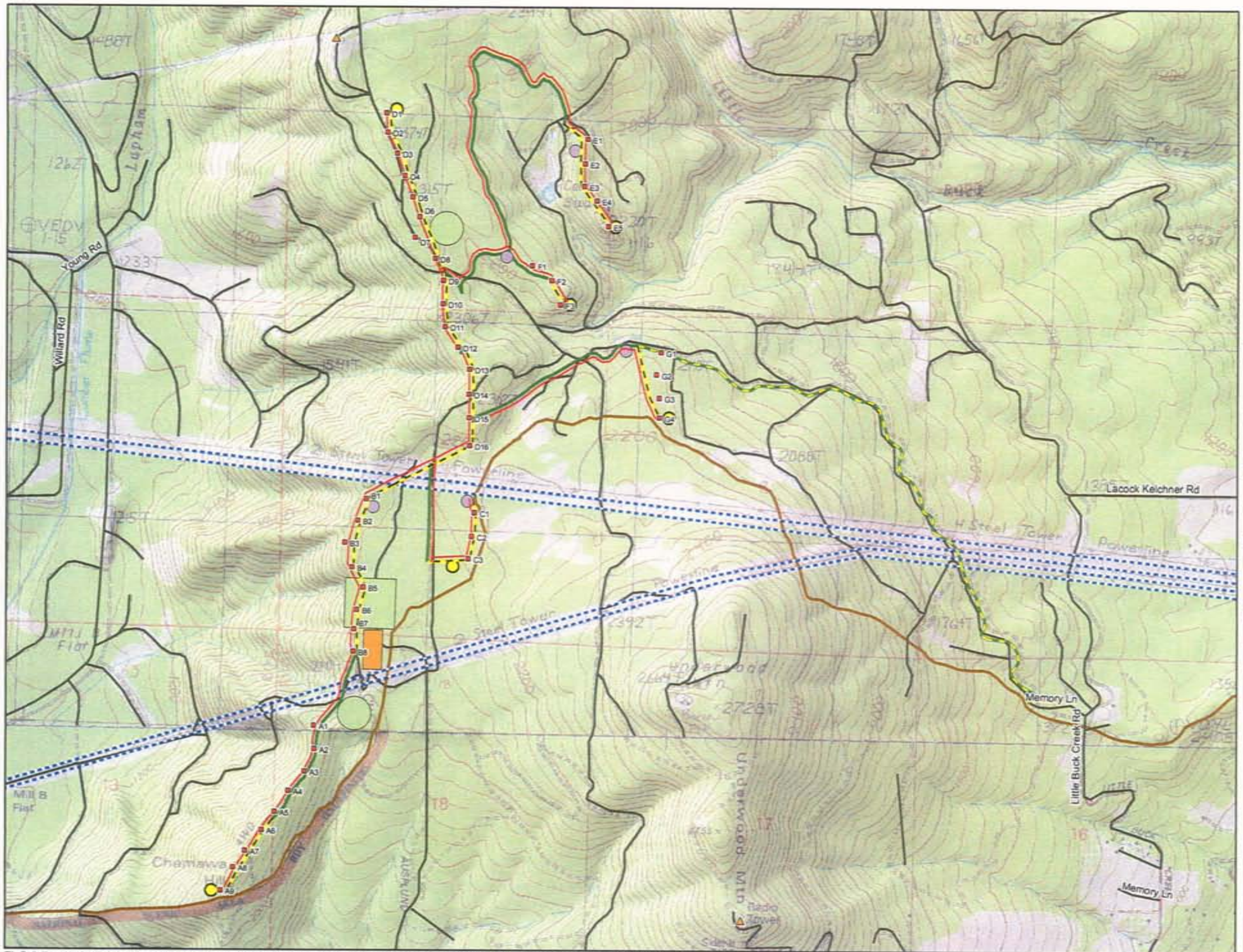

Figure 2
Project Area
Wetland Delineation
Saddleback Wind Project

LEGEND

Proposed Permanent Facilities
- Proposed Turbine
- Proposed Access Road - 20'
- Existing Road - Widened to 15'
- Existing Road - Widened to 20'
- Proposed Underground 34.5kV Collector Line
- Proposed Substation & O&M Facility

Proposed Temporary Facilities
- Temporary Turnaround Area
- Temporary Staging Area - 5 and 15 Acres
- Temporary Staging Area - 2 Acres

Existing Features
- Existing Microwave Tower
- Existing Transmission Line
- Existing Road
- National Scenic Area Boundary

N

0 1,500 3,000
Feet

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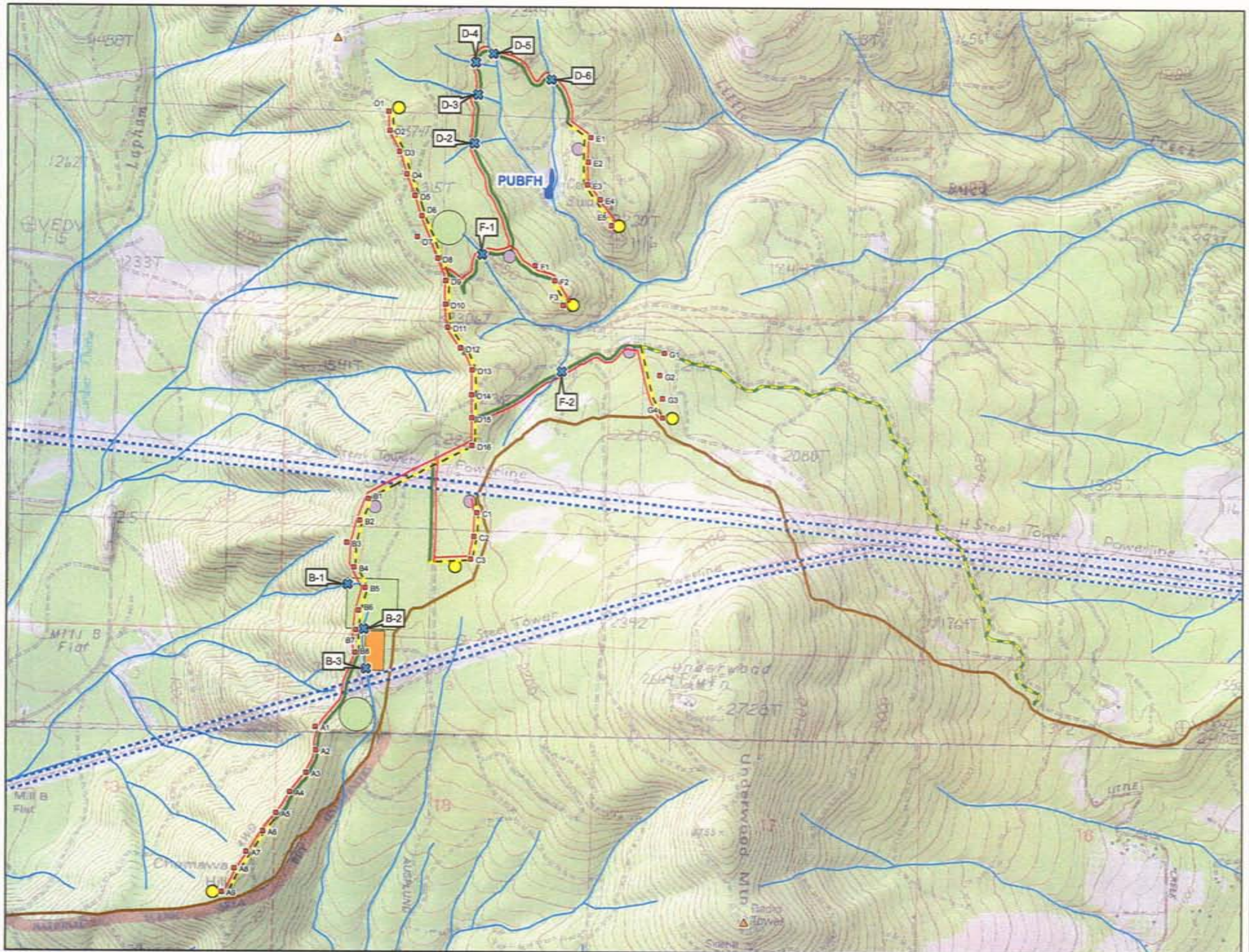

Figure 3
DNR Streams
Wetland Delineation
Saddleback Wind Project

LEGEND

- NWI Wetlands
- Stream Crossing
- Streams (from WA DNR)

Proposed Permanent Facilities

- Proposed Turbine
- Proposed Access Road - 20'
- Existing Road - Widened to 15'
- Existing Road - Widened to 20'
- Proposed Underground 34.5kV Collector Line
- Proposed Substation & O&M Facility

Proposed Temporary Facilities

- Temporary Turnaround Area
- Temporary Staging Area - 5 and 15 Acres
- Temporary Staging Area - 2 Acres

Existing Features

- Existing Microwave Tower
- Existing Transmission Line
- National Scenic Area Boundary

N

0 1,500 3,000
Feet

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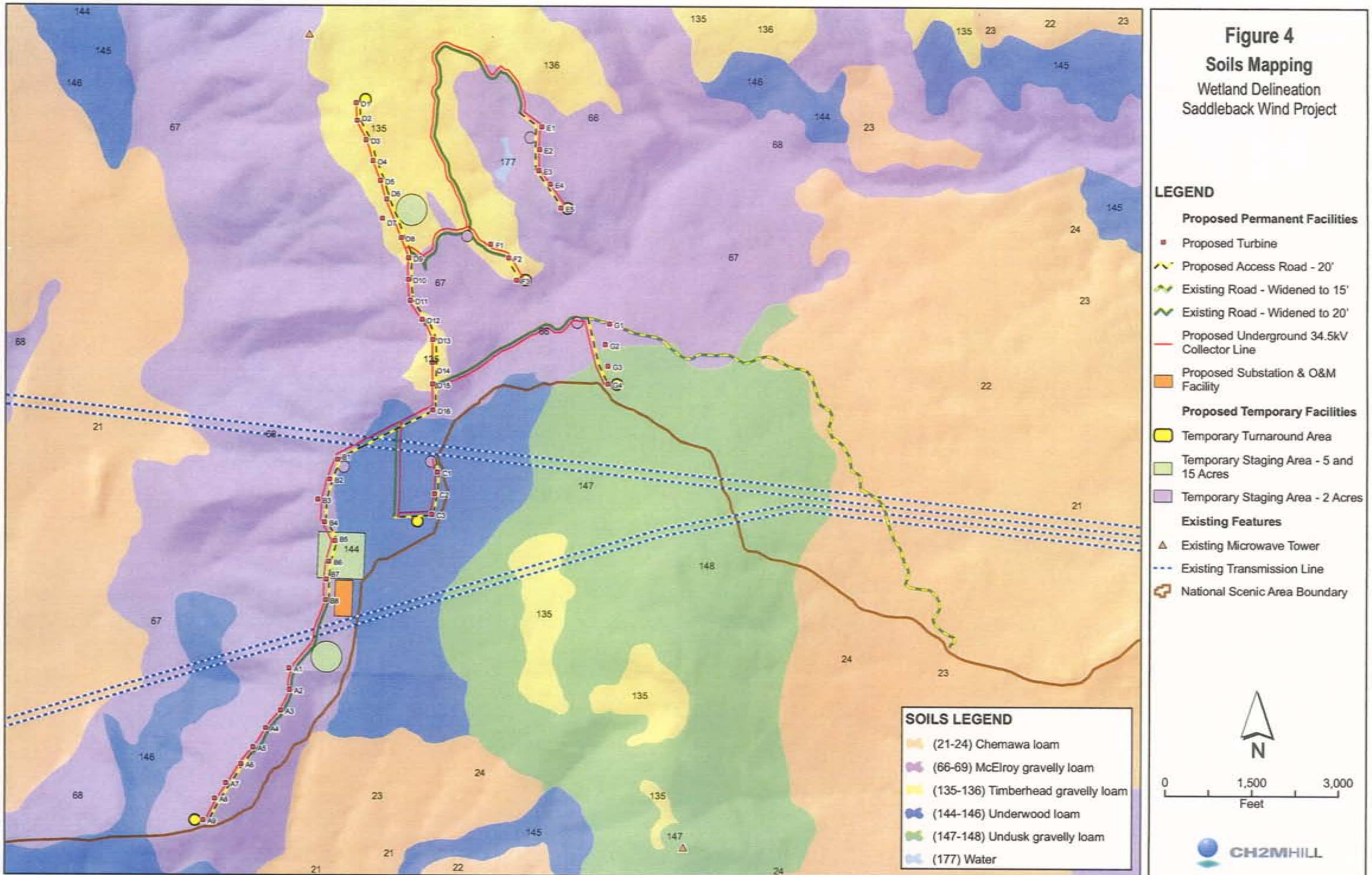

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APPENDIX

SITE PHOTOS

Photo B1-01 . Looking west down slope from edge of plateau at location of upper end of USGS and DNR-mapped stream. 10/26/06.

Photo B1-02. Looking west downslope approximately 100 feet below plateau edge. 10/26/06.

Photo B1-03. Looking east at location of proposed temporary staging area on plateau. 10/26/06.

Photo B2-01. Looking north up slope at location of upper end of DNR mapped stream in proposed temporary staging area. No channel or other evidence of wetlands or waters was observed during this site visit or on an October 26, 2006 site visit. 01/08/07.

Photo B2-02. Looking south at subtle swale in location of DNR-mapped stream in proposed temporary staging area. Swale becomes a larger gully down slope. 01/08/07.

Photo B3-01. Looking west where transmission line access road crosses gully at location of DNR mapped stream. Proposed Substation & O&M Facility location is just north (right) of the road. 01/08/07.

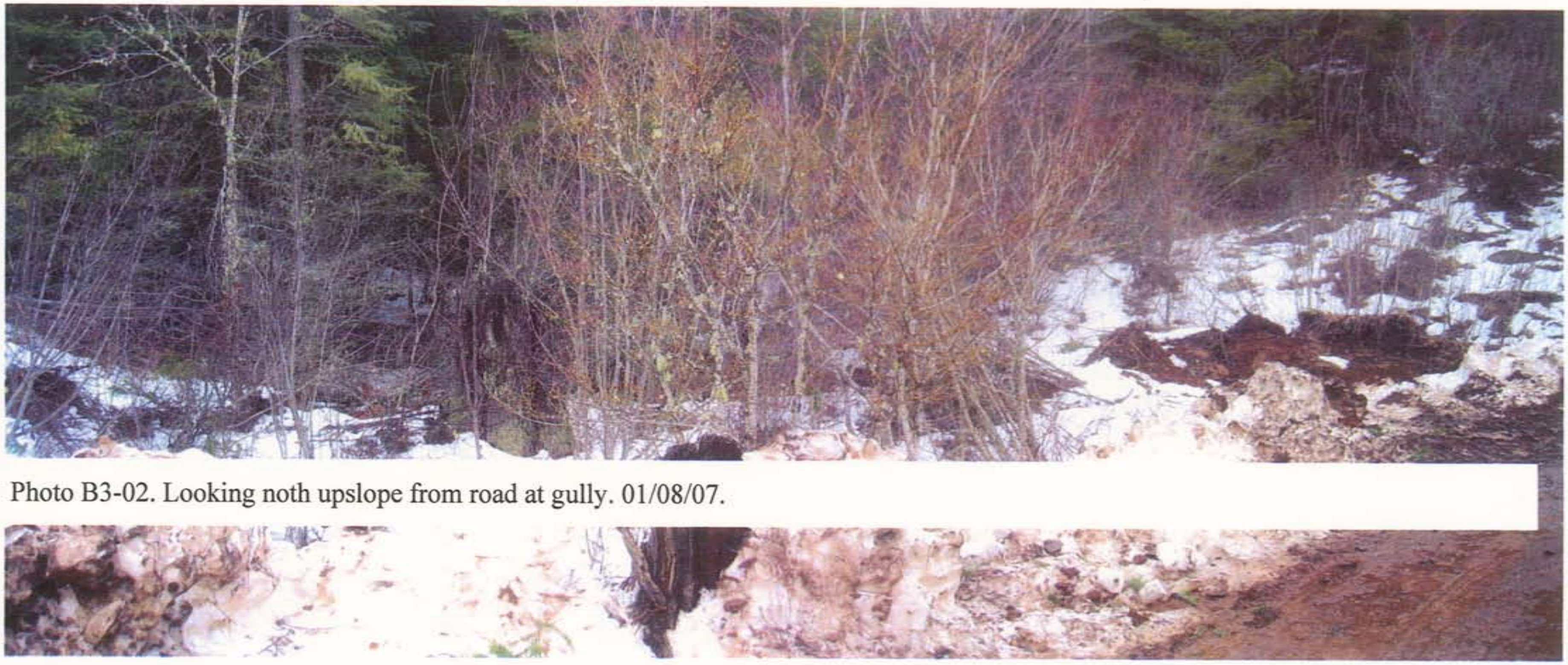

Photo B3-02. Looking noth upslope from road at gully. 01/08/07.

Photo B3-03. Looking south downslope from transmission line access road at gully. 01/08/07.

Photo D2-01. Looking south at location of DNR-mapped stream. 10/26/06.

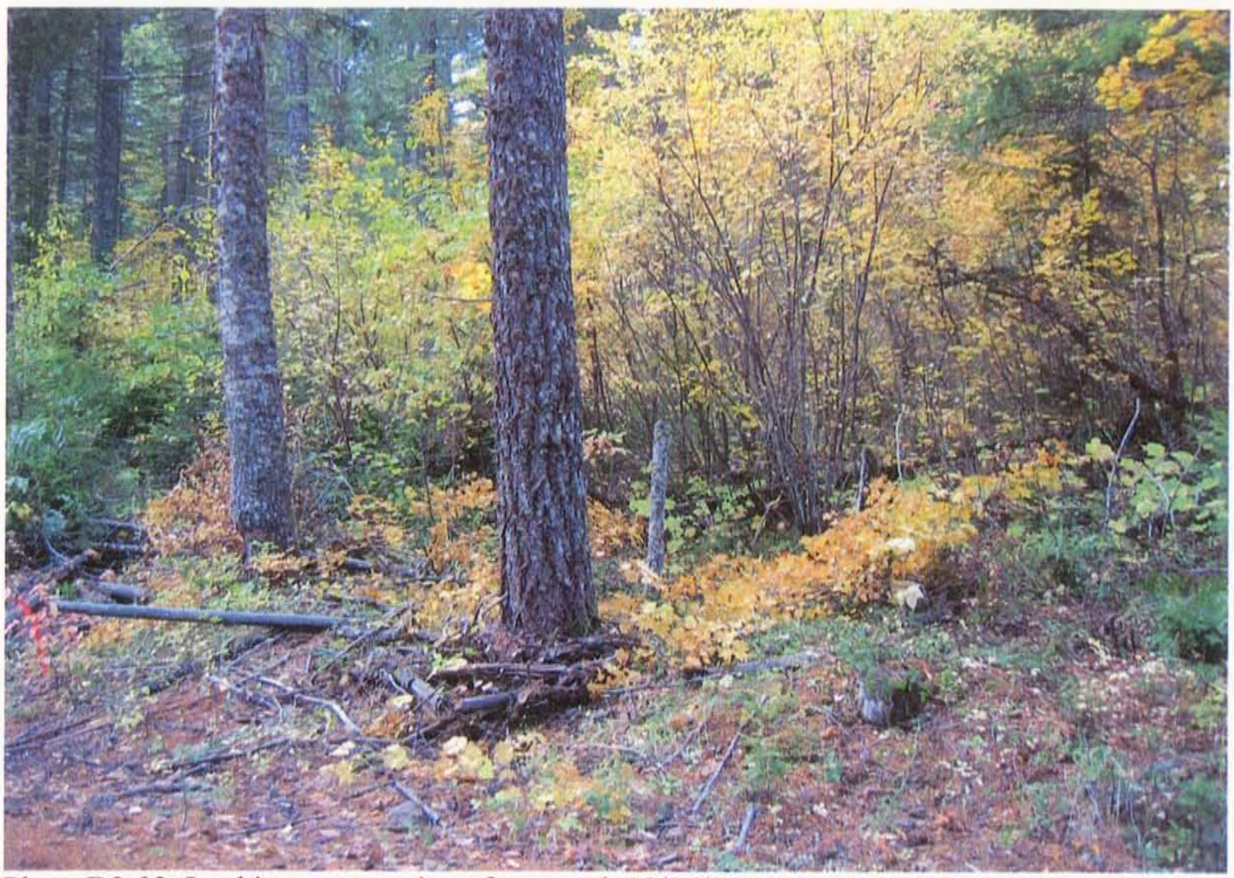

Photo D2-02. Looking west upslope from road. 10/26/06.


Photo D2-03. Looking west upslope from approximately 25 feet below road. 10/26/06.

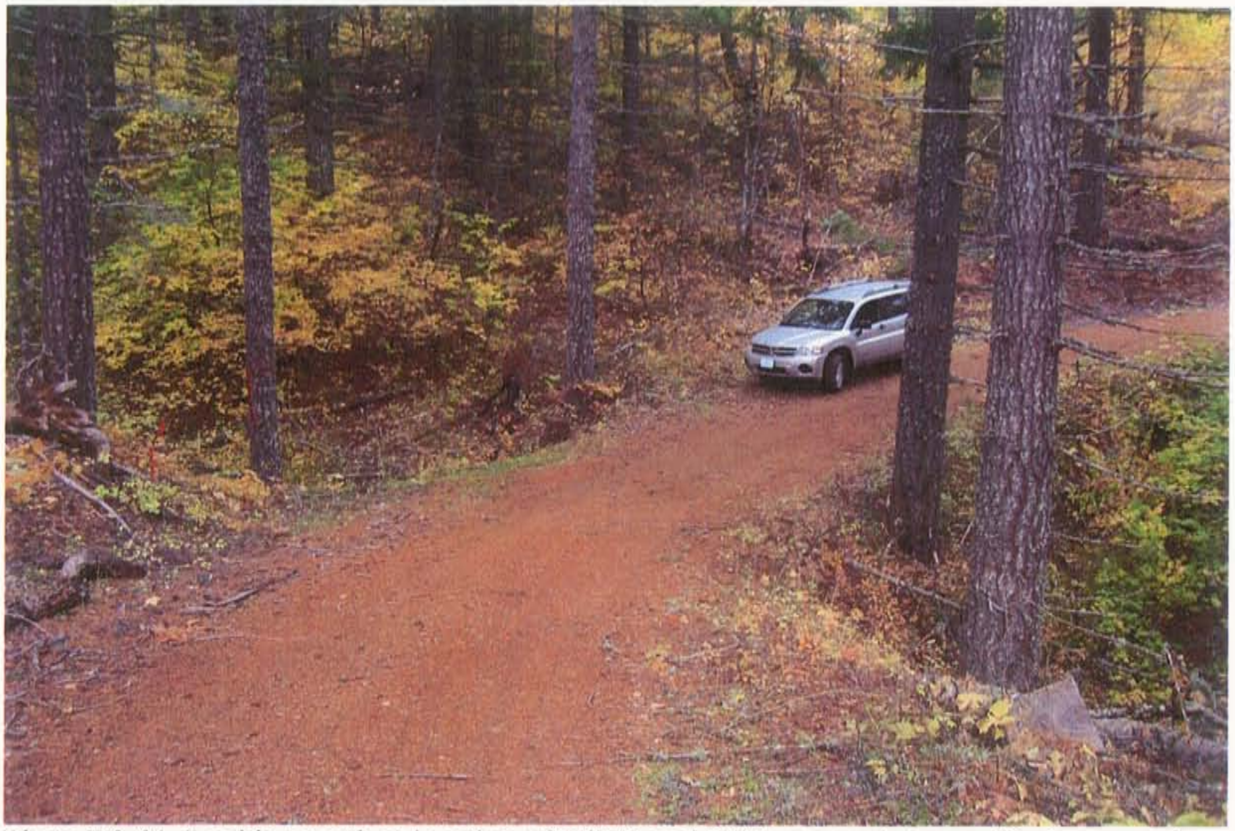

Photo D3-01. Looking north at location of USGS and DNR-mapped stream. Drainageway is in front of vehicle. 10/26/06.

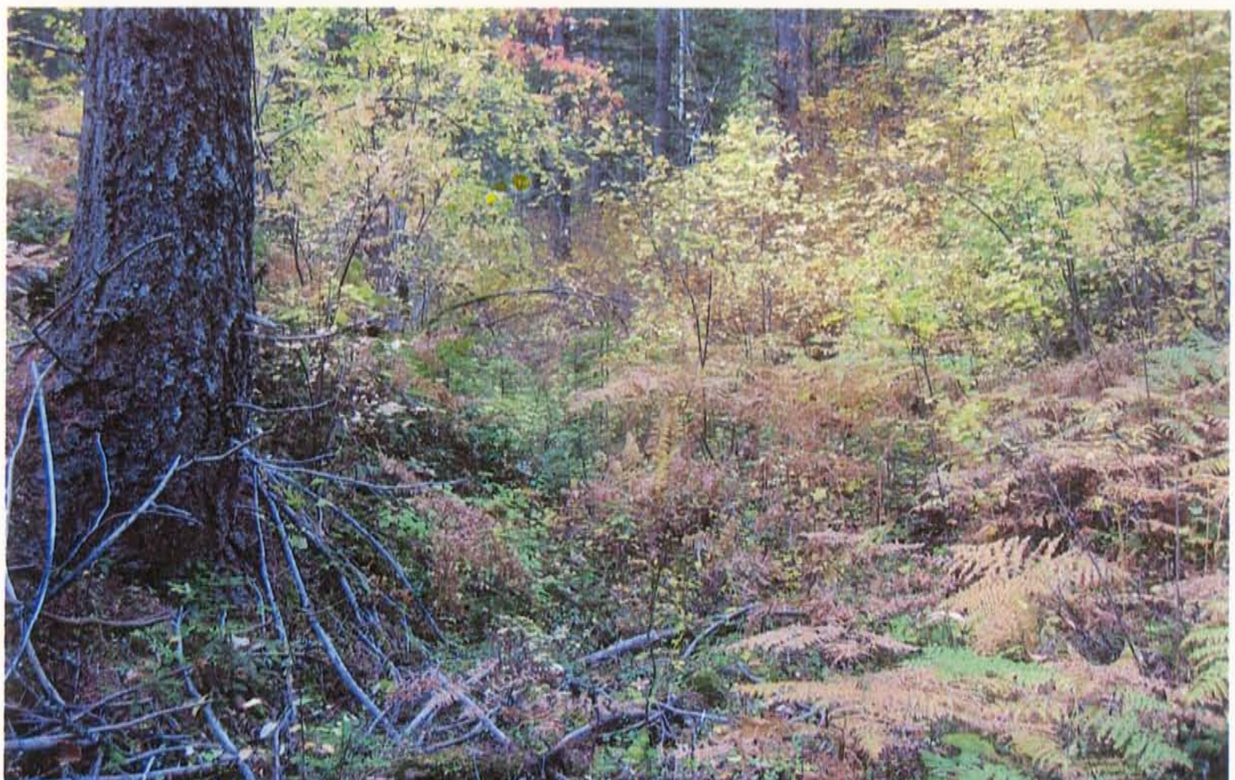

Photo D3-02. Looking west upslope approximately 200 feet below road. 10/26/06.

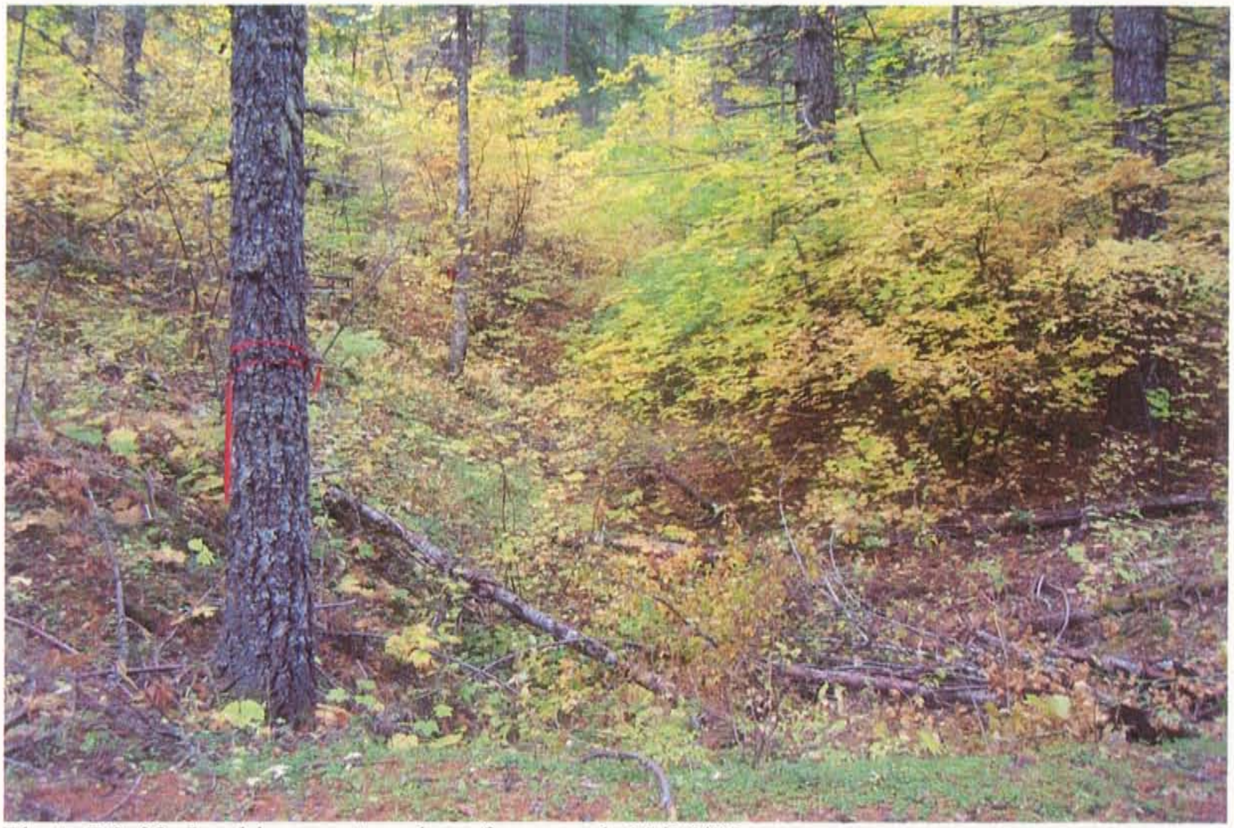

Photo D3-03. Looking west upslope from road. 10/26/06.

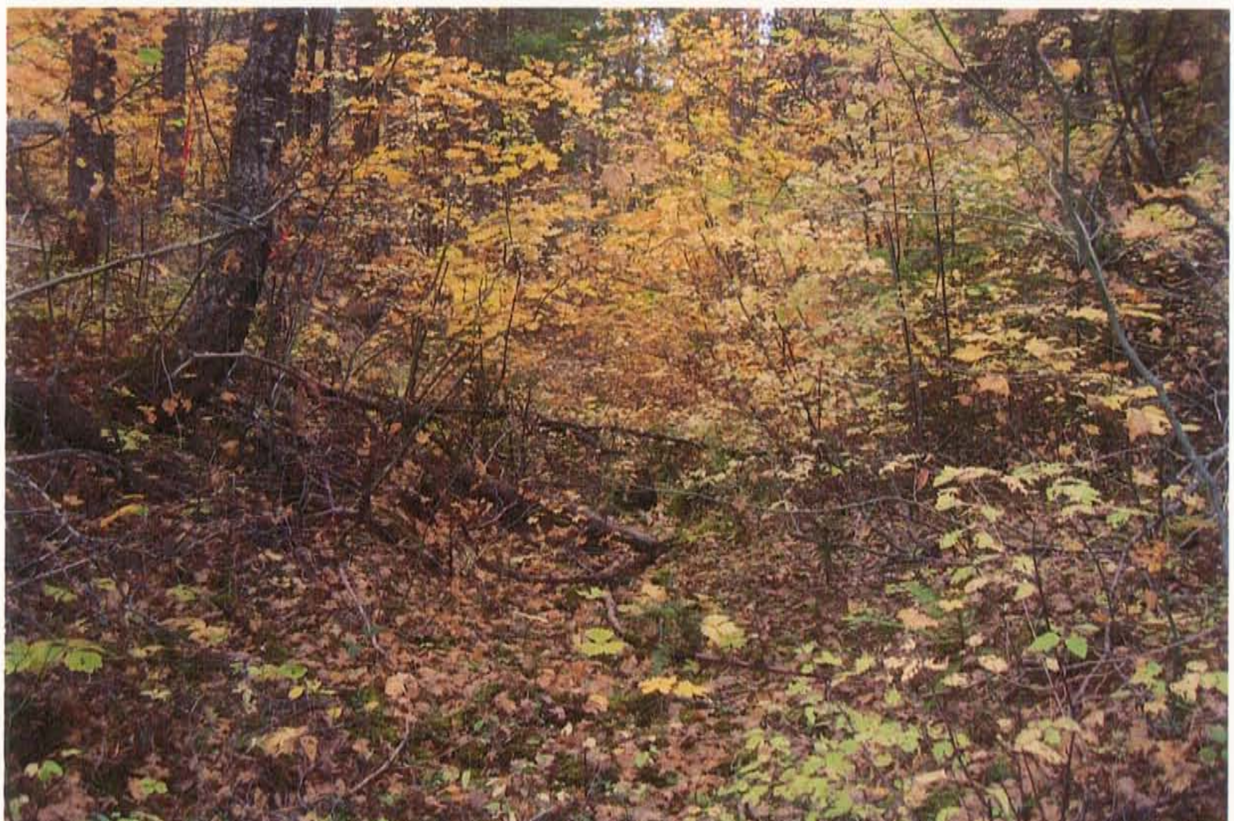

Photo D3-04. Looking west upslope approximately 100 feet above road. 10/26/06.

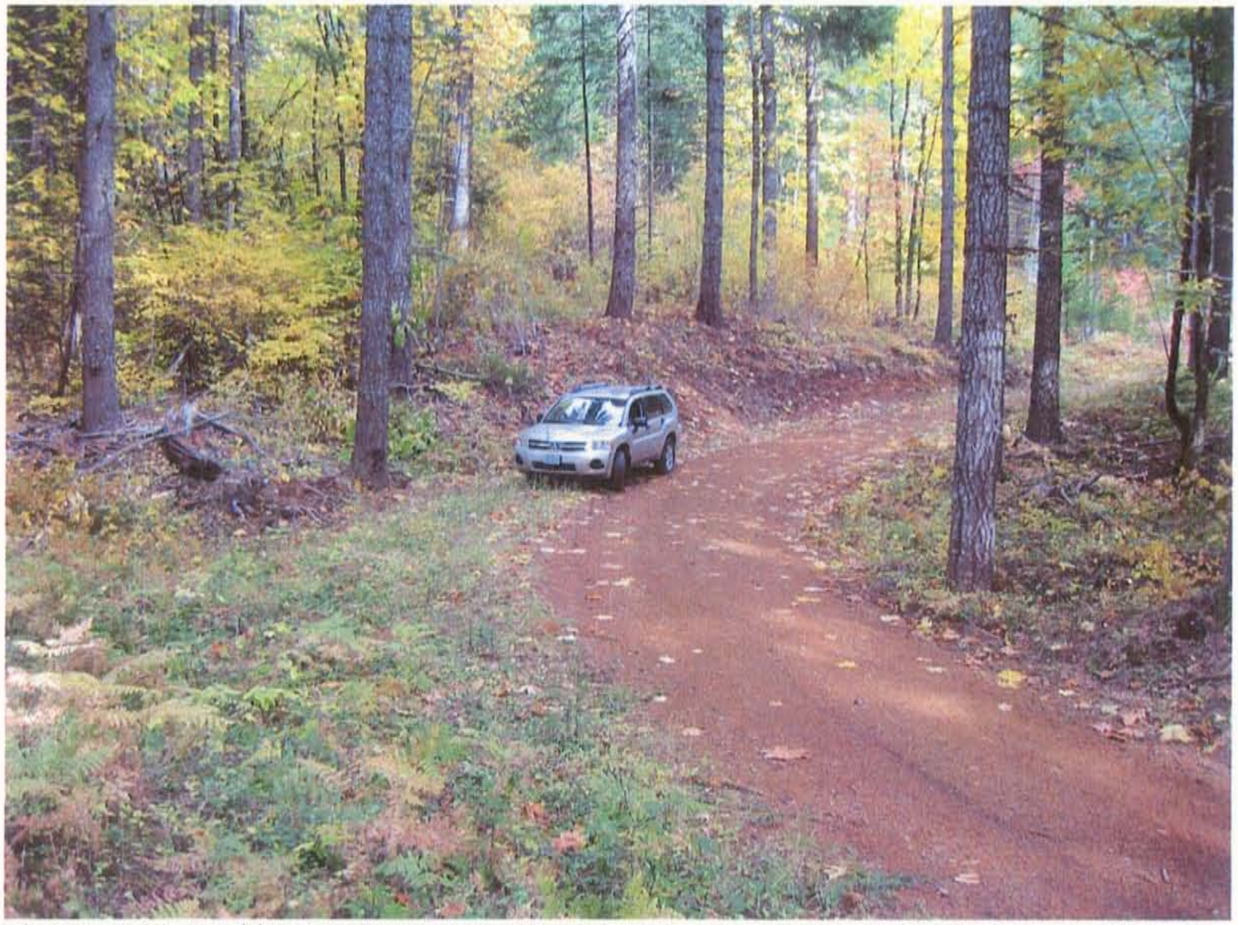

Photo D4-01. Looking northeast at location of DNR-mapped stream. Drainageway is in front of vehicle. 10/26/06.

Photo D4-02. Looking northwest upslope from road. 10/26/06.

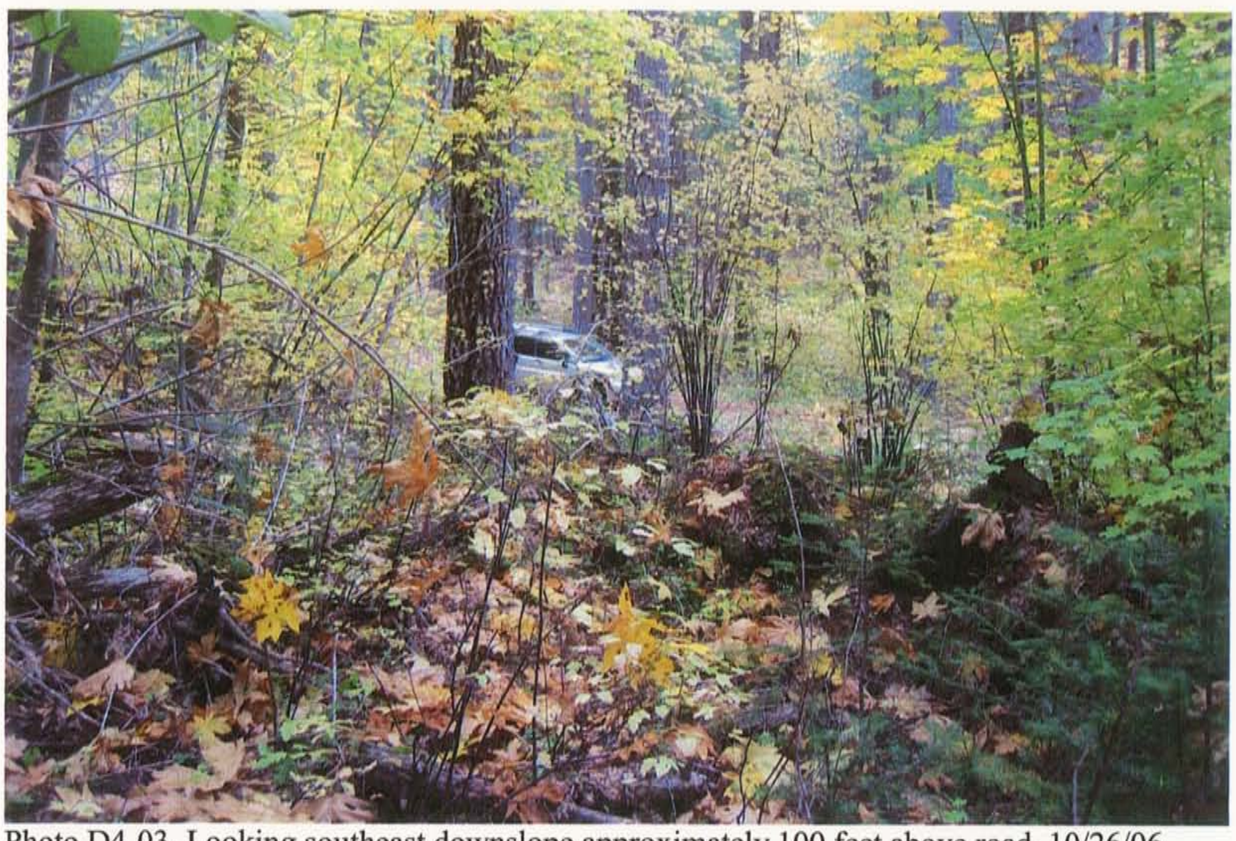

Photo D4-03. Looking southeast downslope approximately 100 feet above road. 10/26/06.

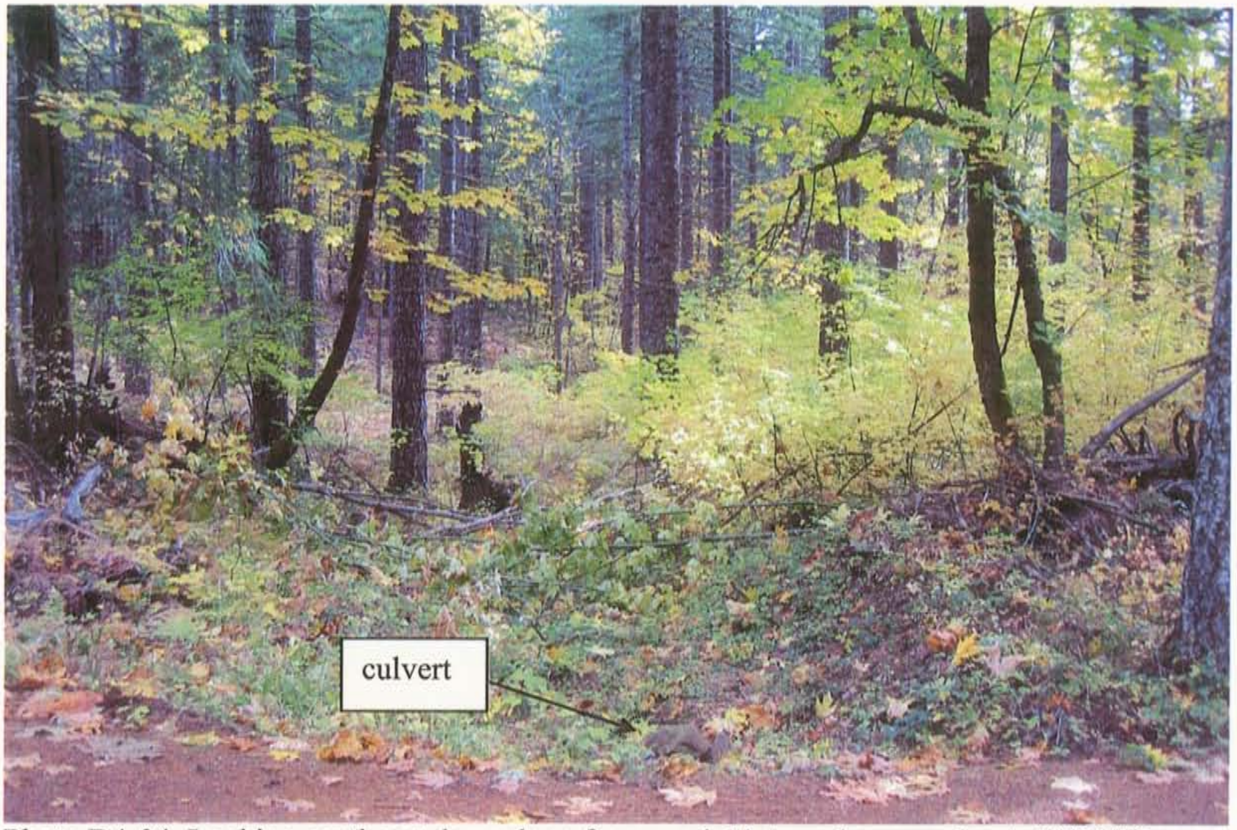

Photo D4-04. Looking southeast downslope from road. Note rock over culvert. 10/26/06.


Photo D4-05. Looking northwest upslope approximately 200 feet below road. 10/26/06.

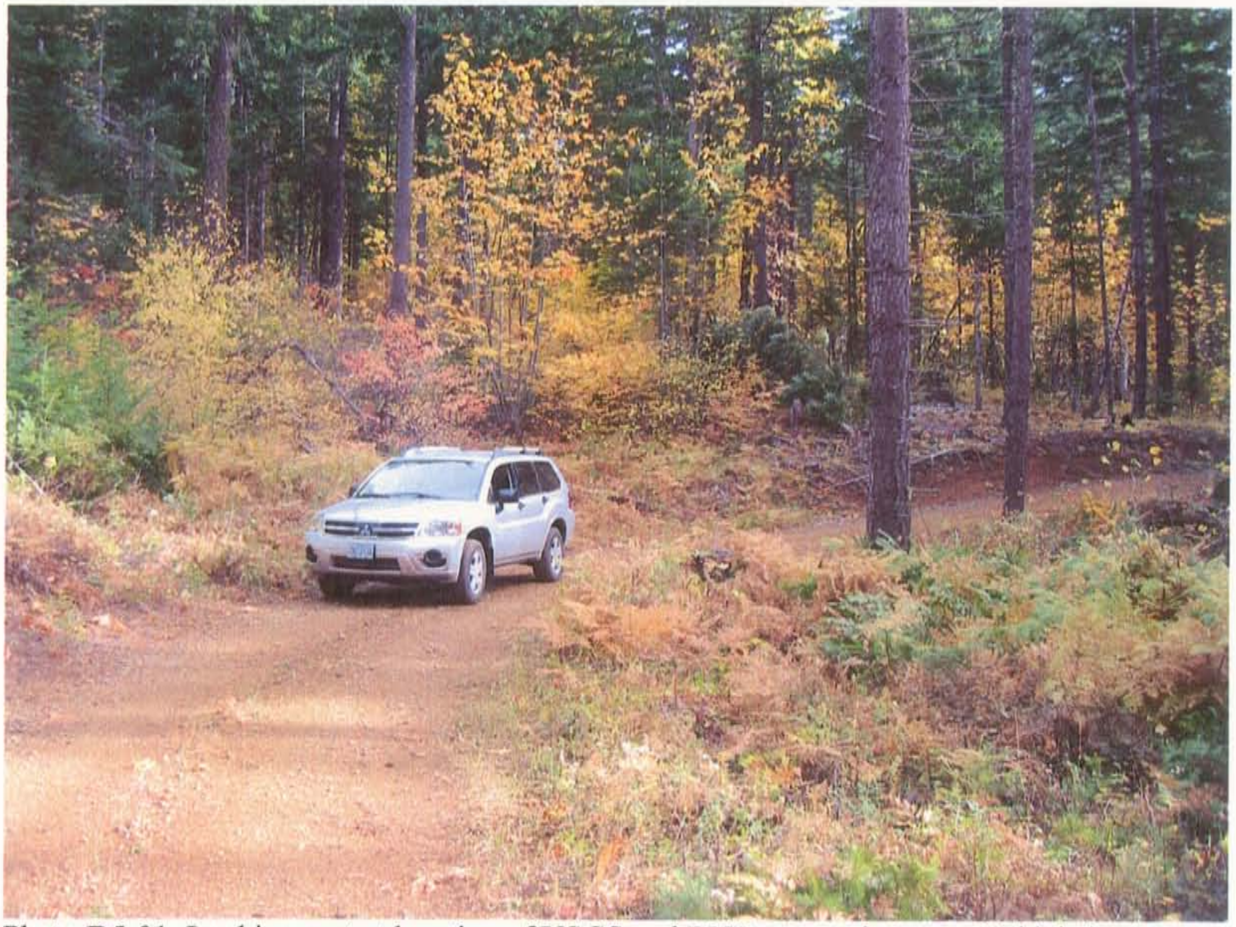

Photo D5-01. Looking east at location of USGS and DNR-mapped stream. Vehicle is at lowest portion of site. 10/26/06.

Photo D5-02. Looking north upslope from road. 10/26/06.

Photo D5-03. Looking north upslope approximately 100 feet above road. 10/26/06.

Photo D5-04. Looking south downslope from road. 10/26/06.

D5-05. Looking north upslope approximately 200 feet below road (note vehicle on road in center of photo). 10/26/06.

Photo D6-01. Looking east at location of USGS and DNR-mapped stream. Drainageway is in front of vehicle. 10/26/06.

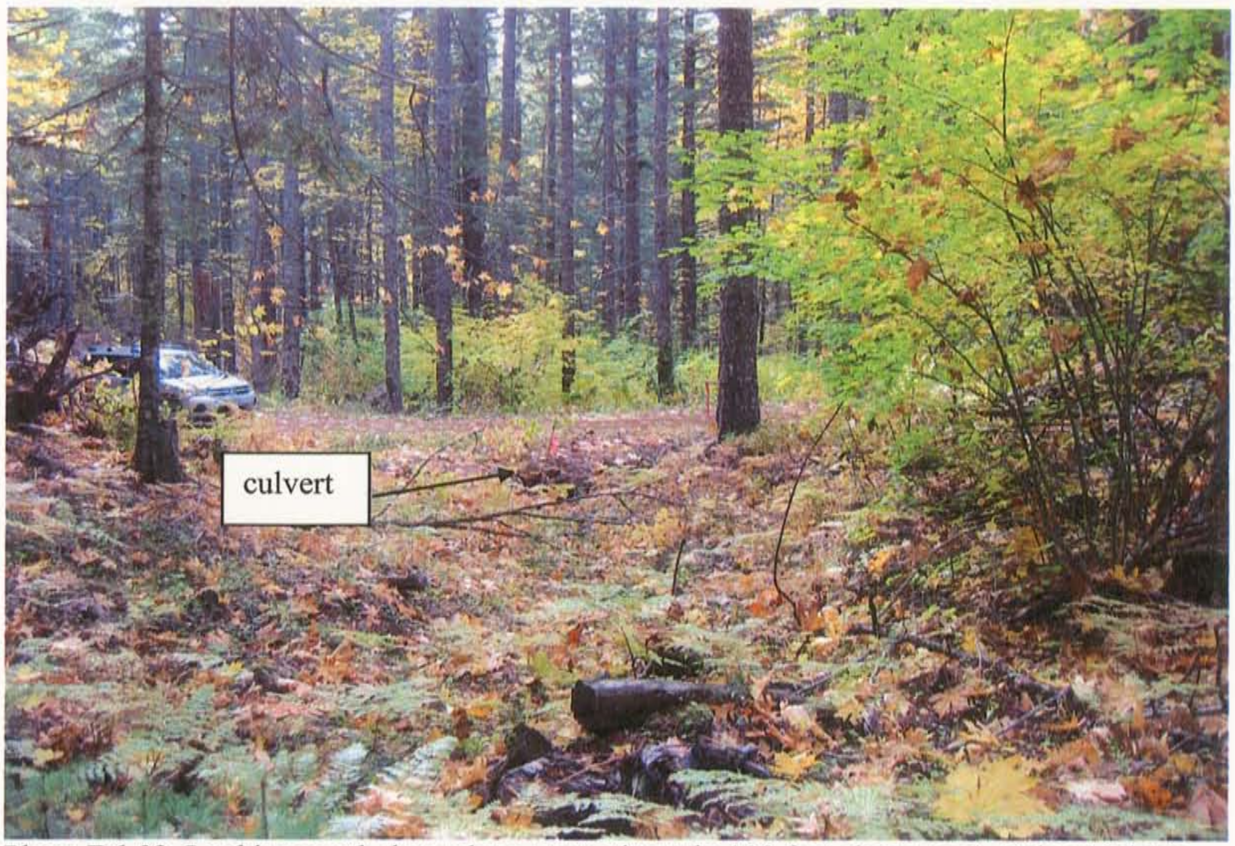

Photo D6-02. Looking south downslope approximately 100 feet above road. Culvert inlet is at pink flag. 10/26/06.


Photo D6-03. Looking south downslope from road. 10/26/06.

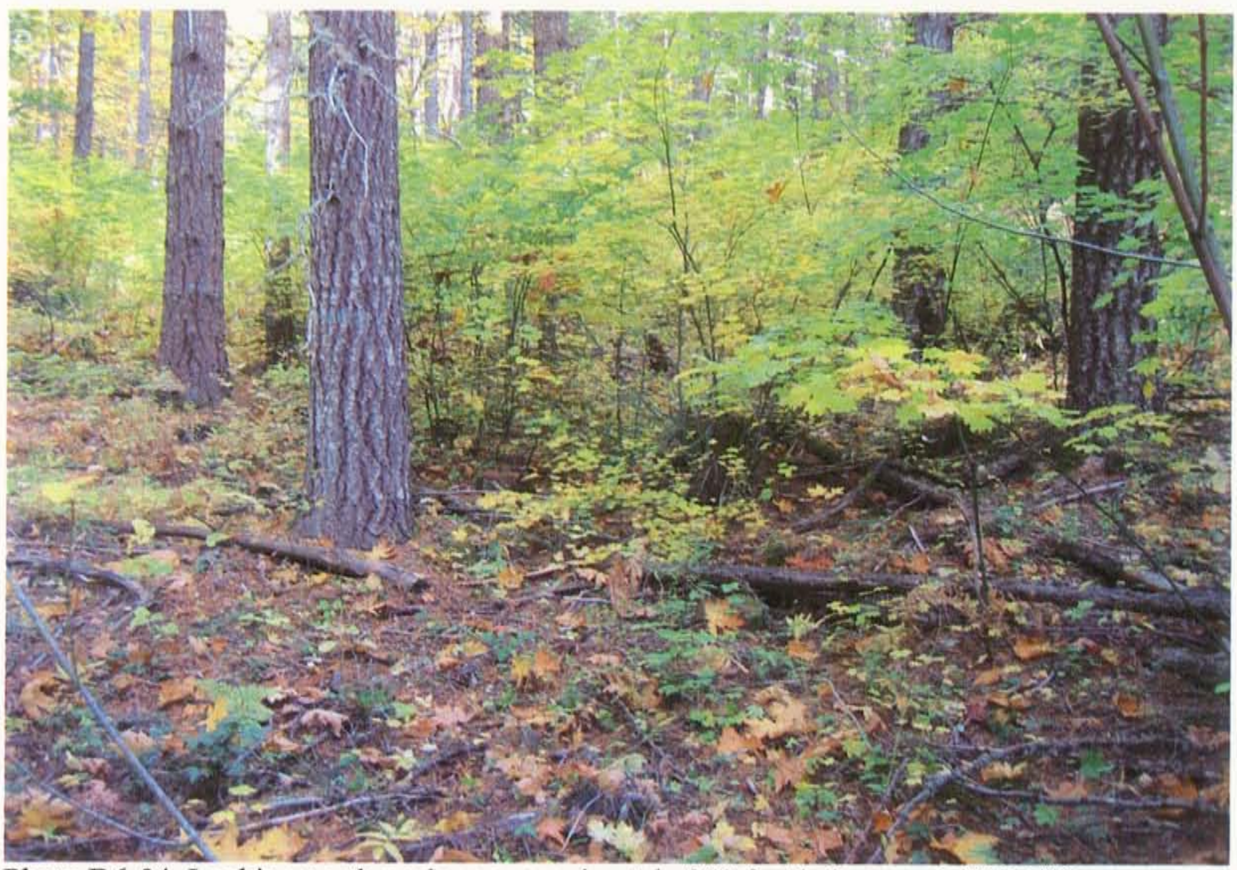
Photo D6-04. Looking north upslope approximately 250 feet below road. 10/26/06.

Photo F1-01. Looking west at location of DNR-mapped stream. Drainageway is behind vehicle. 10/26/06.


Photo F1-02. Looking southeast downslope from road. 10/26/06.


Photo F1-03. Looking northwest upslope approximately 200 feet below road. 10/26/06.

Photo F1-04. Looking northwest upslope from road. 10/26/06.

Photo F1-05. Looking upslope approximately 100 feet above road. 10/26/06.

Photo F2-01. Looking southwest at location of DNR-mapped stream. Dashed line is location of existing dirt road proposed for widening. 01/08/07.

Photo F2-02. Looking northwest along existing dirt road at location of DNR-mapped stream. 01/08/07.

Photo F2-03. Looking south upslope approximately 50 feet above existing dirt road. 01/08/07.

Photo F4-04. Looking north downslope approximately 100 feet below existing dirt road. Surface flow sinks into ground and disappears approximately 100 feet below this point. 01/08/07.

C-3

Rare Plant Survey Report: Saddleback Wind Project, Skamania County, Washington. Prepared for PPM Energy.

CH2M HILL (Peggy O’Neill). 2003

Rare Plant Survey Report Saddleback Wind Project Skamania County, Washington

Prepared for

PPM Energy

October 2003

CH2MHILL
Peggy O'Neill

Contents

1.0 Introduction

CH2M HILL biologists conducted surveys for endangered, threatened, and sensitive plant species for the purpose of complying with state and federal permit requirements for the proposed Saddleback Wind project. BPA and Skamania County are the lead federal and state agencies that are responsible for identifying and evaluating the potential adverse environmental impacts of the proposed Project. The investigation was conducted in the vicinity of Underwood Mountain, approximately 7 miles northwest of the City of White Salmon, in an unincorporated area of Skamania County, Washington (Figure 1). The project area is situated adjacent to, but entirely outside of, the Columbia Gorge National Scenic Area.

1.1 Proposed Project Activites

PPM Energy, Inc. (PPM), proposes to build and operate a wind power facility at a site on private commercial forest land and a parcel owned by the Washington Department of Natural Resources (DNR). The planned facility will generate up to 86 megawatts (MW) of electricity and will consist of up to 48, 1.5 to 1.8-MW, wind turbines and associated support infrastructure, consisting of newly constructed and improved roads, transformers, underground 34.5-kilovolt (kV) collector lines, as well as a substation and operations and maintenance (O&M) facility. Collectively, the facility is known as the "proposed Project" or "Project."

The total project will consist of up to 48 wind turbines. Each turbine will be up to approximately 390 feet tall (measured from the ground to the turbine blade tip), and will be mounted on a concrete pad. Spaced about 347 to 462 feet apart, the turbines will be grouped in strings of 3 to 16 turbines and connected by an underground electrical collector system. The applicant has determined the location and the end points of each turbine string; however, the number of turbines within each string, and the spacing between each turbine, may vary depending on which turbine supplier is selected by PPM Energy. All ultimate turbine siting, spacing, and clear areas will be in accordance with industry standards and safety measures discussed later in this document.

The turbines will operate at wind speeds ranging from 9 to 56 miles per hour (mph). The electrical output of each string of turbines will be connected to the Project substation by underground collector cables. The Project substation will be built directly adjacent to BPA's transmission lines, facilitating interconnection with the BPA grid. Access to the Project area will likely require use of about 5 miles of private logging roads and constructing about 3 miles of new gravel roads on private land.

1.2 Study Area

The project area is located in the Southern Washington Cascades Province (Franklin and Dyrness 1988). This area is characterized by generally accordant ridge crests separated by steep, deeply dissected valleys. The project falls within the *Abies grandis* and *Pseudotsuga menziesii* major vegetation zones (Franklin and Dyrness 1988). Climate is wet and cool, receiving a significant portion of its precipitation in the form of snow which accumulates in winter snowpacks as deep as 1 to 3 meters.

The project area is located on the north and west flanks of Underwood Mountain, northwest of White Salmon, Washington. Major drainages in the area include the White Salmon and the Little White Salmon River basins to the east and west of the site respectively. Both basins drain to the Columbia River south of the site, which drains to the Pacific Ocean.

Historically, the project area was dominated by coniferous species—grand fir (*Abies grandis*), and Douglas-fir (*Pseudotsuga menziesii*). Historical species dominance was dependent on elevation, aspect, underlying soil, and previous disturbance history (Franklin and Dyrness 1988). Mixed conifer and deciduous forest stands usually followed disturbances, but occasionally deciduous-dominated stands developed, depending on the disturbance type and physical environment. Typical deciduous species were alder (*Alnus rubra, A. sinuata*), Pacific dogwood (*Cornus nutallii*), and big-leaf maple (*Acer macrophyllum*).

The predominant land use in the surrounding area between Underwood Mountain and the Little White Salmon River is commercial forest production. Land within the proposed project area is currently in commercial timber production and is owned by SDS Lumber Company, Broughton Lumber Company, and the Washington Department of Natural Resources.

Current vegetation conditions are heavily influenced by forest management activities over the last century. Land in the project area is privately owned, managed industrial forest. While forest management has not reduced tree species diversity, it has resulted in a shift in species dominance to the commercially valuable Douglas-fir and in changes to stand structure and complexity, patch size, and species distribution. Average stand age probably declined from relatively short stand rotation ages. Few large, old conifer trees occur in the project area and there are no known late-successional or “old-growth” stands within or adjacent to the project area, though small groups of big trees occur.

Common understory plants include sword fern (*Polystichum munitum*), vanilla leaf (*Achlys triphylla*), false Solomon’s seal (*Smilacena racemosa*), western starflower (*Trientalis latifolia*), Columbia windflower (*Anemone deltoidea*), snowberry (*Symphoricarpos albus*), vine maple (*Acer circinatum*), Oregongrape (*Berberis nervosa*), red-flowering currant (*Ribes sanguineum*), and red elderberry (*Sambucus racemosa*). A list of all plant species observed within the project area is found in Table 1, Appendix A.

The vegetation communities within the project area are common within the region and maintained through forest management, and to a lesser extent natural disturbance. Because of private ownership, rugged landscape, and the value of high-volume timber producing land, these vegetation communities are expected to persist within the region during the foreseeable future.

Insert Figure 1

VICINITY MAP

2.0 Methods

2.1 Pre-field Review

Prior to the field survey, a list of rare plant species potentially occurring within the project area was compiled. In identifying these species a plant was considered a special status species if it met one of the following criteria: federally or state listed or proposed as a rare, threatened, or endangered species (USFWS 1996 a&b); a federal candidate for listing (USFWS 1996 a&b); a Washington Natural Heritage Information System special plant (WNHIS 2003); or listed by the Washington Natural Heritage Program (WNHP) as a rare plant species known to occur in Skamania County (WNHP, March 2003). A species was determined to have some potential for occurring in the study area if it is known to occur in the vicinity or its known geographic range includes the study area, and if it is known to occur in habitats and elevations likely to occur in the study area. Twenty-nine special status species identified from these searches are shown in Table 2, Appendix B.

Further data was collected regarding the habitat requirements, phenology, associated species, and taxonomy of these species. Taxonomic keys, monographs, species guides, and plant lists were collected to provide additional information. Several references were used to gather habitat descriptions for particular species and are noted in the reference section of this report. This information was used to focus the level of survey intensity in areas where site conditions indicated species habitat requirements were present.

2.2 Field Investigation

The purpose of the rare plant surveys was to locate all populations of special status plants within the project area, to precisely record and map their locations using GPS technology, and to determine the size and phenology of each rare plant population, and its microhabitat characteristics. Surveys were floristic in nature and were conducted according to the rare plant survey guidelines provided by the U.S. Bureau of Land Management *Survey Protocols for Survey and Manage Strategy 2 Vascular Plants* (Whiteaker et al. 1998).

Surveys for potential rare plant species within project area were conducted on May 28, 29, 30 and July 28 and 29, 2003. This range of survey dates was selected to encompass all or a portion of the blooming times of all of the special status plants potentially occurring within the project area. The field surveys were performed by CH2M HILL botanists and ecologists familiar with rare plant species of the region. Potential habitats supporting rare species within the project study area were surveyed on foot at an intensity level sufficient to confirm the presence or absence of targeted rare plant species identifiable at the time of the surveys. The surveyors kept a list of all vascular plants encountered. Observations of plant associations, land use patterns, and unusual habitats were recorded.

Study area boundaries are shown in Figure 2. The project study area for potential habitats included:

- 300-foot corridors centered on all proposed turbine strings and their associated access roads,
- 50-foot corridors on either side of all existing roads proposed for improvement in conjunction with the project,
- an approximately 15-acre plot for proposed substation construction, and
- two 5-acre and five 2-acre areas identified as proposed construction staging areas.

Two survey methods were used. An *Intuitive Controlled Survey* was conducted throughout the project site with a *Complete Survey* conducted in areas of high potential habitat. Protocol for these methods is as follows:

Intuitive Controlled Survey

For the entire project area an intuitive controlled survey was used. This method can also include a complete survey in habitats with the highest potential for rare plant species of concern.

The surveyor traversed through the project area to see a representative cross section of all the major habitats and topographic features, looking for the target species while en route between different areas. When the surveyor arrives at an area of high potential (that is defined in the pre-field review or encountered during the field visit), a complete survey for the target species is conducted.

Complete Survey

For areas where the most suitable habitat was located a complete survey was conducted. These surveys are defined as a 100 percent visual exam of the project area.

All plant species encountered in the survey areas were identified to at least genus and to the level necessary to ensure that they were not special status plant species. Plant identification was aided using current taxonomic guides, including *Flora of the Pacific Northwest* (Hitchcock and Cronquist, 1996) and *Wetland Plants of Oregon and Washington* (Guard, 1995). A list of all plant taxa encountered was recorded in the field by turbine string, road, or staging/substation area. Collections were made for later determination of species that were not readily identifiable in the field. Final species determinations were made by keying specimens using standard references such as *Flora of the Pacific Northwest* (Hitchcock and Cronquist, 1996). A list of plants encountered within the project area during the rare plant survey is provided in Table 1, Appendix A.

FIGURE 2: STUDY AREA

3.0 Results

3.1 Plant Communities

A total of five vegetation types occur within the areas included in project surveys: one wetland and four upland vegetation types. A description of these vegetation types follows.

3.1.1 Wetland Vegetation

Riparian Deciduous. Natural and anthropogenic disturbances frequently result in domination by deciduous species in near-stream areas. Within the project area this type occurs in the area identified on the USGS topographic map as "Cedar Swamp." Historically this area was dominated by very large, old cedar, which have been logged. The area is now dominated by willow and cottonwood (*Populus balsamifera*) with scattered occurrences of young cedar.

The Cedar Swamp area consists of approximately 24 acres is located adjacent to the proposed impact area for Turbine String F.

3.1.2 Upland Vegetation.

Grass-forb Stand. Grass-forb Stands are found in the project vicinity in recently clearcut areas. Grass-forb is the stand condition in the USDA Forest Service classification system defined as areas where shrubs comprise less than 40 percent crown cover and are less than 5 feet tall (Brown, 1985). This stand type occurs when a disturbance such as timber harvest, fires, or wind has killed or removed most or all of the larger trees, or when brush fields are cleared for planting. These units may range from mainly devoid of vegetation to dominance by herbaceous species (grasses and forbs). Tree regeneration in these units is generally less than 5 feet tall and 40 percent crown cover.

In Grass-forb stands within the project vicinity vegetation is minimal and consists predominantly of weedy herbaceous species, including bull thistle (*Cirsium vulgare*), Canada thistle (*Cirsium arvense*), and dandelion (*Taraxacum officinale*). These areas generally consist of ubiquitous coarse woody material (CWM), occasional slash piles, and large areas of bare ground. Within the project's proposed impact area there are approximately 22.3 acres of grass-forb vegetation community.

Brushfield/Shrub Stand. Brushfields are defined as the shrub stand condition in the USDA Forest Service classification system (Brown 1985). They develop on land following clearcut tree harvesting or other disturbances that remove vegetation. In keeping with Washington Forest Practices Rules, Chapter 222 WAC, all harvest units are planted within 3 years after harvest or a period of from 1 to 10 years as determined by the department in the case of a natural regeneration plan and must maintain minimum stocking levels of 150 vigorous, well-distributed undamaged seedlings per acre of commercial tree species.

Thus the majority of brushfields are actually young plantations (typically Douglas-fir, although many landowners are now planting mixed species) that have not yet reached the closed canopy stage or shaded out the shrub species. The type may have large amounts of bare soil, and often has slash and other logging debris on the ground. Vegetation (other than planted conifers) often consists of remnants from the forest understory and early successional annuals. There are vine maple, Sitka alder, beaked hazelnut (*Corylus cornuta*), serviceberry (*Amelanchier alnifolia*), Himalayan blackberry (*Rubus discolor*), bracken fern (*Pteridium aquilinum*), sword fern, oceanspray (*Holodiscus discolor*), fireweed (*Epilobium angustifolium*), wooly yarrow (*Achillea millefollium*), pearly everlasting (*Anaphalis margaritacea*) and grasses as ground cover.

Vegetation control has occurred in conjunction with forest management and includes herbicide application, mechanical control, or both. These areas are visually and functionally different from areas where control has not occurred. Despite control efforts, or where they have not occurred, dense shrub thickets frequently occur, dominated by the native vine maple. Within the thickets are small alders and Douglas-fir that occasionally grow taller than the vine maple. These areas also may have patches of alder saplings, salmonberry (*Rubus spectabilis*), vine maple, red elderberry, oceanspray, lupine (*Lupinus* sp.), Oregon oxalis, and grass. Small diameter coarse woody material (CWM) is common. Within the project's proposed impact area there are approximately 45.8 acres of brushfield/shrub vegetation community.

Conifer-Hardwood Forest. Conifer-Hardwood Forest is found in the project vicinity in the closed sapling-pole stand condition, under the USDA Forest Service vegetation classification system (Brown 1985). The forest canopy in these stands is dominated by a mix of bigleaf maple and Douglas-fir, with some red alder. Canopy height typically ranges from 40 to 60 feet. Canopy closure is between 60 and 80 percent. Maple forms about 30 percent of the canopy cover with Douglas-fir forming most of the rest of the canopy. Stands may have distinct tree canopy layers with deciduous overtopping emerging conifer or remnant conifer over the deciduous component. Stands with shrub layers that merge with the canopy layers are found in the project vicinity. The shrub layer varies from open to dense and contains vine maple, salmonberry, thimbleberry (*Rubus parviflora*),red elderberry, beaked hazelnut, and Pacific dogwood. The herbaceous layer contains sword fern, trailing blackberry, oxalis, grasses, and moss. Within the project's proposed impact area there are approximately 147.9 acres of conifer-hardwood vegetation community.

CWM is dependent on stand age, but is typically low to moderate. Deciduous snags out-number conifer snags, although depending on stand origin, short well decayed conifer snags may be present.

Conifer Forest. Coniferous Forest is found in the project area in closed sapling-pole-sawtimber stands and large sawtimber stands. Within the project area and most of the region, Coniferous Forests are dominated by Grand fir and Douglas-fir. The closed sapling-pole-sawtimber is a continuum of tree diameter sizes with saplings being relatively small, poles being in the 8-12 inch range, and sawtimber ranging from 12 to 23 inches. Important to these stand types is the closed canopy and relative short live crowns found in the pole and sawtimber stages. The closed canopy results in the exclusion of most shrub species and many herbs.

CWM in this stage is typically low and consists of remnants from previous stands. Snags are typically rare, although small diameter snags become more frequent in the pole and sawtimber stages as shading and resource competition kills subdominants.

Large sawtimber is considered to be at least 21 inches in DBH. Within-stand differentiation has begun and dominants are beginning to overtop and out-compete other tree species. Competition for space results in more light reaching the forest floor and shrub and herbaceous communities typically become more diverse. CWM and snags are generally rare, although the number of snags and amount of CWM may be variable amount stands, dependent on past harvest practices, stand management, and actual stand age.

These forests are used for commercial forestry, and are generally regenerated after harvest, although some may be the result of natural disturbance combined with commercial planting. They are subject to timber management activities including harvest, replanting, and stand improvement activities. These forests are widespread in the project vicinity. Within the project's proposed impact area there are approximately 85.8 acres of conifer vegetation community.

3.2 Rare Plants

No special status plant species were observed within the proposed project area in the course of the rare plant surveys.

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Appendix A
Plant Species Observed

TABLE 1 Plant Species Observed May 28-30 and July 28-29, 2003
Saddleback Wind Project

FAMILY	SCIENTIFIC NAME	COMMON NAME	NATIVE	NON-NATIVE
Aceraceae				
	Acer circinatum	vine maple	X	
	Acer macrophyllum	big leaf maple	X	
Apiaceae				
	Daucus carota	Queen Anne's lace		X
	Oenanthe sarmentosa	Pacific water -parsley	X	
	Osmorhiza chilensis	mountain sweet-cicely	X	
	Sanicula crassicaulis	Pacific sanicle	X	
Apocynaceae				
	Apocynum androsaemifolium	spreading dogbane	X	
Araliaceae				
	Oplopanax horridus	Devil's club	X	
Aristolochiaceae				
	Asarum caudatum	wild ginger		
Asteraceae				
	Achillea millefolium	wooly yarrow	X	
	Adenocaulon bicolor	pathfinder		
	Anaphalis margaritacea	pearly-everlasting	X	
	Antennaria luzuloides	woodrush pussytoes	X	
	Centaurea cyanus	bachelor's button		X
	Centaurea diffusa	diffuse knapweed		X
	Chrysanthemum leucanthemum	ox-eye daisy		X
	Cichorium intybus	chicory		X
	Cirsium arvense	Canada thistle		X
	Cirsium vulgare	bull thistle		X
	Gnaphalium palustre	marsh cudweed	X	
	Hieracium albiflorum	white-flowered hawkweed	X	
	Hieracium scouleri	wooly-weed	X	
	Lactuca serriola	prickly lettuce		X
	Taraxacum officinale	dandelion		X
	Tragopogon dubius	yellow salsify		X
Berberidaceae				
	Achlys triphylla	vanilla leaf	X	
	Berberis nervosa	Cascade Oregongrape	X	
	Vancouveria hexandra	white insideout flower	X	
Betulaceae				
	Alnus sinuata	Sitka alder	X	
	Corylus cornuta	beaked hazelnut	X	
Boraginaceae				
	Cryptantha flaccida	common cryptantha	X	
Brassicaceae				
	Erysimum occidentale	pale wallflower	X	
Campanulaceae				
	Campanula scouleri	Scouler's bluebell	X	

TABLE 1 Plant Species Observed May 28-30 and July 28-29, 2003
Saddleback Wind Project

FAMILY	SCIENTIFIC NAME	COMMON NAME	NATIVE	NON-NATIVE
Caprifoliaceae				
	Linnaea borealis	twin flower	X	
	Lonicera hispidula	hairy honeysuckle	X	
	Lonicera sp.	honesuckle	X	
	Sambucus racemosa	red elderberry	X	
	Symphoricarpos albus	snowberry	X	
Caryophyllaceae				
	Stellaria jamesiana	sticky chickweed		
Cornaceae				
	Cornus nutallii	Pacific dogwood	X	
Cupressaceae				
	Thuja plicata	western red cedar	X	
Cyperaceae				
	Eleocharis palustris	creeping spikerush	X	
Dryopteridaceae				
	Athyrium filix-femina	lady fern	X	
Equisitaceae				
	Equisetum arvense	field horsetail	X	
Ericaceae				
	Arctostaphylos patula	green-leaf manzanita	X	
	Chimaphylla menziesii	little pipsissewa	X	
	Chimaphylla umbellata	common pipsissewa	X	
	Pyrola picta	white vein pyrola	X	
	Vaccinium sp.	huckleberry	X	
Fabaceae				
	Cytisus scoparius	Scotch broom		X
	Lathyrus latifolius	everlasting peavine		X
	Lathyrus polyphyllus	leafy peavine	X	
	Lotus purshiana	spanish-clover	X	
	Lupinus caudatus	Kellog spurred lupine	X	
	Lupinus polyphyllus	large-leaf lupine	X	
	Lupinus sp.	lupine	X	
	Trifolium dubium	least hop clover		X
	Trifolium sp.	clover		
	Vicia sp.	vetch		
Grossulariaceae				
	Ribes sanguineum	red-flowering currant	X	
Hydrophyllaceae				
	Nemophila parviflora	small-flowered nemophila	X	
	Phacelia hastata	silver-leaf phacelia	X	
Hypericaceae				
	Hypericum perforatum	common St. John's-wort		X
Juncaceae				
	Juncus effusus	common rush	X	
	Luzula parviflora	small-flowered wood rush	X	

TABLE 1 Plant Species Observed May 28-30 and July 28-29, 2003
Saddleback Wind Project

FAMILY	SCIENTIFIC NAME	COMMON NAME	NATIVE	NON-NATIVE
Lamiaceae				
	Stachys cooleyae	Cooley's hedge-nettle	X	
Liliaceae				
	Clintonia uniflora	bead lily	X	
	Disporum hookeri	Hooker's fairy-bell	X	
	Lilium columbianum	Columbia lily	X	
	Smilacina racemosa	western false Solomon's seal	X	
	Smilacina stellata	star-flowered false Solomon's	X	
	Trillium ovatum	western trillium	X	
Onagraceae				
	Epilobium angustifolium	fireweed		X
	Epilobium sp.	epilobium		
	Oenothera strigosa	common evening-primrose	X	
Orchidaceae				
	Calypso bulbosa	fairy-slipper	X	
	Corallorhiza maculata	spotted coral-root	X	
	Corallorhiza mertensiana	Merten's coral-root	X	
	Corallorhiza striata	striped coral-root	X	
Pinaceae				
	Abies grandis	grand fir	X	
	Pseudotsuga menziesii	Douglas-fir	X	
	Tsuga heterophylla	western hemlock	X	
Plantaginaceae				
	Plantago lanceolata	English plantain	X	
	Plantago major	common plantain	X	
Poaceae				
	Bromus tectorum	cheat grass		X
Polemoniaceae				
	Microsteris gracilis	midget phlox	X	
Polygonaceae				
	Rumex acetosella	sheep sorrel		X
	Rumex occidentalis	western dock	X	
Polypodiaceae				
	Adiantum pedatum	maidenhair fern	X	
	Polystichum munitum	sword fern	X	
	Pteridium aquilinum	bracken fern	X	
Portulacaceae				
	Claytonia perfoliata	miner's lettuce	X	
	Claytonia siberica	Siberian spring beauty	X	
Primulaceae				
	Trientalis latifiolia	western starflower	X	
Ranunculaceae				
	Actaea rubra	baneberry	X	
	Anemone deltoidea	Columbia wind flower	X	

TABLE 1 Plant Species Observed May 28-30 and July 28-29, 2003
Saddleback Wind Project

FAMILY	SCIENTIFIC NAME	COMMON NAME	NATIVE	NON-NATIVE
Rhamnaceae				
	Ceanothus integerrimus	deerbrush	X	
	Ceanothus sanguineus	redstem ceanothus	X	
	Ceanothus velutinus	tobacco-brush	X	
Rosaceae				
	Aruncus sylvester	goatsbeard	X	
	Fragaria virginiana	wild strawberry	X	
	Holodiscus discolor	oceanspray	X	
	Prunus emarginata	bitter cherry	X	
	Prunus virginiana	common chokecherry	X	
	Rosa gymnocarpa	baldhip rose	X	
	Rosa woodsii	Wood's rose	X	
	Rubus leucodermis	blackcap	X	
	Rubus parviflora	thimbleberry	X	
	Rubus ursinus	blackberry	X	
Rubiacea				
	Galium aparine	cleavers	X	
Salicaceae				
	Populus balsamifera	black cottonwood	X	
	Salix lasiandra	Pacific willow	X	
	Salix scouleriana	Scouler's willow	X	
	Salix sitchensis	Sitka willow	X	
Saxifragaceae				
	Mitella diversifolia	varied-leaved mitrewort	X	
	Tellima grandiflora	fringecup	X	
	Tiarella trifoliata	foamflower	X	
Scrophulariaceae				
	Linaria dalmatica	dalmatian toadflax		X
	Penstemon sp.	penstemon	X	
	Penstemon subserratus	fine-toothed penstemon	X	
	Verbascum thapsus	wooly mullein	X	
	Veronica scutellata	marsh speedwell	X	
Valerianaceae				
	Plectritis macrocera	white plectritis	X	
Violaceae				
	Viola glabella	stream violet	X	

Appendix B
Potential Special Status Plant Species

TABLE 2 Status, Distribution and Habitat Data for Special Status Plant Species Identified as Occurring or Potentially Occurring in the Vicinity of the Saddleback Wind Project.

Family	Scientific Name	Common Name	Phenology	Habitat	Associated Species	WA State	Federal Status	Sources
Asteraceae								
	Balsamorhiza deltoidea	Puget balsamroot	mid March to mid June	Open places, usually avoiding the thinner soils; in the Puget trough, from south Vancouver Island to southern California.		Review		WNHP (2001); NPSO (1998)
	Erigeron howellii	Howell's daisy	May to early July	In Washington, Erigeron howellii occurs primarily on steep north-facing slopes at elevations ranging from 1600 to 3400 feet. The taxon generally occurs within microsites that have very little soil development and limited development of competing vegetation. The sites are essentially in a stable, herb-dominated condition.		Threatened	SC	WNHP (2002)
	Erigeron oreganus	Gorge daisy	June	Moist shady cliffs and ledges; Columbia River Gorge, mostly frequently collected on the Oregon side.		Threatened	SC	WNHP (2002); Jolley (1988)
	Microseris borealis	northern microseris	July - August	Marshes at mid to high elevations west of Bonneville Dam. Blooms in the morning.		Sensitive		WNHP (2002): Jolley (1988)
Boraginaceae								
	Hackelia diffusa var. *diffusa*	diffuse stickseed	May through June	Shaded area, cliffs, talus, wooded flats and slopes.	Symphoricarpos albus, Philadelphus lewisii, Osmorhiza occidentalis, Acer glabrum, Fritillaria pudica, Erysimum occidentale	Sensitive		WNHP (2001)

FEDERAL STATUS DESIGNATIONS:
(E) Listed Endangered
(T) Listed Threatened
(CH) Critical Habitat
(PE) Proposed Endangered
(PT) Proposed Threatened
(PCH) Proposed Critical Habitat

STATE STATUS DESIGNATIONS:
(LE) Listed Endangered
(PE) Proposed Endangered
(PT) Proposed Threatened
(SC or C) Sensitive-critical
(SV or V) Sensitive-vulnerable
(SoC) Species of Concern
(SP or P) Sensitive peripheral or naturally rare
(SU or U) Sensitive-undetermined

TABLE 2 Status, Distribution and Habitat Data for Special Status Plant Species Identified as Occurring or Potentially Occurring in the Vicinity of the Saddleback Wind Project.

Family	Scientific Name	Common Name	Phenology	Habitat	Associated Species	WA State	Federal Status	Sources
Brassicaceae								
	Rorippa columbiae	persistentsepal yellowcress	April to October (depending on water regime)	Has been observed near all types of bodies of water, including the Columbia River, intermittent snow-fed streams, permanent lakes, snow-fed lakes, internally-drained lakes, which may be dry for extended periods of time, wet meadows, irrigation ditches, and roadside ditches. The species apparently requires wet soil throughout the growing season. It is known from a wide variety of soil types, including clay, sand, gravel, sandy silt, cobblestones, and rocks. Individuals are usually found in open habitats that have low vegetative cover. A common feature of all of the known sites Is inundation for at least part of the year. R. columbiae typically occurs in the lowest vegetated riparian zone in a band spanning approximately 1-1.5 meters in elevation.	NA	Threatened	SC	WNHP (2001)
Campanulaceae								
	Githopsis specularioides	common blue-cup	Mid-April to mid-June	Open places at lower elevations; typically open habitats within forested landscapes.	Vary, but often include Pseudotsuga menziesii, Pinus ponderosa, Quercus garryana. Other associated species: Agropyron spicatum, Festuca idahoensis, Bromus mollis, Lomatium sp., Collinsia parviflora.			WNHP (2001); Jolley (1988)
Caryophyllaceae								
	Silene douglasii var. *monantha*	Douglas' silene	May - June or later, depending on elevation.	Rocky, well-drained soils, wet areas. Sagebrush plains to montane slopes.		Review		WNHP (2001); John Gammon, Washington DNR (2002) Florence Caplow Washington DNR (2002)
Cyperaceae								
	Carex macrochaeta	large-awn sedge	June - August	Moist or wet, open places, often near the beach. Northwest coast of Asia, east through the Aleutian Islands to the Alaska peninsula, and south near the coast to southern B.C.; reputedly also in the Columbia River Forge at Multnomah Falls, Oregon. An old (1836) collection by Garry is supposed to have come from Ft. Vancouver, WA.		Sensitive		WNHP (2002)

FEDERAL STATUS DESIGNATIONS:
(E) Listed Endangered
(T) Listed Threatened
(CH) Critical Habitat
(PE) Proposed Endangered
(PT) Proposed Threatened
(PCH) Proposed Critical Habitat

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(SP or P) Sensitive peripheral or naturally rare
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TABLE 2 Status, Distribution and Habitat Data for Special Status Plant Species Identified as Occurring or Potentially Occurring in the Vicinity of the Saddleback Wind Project.

Family	Scientific Name	Common Name	Phenology	Habitat	Associated Species	WA State	Federal Status	Sources
Fagaceae								
	Chrysolepsis chrysophylla	golden chinquapin	May through July	Dry, open sites to fairly thick woodland, from sea level up to 5500 feet elevation.		Sensitive		WNHP (2002); Florence Caplow, Washington DNR (2003)
Fumiariaceae								
	Corydalis aquae-gelidae	Clackamas corydalis	June to September	Occurs primarily in the western hemlock (Tusga heterophylla) and Pacific silver fir (Abies amabilis) zone. (Franklin and Dyrness, 1973), at elevations ranging from 2500 to 3800 feet. It is found growing in or near cold flowing water, including seeps and small streams, often occurring within the stream channel itself. Current information suggests that C, aquae-gelidae prefers intermediate levels of overstory canopy closure which provide enough light for flowering and reproduction, yet not so much light that a dense cover of shrubs develops.		Threatened	SC	WNHP (2002)
Iridaceae								
	Sisyrinchium sarmentosum	pale blue-eyed grass	mid-June to early August	Occurs in meadows and small openings from 1600 to 4200 feet. The meadows, which fill with snow and/or water I winter and spring, area variously dominated by grasses and sedges. Conifers such as lodgepole pine (Pinus contorta), and Engelmann spruce (Picea engelmannii), and shrubs such as hardhack (Spiraea douglasii), border the meadows and are occasional invaders. The sites are relatively flat, often being slightly concave. Most sites are within either the Little White Salmon River or the White Salmon River drainages. The underlying bedrock is basalt from various flows.	Pinus contorta, Picea engelmannii, Spiraea douglasii	Threatened	SC	WNHP (2001)

FEDERAL STATUS DESIGNATIONS:
(E) Listed Endangered
(T) Listed Threatened
(CH) Critical Habitat
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TABLE 2 Status, Distribution and Habitat Data for Special Status Plant Species Identified as Occurring or Potentially Occurring in the Vicinity of the Saddleback Wind Project.

Family	Scientific Name	Common Name	Phenology	Habitat	Associated Species	WA State	Federal Status	Sources
Juncaceae								
	Juncus howellii	Howell's rush	July - August	Moist ground in the mountains; chiefly Californian, form Siskiyou to Trinity and Butte cos., but possibly northeast to northeast Oregon and west central Idaho.		Review		WNHP (2002)
Lentibulariaceae								
	Utricularia intermedia	flat-leaved bladderwort	July through August	Shallow ponds, slow-moving streams, and wet sedge or rush meadows. Generally occurs only in significant wetlands where standing water is present year around,. bog-like areas.	Scirpus acutus, Ranunculus flammula, Juncus supiniformis, Juncus balticus, Equisetum fluviatile, Carex sitchensis	Sensitive		WNHP (2001) John Gammon, Washington DNR (2002) Florence Caplow Washington DNR (2002)
Lycopodiaceae								
	Lycopodiella inundata	bog clubmoss		Mostly in sphagnum bogs, seldom in other very wet places.		Sensitive		WNHP (2002)
Ophioglossaceae								
	Botrychium lunaria	moonwort	May through July	Moist or wet, more or less open places at middle to high elevation in the mountains, e.g., about mountain springs; generally neither in meadows nor in deep forest, at least in our range.		Sensitive		WNHP (2002); Florence Caplow, Washington DNR (2003)
	Botrychium minganense	Mingan grape-fern	May through July	Exhibits wide ecological amplitude, occuring in a wide range of habitats, particularly east of the Cascades, where it occurs in open shrubland and barren slopes. However, it typically occurs in older forest stands. The colonies are associated with riparian zones and old growth western redcedar (*Thuja plicata*) in dense shade, sparse understory, on alluvium substrate and often a duff layer of *Thuja* branchlets. Generally occur on soils saturated in the Spring, but tend to dry out later in the growing season. Plants do not occur in soils wet enough to support skunk cabbage, but grow adjacent to these areas.		Review		WNHP (2001); Florence Caplow, Washington DNR (2003)
	Botrychium pinnatum	St. John's moonwort	May through July	Moist or wet, more or less open places in the mountains, but not at highest altitudes.		Sensitive		WNHP (2002); Florence Caplow, Washington DNR (2003)

FEDERAL STATUS DESIGNATIONS:
(E) Listed Endangered
(T) Listed Threatened
(CH) Critical Habitat
(PE) Proposed Endangered
(PT) Proposed Threatened
(PCH) Proposed Critical Habitat

STATE STATUS DESIGNATIONS:
(LE) Listed Endangered
(PE) Proposed Endangered
(PT) Proposed Threatened
(SC or C) Sensitive-critical
(SV or V) Sensitive-vulnerable
(SoC) Species of Concern
(SP or P) Sensitive peripheral or naturally rare
(SU or U) Sensitive-undetermined

TABLE 2 Status, Distribution and Habitat Data for Special Status Plant Species Identified as Occurring or Potentially Occurring in the Vicinity of the Saddleback Wind Project.

Family	Scientific Name	Common Name	Phenology	Habitat	Associated Species	WA State	Federal Status	Sources
Orchidaceae								
	Cypripedium fasciculatum	clustered lady's slipper	May through mid-June	Mid-to late-seral Douglas-fir (Psuedotsuga menziesii) or Ponderosa pine (Pinus ponderosa) overstory with a closed herbaceous layer and variable shrub layer, mostly on northerly aspects. It can also be found in grand fir (Abies grandis) forest with Swauk sandstone, thick duff or sandy loam soils.	Psuedotsuga menziesii, Pinus ponderosa, Pachistima myrsinites, Holodiscus discolor, Spiraea betulifolia, Berberis nervosa, Calamagrostis rubescens, Arnica cordifolia, Carex geyeri, Abies grandis	Threatened	SC	WNHP (2001)
	Plantathera sparsifolia	canyon bog-orchid	Late May-August	Open, wet areas, seeps and bogs.	Plantathere stricta, P. dilatata, Polygonum bistirtoides, Drosera rotundifolia, Gentiana rotundifolia.	Sensitive		WNHP (2002)
	Spiranthes porrifolia	western ladies-tresses	May through August	Wet meadows, along stream, in bogs, and on seepage slopes.	Pinus ponderosa, Psuedotsuga menziesii, Quercus garryana, Purshia tridentata, Allium amplectens, Delphinium burkei, Brodiaea coronaria, Oenothera villosa, Lotus corniculatus, Verbascum blattaria, Chicorium intybus,, Melilotus alba, Trifolium arvense, Lathyrus latifolius	Sensitive		WNHP (2001)
Polemoniaceae								
	Polemonium carneum	great polemonium	mid to late June	Thickets, woodland, and forest opening, from near sea level to moderate elevation in the mountains.		Threatened		WNHP (2002); Jolley (1988)
Portulacaceae								
	Montia diffusa	branching montia	late April to mid June	Mostly in moist woods on the west side of the Cascades.		Sensitive		WNHP (2001); NPSO (1998)
Ranunculaceae								
	Cimicifuga elata	Tall bugbane	late May -Aug	Occurs in and along margins of moist forest at low to middle elevations. From B.C., Olympic Peninsula, along western WA Cascades and Puget Trough, south to NW Oregon. In Washington, C. elata generally grows in or along the margins of mixed, mature or o old growth stands of mesic	Pseudotsuga menziesii, Thuja plicata, Acer macrophyllum, Alnus rubra, Acer circinatum, Holodiscus discolor, Corylus cornuta, Polystichum munitum, Symphoricarpos albus.	T		ONHP (2001); Pojar & MacKinnon (1994); WNHP (2001)

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TABLE 2 Status, Distribution and Habitat Data for Special Status Plant Species Identified as Occurring or Potentially Occurring in the Vicinity of the Saddleback Wind Project.

Family	Scientific Name	Common Name	Phenology	Habitat	Associated Species	WA State	Federal Status	Sources
				coniferous forest, or mixed coniferous-deciduous forest.				
Saxifragaceae								
	Bolandra oregana	bolandra	early May to early July	Moist, mossy rocks, usually near waterfalls, on both sides of the lower Columbia River. Gorge, and along the Snake Rive and its tributaries in southeast Washington, northeast Oregon, and adjacent Idaho.		Sensitive		WNHP (2001); NPSO (1998)
	Parnassia fimbriata var. *hoodiana*	fringed grass-of-parnassus	July - September	Bogs, wet meadows, and stream banks, lower montane to arctic-alpine.		Sensitive		WNHP (2002); Jolley (1988)
	Sullivantia oregana	Oregon sullivantia	May through August	Occurs on moist cliffs, especially near waterfalls. Probably grows in shallow pockets of basalt-derived soils. Occurs in microsites that remain wet to moist much of the year.	Dodecatheum dentatum, Tolmiea menziesii, Oxalis trillifolia.	Threatened	SC	WNHP (2002); Jolley (1988)
Scrophulariaceae								
	Collinsia sparsiflora var. *bruceae*	few-flowered collinsia	mid-March through April	In Washington, the taxon occurs in thin soils over basalt on a variety of slopes, from almost flat to rather steep, generally south-facing. The microsites are generally quite open, but may be adjacent to or found within open stands of ponderosa pine and Oregon white oak. These habitats are moist in spring, but become dry by summer.	There is generally a dense herbaceous layer, commonly with Balsamorhiza sagittata, Lomatium macrocarpum, Sisyrinchium douglasii, Lupinus bicolor, Fritillaria pudica, Lithophragma sp.. Weedy annual species such as Poa bulbosa, and Erodium cicutarium.			WNHP (2002)
	Penstemon barrettiae	Barrett's beardtongue	late April to early June	In Washington, P. Barrettiae generally grows in crevices along basalt cliff faces, on ledges of rock outcrops, on open talus and occasionally along well drained roadsides. It occurs mostly at lower elevations, but its range is up to 3200 feet. It generally occurs on rocky substrates of basaltic origin, with little soil development. Soils area composed of wind blown material and organic matter and provide good drainage.	Psuedotsuga menziesii, Pinus ponderosa	Threatened	SC	WNHP (2001)

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(E) Listed Endangered
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Appendix C
Species Descriptions for Potentially Occurring Rare Plants

TABLE 3 Special Status Plant Descriptions
Saddleback Wind Project

Family	Scientific Name	Common	Description
Asteraceae			
	Balsamorhiza	Puget balsamroot	Perennial with a deep-seated, woody taproot and multicipital caudex; basal leaves long-petiolate, the blade mostly triangular-hastate, or with more cordate base, up to 30 cm. Long and 20 mm wide, green, inconspi8cuously hirsute and often glandular, thinner and less veiny than in B. careyana, often crenate; stem 2-10 dm tall, scapiform, but usually with several strongly reduced narrow leaves; central head large, the disk rarely less than 2.5 cm wide; lateral heads, when present, obviously smaller; involucre only slightly or scarcely wooly, the outer bracts tending to be enlarged and foliaceous, surpassing the disk' rays commonly about 13 or about 21 (fewer on the reduced lateral heads), 2-5 cm long, soon deciduous, not becoming papery; achenes glabrous.
	Erigeron howellii	Howell's daisy	Perennial from a rhizome, 8 to 20 inches tall, scantily short-villous under the heads. Leaves thin, glabrous, the lowermost ones with elliptical or suborbicular blade 1 to 3 inches long and 1/2 to 2 inches wide, abruptly contracted to the 3/4 to 5 inch petiole. Middle cauline leaves ample, ovate to cordate, strongly clasping at the base; upper leaves similar but smaller. Heads solitary, the disk 1/2 to 3/4 inch wide. Involucral bracts loose, equal, glandular, somewhat herbaceous. Rays 30-501/2 to 1 inch long, 1/16 to 1/8 inch wide, white. Disk corollas 1/8 to 1/4 inch long, more flaring than in E. peregrinus. Achenes mostly asymmetrically 5-nerved. Pappus of 20-30 capillary bristles.
	Erigeron oreganus	Gorge daisy	Perennial with a stout mostly simple caudex and stout root; herbage glandular and loosely viscid-villous; stem lax, 5-15 cm long; basal leaves tufted, spatulate to obovate, coarsely toothed or incised, up to 9 cm long and 2.5 cm wide; cauline leaves well developed, broadly lanceolate to elliptic or ovate, up to 4 cm long and 1 cm wide; heads 1-severa in a leafy inflorescence, the disk 9-13 mm wide; involucre 5-7 mm high, glandular and viscid-villous, the bracts loose, equal, thin, green; rays mostly 30-60, bluish to more often pink or white, 5-8 mm long; disk corollas usually 3.4-4.7 mm long; pappus simple, of about 15-20 bristles which are characteristically curled and twisted for at least the upper half.
	Microseris borealis	northern microseris	Perennial (with stout taproot). Stems leafless with solitary flower head. Leaves with minute teeth on margins.
Boraginaceae			
	Hackelia diffusa var.	diffuse stickseed	Perennial 1 2/3 to 2/12 inches tall. Stems few, erect or ascending, internodes long near the base, short near midstem, the plant therefore appearing leafy near the middle. Pubescence strongly spreading, hirsute, becoming antrorsely appressed in the inflorescence. Radial leaves few to many, 5 to 9 inches long, 1/2 to 1 inch wide, elliptic, petiolate for 1/3 their length, hirsute, all but the lowermost cauline leaves sessile, the lower ones 3 2/3 to 6 inches long, 1/2 to 2/3 inch wide, elliptic, becoming lanceolate or linear-lanceolate above, at mid-stem 2 1/2 to 4 inches long and 1/4 to 1/3 inch wide. Pedicel 1/4 to 1/3 inch long in fruit. Calyx 1/8 inch long, lanceolate or linear-lanceolate. Corolla limb blue or cream, with a yellowish throat, 1/4 to 1/2 inch wide. Fornices with appendages papillate-puberulent to short pilose, not always evidently emarginate. Anthers 1/16 inch long. Nutlets 1/8 inch long, ovate, dorsal surface rough, verrucose-hispidulous, the intramarginal prickles distinct, 10. Prominent marginal prickles distinct to their bases, 1/16 to 1/8 inch long, these alternating with 1-3 short barbs.

TABLE 3 Special Status Plant Descriptions
Saddleback Wind Project

Family	Scientific Name	Common	Description
Brassicaceae			
	Rorippa columbiae	persistentsepal yellowcress	Low-growing perennial with stems that usually are 4-12 inches long. The stems generally grow flat on the ground but are sometimes erect and much-branched. The stems arise from underground stems and rhizomes and can at times form large clusters of stems. The leaves are divided almost to their center into several pairs of opposite leaflets, and sometimes have small teeth on the edge. Flowers are borne both on the ends of the stems and in the axis of leaves. The flowers are approximately 1/3 inch wide and have four bright yellow petals, which are about 1/10 inch long. The sepals are flat and ovate to oblong and tend to persist through fruiting. The fruits are almost oblong and are 1/4 inch long and are usually
Campanulace			
	Githopsis specularioides	common blue-cup	Annual herb with branched or unbranched stems up to 12 inches tall. In Washington it has usually been observed to be less than 6 inches tall. The plants are leafy stemmed, and the narrow, toothed, alternate leaves are sessile, up to 2/3 inch long and 1/16 inch wide. Flowers occur single, and are irregularly scattered on the upper stems, or are strictly terminal on small, unbranched plants. Flowers are deep blue, with a whitish throat, 3/8 inch long or less. Flowers have five lobes, and the lobes are about as long the flower tube. The sepals, 1/4 to 1/2 inch long, tend to obscure the flowers from view.
Caryophyllac			
	Silene douglasii. var. *monantha*	Douglas' silene	Caespitose perennial with a stout taproot, branched caudex, and numerous decumbent simple stems 1-4 (7) dm tall, finely and densely pubescent throughout with crisped and usually retrorse hairs, very rarely slightly glandular above; leaves mostly matted at the base of the stems and on the new shoots, narrowly to broadly oblanceolate to linear-lanceolate, mostly 2-5 (8) cm long, 2-7 (12) mm broad, acute, long-petiolate; cauline leaves 1-8 pairs, becoming smaller and sessile above; flowers usually 1-7, linear-bracteate, cymose, the lower ones sometimes remote from the terminal; calyx tubular, (10) 12-15 mm long, becoming inflated, papery, and tubular-campanulate in fruit, 10-nerved, usually thickly puberulent, less commonly nearly glabrous, very rarely somewhat glandular; corolla creamy-white or greenish, pink, or purplish-tinged; claw of the petals 8-12 mm long, sometimes auriculate, the blade oblong, 4-6 (8) mm long, bilobed 1/5 to 1/3 of the length but otherwise usually entire (very rarely with a small lateral tooth on each margin below the sinus); appendages 2, linear or oblong, 1 (3) mm long; carpophore 3-4 mm long, finely puberulent; styles 3 (4or 5); capsule 1-celled; seeds about 1.3 mm long, rugose-tesselate, the margins more prominently rounded-papillate.
Cyperaceae			
	Carex macrochaeta	large-awn sedge	Stems loosely clustered on a system of short, branching rhizomes, 1-7 dm tall, aphyllopodic; roots pubescent, covered with a yellowish-brown felt; leaves rather few, flat, mostly 2-5 mm wide, glabrous, evidently to obscurely white-papillate on the lower surface; staminate spike solitary (seldom 2 or 3), terminal, 1-3 cm long, with black or dark brown, awn-tipped scales; pistillate spikes (1) 2-4, not crowded, the lowest one loose or nodding on a slender, flexuous, often elongate peduncle and subtended by a leafy bract which may or may not surpass the inflorescence and which is sheathless or has a short sheath up to about 5 mmm long; upper pistillate spikes shorter-pedunculate or even sub-sessile, with shorter and less-foliaceous subtending bracts; pistillate scales black or sometimes merely dark purple or brown, often with a paler mid-vein, the body shorter or sometimes long than the perigynium, usually narrower distally than the perigynium, distinctly awn-tipped, the awn sometimes as much as 1 cm long, always at least some of the awns in the spike 2 mm long or more; perygynia glabrous, narrow, commonly lance-elliptic, light green or sometimes partly or wholly dark purplish, 10- to 15-nerved, 3.3-4.8 mm long, beakless or with a very short beak seldom over 0.2 mm long; stigmas 3; achene trigonous, 1.7-2.3 mm long, loosely enclosed in the lower half or three-fifths of the perigynium.

TABLE 3 Special Status Plant Descriptions
Saddleback Wind Project

Family	Scientific Name	Common	Description
Fagaceae			
	Chrysolepsis chrysophylla	golden chinquapin	Large shrub or small tree (3) 5-30 m tall, the bark thick and heavily furrowed; leaves with petioles scarcely 1 cm long, the blades lanceolate to oblong-lanceolate or -elliptic, (3) 5-10 cm long, entire, thick and coriaceous, dark green and glabrous or sparsely scurfy-tomentose above, yellow-green to golden and densely scurfy-tomentose beneath, the vase acute, gradually to abruptly acuminate; involucre a 4-valved, spiny bur 1.5-2 cm broad, containing 1 (2) hard-shelled nuts about
Fumiariaceae			
	Corydalis aquae-gelidae	Clackamas corydalis	Perennial from deep-seated, fleshy roots, the stems succulent and strongly fistulose, 12 to 44 inches tall, simple to branched; leaves several, yellowish-green, glaucous on the lower surface, the lower cauline ones up to 24 inches long often equaling the racemes, from 4 to 6 times pinnate, the ultimate segments very numerous, more or less elliptic, 3/16 to 1/2 inch long and 1/16 to 3/16 inches broad; racemes simple to compounded, conspicuously bracteate, rather compactly 30 to 60 flowered, ultimately elongate and up to 9 inches long; corolla 1/2 to 3/4 inch long, pale to deep pinkish with a slight trace of purple, the inner petals more deeply colored at the tip; spurred petal conspicuously crested, usually without free margins or the margins very slightly upturned; spur 3/8 inch long; capsule ellipsoid, 3/8 to 1/2 inch long, about 1/3 as thick, the style 1/4 to 1/2 as long; seeds about 1/16 inch long.
Iridaceae			
	Sisyrinchium sarmentosum	pale blue-eyed grass	Perennial herb up to 12 inches tall, although generally it is only 6 to 8 inches in height. The leaves are narrow and area generally, but not always, shorter than the stem. Both the stems and leaves are a pale green or blue-green color. Each stem has 2-7 flowers on slender pedicels. The perianth is pale blue with a yellow spot in the center. The tepals are about 1/2 inch in length and pale blue in color. The anthers are yellow. A technical description needs to be consulted for positive
Juncaceae			
	Juncus howellii	Howell's rush	Rhizomatous perennial 2-6 dm tall, the stems slightly compressed, exceeding the leaves; sheaths with membranous margins freed above and forming erect auricles 1-3 mm long; blades 2-4 mm broad dorsiventrally flattened, grasslike, nonseptate; heads (2) 3-9, in a terminal inflorescence 2-9 cm long, each head 3- to 8 (15)-flowered, 7-17 mm broad (pressed); involucral bract rarely as much as 15 mm long; perianth segments lanceolate-acuminate, 5-6.5 mm long, subequal, medium- to chestnut-brown with a broad greenish midstripe, usually minutely papillose toward the tip (under 20X magnification); stamens 6, the anthers 1.8-2.6 mm long, much longer than the filaments; capsule ovoid, 0,5-0.7 mm long, covered with a strongly reticulate membrane that forms a conspicuous appendage at each end.
Lentibulariac			
	Utricularia intermedia	flat-leaved bladderwort	Submersed plants with very slender stems, commonly creeping along the bottom; leaves numerous, alternate, mostly 1/4 to 3/4 inch long, commonly 3-parted at the base and then 1-3 time dichotomous, the segments often unequal, slender, flat, not much narrower in successive dichotomies, the ultimate ones rather blunt; blades borne on specialized branches distinct from the leaves, 1/16 to 3/16 inch wide; winter buds ovoid or ellipsoid, 3/16 to 18 inch long, flowers mostly 2-4 in lax racemes at the end of an emergent peduncle 2 1/2 to 8 inches long;; corolla yellow, the proper tube very short, the lower lip commonly 1/3 to 1/2 inch long, with a well-developed palate; upper li not much more than half as long as the lower; spur nearly as long as the broad, slightly lobed lower lip; fruiting pedicels suberect.

TABLE 3 Special Status Plant Descriptions
Saddleback Wind Project

Family	Scientific Name	Common	Description
Lycopodiacea			
	Lycopodiella inundata	bog clubmoss	Main stem annual, more or less elongate, prostrate or arching, irregularly rooting, leafy, giving rise to scattered, erect, leafy branches, each of which is up to about 1 dm tall and terminates in a cone 1.5-4 cm long; plant perennating by a winter bud; leaves crowded, in 8-10 ranks, think, narrow, mostly entire, 4-8 mm long and less than 1mm wide, broadest near the base, tapering gradually to the softly acicular tip, the ones on the lower side of the main stem twisted into a more or less erect position, those of the erect stems loosely ascending; sporophylls numerous, crowded, expanded at the base, otherwise resembling the vegetative leaves, the long, slender, green tips loosely ascending; sporangia ellipsoid-globose, about 1 mm wide; spores 43 microns or more in diameter,, rounded-triangular or nearly circular in outline, the outer face irregularly ridged-reticulate, the commissural faces papillate, the commissures in furrows; gametophyte cylindrical, erect, with distal filamentous lobes, distally emergent and photosynthetic.
Ophioglossac			
	Botrychium lunaria	moonwort	Plants (3) 6-18 (22) cm tall, glabrous throughout; sterile blade sessile or on a short stalk up to about 5 mm long, about equaling or more often somewhat shorter than the common stalk, which is (1.5) 4-10 cm long, the blade itself mostly 1.5 to 7 cm long and 0.7 to 3 (3.5) cm wide, distinctly pinnate, with (2) 3-6 (7) pairs of pinnae, these sessile, dichotomously veined, without a midrib, broadly flabellate, broader than long, crowded and often somewhat overlapping, the lowest pair not notable different from the next pair; fertile stalk and fruiting spike each 0.5 to 7 cm long, subequal or either one longer than the other; both the sterile blade and the fertile spike erect or nearly so in bud; bud glabrous, completely hidden by the sheathing base of the common stalk.
	Botrychium minganense	Mingan grape-fern	A small, herbaceous perennial fern. The sterile blade (trophophore) is dull green in color, narrowly oblong to linear in overall outline, about 10 cm long by 2.5 cm wide. The sterile blade is once-pinnate, with up to 10 pairs of pinnae. In general the segments are well-developed, cuneate to flabellate in shape, and spaced separately from each other along the rachis. The margins of the pinnae are entire to shallowly crenate. The lowest pinnae are narrowly fan-shaped. The above-ground or visible parts of this species consist of a single upright stem arising from the ground and terminating in a cluster of tiny ball-like structures that resemble a bunch of grapes. Branching off from the main stem is the sterile, fern like leaf blade (the trophophore).At the base of the common stalk, but just below the ground, are seveal layers of leaf primordia that are the preformed buds of plants that will emerge in future years.
	Botrychium pinnatum	St. John's moonwort	Plants mostly 1-2 dm tall, glabrous from the first, commonly yellow-green; sterile blade attached near or more commonly above the middle of the plant (the common stalk mostly 4-13 cm long) sessile or nearly so, mostly ovate or ovate-oblong in outline, mostly 2-5 cm long and 1.5-4 cm wide, somewhat fleshy, evidently veiny, bipinnate or subbipinnate (at least toward the bade), the pinnae mostly 3-6 pairs, the ultimate segments rounded, not much if at all longer than wide, somewhat crowded; fertile stalk mostly 1-4 cm long, the fertile spike 1.5-6 cm long, erect even in bud; sterile blade erect in bud except for the inclined but not clasping tip; bud glabrous, wholly concealed by the base of the common stalk.

TABLE 3 Special Status Plant Descriptions
Saddleback Wind Project

Family	Scientific Name	Common	Description
Orchidaceae			
	Cypripedium fasciculatum	clustered lady's slipper	Perennial herbaceous plant with a single erect stem 2-8 inches tall and a single pair of broad, parallel-veined, pleated leaves at or above the middle of the stem, which is covered with wooly hairs. Flowers droop in a tight cluster of 2-4 at the tip of the stem and consist of greenish-brown or greenish-purple petals and sepals, usually purple-lined or mottled, and a greenish-yellow pouch with brownish-purple margins, often with a purplish tinge. The stem above the leaves becomes erect and elongates as the capsules develop.
	Plantathera sparsifolia	canyon bog-orchid	Plant glabrous, 12 to 32 inches tall, the stems leafy mostly on the lower half. Leaves narrowly oblong-lanceolate, up to 10 inches long and mostly 1/2 to 1 1/4 inches broad. Raceme much elongate and usually very lax flowered, 6 to 16 inches long, the first several flowers rarely overlapping. Bracts usually shorter than the flowers but the lowermost sometimes considerably loner. Flowers greenish. Upper sepal broadly ovate to suborbicular, blunt, concave and converging with the upper petals to form a distinct hood, 1/4 to 1/3 inch long, 3-nerved. Lateral sepals spreading, falcately oblong-lanceolate, 1/4 to 1/2 inch long, 3-nerved. Lip pendent, thickish, linear to linear-lanceolate, 1/4 to 1/2 inch long. Spur cylindric to slightly clavate and mostly abruptly narrowed at the tip, from slightly shorter to somewhat longer than the lip, mostly somewhat curved. Column rather large, well over half as long as the upper sepal, the pollen sacs 1/16 inch long, well-separated by the connective.
	Spiranthes porrifolia	western ladies-tresses	Terrestrial, glabrous 8-20 inches tall; leaves 3 to 5, elliptic-lanceolate, basal or on lower portion of stem, sometimes absent at flowering time; stems with a few bracts above the leaves; inflorescence a dense spiral of up to forty small yellowish flowers in several vertical ranks; floral bracts lanceolate, 1/2 inch long; dorsal sepal lanceolate, lateral sepals similar but oblique; petals linear-lanceolate; lip ovate, not expanded at apex, base with prominent protuberances; column 1/16 inch long with dorsal anther; ovary sessile, stout, 1/16 inch long.
Polemoniace			
	Polemonium carneum	great polemonium	Perennial with loosely clustered (sometime solitary) stems from a woody rhizome or caudex, loosely erect, 3-10 dm tall, viscid-villous in the inflorescence, otherwise glabrous or nearly so except for the villous-ciliate margins of the petioles or the lower portion thereof, or sometimes the stem viscid-villous throughout; leaflets mostly 11-19, lanceolate to ovate or elliptic, generally acute, thin, mostly 1.5-4.5 cm long and 6-23 mm wide, the 3 terminal ones sometimes partly confluent; basal leaves long-petiolate, cauline progressively less so, long-pedicellate, in an open terminal, generally leafy inflorescence; calyx 7.5-14 mm long at anthesis, the lobes shorter or longer than the tube; corolla campanulate, (15) 18-28 mm long, the lobes longer than the tube, variable in color, often flesh-colored, salmon, or yellow, sometimes lavender to
Portulacacea			
	Montia diffusa	branching montia	Low, spreading, diffusely (more or less dichotomously) branched annual, up to 3-4 dm broad and as much as 1.5-2 dm tall; basal leaves few, the blade lanceolate or rhombic-lanceolate to suborbicular, mostly 1-2.5 cm long, often nearly as broad, abruptly narrowed to a petiole 2-4 time as long; cauline leaves alternate, not greatly reduced even in the inflorescence, usually more or less lanceolate-rhombic, the lower ones with blades sometimes as much as 5 cm long; racemes often ancillary to ordinarily foliage leaves, clustered and paniculate toward the branch ends, the lower 1 or 2 of the several flowers often from the axil of a leafy bract; sepals 2-3 mm long, unequal; petals white or pale pink, 3-4 mm long; stamens 5; capsule equaling or slightly exceeding the sepals, obovoid-pointed, 3-valved; seeds usually (1) 2-3, black, finely and regularly papillate with low, oval protuberances, 1.2-1.5 mm long, with a short conical strophiole nearly 0.5 mm long.

TABLE 3 Special Status Plant Descriptions
Saddleback Wind Project

Family	Scientific Name	Common	Description
Ranunculace			
	Cimicifuga elata	Tall bugbane	Tall woodland perennial with large expansive, bi- and triternate-toothed leaves. The leaves are downy-hairy above, smooth below and usually arranged in clusters of three, with 9-17 leaflets. The leaflets have 5-7 lobes, coarsely toothed margins and are similar in shape to maple leaves. Stem leaves gradually become smaller as the height of their attachment increases. Plants usually have a single, sometimes branched flowering stem, 3-6 feet tall, from a horizontal rhizome that is up to 4 inches long and 1 inch in diameter. The long, open racemes consist of many 1/4 inch white flowers whose sepals drop at once, giving the appearance of a "bottle brush" of long white stamens and pistils. As its fruits mature, the terminal raceme often becomes declined at a 45-90 degree angle from the axis of the main stem. The fruit is a dry flat capsule containing approximately 10 red to purple-brown seeds. Each flower usually produces 1 capsule; occasionally 2 or 3 capsules are produced. Somewhat similar to false bugbane (Trautvetteria caroliniensis) with tall (1-2 m), branched stems, large compound leaves (somewhat like those of Actea rubra), numerous small, white-stamened flowers in a narrow, terminal, branched inflorescence, and several-seeded follicles.
Saxifragacea			
	Bolandra oregana	bolandra	Weakly glandular-pubescent, herbaceous perennial with numerous bulblets along the very short, horizontal rootstocks, the stems mostly single, (1.5) 2-4 (6) dm tall; basal and lower cauline leaves with slender petioles up to 15 cm long, the blades reniform (2) 3-7 cm broad, shallowly lobed and with 9013 acutely dentate or usually somewhat serrate-dentate segments; petioles much shortened on the upper leaves and the stipules much more conspicuous and leaflike; bracts of the inflorescence somewhat clasping, 1-3 cm long, deeply crenate-dentate' panicle branches (1) 2-7, remote, spreading, 1-7 flowered; calyx accrescent and eventually 14-18 mm long, the linear-lanceolate, usually purplish lobes equaling or slightly exceeding the campanulate-tubular portion; petals purplish, linear, about equal to the calyx lobes, the stamens about 1/3 as long, the filament reddish-purple; capsule about 1 cm long, the carpels fused only 1/5 to 1/4 their length.
	Parnassia fimbriata var. *hoodiana*	fringed grass-of-parnassus	Rootstock short, rather stout, from slightly ascending to nearly erect; flowering stems 1-several, mostly 1.5-3 (5) dm tall. The bract cordate and more or less clasping, mostly 5-15 (20) mm long, borne from slightly below to considerably above midlength of the scape; petioles (1) 3-10 (15) cm long; leaf blades (1.5) 2-4 (5) cm broad, mostly reniform or somewhat reniform-auriculate and broader than long, but not uncommonly more nearly cordate or truncate at base, and sometimes slightly cuneate and somewhat longer than broad; calyx fused with the ovary for only about 1 mm, the segments oblong-ovate to elliptic-oval, 4-7 mm long, usually 5 (7) -veined, entire or more commonly crenulate-fimbriate, at least toward the rounded tip; petals white, 5- to 7-veined, 8-12 mm long (about twice as long as the calyx lobes, more or less cuneate-obovate in general appearance but claw-like at the base and with numerous long, filiform-linear, plainly cellular-verrucose fimbriae, becoming more or less erose to entire on the upper half; staminoidia thickened and scalelike, flared above the middle and usually with a central, subterminal, larger lobe and 7-9 marginal, short, thick, rounded lobes, but sometimes with 5-many elongate, slender, capitate-tipped segments; filaments stout, about equaling the calyx segments, anthers 2-2.5 mm long; capsule ovoid, about 1 cm long. Variety hoodiana: Staminodia ending in longer, more slender, filamentlike, usually capitate segments. Segments of the staminodia mostly less than 10, slender, strongly capitate, all marginal, equaling (or longer than) the rather narrow basal scale.
	Sullivantia oregana	Oregon sullivantia	Delicate, yellowish-green perennial spreading by long slender stolons, nearly or quite glabrous except for some glandular pubescence on the upper portion of the flowering stems and on the inflorescence, the hairs mostly purplish-tipped. The basal leaves are long-petiolate, the blade reniform, 1/2 to 4 inches broad, incisely lobed to 1/2 their length into 7 to 9 cuneate segments and again once or twice sharply toothed. Flowering stems 2 to 8 inches tall with 1 to 3 leaves that are greatly reduced upward. Flowers erect, but becoming sharply reflexed in fruit. Calyx glabrous, pale green, 1/10 to 1/8 inch long, more or less campanulate. Petals slightly long than the calyx lobes, the blade oval to obovate-oblanceolate, narrowed to a very short, broad claw. Stamens shorter than the sepals, the cordate anthers about equaling the slender filaments. Capsule about 1/8 inch long, seeds brown 1/16 inch long.

TABLE 3 Special Status Plant Descriptions
Saddleback Wind Project

Family	Scientific Name	Common	Description
Scrophularia			
	Collinsia sparsiflora var. *bruceae*	few-flowered collinsia	Plants annual, 2 to 8 inches tall, simple or often branched, erect, glabrous or minutely spreading-hirtellous. Leaves opposite throughout, the lower petiolate, with broadly elliptic or ovate to subround, often few-toothed blade about 1/2 inch long or less, often deciduous, the others narrow and becoming sessile, commonly linear to linear-oblong or linear-lanceolate, mostly entire, up to about 1 1/4 inches long and 1/4 inch wide. Flowers long-pedicellate, 1-3 at each of the upper nodes, their subtending leaves more or less reduced. Calyx 1/4 to 1/2 inch long, the lanceolate to narrowly lance-triangular, acute to acutish lobes prominent, firm-foliaceous, much longer than the tube, commonly concealing much of the corolla tube. Corolla blue-lavender or often white, 1/3 to 1/2 inch long, the tube abruptly bent near the base, forming and oblique angle with the calyx and strongly enlarged on the upper side at the bend. Keel generally somewhat hairy externally near the tip. Upper pair of filaments shortly spreading-hairy over most of their length. Capsule subglobose, 1/8 to 1/4 inch wide. Sees flattened, irregularly wing-margined, evidently ce3llular-reticulate, 1/8 inch long. Can be distinguished from other species of Collinsia by the following characters: upper filaments pubescent rather than glabrous; calyx nearly as long or as long as corolla; capsule subglobose rather than ellipsoid; seed flattened with a narrow wing margin, rather than turgid with a thickened margin, or flattened with a wide margin.
	Penstemon barrettiae	Barrett's beardtongue	Medium-sized perennial herb with stems 8-16 inches tall, much branched and somewhat shrubby at the base. The leaves area evergreen, thick, leathery or succulent, bluish- to grayish-green, and toothed along the margins. The rose-purple flowers are 1 to 1 1/2 inches long, tubular, and strongly two-lipped at the end. The flowers are approximately 1/2 inch wide at the mouth, and hairy on the inside of the lower lip.

Figures 1 and 2 are missing from Appendix C-3 as the full report was not provided to URS

C-4

Baseline Avian Use Surveys of the Project in Fall 2004, Summer 2006, and Winter-Spring 2008-2009

West, Inc. 2009

FINAL REPORT

Wildlife Baseline Studies for the Whistling Ridge Wind Resource Area Skamania County, Washington

Final Report
September 11 – November 4, 2004,
May 21 – July 14, 2006, and
December 4, 2008 – May 29, 2009

Prepared for:

SDS Lumber
P.O. Box 266
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Prepared by:

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Western **E**co**S**ystems **T**echnology**,** Inc.
2003 Central Avenue
Cheyenne, Wyoming

WEST, Inc.

August 7, 2009

EXECUTIVE SUMMARY

SDS Lumber has proposed a wind-energy facility in Skamania County, Washington, near the town of White Salmon. SDS Lumber contracted Western EcoSystems Technology, Inc. to conduct surveys and monitor wildlife resources in the Whistling Ridge Wind Resource Area to estimate the impacts of project construction and operations on wildlife. The following document contains results for fixed-point bird use surveys and incidental wildlife observations.

The proposed wind-energy facility contains minimal habitat diversity. Approximately 82.0% of the 1,151-acre (1.8 square mile; 4.7 square kilometer) area is composed of evergreen forest. The next most common habitat is developed open space, which comprises 8.5% of the Whistling Ridge Wind Resource Area. Shrub-scrub habitat comprises 7.1% and grassland areas comprise 1.8% of the study area. All other habitats collectively comprise less than 1% of the Whistling Ridge Wind Resource Area.

The principal objectives of the study were to: 1) provide site specific bird resource and use data that would be useful in evaluating potential impacts from the proposed wind-energy facility; 2) provide information that could be used in project planning and design of the facility to minimize impacts to birds; and 3) recommend further studies or potential mitigation measures, if warranted.

The objective of the fixed-point bird use surveys was to estimate the seasonal, spatial, and temporal use of the study area by birds, particularly raptors. Fixed-point surveys were conducted from September 11, 2004 through November 4, 2004, May 21, 2006 through July 14, 2006, and again in December 4, 2008 through May 29, 2009. A total of 261 20-minute fixed-point surveys were completed and 86 bird species were identified.

Waterfowl use only occurred during spring (0.07 birds/plot/20-min survey), and consisted of a single group of Canada geese. Raptor use was highest during the fall (0.63 birds/plot/20-min survey) and lowest during the spring (0.16). The most common raptors observed in the study area were red-tailed hawk, Cooper’s hawk, and sharp-shinned hawk. Vultures had the highest use in summer (0.31 birds/plot/20-min survey) and much lower use during all other seasons. Upland gamebirds had much lower use than other bird types recorded, with highest use recorded during spring (0.11 birds/plot/20-min survey). Passerines had the highest use among all bird types across all seasons, with use ranging from 14.13 birds/plot/20-minute survey in the summer to 1.65 in winter.

Levels of bird use varied within the study area by point. For all bird species combined, use was highest at points D, C, and B (13.7, 12.8, and 11.8 birds/20-minute survey, respectively). Bird use at other points ranged from 5.31 to 11.0 birds/20-minute survey. The higher mean use at points D, C, and B was due mostly to relatively high use by passerines at these points (11.1, 11.5, and 11.0 birds/20-minute survey, respectively). Passerine use at other points ranged from 4.15 to 8.94 birds/20-minute survey. Waterfowl use only occurred at point J, with 0.62 birds/20-minute survey. Raptor use was highest at point A (0.56 birds/20-minute survey), and ranged from zero to 0.35 birds/20-minute survey at other points. Vultures were observed at approximately half of the points (A, B, C, D, E, and H); use ranged from 0.04 birds/20-minute survey at point A to 0.36 at point D.

Survey points were located within evergreen forest habitat in the Whistling Ridge Wind Resource Area. No obvious flyways or concentration areas were observed. No strong association with topographic features within the study area was noted for raptors or other large birds. Although some differences in bird use were detected among survey points, the differences are not large enough to suggest that any portions of the Whistling Ridge Wind Resource Area should be avoided when siting turbines due to very high bird use.

During the study, 523 single or groups of birds totaling 1,449 individuals were observed flying during fixed-point bird use surveys. For all bird species combined, 65.7% of birds were observed flying below the likely zone of risk, 31.3% were within the zone of risk, and 3.0% were observed flying above the zone of risk for typical turbines that could be used in the Whistling Ridge Wind Resource Area. Bird types most often observed flying within the turbine zone of risk were doves/pigeons (58.8%), raptors (58.6%) and vultures (53.6%). Waterfowl were always observed flying above the zone of risk. Upland gamebirds, passerines, and other birds were typically observed flying below the zone of risk.

For all bird species with at least 10 separate groups of flying birds, only six species were observed flying within the zone of risk during more than 50% of observations: red crossbill (90.2%), common raven (55.1%), western bluebird (62.3%), band-tailed pigeon (59.4%), red-tailed hawk (70.0%), and turkey vulture (53.6%). Based on the use (measure of abundance) of the study area by each species and the flight characteristics observed for those species, the red crossbill and common raven had the highest probability of turbine exposure, with exposure indices of 0.29 and 0.23, respectively. The raptor species with the highest exposure index was the red-tailed hawk, which was ranked eleventh of all species, although its exposure index was only 0.05.

The objective of incidental wildlife observations was to provide a record of wildlife seen outside of the standardized surveys. Incidental observations included six bird species and five mammal species. The most abundant bird species recorded incidentally was pine siskin.

Based on fixed-point bird use data collected for the Whistling Ridge Wind Resource Area, mean annual raptor use was 0.28 raptors/plot/20-minute survey. The annual rate was low relative to raptor use at 36 other wind-energy facilities that implemented similar protocols to the present study and had data for three or four different seasons. Mean raptor use in the study area was low compared to these other wind resource areas, ranking twenty-ninth.

A regression analysis of raptor use and raptor collision mortality for 13 new-generation wind-energy facilities where similar methods were used to obtain raptor use estimates showed a significant (R^2 = 69.9%) correlation between raptor use and raptor collision mortality. Due to the low raptor use in comparison to most wind resource areas, using this regression to predict raptor collision mortality the Whistling Ridge Wind Resource Area yielded an estimated fatality rate of zero. However, A 90% prediction interval around this estimate is zero to 0.25 fatalities per megawatt per year.

Based on species composition of the most common raptor fatalities at other western wind-energy facilities and species composition of raptors observed at the Whistling Ridge Wind Resource Area during the surveys, the majority of the fatalities of diurnal raptors will likely consist of red-tailed hawk. Based on the seasonal use estimates, it is expected that risk to raptors would be unequal across seasons, with the lowest risk in spring and winter, and highest risk during the fall.

The data collected during this study suggests that the Whistling Ridge Wind Resource Area does not receive substantial use by waterfowl, and does not appear to be within a major migratory pathway for raptors. In addition, the study area does not appear to provide important stopover habitat for migrant songbirds based on fixed-point bird use surveys. Construction and operation of the wind-energy facility may displace some types of birds.

Some species considered to be sensitive or of conservation concern were observed within the Whistling Ridge Wind Resource Area. During all surveys and incidental observations, five sensitive bird species were observed including 30 Vaux's swifts, 15 pileated woodpeckers, five northern goshawks, three bald eagles, and two golden eagles. This is a tally that in some cases may represent repeated observations of the same individual.

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INTRODUCTION

SDS Lumber has proposed a wind-energy facility in Skamania County, Washington, near the town of White Salmon (Figures 1 and 2). SDS Lumber contracted Western EcoSystems Technology, Inc. (WEST) to conduct surveys and monitor wildlife resources in the Whistling Ridge Wind Resource Area (WRWRA) to estimate the impacts of wind-energy facility construction and operations on wildlife.

The principal objectives of the study were to: 1) provide site specific bird resource and use data that would be useful in evaluating potential impacts from the proposed wind-energy facility; 2) provide information that could be used in project planning and design of the facility to minimize impacts to birds; and 3) recommend further studies or potential mitigation measures, if warranted. The protocols for the baseline studies are similar to those used at other wind-energy facilities across the nation, and follow the guidance of the National Wind Coordinating Collaborative (Anderson et al. 1999). The protocols have been developed based on WEST's experience studying wildlife at proposed wind-energy facilities throughout the US, and were designed to help predict potential impacts to birds (particularly raptors).

Baseline surveys were conducted from September 11 through November 4, 2004, May 15 through July 14, 2006, and December 4, 2008 through May 29, 2009 at the WRWRA. Surveys were conducted across all four seasons and included fixed-point bird use surveys and incidental wildlife observations. Other baseline data have previously been collected at this site, including bat acoustical surveys, habitat mapping, rare plant surveys, and targeted surveys for species of concern including spotted owl (*Strix occidentalis*), northern goshawk (*Accipiter gentilis*), and western gray squirrel (*Sciurus griseus*). The results of those studies are included in other reports.

In addition to site-specific data, this report presents existing information and results of studies conducted at other wind-energy facilities. The ability to estimate potential bird mortality at the proposed WRWRA is greatly enhanced by operational monitoring data collected at existing wind-energy facilities. For several wind-energy facilities, standardized data on fixed-point surveys were collected in association with standardized post-construction (operational) monitoring, allowing comparisons of bird use with bird mortality. Where possible, comparisons with regional and local studies were made.

STUDY AREA

The proposed wind resource area is in southeast Skamania County, approximately four miles (6.4 kilometers [km]) northwest of White Salmon, Washington (Figure 1). The specific study area is just north of Underwood Mountain and includes Sections 5, 6, 7, & 8, Township 3N, Range 10E. The WRWRA consists of hilltops dominated by coniferous forests with some clearcuts and linear clearings associated with powerline rights-of-way (Figure 2). Elevation of the study area ranges from approximately 1,700 – 2,400 feet (ft; 518 – 732 meters [m]).

Approximately 82.0% of the 1,151-acre (1.8 square mile [mi^2]; 4.7 km^2) area is composed of evergreen forest (Table 1; Figure 3). Forests in the project area are managed by SDS Lumber for commercial timber production. The next most common habitat is developed, open space, which comprises 8.5% of the WRWRA. Shrub-scrub habitat comprises 7.1% and grassland areas comprise 1.8% of the WRWRA. All other habitats collectively comprise less than one percent of the WRWRA (Table 1).

METHODS

Fixed-Point Bird Use Surveys

The objective of the fixed-point bird use surveys was to estimate the seasonal, spatial, and temporal use of the study area by birds, particularly raptors, defined here as kites, accipiters, buteos, harriers, eagles, falcons, and owls. Fixed-point surveys (variable circular plots) were conducted using methods described by Reynolds et al. (1980). The points were selected to survey representative habitats and topography of the study area, while also providing relatively even coverage. All birds seen during each 20-minute (min) fixed-point survey were recorded.

Bird Use Survey Plots
Ten points were selected to achieve relatively even coverage of the study area and survey representative habitats and topography within the study area. Six of the points were used for the 2004 and 2006 surveys seasons, with four additional points being added for the 2008/2009 study season (Figure 4). Each survey plot was an 800-m (2,625-ft) radius circle centered on the point.

Bird Survey Methods
All species of birds observed during fixed-point surveys were recorded. Observations of large birds beyond the 800 m radius were recorded, but were not included in the statistical analyses; for small birds observations beyond the 100 m (328 ft) radius were excluded. A unique observation number was assigned to each observation.

The date, start and end time of the survey period, and weather information such as temperature, wind speed, wind direction, and cloud cover were recorded for each survey. Species or best possible identification, number of individuals, sex and age class (if possible), distance from plot center when first observed, closest distance, altitude above ground, activity (behavior), and habitat(s) were recorded for each observation. The behavior of each bird observed, and the vegetation type in which or over which the bird occurred, were recorded based on the point of first observation. Approximate flight height and flight direction at first observation were recorded to the nearest 5-m (16-ft) interval.

Locations of raptors, other large birds, and species of concern seen during fixed-point bird use surveys were recorded on field maps by observation number. Flight paths and perched locations were digitized using ArcGIS 9.3. Any comments were recorded in the comments section of the data sheet. Any unusual wildlife observations were recorded on the incidental datasheets.

Observation Schedule
Sampling intensity was designed to document bird use and behavior by habitat and season within the study area. Fixed-point surveys were conducted from September 11 through November 4,

2004 (fall migration period), from May 21 through July 14, 2006 (summer breeding season), from December 4, 2008 through March 15, 2009 (winter), and from March 16 through May 29, 2009 (spring migration period). Surveys were conducted approximately weekly during the spring, summer and fall, and every other week during the winter. Surveys were conducted during daylight hours and survey periods were varied to approximately cover all daylight hours during a season. To the extent practical, each point was surveyed about the same number of times. A total of 261 20-min fixed-point surveys were conducted at the WRWRA.

Incidental Wildlife Observations

The objective of incidental wildlife observations was to provide a record of wildlife seen outside of the standardized surveys. All raptors, unusual or unique birds, sensitive species, mammals, reptiles, and amphibians were recorded in a similar fashion to standardized surveys. The observation number, date, time, species, number of individuals, sex/age class, distance from observer, activity, height above ground (for bird species), habitat, and, in the case of sensitive species, the location was recorded by Universal Transverse Mercator (UTM) or Global Positioning System (GPS) coordinates.

Statistical Analysis

Quality Assurance and Quality Control
Quality assurance and quality control (QA/QC) measures were implemented at all stages of the study, including in the field, during data entry and analysis, and report writing. Following field surveys, observers were responsible for inspecting data forms for completeness, accuracy, and legibility. A sample of records from an electronic database was compared to the raw data forms and any errors detected were corrected. Irregular codes or data suspected as questionable were discussed with the observer and/or project manager. Errors, omissions, or problems identified in later stages of analysis were traced back to the raw data forms, and appropriate changes in all steps were made.

Data Compilation and Storage
A Microsoft® ACCESS database was developed to store, organize, and retrieve survey data. Data were keyed into the electronic database using a pre-defined format to facilitate subsequent QA/QC and data analysis. All data forms, field notebooks, and electronic data files were retained for reference.

Fixed-Point Bird Use Surveys
<u>Bird Diversity and Species Richness</u>
Bird diversity was illustrated by the total number of unique species observed. Species lists, with the number of observations and the number of groups, were generated by season, including all observations of birds detected regardless of their distance from the observer. Species richness was calculated as the mean number of species observed per plot per survey (i.e., number of species/plot/20-min survey). Species diversity and richness were compared between seasons for fixed-point bird use surveys.

Bird Use, Composition, and Frequency of Occurrence

For the standardized fixed-point bird use estimates, only observations of large birds detected within the 800-m radius plot were used; small birds observations were limited to 100 m. Estimates of mean bird use (i.e., number of birds/plot/20-min survey) were used to compare differences between bird types, seasons, and other wind-energy facilities.

The frequency of occurrence was calculated as the percent of surveys in which a particular species or bird type was observed. Percent composition was calculated as the proportion of the overall mean use for a particular species or bird type. Frequency of occurrence and percent composition provide relative estimates of species exposure to the proposed wind-energy facility. For example, a species may have high use estimates for the area based on just a few observations of large groups; however, the frequency of occurrence will indicate that the species occurs during very few of the surveys and therefore, the species may be less likely affected by the wind resource area.

Bird Flight Height and Behavior

To calculate potential risk to bird species, the first flight height recorded was used to estimate the percentages of birds flying within the likely “zone of risk” (ZOR) for collision with turbine blades of 35 to 130 m (114 to 427 ft) above ground level (AGL), which is the blade height of typical turbines that could be used at the WRWRA.

Bird Exposure Index

A relative index of collision exposure (R) was calculated for bird species observed during the fixed-point bird use surveys using the following formula:

$$R = A*P_f*P_t$$

Where A equals mean relative use for species *i* (large bird observations within 800 m of the observer or 100 m for small birds) averaged across all surveys, P_f equals the proportion of all observations of species *i* where activity was recorded as flying (an index to the approximate percentage of time species *i* spends flying during the daylight period), and P_t equals the proportion of all initial flight height observations of species *i* within the likely ZOR.

Spatial Use

Data were analyzed by comparing use among plots. Mapped flight paths were qualitatively compared to study area features such as topographic features. The objective of mapping observed bird locations and flight paths was to look for areas of concentrated use by raptors and other large birds and/or consistent flight patterns within the study area. This information can be useful in turbine layout design or adjustments of individual turbines for micro-siting.

RESULTS

Surveys were completed at the WRWRA from September 11 through November 4, 2004, May 21 through July 14, 2006 and December 4, 2008 – May 29, 2009. Eighty-eight bird species and five mammal species were identified during surveys completed at the WRWRA. Results of the fixed-point surveys and incidental wildlife observations, and the specific numbers of unique species for each survey type, are discussed in the sections below.

Fixed-Point Bird Use Surveys

Bird Diversity and Species Richness

Eighty-six unique species were observed over the course of all fixed-point bird use surveys, with a mean number 4.51 species/survey (Table 2). More unique species were observed during the spring (67 species), followed by summer (55), fall (39), and winter (16; Table 2). The mean number of species per survey was higher in the summer (10.84 species/survey), compared to spring (4.54), fall (4.02) and winter (1.16; Table 2). A total of 2,663 individual bird observations within 1,407 separate groups were recorded during the fixed-point surveys (Table 3). Cumulatively, six species (7.0% of all species) composed approximately 43.7% of the observations: dark-eyed junco (*Junco hyemalis*), American robin (*Turdus migratorius*), white-crowned sparrow (*Zonotrichia leucophrys*), yellow-rumped warbler (*Dendroica coronata*), common raven (*Corvus corax*), and Steller's jay (*Cyanocitta stelleri*). All other species comprised less than 5% of the observations. A total of 76 individual raptors were recorded within the WRWRA, representing 11 species (Table 3).

Bird Use, Composition, and Frequency of Occurrence by Season

Mean bird use, percent composition, and frequency of occurrence for all species and bird types by season were calculated (Table 4). The highest overall bird use occurred in the summer (15.98 birds/plot/20-min survey), followed by fall (14.34), spring (9.13), and winter (1.99). Passerines were the most abundant bird type observed across all seasons.

<u>Waterfowl</u>

Waterfowl were only observed during spring (0.07 birds/plot/20-minute survey; Table 4). The only waterfowl species recorded was Canada goose (*Branta canadensis*), which consisted of one group of eight individuals observed. Waterfowl comprised 0.8% of overall bird use in spring and were observed during 0.9% of spring surveys.

<u>Raptors</u>

Raptor use was much higher during fall (0.63 birds/plot/20-min survey; Table 4), compared to summer (0.22), winter (0.17) and spring (0.16; Table 4). High raptor use in fall consisted mostly of sharp-shinned hawk (*Accipter striatus*; 0.13 birds/plot/20-min survey), unidentified buteo (0.13), and Cooper's hawk (*Accipiter* cooperii; 0.12). Cooper's hawk had the highest use of any one raptor species in spring (0.06 birds/plot/20-min survey), red-tailed hawk (*Buteo jamaicensis*) had the highest use in summer (0.13), and bald eagle (*Haliaeetus leucocephalus*) had the highest use in winter (0.08), although this was due to observations of only two individual bald eagles. Raptors comprised 8.4% of the overall bird use in winter and 4.4% in fall, compared to 1.8% overall bird use in spring and 1.4% in summer. Raptors were observed during 34.8% of surveys in the fall and 22.2% in the summer, compared to 13.3% of the surveys in the winter and 12.9% in the spring.

Vultures

Vulture use was much higher in summer (0.31 birds/plot/20-minute survey; Table 4), than in spring (0.08), fall (0.08), and winter (zero). The only vulture species observed was turkey vulture (*Cathartes aura*). Vultures comprised 1.9% of overall bird use during summer surveys, 0.9% during spring surveys, and 0.5% during fall surveys. Vultures were observed during 11.1% of summer surveys, compared to 6.7% of spring surveys and 5.9% of fall surveys.

Upland Gamebirds

Upland gamebirds had relatively low use in spring, summer, and fall (0.11 birds/plot/20-min survey, 0.02, and 0.02, respectively; Table 4). Only three upland gamebird species were observed within the WRWRA, including wild turkey (*Meleagris gallopavo*), sooty grouse (*Dendragapus fuliginosus*), and ruffed grouse (*Bonasa umbellus*). Upland gamebirds comprised 1.2% of overall bird use during spring surveys and only 0.1% during both summer and fall surveys. Upland gamebirds were observed during 10.1% of surveys in the spring compared to 2.2% of summer surveys and 1.9% of fall surveys.

Passerines

Passerines had the highest use of any bird type during all four seasons (Table 4). Passerine use was highest in summer (14.13 birds/plot/20-min survey) and fall (12.53), and lower during spring (7.88) and winter (1.69). Passerine use varied by season. Passerines with the highest use by season were American robin in spring (1.31 birds/plot/20-min survey), white-crowned sparrow in summer (2.07), dark-eyed junco in fall (2.19), and common raven in winter (0.69). Passerines comprised greater than 80% of overall bird use during all seasons. Passerines were observed during 90% or more of the surveys during spring, summer, and fall surveys, and 58.3% of surveys in winter.

Bird Flight Height and Behavior

Flight height characteristics were estimated for both bird types and bird species (Tables 5 and 6). During the study, 523 single birds or groups totaling 1,449 individuals were observed flying during fixed-point bird use surveys (Table 5). Overall, 31.3% of birds observed flying were recorded within the ZOR for collision with turbine blades of 35 to 130 m (114 to 427 ft) AGL, 65.7% were below the ZOR, and 3.0% were flying above the ZOR (Table 5). More than half (58.6%) of flying raptors were observed flying within the ZOR, 15.5% were below the ZOR, and only 25.9% were above the ZOR. Raptor subtypes that were observed within the ZOR most often were falcons (100%), accipiters (65.2%), and eagles (60.0%). Doves/pigeons had the highest percentage of flying birds within the ZOR (58.8%) followed by raptors (58.6%) and vultures (53.6%). Upland gamebirds, passerines, and other birds were typically observed flying below the ZOR (Table 5).

Six species had at least 10 groups observed flying and were observed flying within the ZOR during at least 50% of observations, including red crossbill (*Loxia curvirostra*; 90.2%), common raven (*Corvus corax*; 55.1%), western bluebird (*Sialia mexicana*; 62.3%), band-tailed pigeon (*Columba fasciata*; 59.4%), red-tailed hawk (70.0%) and turkey vulture (53.6%; Table 6). Ten species were always seen flying within the likely ZOR; however, these were based on fewer than five observations.

Bird Exposure Index

A relative exposure index was calculated for each species (Table 6). This index is only based on initial flight height observations and relative abundance (defined as the use estimate) and does not account for other possible collision risk factors such as foraging or courtship behavior. Red crossbill (0.29) and common raven (0.23) had exposure indices higher than any other species. Red-tailed hawk had the highest exposure index of any raptor species (0.05); all other raptor species had an exposure index of 0.02 or less (Table 6).

Spatial Use

For all bird species combined, use was highest at points D, C, and B (13.7, 12.8 and 11.8 birds/20-min survey, respectively). Bird use at other points ranged from 5.31 to 11.0 birds/20-min survey (Figure 5). The higher mean use estimates for points D, C, and B were largely due to higher passerine use at these points (11.1, 11.5, and 11.0 birds/20-min survey, respectively). Passerine use at the other points ranged from 4.15 to 8.94 birds/20-min survey. Waterfowl use only occurred at point J with 0.62 birds/20-min survey. Raptor use was highest at point A (0.56 birds/20-min survey), and ranged from zero to 0.35 birds/20-min survey at other points. Vultures were observed at approximately half of the points (A, B, C, D, E, and H); use ranged from 0.04 birds/20-min survey at point A to 0.36 at point D. Upland gamebird use was highest at point G (0.17 birds/20-min survey), and ranged from zero to 0.09 birds/20-min survey at other points.

Flight paths for waterbirds, waterfowl, shorebirds, raptors, and vultures were digitized and mapped (Figures 6a-d). No obvious flyways or concentration areas were observed for any species. The available data do not indicate that any portions of the study area warrant being excluded from development due to very high bird use.

Incidental Wildlife Observations

There were six bird species observed incidentally, totaling 23 birds within eight separate groups during the study (Table 7). Five mammal species were also observed incidentally at the WRWRA.

Bird Observations

The most abundant bird species recorded as an incidental wildlife observation was pine siskin (*Carduelis pinus*; nine individuals). Two species, osprey (*Pandion haliaetus*) and common poorwill (*Phalaenoptilus nuttallii*), were only seen incidentally at the WRWRA. Canada goose, red-tailed hawk, and ruffed grouse (*Bonasa umbellus*) were also observed incidentally.

Mammal Observations

A total of five mammal species including 43 mule deer (*Odocoileus hemionus*), nine black-tailed deer (*Odocoileus hemionus columbianus*), three elk (*Cervus elephus*), one Douglas squirrel (*Tamiasciurus douglasii*), and one gray squirrel (*Sciurus* sp.) were observed incidentally during the fixed-point surveys at the WRWRA (Table 8). The gray squirrel was only observed for a brief period and therefore it could not be positively identified as being either a state threatened western gray squirrel or an eastern gray squirrel (*Sciurus carolinensis*).

DISCUSSION AND IMPACT ASSESSMENT

Bird Impacts

Direct Effects

The most probable direct impact to birds from wind-energy facilities is direct mortality or injury due to collisions with turbines or guy wires of meteorological (met) towers. Collisions may occur with resident birds foraging and flying within the study area or with migrant birds seasonally moving through the study area. Project construction could affect birds through loss of habitat, or potential fatalities from construction equipment. Impacts from the decommissioning of the facility are anticipated to be similar to construction in terms of noise, disturbance, and equipment. Potential mortality from construction equipment is expected to be very low. Equipment used in wind-energy facility construction generally moves at slow rates or is stationary for long periods (e.g., cranes). The risk of direct mortality to birds from construction is most likely potential destruction of a nest during initial site clearing if conducted during the nesting season.

Substantial data on bird mortality at wind-energy facilities are available from studies in California and throughout the West and Midwest. Of 841 bird fatalities reported from California studies (more than 70% from the Altamont Pass facility in California), about 39% were diurnal raptors, about 19% were passerines (excluding house sparrows [*Passer domesticus*] and European starlings [*Sturnus vulgaris*]), and about 12% were owls. Non-protected birds including house sparrows, European starlings, and rock pigeons (*Columba livia*) comprised about 15% of the fatalities. Other bird types generally made up less than 10% of the fatalities (Erickson et al. 2002b). During 12 fatality monitoring studies conducted outside of California, diurnal raptor fatalities comprised about 2% of the wind-energy facility-related fatalities and raptor mortality averaged 0.03/turbine/year. Passerines (excluding house sparrows and European starlings) were the most common collision victims, comprising about 82% of the 225 fatalities documented. For all bird species combined, estimates of the number of bird fatalities per turbine per year from individual studies ranged from zero at the Searsburg wind-energy facility in Vermont (Kerlinger 1997) and the Algona facility in Iowa (Demastes and Trainer 2000), to 7.7 at the Buffalo Mountain facility in Tennessee (Nicholson 2003). Using mortality data from a 10-year period from wind-energy facilities throughout the entire United States, the average number of bird collision fatalities is 3.1 per megawatt (MW) per year, or 2.3 per turbine per year (NWCC 2004).

<u>Raptor Use and Exposure Risk</u>

The annual mean raptor use at the WRWRA (0.28 raptors/plot/20-min survey) was compared with other wind-energy facilities that implemented similar protocols and had data for three or four seasons. Similar studies were conducted at 36 other wind-energy facilities. The annual mean raptor use at these wind-energy facilities ranged from 0.09 to 2.34 raptors/plot/20-min survey (Figure 7). Based on the results from these wind-energy facilities, a ranking of seasonal raptor mean use was developed as: low (0 – 0.5 raptors/plot/20-min survey); low to moderate (0.5 –

1.0); moderate (1.0 – 2.0); high (2.0 – 3.0); and very high (> 3.0). Under this ranking, mean raptor use (number of raptors divided by the number of 800 m plots and the total number of surveys) at the WRWRA is considered to be low. Compared to the other wind-energy facilities, the WRWRA ranked twenty-ninth (Figure 7).

Although high numbers of raptor fatalities have been documented at some wind-energy facilities (e.g. Altamont Pass), a review of studies at wind-energy facilities across the United States reported that only 3.2% of casualties were raptors (Erickson et al. 2001a). Indeed, although raptors occur in most areas with the potential for wind-energy development, individual species appear to differ from one another in their susceptibility to collision (NRC 2007). Results from Altamont Pass in California suggest that mortality for some species is not necessarily related to abundance (Orloff and Flannery 1992). American kestrels (*Falco sparverius*), red-tailed hawks, and golden eagles (*Aquila chrysaetos*) were killed more often than predicted based on abundance. Thus far, only three northern harrier (*Circus cyaneus*) fatalities at existing wind energy facilities have been reported in publicly available documents, despite the fact they are commonly observed during point counts at these facilities (Erickson et al. 2001a; Whitfield and Madders 2006). Because northern harriers often forage close to the ground, risk of collision with turbine blades is considered low for this species. Relative use by American kestrels at the High Winds facility was almost six times the use of American kestrels at the Altamont Pass facility (Kerlinger 2005). It is likely that many factors, in addition to abundance, are important in predicting raptor mortality.

An exposure index analysis may also provide insight into what species has a higher likelihood of turbine casualties. The index considers relative probability of exposure based on abundance, proportion of daily activity spent flying, and proportion of flight height of each species within the ZOR for turbines likely to be used at the wind-energy facility. For the WRWRA, the raptor species with the highest exposure index was the red-tailed hawk, which was ranked eleventh of all species (Table 6). The exposure index analysis is based on observations of birds during the daylight period and does not take into consideration flight behavior (e.g., during foraging or courtship) or abundance of nocturnal migrants. It also does not take into consideration habitat selection, the ability to detect and avoid turbines, and other factors that may vary among species and influence likelihood for turbine collision. For these reasons, the actual risk for some species may be lower or higher than indicated by this index

A regression analysis of raptor use and mortality for 13 new-generation wind-energy facilities, where similar methods were used to estimate raptor use and mortality, found that there was a significant correlation between use and mortality (R^2 = 69.9%; Figure 8). Using this regression to predict raptor collision mortality at the WRWRA, based on an adjusted mean raptor use of 0.28 raptors/20-min survey, yields an estimated fatality rate of zero due to the low raptor use observed. A 90% prediction interval around this estimate is zero to 0.25 fatalities/MW/year. Based on the relative abundance of red-tailed hawks, Cooper’s hawks, and sharp-shinned hawks, there is higher potential for fatalities of these three species compared to other species.

<u>Non-Raptor Use and Exposure Risk</u>

Mean overall bird use at the WRWRA was 9.3 birds/800-m radius plot/20-minute survey. Mean overall bird use for 24 other WRAs in the Pacific Northwest has ranged from 5-23.6. The

WRWRA ranks 19th compared to these 24 other WRA (Figure 9). To date, no relationships have been observed between overall use by bird types other than raptors, and fatality rates of those bird types at wind-energy facilities. However, the overall avian use at the WRWRA is low compared to most other WRAs in the Pacific Northwest and therefore high levels of avian mortality would not be expected.

Most bird species in the US are protected by the Migratory Bird Treaty Act (MBTA 1918). Passerines (primarily perching birds) have been the most abundant bird fatality at wind energy facilities outside California (Erickson et al. 2001a, 2002b), often comprising more than 80% of the bird fatalities. Both migrant and resident passerine fatalities have been observed. Given that passerines made up a large proportion of the birds observed during the baseline study, passerines would be expected to make up the largest proportion of fatalities at the WRWRA. Exposure indices based on observations within 100 m indicate that red crossbill is the most likely passerine to be exposed to collision from wind turbines at the WRWRA. Other passerine species likely most at risk based on abundance and flight behavior would include common raven, American robin, western bluebird, tree swallow (*Tachycineta bicolor*), evening grosbeak (*Coccothraustes vespertinus*), Vaux's swift (*Chaetura vauxi*), and American goldfinch (*Carduelis tristis*; Table 6b). Other non-raptor species with high exposure indices include turkey vulture and band-tailed pigeon. Most non-raptors had relatively low exposure indices due to the majority of individuals flying below the likely zone of risk. Due to the low exposure risks at WRWRA, it is unlikely that non-raptor populations will be adversely affected by direct mortality from the operation of the wind-energy facility.

The only waterfowl species observed in the WRWRA was a single group of eight Canada goose recorded during spring fixed-point bird use surveys, and another group of six individuals were observed incidentally. Wind-energy facilities with year-round use by water dependent species have shown the highest mortality, although the levels of waterfowl/waterbird/shorebird mortality appear insignificant compared to the use of the facilities by these groups. Of 1,033 bird carcasses collected at US wind-energy facilities, waterbirds comprised about 2%, waterfowl comprised about 3%, and shorebirds comprised less than 1% (Erickson et al. 2002b). At the Klondike, Oregon wind-energy facility, only two Canada goose fatalities were documented (Johnson et al. 2003) even though 43 groups totaling 4845 individual Canada geese were observed during pre-construction surveys (Johnson et al. 2002a). The recently constructed Top of Iowa wind-energy facility is located in cropland between three Wildlife Management Areas (WMAs) with historically high bird use, including migrant and resident waterfowl. During a recent study, approximately one million goose-use days and 120,000 duck-use days were recorded in the WMAs during the fall and early winter, and no waterfowl fatalities were documented during concurrent and standardized wind-energy facility fatality studies (Jain 2005). Similar findings were observed at the Buffalo Ridge wind-energy facility in southwestern Minnesota, which is located in an area with relatively high waterfowl/waterbird use and some shorebird use. Snow geese (*Chen caerulescens*), Canada geese, and mallards (*Anas platyrhynchos*) were the most common waterfowl observed. Three of the 55 fatalities observed during the fatality monitoring studies were waterfowl, including two mallards and one blue-winged teal (*Anas discors*). Two American coots (*Fulica americana*), one grebe, and one shorebird fatality were also found (Johnson et al. 2002b). Based on available evidence, waterfowl do not seem especially vulnerable to turbine collisions and significant impacts are not likely.

<u>Sensitive Species Use and Exposure Risk</u>
All sensitive species observed at the WRWRA are summarized in Table 8. No federal-listed species were observed during the study (Table 3). One gray squirrel was observed as an incidental observation. However, the gray squirrel was only observed for a brief period and therefore it could not be positively identified as being either a state threatened western gray squirrel or an eastern gray squirrel. One state sensitive species, bald eagle, was observed during fixed-point surveys at the WRWRA (two observations; Table 2). Four state candidate species, Vaux's swift, pileated woodpecker (*Dryocopus pileatus*), northern goshawk, and golden eagle, were observed during fixed point surveys (Table 8). The bald eagle and golden eagle are also legally protected under the Bald and Golden Eagle Protection Act (BGEPA 1940), while the others are protected under the Migratory Bird Treaty Act (MBTA 1918).

Use of the WRWRA by bald eagle, northern goshawk, and golden eagle was very low, and significant impacts are not expected. Vaux's swifts were fairly common and were commonly observed flying at turbine rotor-swept heights; therefore, some turbine mortality may occur for these species over the life of the facility. These collisions would likely be rare occurrences and it is unlikely the WRWRA would have any negative impacts on population levels in and near the study area. Based on seasonality of the observations, the Vaux's swifts appear to be migrants through the WRWRA rather than local breeding residents

Indirect Effects
The presence of wind turbines may alter the landscape so that wildlife use patterns are affected, displacing wildlife away from the project facilities and suitable habitat. Some studies from wind-energy facilities in Europe consider displacement effects to have a greater impact on birds than collision mortality (Gill et al. 1996). The greatest concern with displacement impacts for wind-energy facilities in the US has been where these facilities have been constructed in grassland or other native habitats (Leddy et al. 1999; Mabey and Paul 2007), Although Crockford (1992) suggests that disturbance appears to impact feeding, resting, and migrating birds, rather than breeding birds, results from studies at the Stateline wind-energy facility in Washington and Oregon (Erickson et al. 2004) and the Buffalo Ridge wind-energy facility in Minnesota (Johnson et al. 2000a) suggest that breeding birds are also affected by wind-facility operations.

<u>Raptor Displacement</u>
In addition to possible direct effects on raptors within the study area (discussed above), indirect effects caused by disturbance-type impacts, such as construction activity near an active nest or primary foraging area, also have a potential impact on raptor species. Birds displaced from wind-energy facilities might move to areas with fewer disturbances, but with lower quality habitat, with an overall effect of reducing breeding success. Most studies on raptor displacement at wind-energy facilities, however, indicate effects to be negligible (Howell and Noone 1992; Johnson et al. 2000a, 2003; Madders and Whitfield 2006). Notable exceptions to this include a study in Scotland that described territorial golden eagles avoiding the entire wind-energy facility area, except when intercepting non-territorial birds (Walker et al. 2005). A study at the Buffalo Ridge wind-energy facility in Minnesota found evidence of northern harriers avoiding turbines on both a small scale (< 100 m from turbines) and a larger scale in the year following construction (Johnson et al. 2000a). Two years following construction, however, no large-scale displacement of northern harriers was detected.

The only published report of avoidance of wind turbines by nesting raptors occurred at Buffalo Ridge, Minnesota, where raptor nest density on 101 mi^2 (262 km^2) of land surrounding a wind-energy facility was 5.94 nests/39 mi^2 (5.94 nests/101 km^2), yet no nests were present in the 12 mi^2 (31 km^2) facility itself, even though habitat was similar (Usgaard et al. 1997). However, this analysis assumes that raptor nests are uniformly distributed across the landscape, an unlikely event, and even though no nests were found, only two nests would be expected for an area 12 mi^2 in size if the nests were distributed uniformly. At a wind-energy facility in eastern Washington, based on extensive monitoring using helicopter flights and ground observations, raptors still nested in the study area at approximately the same levels after construction, and several nests were located within 0.5 miles (0.8 km) of turbines (Erickson et al. 2004). At the Foote Creek Rim Wind-Energy Facility in southern Wyoming, one pair of red-tailed hawks nested within 0.3 miles (0.5 km) of the turbine strings, and seven red-tailed hawk nests, one great horned owl (*Bubo virginianus*) nest, and one golden eagle nest located within one mile (1.6 km) of the wind-energy facility successfully fledged young (Johnson et al. 2000b). The golden eagle pair successfully nested 0.5 mile from the facility for three different years after it became operational. A Swainson's hawk (*Buteo swainsoni*) also nested within 0.25 mile (0.4 km) of a turbine string at the Klondike I wind-energy facility in Oregon after the facility was operational (Johnson et al. 2003). These observations suggest that there will be limited nesting displacement of raptors at the WRWRA.

<u>Displacement of Non-Raptor Bird Species</u>

Studies concerning displacement of non-raptor species have concentrated on grassland passerines and waterfowl/waterbirds (Winkelman 1990; Larsen and Madsen 2000; Mabey and Paul 2007). Wind-energy facility construction appears to cause small-scale local displacement of grassland passerines and is likely due to the birds avoiding turbine noise and maintenance activities. Construction also reduces habitat effectiveness because of the presence of access roads and large gravel pads surrounding turbines (Leddy 1996; Johnson et al. 2000a). Leddy et al. (1999) surveyed bird densities in Conservation Reserve Program (CRP) grasslands at the Buffalo Ridge wind-energy facility in Minnesota, and found mean densities of 10 grassland bird species were four times higher at areas located 180 m (591 ft) from turbines than they were at grasslands nearer turbines. Johnson et al. (2000a) found reduced use of habitat by seven of 22 grassland-breeding birds following construction of the Buffalo Ridge wind energy facility in Minnesota. Results from the Stateline wind-energy facility in Oregon and Washington (Erickson et al. 2004), and the Combine Hills wind-energy facility in Oregon (Young et al. 2005), suggest a relatively small impact of the wind-energy facilities on grassland nesting passerines. Transect surveys conducted prior to and after construction of the wind-energy facilities found that grassland passerine use was significantly reduced within approximately 50 m (164 ft) of turbine strings, but areas further away from turbine strings did not have reduced bird use.

Displacement effects of wind-energy facilities on waterfowl and shorebirds appear to be mixed. Studies from the Netherlands and Denmark suggest that densities of these types of species near turbines were lower compared to densities in similar habitats away from turbines (Winkelman 1990; Pedersen and Poulsen 1991). However, a study from a facility in England, found no effect of wind turbines on populations of cormorant (*Phalacrcorax xarbo*), purple sandpipers (*Calidris maritima*), eiders (*Somateria mollissima*), or gulls, although the cormorants were temporarily displaced during construction (Lawrence et al. 2007). At the Buffalo Ridge wind-energy facility in Minnesota, the abundance of several bird types, including shorebirds and waterfowl, were found to be significantly lower at survey plots with turbines than at reference plots without turbines (Johnson et al. 2000a). The report concluded that the area of reduced use was limited primarily to those areas within 100 m of the turbines. Disturbance tends to be greatest for migrating birds while feeding and resting (Crockford 1992; NRC 2007). The only waterfowl/waterbirds use at the WRWRA included one group of eight Canada goose observed during spring fixed-point bird use surveys and one group of six individuals during incidental observations. Based on the minimal presence of waterfowl/waterbird species, impacts should be negligible.

A study conducted in England to assess displacement of wintering farmland birds by wind turbines located in an agricultural landscape found that only common (ring-necked) pheasants (*Phasianus colchicus*) apparently avoided turbines. The other species/bird groups examined, including granivores, red-legged partridge (*Alectoris rufa*), Eurasian skylark (*Alauda arvensis*) and corvids, showed no displacement from wind turbines. In fact, Eurasian skylarks and corvids showed increased use of areas close to turbines, possibly due to increased food resources associated with disturbed areas (Devereux et al. 2008).

No studies have been conducted to assess displacement effects of birds in western coniferous forest. It is likely that some displacement may occur similar to that observed in other habitat types.

CONCLUSIONS AND RECOMMENDATIONS

Based on data collected during this study, raptor and all bird use of the WRWRA is generally lower than most wind resource areas evaluated throughout the western and Midwestern U.S. using similar methods. Based on the results of the studies to date, bird mortality at the WRWRA would likely be similar or lower than that documented at other wind-energy facilities located in the western and Midwestern United States where bird collision mortality has been relatively low.

Based on research conducted at wind-energy facilities throughout the US, raptor use at the WRWRA is generally lower than use levels recorded at other wind-energy facilities. Raptor fatality rates are expected to be within the range of fatality rates observed at other facilities where raptor use levels are lower. To date, no relationships have been observed between overall use by other bird types, and fatality rates of those bird types at wind-energy facilities. However, the flight characteristics and foraging habits of some species may result in increased exposure for these species at the WRWRA. The surveys conducted for this proposed wind resource area also do not address the impacts of the proposed facility to nocturnal migrants, such as passerines. To date, overall fatality rates for birds (including nocturnal migrants) at wind-energy facilities have been relatively low and consistent in the West. As more research is conducted at facilities in the West, more information regarding the potential direct impacts of wind-energy facilities to bird species will be obtained.

The proposed wind-energy facility contains minimal habitat diversity; approximately 82% of the WRWRA contains forested habitat, while the remaining areas are comprised of developed open space, scrub-shrub, and grasslands (Table 1, Figure 3). Some species considered to be sensitive or of conservation concern were observed within the WRWRA. Some potential exists for wind turbines to displace birds within forested habitats. Research concerning displacement impacts to songbirds, waterfowl and waterbirds and wind-energy facilities is limited, but some studies show the potential for small scale (180 m or less) displacement, while impacts to densities of birds at larger scales has not been shown.

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Table 1. The land cover types, coverage, and composition within the Whistling Ridge Wind Resource Area.

Habitat	Acres	% Composition
Developed, Open Space	97.55	8.5
Developed, Low Intensity	4.91	0.4
Deciduous Forest	2.32	0.2
Evergreen Forest	944.07	82.0
Mixed Forest	0.53	<0.1
Scrub-Shrub	81.32	7.1
Grassland	20.80	1.8
Total	**1,151.49**	**100**

Data from the National Landcover Database (USGS NLCD 2001).

Table 2. Summary of bird use (number of birds/plot/20-min survey), species richness (species/20-min survey), and sample size by season and overall during the fixed-point bird use surveys at the Whistling Ridge Wind Resource Area, September 11, 2004 - May 29, 2009.

Season	Number of Visits	Mean Use	Species Richness	# Species	# Surveys Conducted
Fall 2004	9	14.34	4.02	39	53
Summer 2006	9	15.98	10.84	55	45
Winter 2008/2009	6	1.99	1.16	16	47
Spring 2009	12	9.13	4.54	67	116
Overall	36	9.32	4.51	86	261

Table 3. Total number of individuals and groups for each bird type and species, by season and overall, during the fixed-point bird use surveys at the Whistling Ridge Wind Resource Area, September 11, 2004 - May 29, 2009.

		Fall 2004		Summer 2006		Winter 2008/09		Spring 2009		Total	
Species/Type	**Scientific Name**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
Waterfowl		**0**	**0**	**0**	**0**	**0**	**0**	**1**	**8**	**1**	**8**
Canada goose	*Branta canadensis*	0	0	0	0	0	0	1	8	1	8
Raptors		**29**	**33**	**10**	**10**	**6**	**7**	**25**	**26**	**70**	**76**
Accipiters		*16*	*16*	*4*	*4*	*1*	*1*	*10*	*10*	*31*	*31*
Cooper's hawk	*Accipiter cooperii*	6	6	0	0	1	1	8	8	15	15
northern goshawk	*Accipiter gentilis*	2	2	3	3	0	0	0	0	5	5
sharp-shinned hawk	*Accipter striatus*	7	7	1	1	0	0	2	2	10	10
unidentified accipiter		1	1	0	0	0	0	0	0	1	1
Buteos		*9*	*13*	*6*	*6*	*3*	*3*	*11*	*12*	*29*	*34*
red-tailed hawk	*Buteo jamaicensis*	6	6	6	6	3	3	11	12	26	27
unidentified buteo		3	7	0	0	0	0	0	0	3	7
Northern Harrier		*1*	*1*	*0*	*0*	*0*	*0*	*1*	*1*	*2*	*2*
northern harrier	*Circus cyaneus*	1	1	0	0	0	0	1	1	2	2
Eagles		*2*	*2*	*0*	*0*	*2*	*3*	*0*	*0*	*4*	*5*
bald eagle	*Haliaeetus leucocephalus*	0	0	0	0	2	3	0	0	2	3
golden eagle	*Aquila chrysaetos*	2	2	0	0	0	0	0	0	2	2
Falcons		*1*	*1*	*0*	*0*	*0*	*0*	*1*	*1*	*2*	*2*
American kestrel	*Falco sparverius*	0	0	0	0	0	0	1	1	1	1
prairie falcon	*Falco mexicanus*	1	1	0	0	0	0	0	0	1	1
Owls		*0*	*0*	*0*	*0*	*0*	*0*	*2*	*2*	*2*	*2*
northern saw-whet owl	*Aegolius acadicus*	0	0	0	0	0	0	1	1	1	1
snowy owl	*Bubo scandiacus*	0	0	0	0	0	0	1	1	1	1
Vultures		**4**	**4**	**6**	**14**	**0**	**0**	**10**	**12**	**20**	**30**
turkey vulture	*Cathartes aura*	4	4	6	14	0	0	10	12	20	30
Upland Gamebirds		**1**	**1**	**1**	**1**	**0**	**0**	**12**	**13**	**14**	**15**
ruffed grouse	*Bonasa umbellus*	1	1	1	1	0	0	0	0	2	2
sooty grouse	*Dendragapus fuliginosus*	0	0	0	0	0	0	2	2	2	2
wild turkey	*Meleagris gallopavo*	0	0	0	0	0	0	10	11	10	11

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		Fall 2004		Summer 2006		Winter 2008/09		Spring 2009		Total	
Species/Type	Scientific Name	# grps	# obs	# grps	# obs	# grps	# obs	# grps	# obs	# grps	# obs
Doves/Pigeons		**5**	**29**	**9**	**23**	**0**	**0**	**3**	**4**	**17**	**56**
band-tailed pigeon	*Columba fasciata*	3	27	9	23	0	0	3	4	15	54
mourning dove	*Zenaida macroura*	2	2	0	0	0	0	0	0	2	2
Passerines		**184**	**667**	**482**	**636**	**59**	**85**	**440**	**926**	**1,165**	**2,314**
American crow	*Corvus brachyrhynchos*	0	0	0	0	0	0	3	9	3	9
American goldfinch	*Carduelis tristis*	10	89	5	8	1	1	4	17	20	115
American robin	*Turdus migratorius*	9	44	22	27	9	12	48	149	88	232
barn swallow	*Hirundo rustica*	0	0	0	0	0	0	1	1	1	1
Bewick's wren	*Thryomanes bewickii*	0	0	1	1	0	0	0	0	1	1
black-capped chickadee	*Poecile atricapillus*	6	8	1	1	1	2	2	2	10	13
black-headed grosbeak	*Pheucticus melanocephalus*	0	0	23	25	0	0	11	15	34	40
black-throated gray warbler	*Dendroica nigrescens*	0	0	21	22	0	0	0	0	21	22
brown creeper	*Certhia americana*	0	0	0	0	1	1	3	3	4	4
brown-headed cowbird	*Molothrus ater*	0	0	5	6	0	0	2	3	7	9
Bullock's oriole	*Icterus bullockii*	0	0	0	0	0	0	1	1	1	1
Cassin's finch	*Carpodacus purpureus*	0	0	0	0	0	0	1	1	1	1
Cassin's vireo	*Vireo cassinii*	0	0	2	2	0	0	0	0	2	2
cedar waxwing	*Bombycilla cedrorum*	0	0	4	10	0	0	0	0	4	10
chestnut-backed chickadee	*Poecile rufescens*	1	1	12	21	2	2	7	16	22	40
chipping sparrow	*Spizella passerina*	0	0	7	8	0	0	2	2	9	10
Clark's nutcracker	*Nucifraga columbiana*	1	1	0	0	0	0	0	0	1	1
common raven	*Corvus corax*	34	59	5	5	31	37	36	43	106	144
dark-eyed junco	*Junco hyemalis*	23	116	23	30	0	0	45	123	91	269
evening grosbeak	*Coccothraustes vespertinus*	0	0	2	9	0	0	1	14	3	23
golden-crowned kinglet	*Regulus satrapa*	10	13	1	1	2	3	4	14	17	31
golden-crowned sparrow	*Zonotrichia atricapilla*	2	20	0	0	0	0	0	0	2	20

Table 3. Total number of individuals and groups for each bird type and species, by season and overall, during the fixed-point bird use surveys at the Whistling Ridge Wind Resource Area, September 11, 2004 - May 29, 2009.

		Fall 2004		Summer 2006		Winter 2008/09		Spring 2009		Total	
Species/Type	**Scientific Name**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
gray jay	*Perisoreus canadensis*	0	0	0	0	0	0	2	6	2	6
Hammond's flycatcher	*Empidonax hammondii*	0	0	5	5	0	0	1	1	6	6
hermit thrush	*Catharus guttatus*	0	0	2	2	0	0	5	6	7	8
hermit warbler	*Dendrocia occidentalis*	0	0	0	0	0	0	9	12	9	12
house wren	*Troglodytes aedon*	0	0	3	5	0	0	1	1	4	6
lazuli bunting	*Passerina amoena*	0	0	7	7	0	0	4	13	11	20
Lincoln's sparrow	*Melospiza lincolnii*	1	1	0	0	0	0	0	0	1	1
Macgillivray's warbler	*Oporornis tolmiei*	0	0	*27*	33	0	0	6	8	33	41
mountain chickadee	*Poecile gambeli*	1	2	0	0	0	0	1	1	2	3
Nashville warbler	*Vermivora ruficapilla*	0	0	2	2	0	0	7	10	9	12
northern rough-winged swallow	*Stelgidopteryx serripennis*	0	0	2	2	0	0	0	0	2	2
olive-sided flycatcher	*Contopus cooperi*	0	0	21	21	0	0	5	6	26	27
orange-crowned warbler	*Vermivora celata*	0	0	5	6	0	0	7	8	12	14
pacific-slope flycatcher	*Empidonac difficilis*	0	0	0	0	0	0	2	4	2	4
pine siskin	*Carduelis pinus*	0	0	3	11	0	0	5	13	8	24
purple finch	*Carpodacus purpureus*	1	2	14	20	0	0	1	6	16	28
red crossbill	*Loxia curvirostra*	4	30	9	48	0	0	1	8	14	86
red-breasted nuthatch	*Sitta canadensis*	11	12	11	12	6	6	18	24	46	54
red-winged blackbird	*Agelaius phoeniceus*	0	0	0	0	0	0	4	7	4	7
ruby-crowned kinglet	*Regulus calendula*	3	3	2	2	0	0	2	3	7	8
Say's phoebe	*Sayornis saya*	0	0	0	0	0	0	1	1	1	1
song sparrow	*Melospiza melodia*	1	1	0	0	1	1	1	2	3	4
spotted towhee	*Pipilo maculatus*	5	5	34	35	0	0	16	20	55	60
Steller's jay	*Cyanocitta stelleri*	31	76	12	16	4	5	27	41	74	138
Swainson's thrush	*Catharus ustulatus*	0	0	11	12	0	0	0	0	11	12
Townsend's solitaire	*Myadestes townsendi*	0	0	2	2	0	0	8	9	10	11
Townsend's warbler	*Dendroica townsendi*	0	0	13	14	0	0	0	0	13	14

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		Fall 2004		Summer 2006		Winter 2008/09		Spring 2009		Total	
Species/Type	**Scientific Name**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
tree swallow	*Tachycineta bicolor*	3	15	0	0	0	0	4	8	7	23
unidentified empidonax		0	0	1	1	0	0	0	0	1	1
unidentified finch		0	0	0	0	1	15	0	0	1	15
unidentified passerine		5	28	2	2	0	0	0	0	7	30
unidentified warbler		0	0	1	1	0	0	0	0	1	1
varied thrush	*Ixoreus naevius*	5	14	0	0	0	0	8	14	13	28
violet-green swallow	*Tachycineta thalassina*	0	0	3	4	0	0	13	38	16	42
warbling vireo	*Vireo gilvus*	0	0	10	10	0	0	1	1	11	11
western bluebird	*Sialia mexicana*	4	27	1	1	0	0	11	26	16	54
western tanager	*Piranga ludoviciana*	1	1	38	41	0	0	18	24	57	66
western wood-pewee	*Contopus virens*	0	0	11	12	0	0	3	3	14	15
white-breasted nuthatch	*Sitta carolinenis*	0	0	0	0	0	0	10	13	10	13
white-crowned sparrow	*Zonotrichia leucophrys*	3	58	57	93	0	0	38	80	98	231
willow flycatcher	*Empidonax traillii*	0	0	8	9	0	0	0	0	8	9
Wilson's warbler	*Wilsonia pusilla*	0	0	16	16	0	0	2	2	18	18
yellow warbler	*Dendroica petechia*	0	0	1	1	0	0	0	0	1	1
yellow-rumped warbler	*Dendroica coronata*	9	41	14	14	0	0	27	94	50	149
Other Birds		**15**	**29**	**28**	**35**	**5**	**5**	**70**	**93**	**118**	**162**
downy woodpecker	*Picoides pubescens*	0	0	1	1	1	1	1	1	3	3
hairy woodpecker	*Picoides villosus*	2	2	6	8	0	0	10	11	18	21
northern flicker	*Colaptes auratus*	4	6	12	15	2	2	22	25	40	48
pileated woodpecker	*Dryocopus pileatus*	6	6	0	0	2	2	7	7	15	15
red-breasted sapsucker	*Sphyrapicus ruber*	0	0	0	0	0	0	22	29	22	29
rufous hummingbird	*Selasphorus rufus*	0	0	7	7	0	0	5	8	12	15
unidentified hummingbird		0	0	0	0	0	0	1	1	1	1
Vaux's swift	*Chaetura vauxi*	3	15	2	4	0	0	2	11	7	30
Unidentified Birds		**0**	**0**	**0**	**0**	**2**	**2**	**0**	**0**	**2**	**2**

Table 3. Total number of individuals and groups for each bird type and species, by season and overall, during the fixed-point bird use surveys at the Whistling Ridge Wind Resource Area, September 11, 2004 - May 29, 2009.

		Fall 2004		Summer 2006		Winter 2008/09		Spring 2009		Total	
Species/Type	**Scientific Name**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
unidentified bird		0	0	0	0	2	2	0	0	2	2
Overall		**238**	**763**	**536**	**719**	**72**	**99**	**561**	**1,082**	**1,407**	**2,663**

Table 4. Mean bird use (number of birds/plot/20-min survey), percent of total composition (%), and frequency of occurrence (%) for each bird type and species by season during the fixed-point bird use surveys at the Whistling Ridge Wind Resource Area, September 11, 2004 - May 29, 2009.

	Use				% Composition				% Frequency			
Species/Type	**Fall 2004**	**Summer 2006**	**Winter 2008/09**	**Spring 2009**	**Fall 2004**	**Summer 2006**	**Winter 2008/09**	**Spring 2009**	**Fall 2004**	**Summer 2006**	**Winter 2008/09**	**Spring 2009**
Waterfowl	**0**	**0**	**0**	**0.07**	**0**	**0**	**0**	**0.8**	**0**	**0**	**0**	**0.9**
Canada goose	0	0	0	0.07	0	0	0	0.8	0	0	0	0.9
Raptors	**0.63**	**0.22**	**0.17**	**0.16**	**4.4**	**1.4**	**8.4**	**1.8**	**34.8**	**22.2**	**13.3**	**12.9**
Accipiters	*0.31*	*0.09*	*0.03*	*0.08*	*2.1*	*0.6*	*1.7*	*0.8*	*25.2*	*8.9*	*3.3*	*7.7*
Cooper's hawk	0.12	0	0.03	0.06	0.8	0	1.7	0.7	11.9	0	3.3	6.0
northern goshawk	0.04	0.07	0	0	0.3	0.4	0	0	4.1	6.7	0	0
sharp-shinned hawk	0.13	0.02	0	0.02	0.9	0.1	0	0.2	7.4	2.2	0	1.7
unidentified accipiter	0.02	0	0	0	0.1	0	0	0	1.9	0	0	0
Buteos	*0.24*	*0.13*	*0.05*	*0.05*	*1.7*	*0.8*	*2.5*	*0.6*	*15.2*	*13.3*	*5.0*	*3.4*
red-tailed hawk	0.11	0.13	0.05	0.05	0.8	0.8	2.5	0.6	11.5	13.3	5.0	3.4
unidentified buteo	0.13	0	0	0	0.9	0	0	0	5.6	0	0	0
Northern Harrier	*0.02*	*0*	*0*	*0.01*	*0.1*	*0*	*0*	*0.1*	*1.9*	*0*	*0*	*0.8*
northern harrier	0.02	0	0	0.01	0.1	0	0	0.1	1.9	0	0	0.8
Eagles	*0.04*	*0*	*0.08*	*0*	*0.3*	*0*	*4.2*	*0*	*4.1*	*0*	*5.0*	*0*
bald eagle	0	0	0.08	0	0	0	4.2	0	0	0	5.0	0
golden eagle	0.04	0	0	0	0.3	0	0	0	4.1	0	0	0
Falcons	*0.02*	*0*	*0*	*0.01*	*0.1*	*0*	*0*	*0.1*	*1.9*	*0*	*0*	*0.8*
American kestrel	0	0	0	0.01	0	0	0	0.1	0	0	0	0.8
prairie falcon	0.02	0	0	0	0.1	0	0	0	1.9	0	0	0
Owls	*0*	*0*	*0*	*0.02*	*0*	*0*	*0*	*0.2*	*0*	*0*	*0*	*1.8*
northern saw-whet owl	0	0	0	0.01	0	0	0	0.1	0	0	0	0.9
snowy owl	0	0	0	0.01	0	0	0	0.1	0	0	0	0.8
Vultures	**0.08**	**0.31**	**0**	**0.08**	**0.5**	**1.9**	**0**	**0.9**	**5.9**	**11.1**	**0**	**6.7**
turkey vulture	0.08	0.31	0	0.08	0.5	1.9	0	0.9	5.9	11.1	0	6.7
Upland Gamebirds	**0.02**	**0.02**	**0**	**0.11**	**0.1**	**0.1**	**0**	**1.2**	**1.9**	**2.2**	**0**	**10.1**
ruffed grouse	0.02	0.02	0	0	0.1	0.1	0	0	1.9	2.2	0	0
sooty grouse	0	0	0	0.02	0	0	0	0.2	0	0	0	1.7

Table 4. Mean bird use (number of birds/plot/20-min survey), percent of total composition (%), and frequency of occurrence (%) for each bird type and species by season during the fixed-point bird use surveys at the Whistling Ridge Wind Resource Area, September 11, 2004 - May 29, 2009.

	Use				% Composition				% Frequency			
Species/Type	**Fall 2004**	**Summer 2006**	**Winter 2008/09**	**Spring 2009**	**Fall 2004**	**Summer 2006**	**Winter 2008/09**	**Spring 2009**	**Fall 2004**	**Summer 2006**	**Winter 2008/09**	**Spring 2009**
wild turkey	0	0	0	0.09	0	0	0	1.0	0	0	0	8.4
Doves/Pigeons	**0.54**	**0.51**	**0**	**0.03**	**3.7**	**3.2**	**0**	**0.4**	**9.3**	**17.8**	**0**	**2.6**
band-tailed pigeon	0.50	0.51	0	0.03	3.5	3.2	0	0.4	5.6	17.8	0	2.6
mourning dove	0.04	0	0	0	0.3	0	0	0	3.7	0	0	0
Passerines	**12.53**	**14.13**	**1.69**	**7.88**	**87.4**	**88.5**	**84.6**	**86.4**	**94.4**	**100.0**	**58.3**	**91.9**
American crow	0	0	0	0.08	0	0	0	0.9	0	0	0	2.7
American goldfinch	1.71	0.18	0.02	0.14	12.0	1.1	0.8	1.6	17.4	11.1	1.7	3.3
American robin	0.81	0.60	0.23	1.31	5.7	3.8	11.7	14.4	14.8	46.7	16.7	41.4
barn swallow	0	0	0	0.01	0	0	0	0.1	0	0	0	0.8
Bewick's wren	0	0.02	0	0	0	0.1	0	0	0	2.2	0	0
black-capped chickadee	0.15	0.02	0.03	0.02	1.0	0.1	1.7	0.2	11.1	2.2	1.7	1.8
black-headed grosbeak	0	0.56	0	0.13	0	3.5	0	1.4	0	44.4	0	9.2
black-throated gray warbler	0	0.49	0	0	0	3.1	0	0	0	46.7	0	0
brown-headed cowbird	0	0.13	0	0.03	0	0.8	0	0.3	0	11.1	0	1.7
brown creeper	0	0	0.02	0.03	0	0	0.8	0.3	0	0	1.7	2.5
Bullock's oriole	0	0	0	0.01	0	0	0	0.1	0	0	0	0.8
Cassin's finch	0	0	0	0.01	0	0	0	0.1	0	0	0	0.8
Cassin's vireo	0	0.04	0	0	0	0.3	0	0	0	4.4	0	0
cedar waxwing	0	0.22	0	0	0	1.4	0	0	0	8.9	0	0
chestnut-backed chickadee	0.02	0.47	0.05	0.14	0.1	2.9	2.5	1.6	1.9	26.7	5.0	6.0
chipping sparrow	0	0.18	0	0.02	0	1.1	0	0.2	0	15.6	0	1.7
Clark's nutcracker	0.02	0	0	0	0.1	0	0	0	1.9	0	0	0
common raven	1.12	0.11	0.69	0.34	7.8	0.7	34.8	3.7	48.9	11.1	36.0	22.9
dark-eyed junco	2.19	0.67	0	1.09	15.2	4.2	0	12.0	41.5	48.9	0	36.2
evening grosbeak	0	0.20	0	0.12	0	1.3	0	1.3	0	4.4	0	0.8
golden-crowned kinglet	0.25	0.02	0.07	0.12	1.7	0.1	3.6	1.3	19.3	2.2	4.8	3.3
golden-crowned sparrow	0.37	0	0	0	2.6	0	0	0	3.7	0	0	0

Table 4. Mean bird use (number of birds/plot/20-min survey), percent of total composition (%), and frequency of occurrence (%) for each bird type and species by season during the fixed-point bird use surveys at the Whistling Ridge Wind Resource Area, September 11, 2004 - May 29, 2009.

	Use				% Composition				% Frequency			
Species/Type	Fall 2004	Summer 2006	Winter 2008/09	Spring 2009	Fall 2004	Summer 2006	Winter 2008/09	Spring 2009	Fall 2004	Summer 2006	Winter 2008/09	Spring 2009
gray jay	0	0	0	0.05	0	0	0	0.5	0	0	0	1.7
Hammond's flycatcher	0	0.11	0	0.01	0	0.7	0	0.1	0	11.1	0	0.8
hermit thrush	0	0.04	0	0.05	0	0.3	0	0.5	0	4.4	0	4.2
hermit warbler	0	0	0	0.10	0	0	0	1.1	0	0	0	7.5
house wren	0	0.11	0	0.01	0	0.7	0	0.1	0	6.7	0	0.8
lazuli bunting	0	0.16	0	0.11	0	1.0	0	1.2	0	15.6	0	3.3
Lincoln's sparrow	0.02	0	0	0	0.1	0	0	0	1.9	0	0	0
Macgillivray's warbler	0	0.73	0	0.07	0	4.6	0	0.7	0	48.9	0	5.0
mountain chickadee	0.04	0	0	0.01	0.3	0	0	0.1	1.9	0	0	0.8
Nashville warbler	0	0.04	0	0.08	0	0.3	0	0.9	0	4.4	0	5.8
northern rough-winged swallow	0	0.04	0	0	0	0.3	0	0	0	4.4	0	0
olive-sided flycatcher	0	0.47	0	0.05	0	2.9	0	0.5	0	40.0	0	4.2
orange-crowned warbler	0	0.13	0	0.07	0	0.8	0	0.7	0	11.1	0	5.8
pacific-slope flycatcher	0	0	0	0.03	0	0	0	0.4	0	0	0	1.7
pine siskin	0	0.24	0	0.11	0	1.5	0	1.2	0	6.7	0	4.2
purple finch	0.04	0.44	0	0.05	0.3	2.8	0	0.5	1.9	31.1	0	0.8
red-breasted nuthatch	0.22	0.27	0.10	0.20	1.5	1.7	5.0	2.2	20.4	24.4	10.0	15.4
red-winged blackbird	0	0	0	0.06	0	0	0	0.6	0	0	0	3.3
red crossbill	0.56	1.07	0	0.07	3.9	6.7	0	0.7	7.4	20.0	0	0.8
ruby-crowned kinglet	0.06	0.04	0	0.03	0.4	0.3	0	0.3	5.6	4.4	0	1.7
Say's phoebe	0	0	0	0.01	0	0	0	0.1	0	0	0	0.8
song sparrow	0.02	0	0.02	0.02	0.1	0	0.8	0.2	1.9	0	1.7	0.8
spotted towhee	0.10	0.78	0	0.17	0.7	4.9	0	1.8	10.0	64.4	0	13.3
Steller's jay	1.42	0.36	0.10	0.35	9.9	2.2	4.9	3.9	47.0	26.7	7.4	22.2
Swainson's thrush	0	0.27	0	0	0	1.7	0	0	0	24.4	0	0
Townsend's solitaire	0	0.04	0	0.08	0	0.3	0	0.8	0	4.4	0	6.7
Townsend's warbler	0	0.31	0	0	0	1.9	0	0	0	24.4	0	0

Table 4. Mean bird use (number of birds/plot/20-min survey), percent of total composition (%), and frequency of occurrence (%) for each bird type and species by season during the fixed-point bird use surveys at the Whistling Ridge Wind Resource Area, September 11, 2004 - May 29, 2009.

	Use				% Composition				% Frequency			
Species/Type	**Fall 2004**	**Summer 2006**	**Winter 2008/09**	**Spring 2009**	**Fall 2004**	**Summer 2006**	**Winter 2008/09**	**Spring 2009**	**Fall 2004**	**Summer 2006**	**Winter 2008/09**	**Spring 2009**
tree swallow	0.30	0	0	0.07	2.1	0	0	0.7	4.1	0	0	3.3
unidentified empidonax	0	0.02	0	0	0	0.1	0	0	0	2.2	0	0
unidentified finch	0	0	0.36	0	0	0	17.9	0	0	0	2.4	0
unidentified passerine	0.52	0.04	0	0	3.6	0.3	0	0	9.3	4.4	0	0
unidentified warbler	0	0.02	0	0	0	0.1	0	0	0	2.2	0	0
varied thrush	0.26	0	0	0.12	1.8	0	0	1.3	9.3	0	0	6.9
violet-green swallow	0	0.09	0	0.32	0	0.6	0	3.5	0	6.7	0	11.1
warbling vireo	0	0.22	0	0.01	0	1.4	0	0.1	0	22.2	0	0.8
western bluebird	0.50	0.02	0	0.23	3.5	0.1	0	2.5	5.6	2.2	0	9.5
western tanager	0.02	0.91	0	0.20	0.1	5.7	0	2.2	1.9	75.6	0	15.0
western wood-pewee	0	0.27	0	0.03	0	1.7	0	0.3	0	24.4	0	2.5
white-breasted nuthatch	0	0	0	0.11	0	0	0	1.2	0	0	0	8.3
white-crowned sparrow	1.07	2.07	0	0.67	7.5	12.9	0	7.3	5.6	77.8	0	30.8
willow flycatcher	0	0.20	0	0	0	1.3	0	0	0	17.8	0	0
Wilson's warbler	0	0.36	0	0.02	0	2.2	0	0.2	0	35.6	0	1.7
yellow-rumped warbler	0.76	0.31	0	0.78	5.3	1.9	0	8.6	14.8	31.1	0	22.5
yellow warbler	0	0.02	0	0	0	0.1	0	0	0	2.2	0	0
Other Birds	**0.54**	**0.78**	**0.10**	**0.78**	**3.8**	**4.9**	**5.0**	**8.6**	**26.7**	**44.4**	**10.0**	**47.2**
downy woodpecker	0	0.02	0.02	0.01	0	0.1	0.8	0.1	0	2.2	1.7	0.9
hairy woodpecker	0.04	0.18	0	0.09	0.3	1.1	0	1.0	3.7	13.3	0	8.6
northern flicker	0.11	0.33	0.05	0.21	0.8	2.1	2.5	2.3	7.4	26.7	5.0	18.4
pileated woodpecker	0.11	0	0.03	0.06	0.8	0	1.7	0.6	11.5	0	3.3	5.9
red-breasted sapsucker	0	0	0	0.24	0	0	0	2.6	0	0	0	18.3
rufous hummingbird	0	0.16	0	0.07	0	1.0	0	0.7	0	15.6	0	4.2
unidentified hummingbird	0	0	0	0.01	0	0	0	0.1	0	0	0	0.8
Vaux's swift	0.28	0.09	0	0.09	2.0	0.6	0	1.0	4.1	4.4	0	1.7
Unidentified Birds	**0**	**0**	**0.04**	**0**	**0**	**0**	**2.0**	**0**	**0**	**0**	**4.0**	**0**

Table 4. Mean bird use (number of birds/plot/20-min survey), percent of total composition (%), and frequency of occurrence (%) for each bird type and species by season during the fixed-point bird use surveys at the Whistling Ridge Wind Resource Area, September 11, 2004 - May 29, 2009.

Species/Type	Use				% Composition				% Frequency			
	Fall 2004	Summer 2006	Winter 2008/09	Spring 2009	Fall 2004	Summer 2006	Winter 2008/09	Spring 2009	Fall 2004	Summer 2006	Winter 2008/09	Spring 2009
unidentified bird	0	0	0.04	0	0	0	2.0	0	0	0	4.0	0
Overall	**14.34**	**15.98**	**1.99**	**9.13**	**100**	**100**	**100**	**100**				

Table 5. Flight height characteristics by bird type during fixed-point bird use surveys at the Whistling Ridge Wind Resource Area, September 11, 2004 - May 29, 2009.

Bird Type	# Groups Flying	# Obs Flying	Mean Flight Height (m)	% Obs Flying	% within Flight Height Categories 0-35 m	35-130 m	> 130 m
Waterfowl	1	8	180.00	100	0	0	100
Raptors	52	58	86.96	84.1	15.5	58.6	25.9
Accipiters	*23*	*23*	*68.39*	*76.7*	*21.7*	*65.2*	*13.0*
Buteos	*21*	*26*	*115.57*	*92.9*	*3.8*	*53.8*	*42.3*
Northern Harrier	*2*	*2*	*23.50*	*100*	*100*	*0*	*0*
Eagles	*4*	*5*	*90.00*	*100*	*20.0*	*60.0*	*20.0*
Falcons	*2*	*2*	*57.50*	*100*	*0*	*100*	*0*
Owls	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Vultures	18	28	111.72	100	17.9	53.6	28.6
Upland Gamebirds	1	1	1.00	6.7	100	0	0
Doves/Pigeons	15	34	63.93	60.7	35.3	58.8	5.9
Passerines	384	1,235	29.79	53.6	69.7	29.5	0.8
Other Birds	52	85	18.56	52.5	75.3	24.7	0
Unidentified Birds	0	0	0	0	0	0	0
Overall	**523**	**1,449**	**38.39**	**54.8**	**65.7**	**31.3**	**3.0**

ZOR: The likely "zone of risk" for potential collision with a turbine blade, 35 – 130m or (114-427 ft) above ground level (AGL).

Table 6. Relative exposure index and flight characteristics by species during the fixed-point bird use surveys at the Whistling Ridge Wind Resource Area, September 11, 2004 - May 29, 2009.

Species	# Groups Flying	Overall Mean Use	% Flying	% Flying within ZOR based on initial obs	Exposure Index	% Within ZOR at anytime
red crossbill	12	0.34	95.3	90.2	0.29	90.2
common raven	67	0.59	72.1	55.1	0.23	68.4
American robin	31	0.73	59.5	31.9	0.14	41.3
western bluebird	15	0.18	98.1	62.3	0.11	67.9
unidentified passerine	6	0.13	96.7	75.9	0.09	75.9
band-tailed pigeon	13	0.22	59.3	59.4	0.08	68.8
tree swallow	7	0.09	100	78.3	0.07	91.3
evening grosbeak	2	0.07	91.3	100	0.06	100
Vaux's swift	7	0.11	100	56.7	0.06	93.3
American goldfinch	18	0.47	96.5	12.6	0.06	12.6
red-tailed hawk	19	0.08	95.2	70.0	0.05	75.0
turkey vulture	18	0.10	100	53.6	0.05	78.6
violet-green swallow	16	0.11	100	45.2	0.05	59.5
pine siskin	8	0.07	100	58.3	0.04	58.3
purple finch	2	0.10	35.7	100	0.04	100
cedar waxwing	3	0.04	90.0	100	0.04	100
Steller's jay	37	0.52	62.3	9.3	0.03	46.5
sharp-shinned hawk	7	0.04	70.0	85.7	0.02	71.4
American crow	3	0.02	100	100	0.02	100
Cooper's hawk	11	0.05	78.6	45.5	0.02	54.5
bald eagle	2	0.03	100	66.7	0.02	66.7
northern goshawk	4	0.02	80.0	100	0.02	100
western tanager	15	0.23	30.3	20.0	0.01	25.0
northern flicker	12	0.16	25.0	25.0	0.01	25.0
northern rough-winged swallow	2	0.01	100	100	0.01	100
chestnut-backed chickadee	5	0.14	35.0	14.3	0.01	14.3
black-headed grosbeak	6	0.14	20.0	25.0	0.01	25.0

Table 6. Relative exposure index and flight characteristics by species during the fixed-point bird use surveys at the Whistling Ridge Wind Resource Area, September 11, 2004 - May 29, 2009.

Species	# Groups Flying	Overall Mean Use	% Flying	% Flying within ZOR based on initial obs	Exposure Index	% Within ZOR at anytime
golden eagle	2	0.01	100	50.0	<0.01	100
mourning dove	2	0.01	100	50	<0.01	50.0
Clark's nutcracker	1	0.00	100	100	<0.01	100
prairie falcon	1	0.00	100	100	<0.01	100
brown-headed cowbird	3	0.03	33.3	33.3	<0.01	33.3
hairy woodpecker	9	0.07	52.4	9.1	<0.01	9.1
yellow-rumped warbler	25	0.45	65.1	1.0	<0.01	12.4
Townsend's solitaire	6	0.03	63.6	14.3	<0.01	14.3
American kestrel	1	0.00	100	100	<0.01	100
barn swallow	1	0.00	100	100	<0.01	100
dark-eyed junco	37	0.92	68.4	0	0	0
white-crowned sparrow	8	0.81	30.3	0	0	0
spotted towhee	4	0.21	8.3	0	0	0
red-breasted nuthatch	3	0.19	5.6	0	0	0
Macgillivray's warbler	3	0.15	9.8	0	0	0
golden-crowned kinglet	2	0.12	29.0	0	0	0
unidentified finch	1	0.11	100	0	0	0
olive-sided flycatcher	2	0.10	7.4	0	0	50.0
varied thrush	2	0.09	14.3	0	0	50.0
black-throated gray warbler	0	0.09	0	0	0	0
golden-crowned sparrow	0	0.08	0	0	0	0
Wilson's warbler	0	0.07	0	0	0	0
red-breasted sapsucker	10	0.07	51.7	0	0	0
lazuli bunting	4	0.06	55.0	0	0	0
Townsend's warbler	0	0.06	0	0	0	0
western wood-pewee	0	0.06	0	0	0	0
black-capped chickadee	2	0.05	15.4	0	0	0
pileated woodpecker	1	0.05	6.7	0	0	0

Table 6. Relative exposure index and flight characteristics by species during the fixed-point bird use surveys at the Whistling Ridge Wind Resource Area, September 11, 2004 - May 29, 2009.

Species	# Groups Flying	Overall Mean Use	% Flying	% Flying within ZOR based on initial obs	Exposure Index	% Within ZOR at anytime
Swainson's thrush	0	0.05	0	0	0	0
rufous hummingbird	12	0.05	100	0	0	0
warbling vireo	0	0.04	0	0	0	0
orange-crowned warbler	5	0.04	42.9	0	0	0
chipping sparrow	0	0.04	0	0	0	0
willow flycatcher	0	0.04	0	0	0	0
Nashville warbler	3	0.03	41.7	0	0	0
white-breasted nuthatch	1	0.03	7.7	0	0	0
unidentified buteo	2	0.03	85.7	0	0	0
ruby-crowned kinglet	3	0.03	50	0	0	0
hermit warbler	3	0.03	33.3	0	0	0
wild turkey	0	0.03	0	0	0	0
Hammond's flycatcher	0	0.02	0	0	0	0
house wren	1	0.02	16.7	0	0	0
hermit thrush	0	0.02	0	0	0	0
Canada goose	1	0.02	100	0	0	0
red-winged blackbird	0	0.02	0	0	0	0
song sparrow	1	0.01	50.0	0	0	0
gray jay	2	0.01	100	0	0	0
unidentified bird	0	0.01	0	0	0	0
brown creeper	1	0.01	25.0	0	0	0
downy woodpecker	0	0.01	0	0	0	0
mountain chickadee	1	0.01	66.7	0	0	0
pacific-slope flycatcher	1	0.01	75.0	0	0	0
ruffed grouse	1	0.01	50.0	0	0	0
Cassin's vireo	0	0.01	0	0	0	0
northern harrier	2	0.01	100	0	0	50.0
sooty grouse	0	<0.01	0	0	0	0

Table 6. Relative exposure index and flight characteristics by species during the fixed-point bird use surveys at the Whistling Ridge Wind Resource Area, September 11, 2004 - May 29, 2009.

Species	# Groups Flying	Overall Mean Use	% Flying	% Flying within ZOR based on initial obs	Exposure Index	% Within ZOR at anytime
Lincoln's sparrow	0	<0.01	0	0	0	0
unidentified accipiter	1	<0.01	100	0	0	0
Bewick's wren	0	<0.01	0	0	0	0
unidentified empidonax	0	<0.01	0	0	0	0
unidentified warbler	1	<0.01	100	0	0	0
yellow warbler	0	<0.01	0	0	0	0
northern saw-whet owl	0	<0.01	0	0	0	0
Bullock's oriole	1	<0.01	100	0	0	0
Cassin's finch	0	<0.01	0	0	0	0
Say's phoebe	1	<0.01	100	0	0	0
snowy owl	0	<0.01	0	0	0	0
unidentified hummingbird	1	<0.01	100	0	0	0

ZOR: The likely “zone of risk” for potential collision with a turbine blade, or 114-427 ft (35-130 m) above ground level (AGL).

Table 7. Incidental wildlife observed while conducting all surveys at the Whistling Ridge Wind Resource Area, September 11, 2004 - May 29, 2009.

Species	Scientific Name	# grps	# obs
pine siskin	*Carduelis pinus*	1	9
Canada goose	*Branta canadensis*	1	6
red-tailed hawk	*Buteo jamaicensis*	3	4
osprey	*Pandion haliaetus*	1	2
common poorwill	*Phalaenoptilus nuttallii*	1	1
ruffed grouse	*Bonasa umbellus*	1	1
Bird Subtotal	**6 Species**	**8**	**23**
mule deer	*Odocoileus hemionus*	7	43
black-tailed deer	*Odocoileus hemionus columbianus*	4	9
elk	*Cervus elephus*	2	3
Douglas squirrel	*Tamiasciurus douglasii*	1	1
gray squirrel	*Sciurus sp.*	1	1
Mammal Subtotal	**5 Species**	**15**	**57**

Table 8. Summary of sensitive species observed at the Whistling Ridge Wind Resource Area during fixed-point bird use surveys (FP) and as incidental wildlife observations (Inc.), September 11, 2004 – May 29, 2009.

			FP		Inc.		Total	
Species	**Scientific Name**	**Status**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
Vaux's swift	*Chaetura vauxi*	SCS	7	30	0	0	7	30
pileated woodpecker	*Dryocopus pileatus*	SCS	15	15	0	0	15	15
northern goshawk	*Accipiter gentilis*	SCS	5	5	0	0	5	5
bald eagle	*Haliaeetus leucocephalus*	SSC	2	3	0	0	2	3
golden eagle	*Aquila chrysaetos*	SCS	2	2	0	0	2	2
gray squirrel	*Sciurus sp.**	ST?	0	0	1	1	1	1
Total	**5 Species**		**31**	**55**	**1**	**1**	**32**	**56**

ST = state threatened; SSC = State species of concern; SCS = State candidate species (Data from WDFW 2009). * The gray squirrel was only observed briefly and was not positively identified as being either a western or eastern gray squirrel.

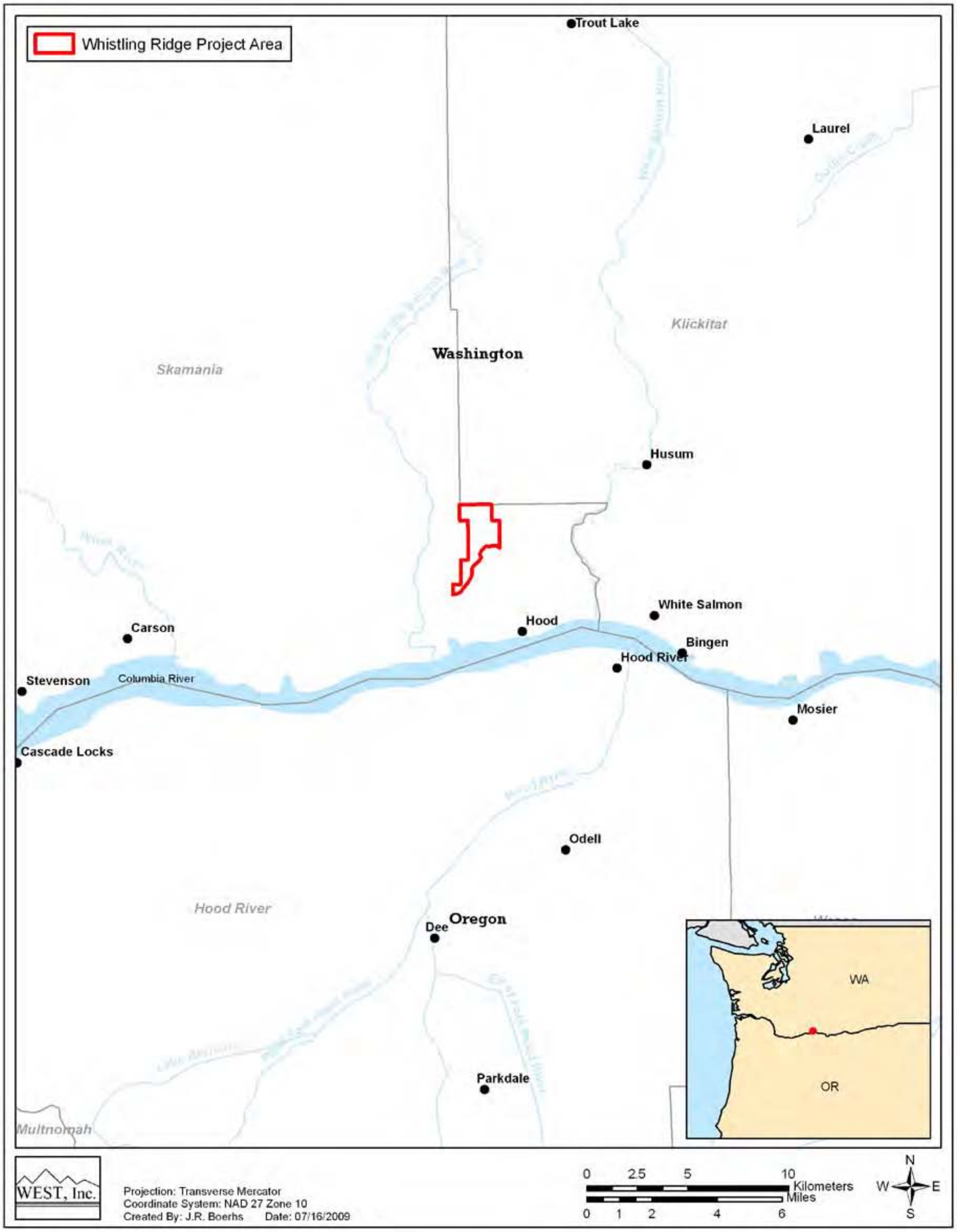


Figure 1. Location of the Whistling Ridge Wind Resource Area.

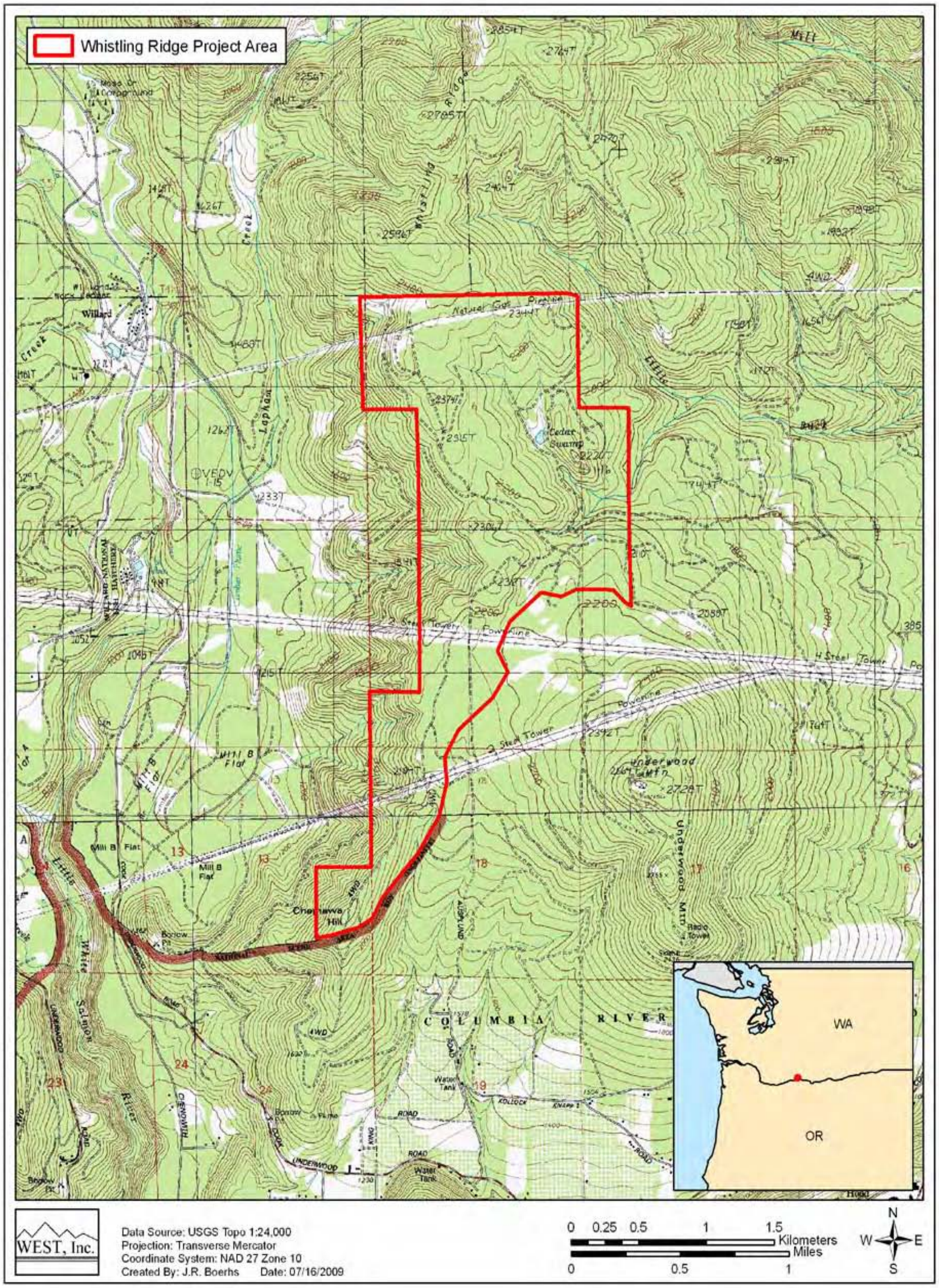


Figure 2. Elevation and topography of the Whistling Ridge Wind Resource Area.

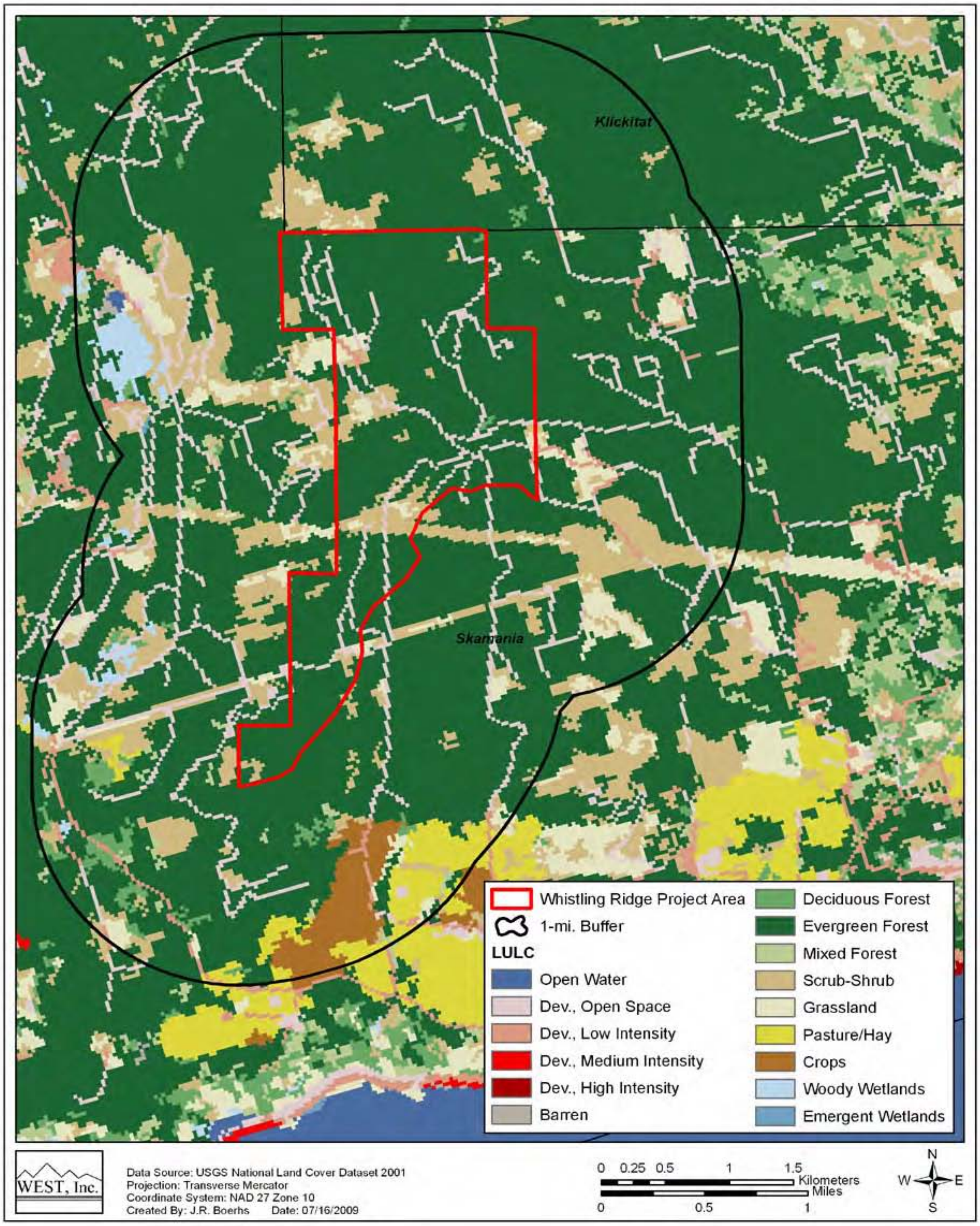


Figure 3. The land cover types and coverage within the Whistling Ridge Wind Resource Area (USGS NLCD 2001).

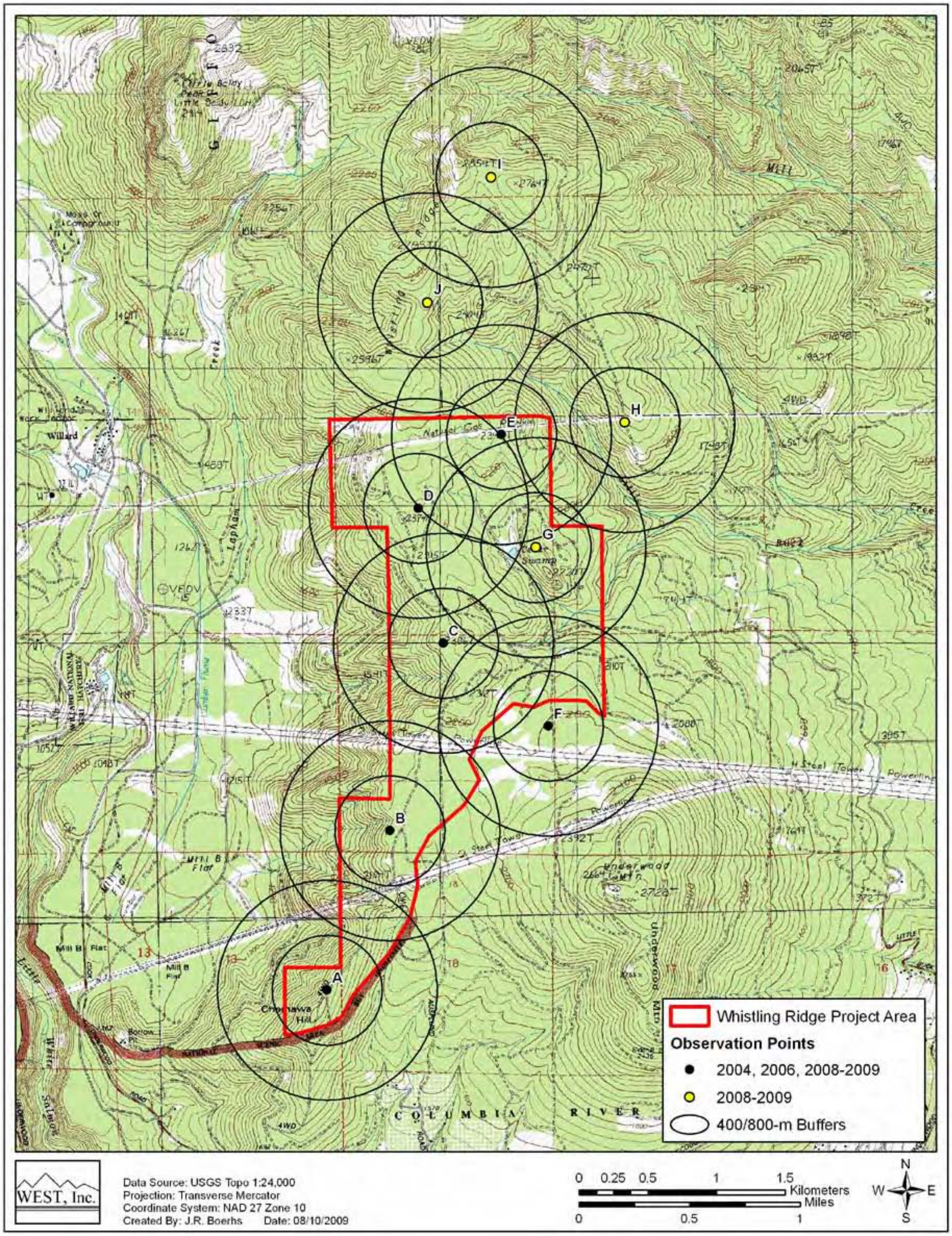


Figure 4. Fixed-point bird use survey points at the Whistling Ridge Wind Resource Area.

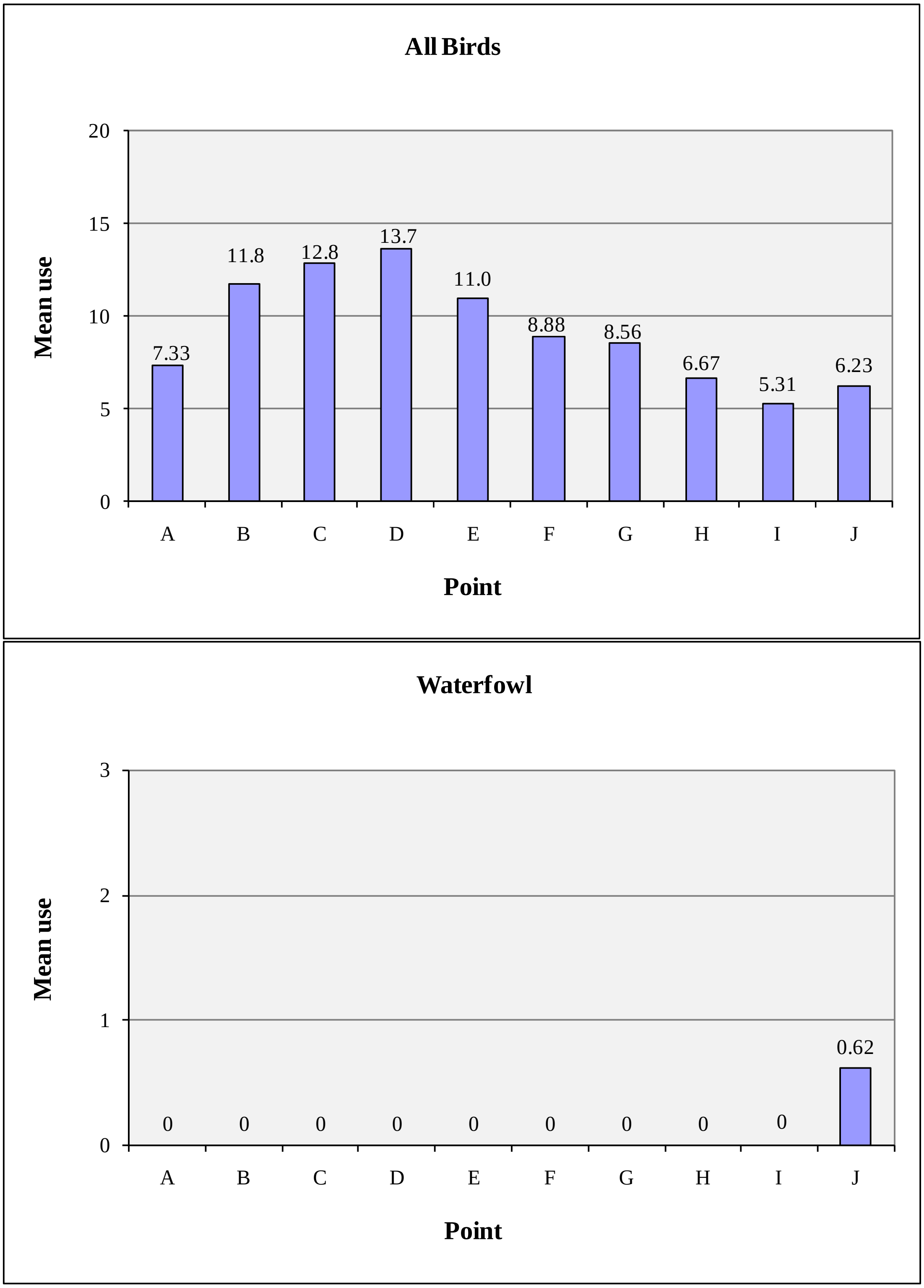
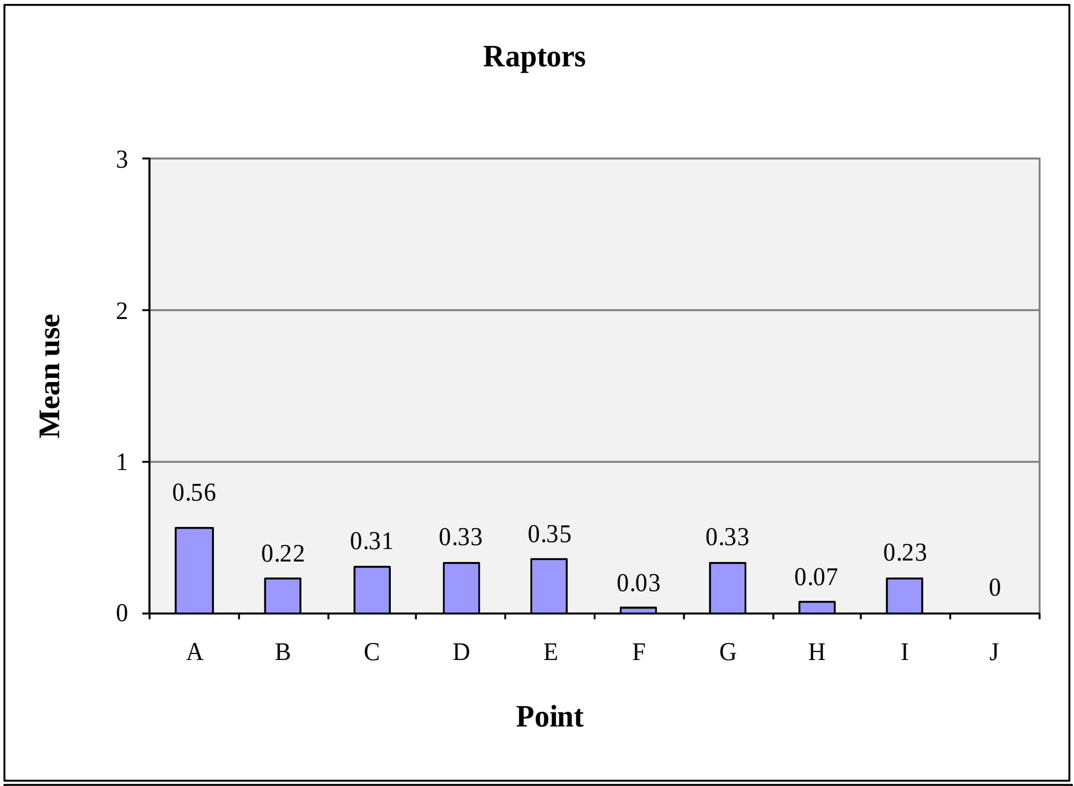


Figure 5. Mean use (number of birds/20-min survey) at each fixed-point bird use survey point for all birds major bird types at the Whistling Ridge Wind Resource Area.



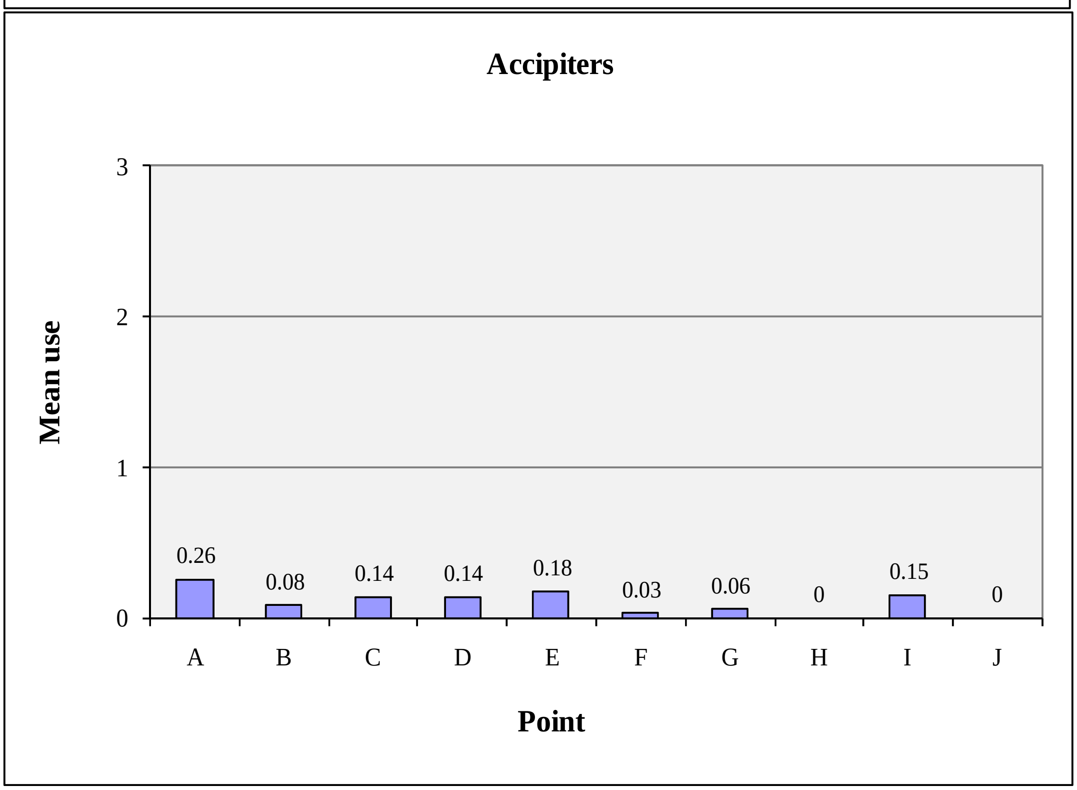
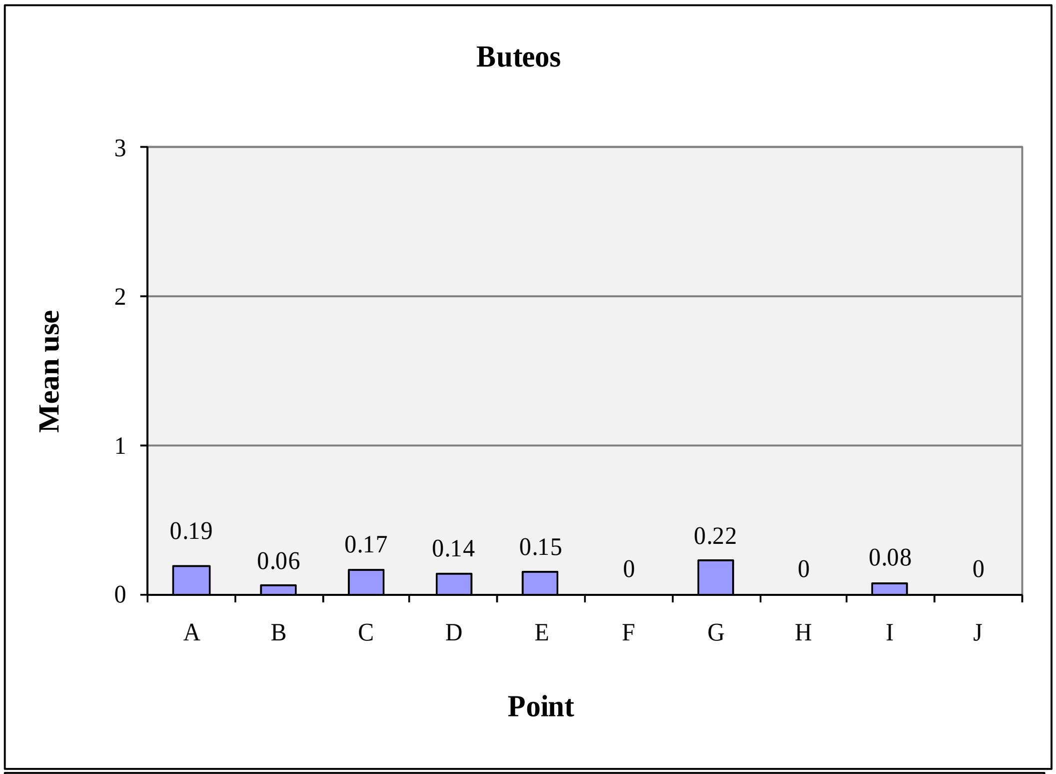


Figure 5 (*continued*). Mean use (number of birds/20-min survey) at each fixed-point bird use survey point for all birds and major bird types at the Whistling Ridge Wind Resource Area.



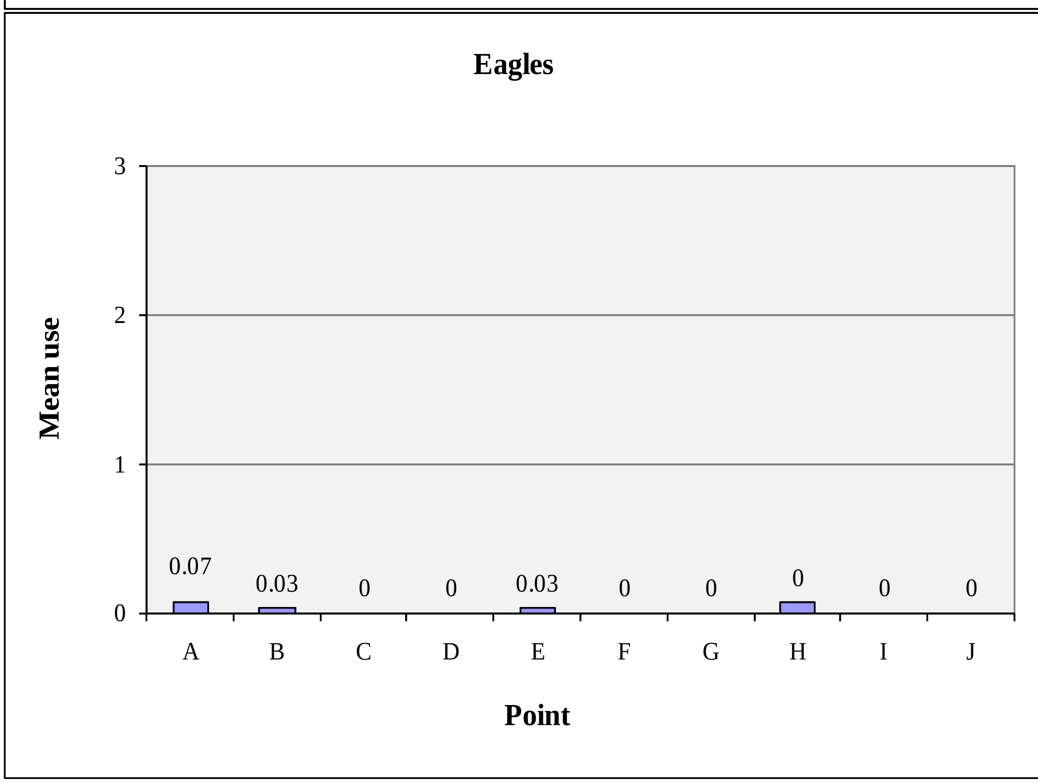
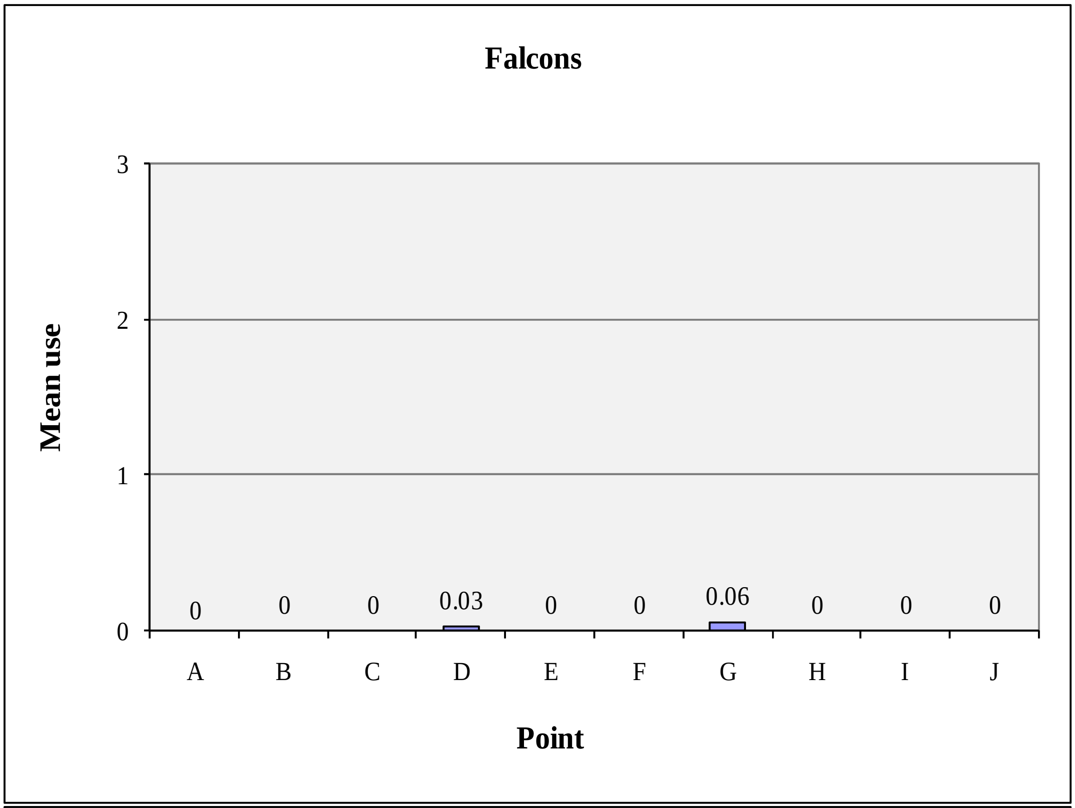


Figure 5 (*continued*). Mean use (number of birds/20-min survey) at each fixed-point bird use survey point for all birds and major bird types at the Whistling Ridge Wind Resource Area.



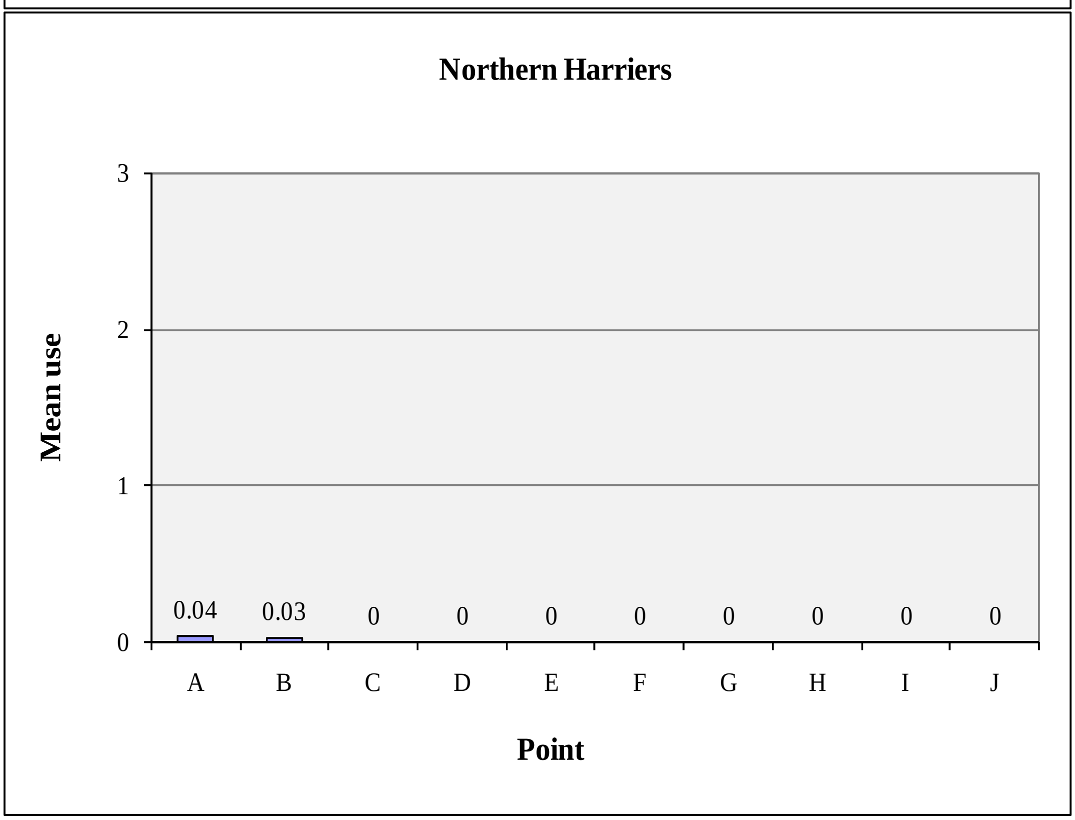
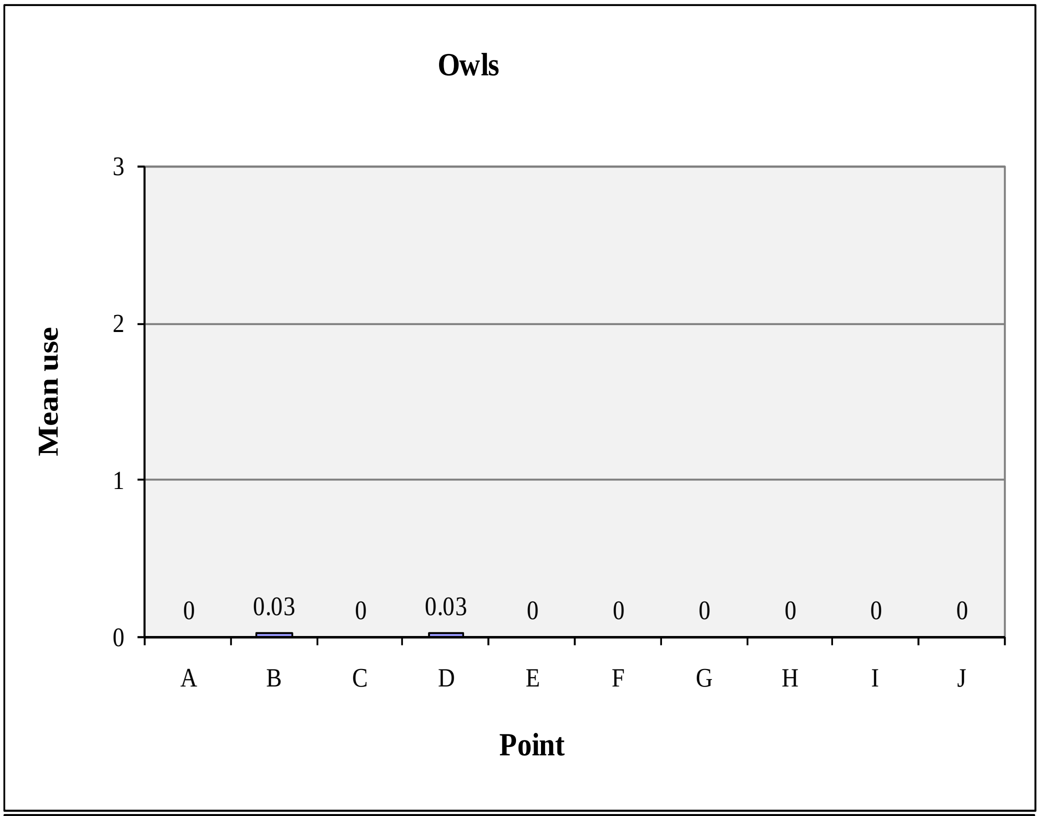


Figure 5 (*continued*). Mean use (number of birds/20-min survey) at each fixed-point bird use survey point for all birds and major bird types at the Whistling Ridge Wind Resource Area.



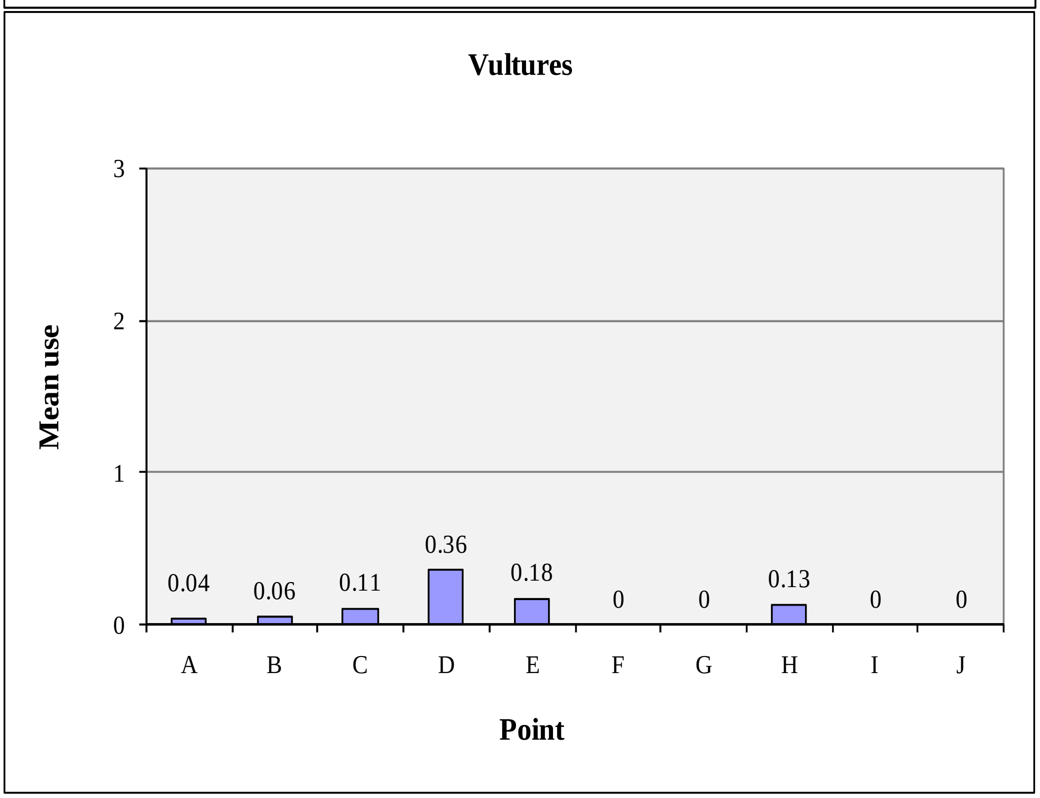
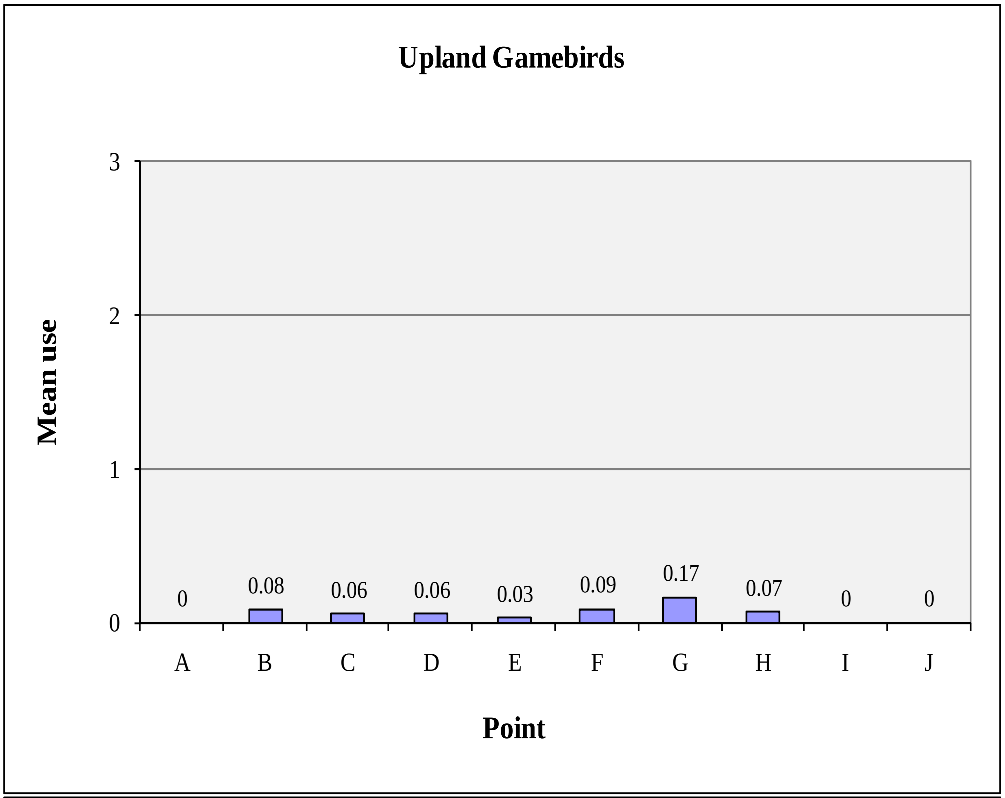


Figure 5 (*continued*). Mean use (number of birds/20-min survey) at each fixed-point bird use survey point for all birds and major bird types at the Whistling Ridge Wind Resource Area.



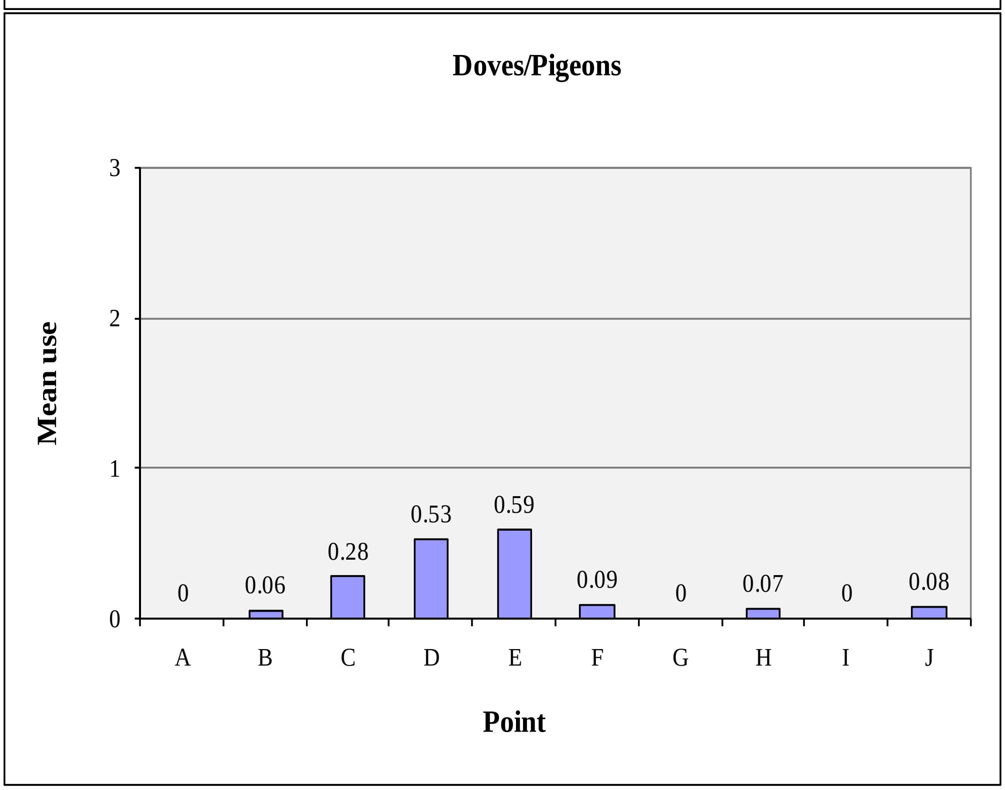
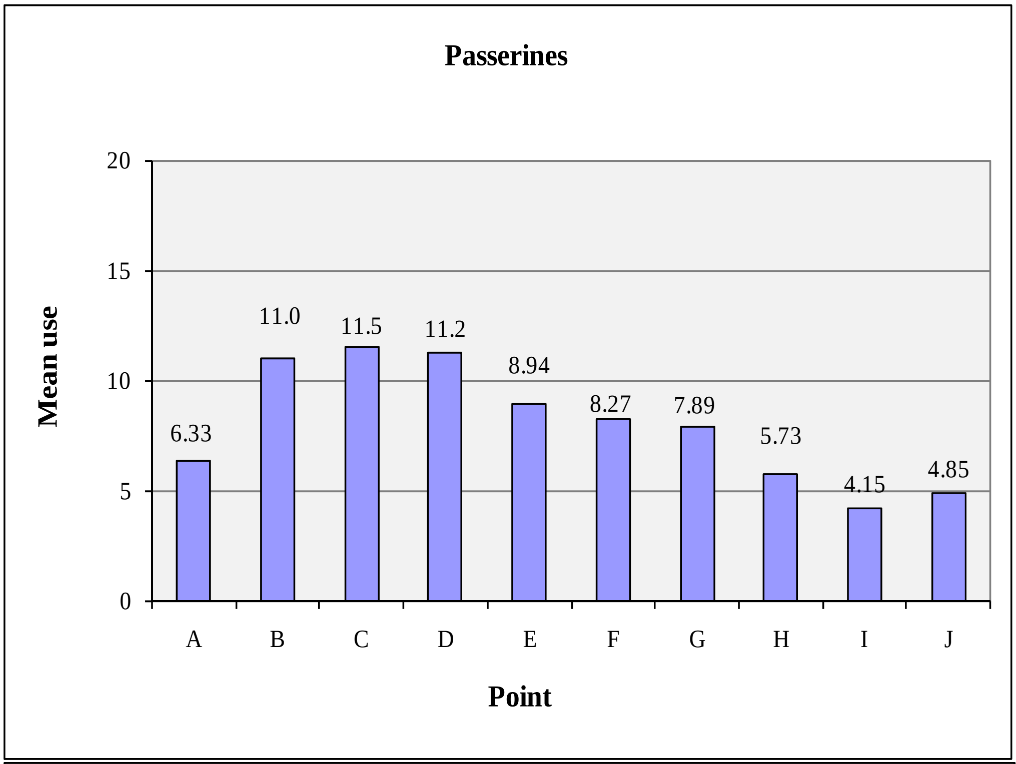


Figure 5 (continued). Mean use (number of birds/20-min survey) at each fixed-point bird use survey point for all birds and major bird types at the Whistling Ridge Wind Resource Area.



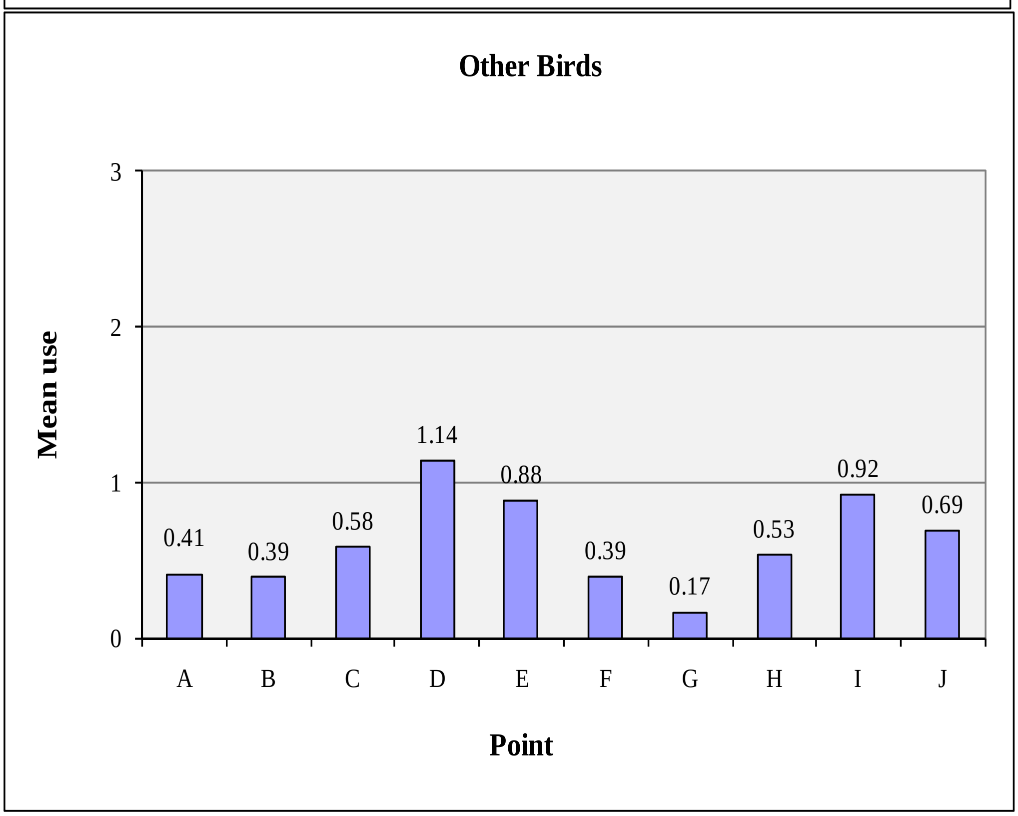


Figure 5 (*continued*). Mean use (number of birds/20-min survey) at each fixed-point bird use survey point for all birds and major bird types at the Whistling Ridge Wind Resource Area.

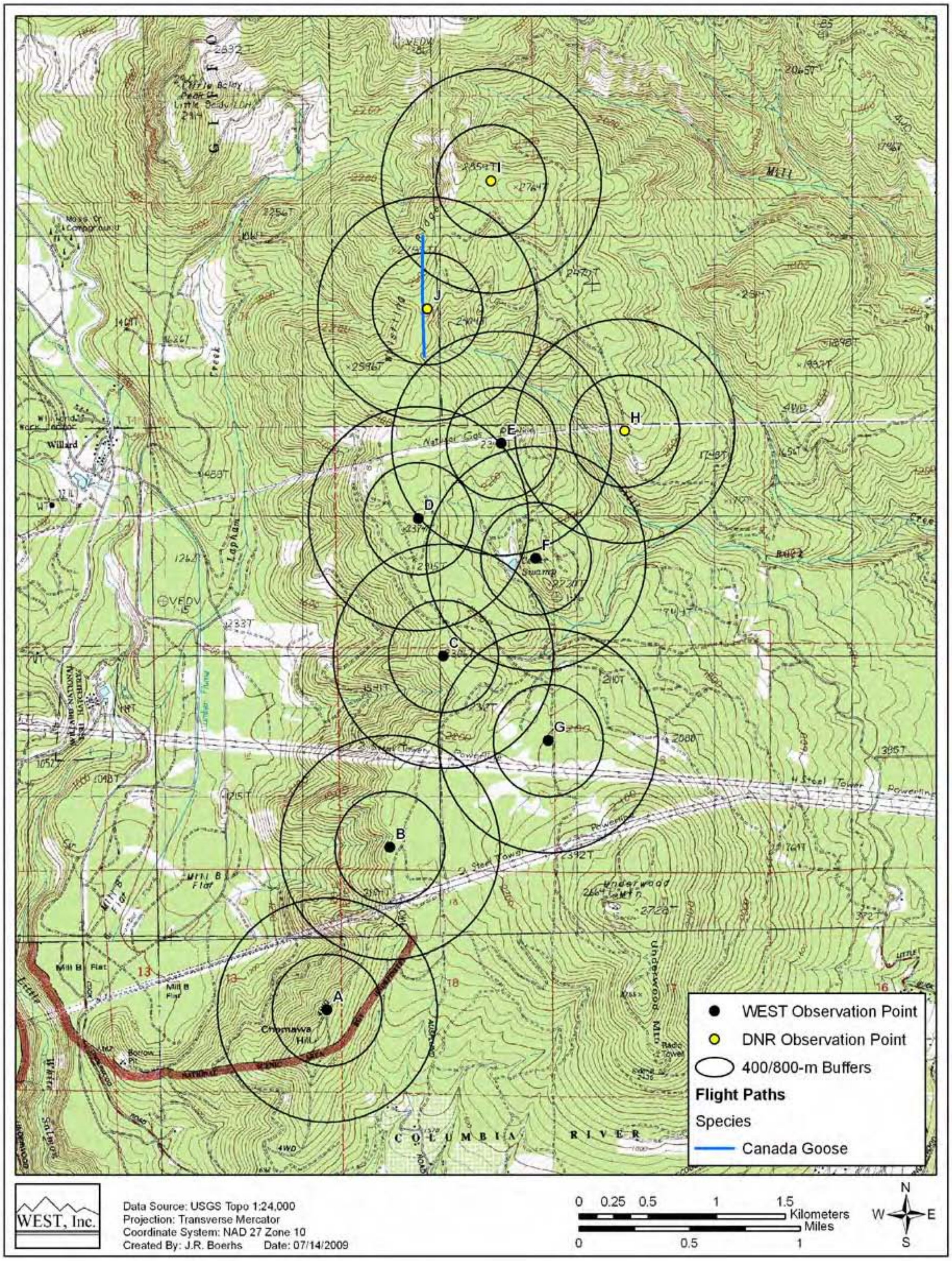


Figure 6a. Flight paths of waterfowl at the Whistling Ridge Wind Resource Area.

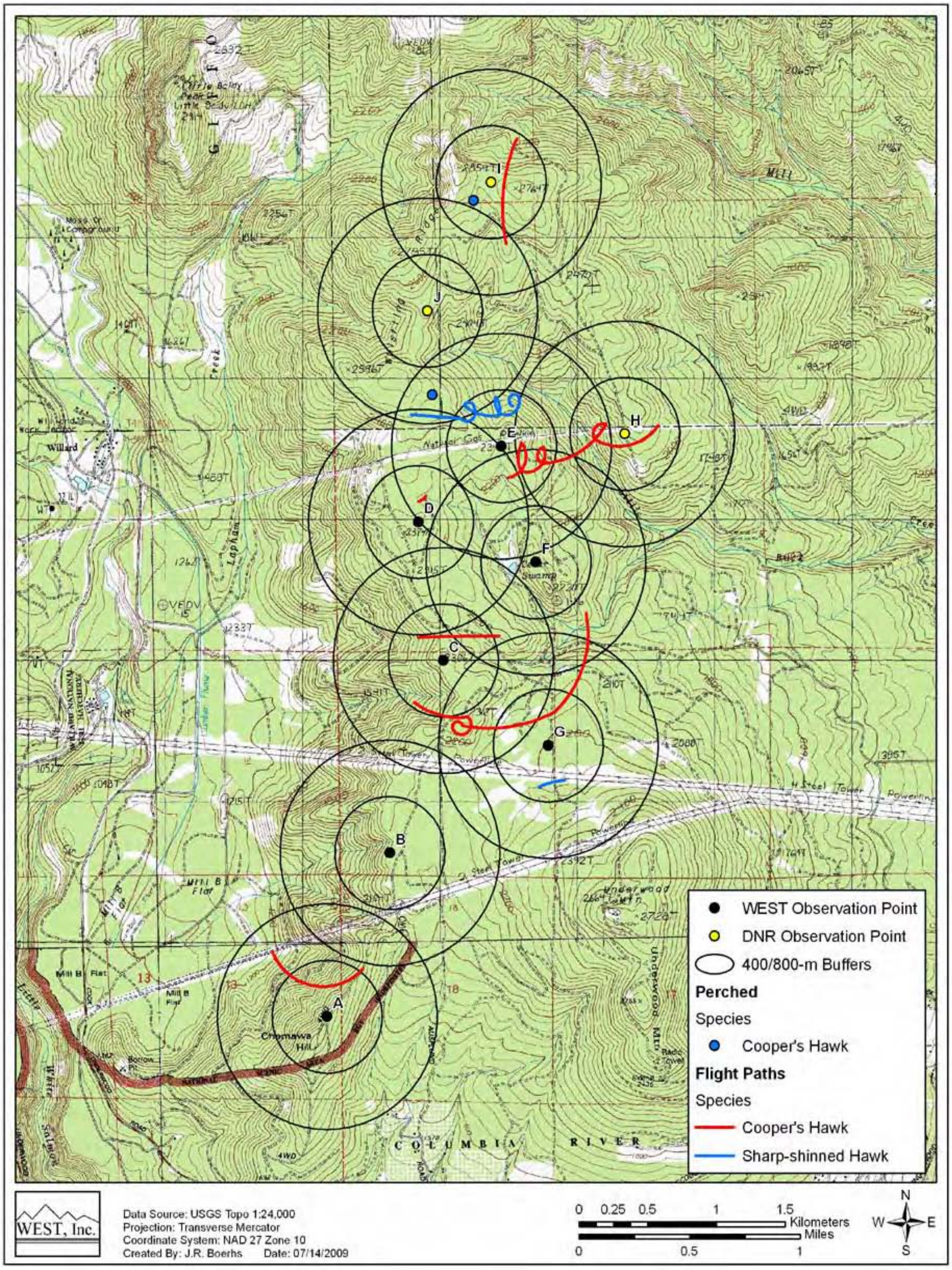


Figure 6b. Flight paths of accipiters at the Whistling Ridge Wind Resource Area.

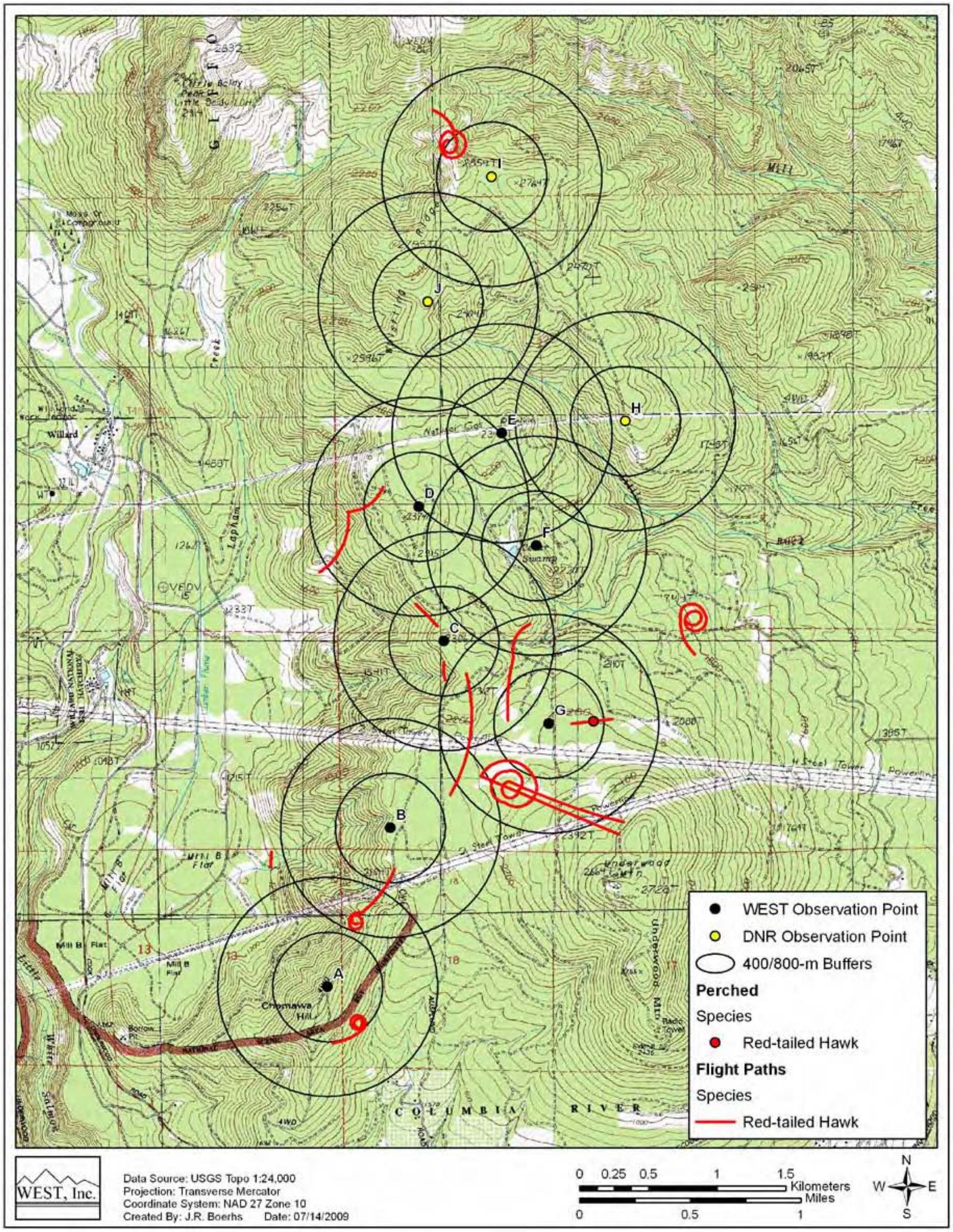


Figure 6c. Flight paths of buteos at the Whistling Ridge Wind Resource Area.

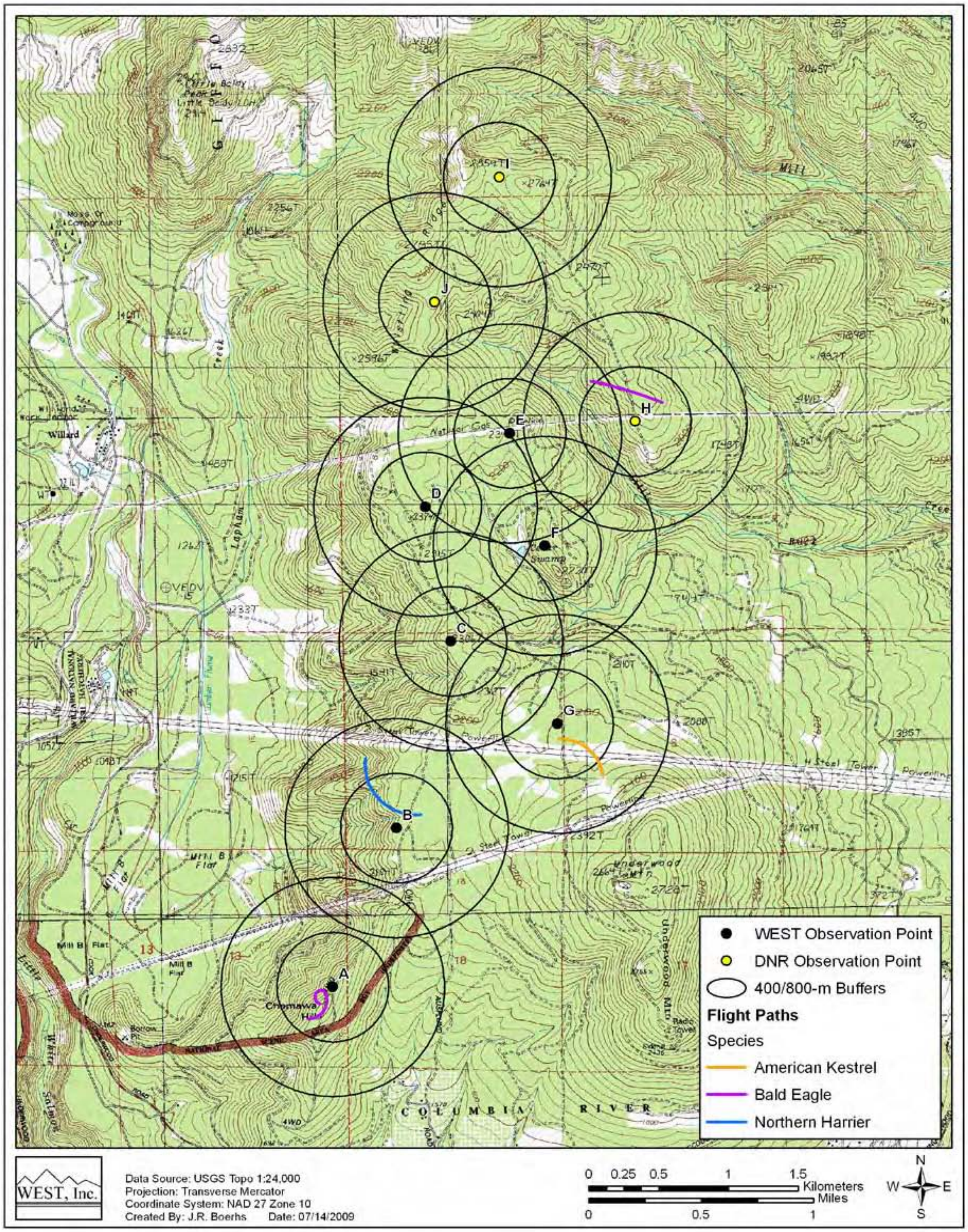


Figure 6d. Flight paths of other raptors at the Whistling Ridge Wind Resource Area.

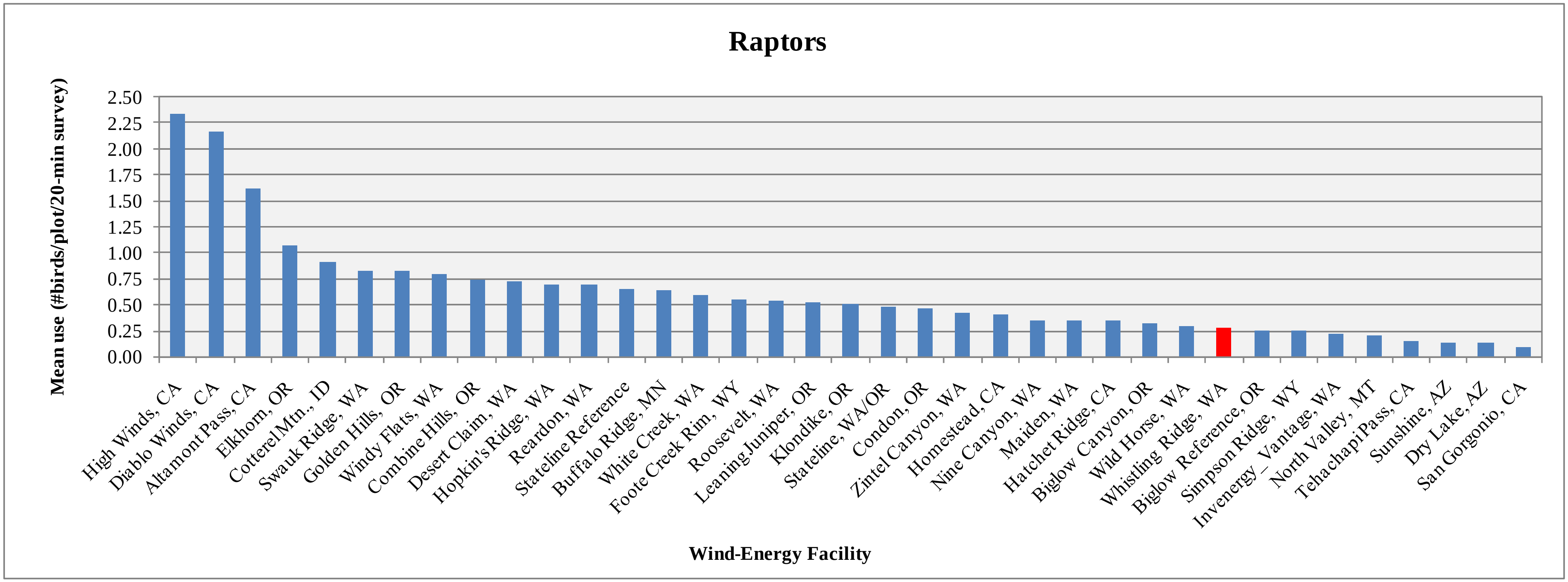
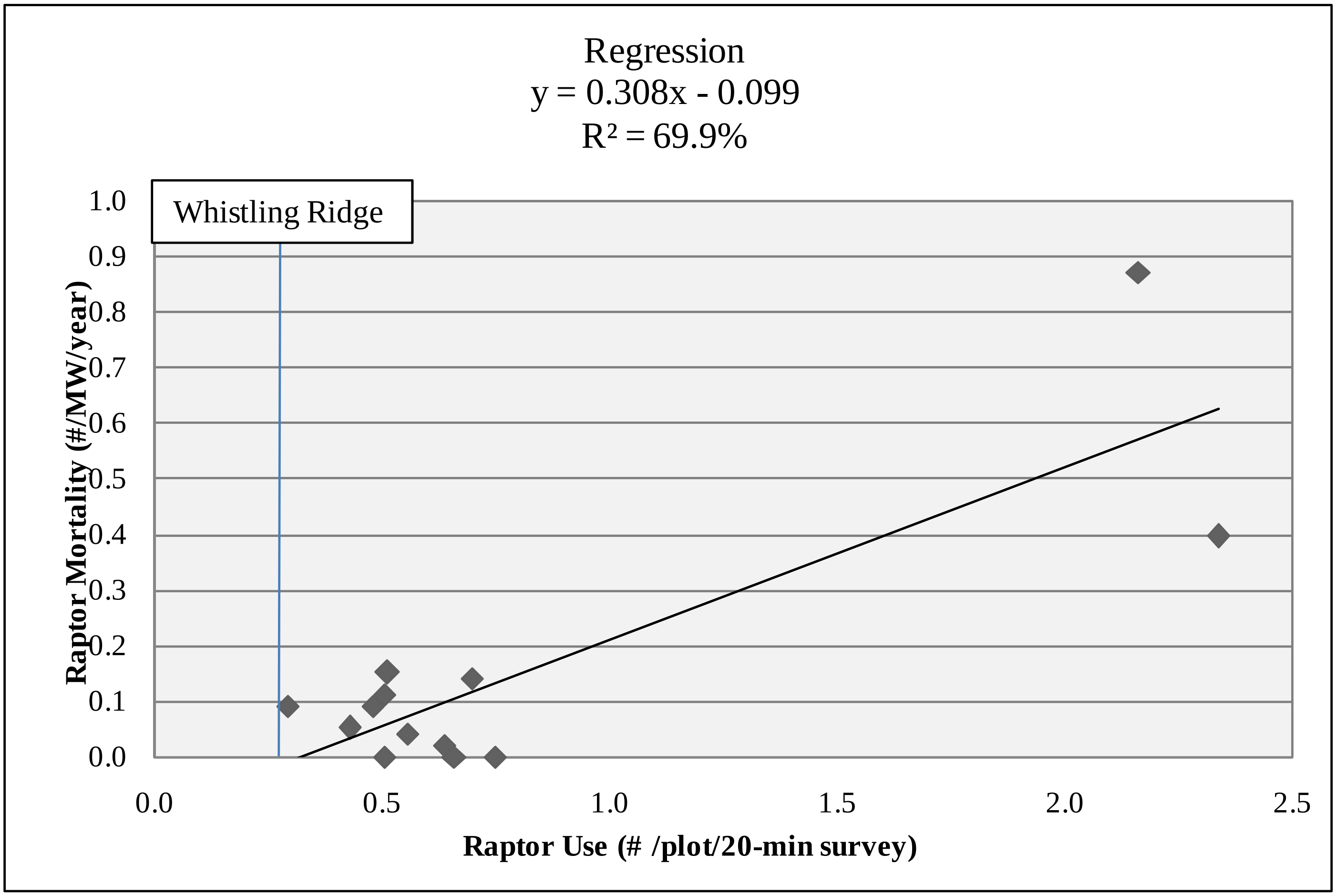


Figure 7. Comparison of annual raptor use between the Whistling Ridge Wind Resource Area and other US wind-energy facilities.

Data from the following sources:

Whistling Ridge, WA	This study.				
High Winds, CA	Kerlinger et al. 2005	Stateline Reference	URS et al. 2001	Maiden, WA	Erickson et al. 2002b
Diablo Winds, CA	WEST 2006a	Buffalo Ridge, MN	Erickson et al. 2002b	Hatchet Ridge, CA	Young et al. 2007b
Altamont Pass, CA	Erickson et al. 2002b	White Creek, WA	NWC and WEST 2005a	Biglow Canyon, OR	WEST 2005c
Elkhorn, OR	WEST 2005a	Foote Creek Rim, WY	Erickson et al. 2002b	Wild Horse, WA	Erickson et al. 2003a
Cotterel Mtn., ID	Cooper et al. 2004	Roosevelt, WA	NWC and WEST 2004	Biglow Reference, OR	WEST 2005c
Swauk Ridge, WA	Erickson et al. 2003b	Leaning Juniper, OR	NWC and WEST 2005b	Simpson Ridge, WY	Johnson et al. 2000b
Golden Hills, OR	Jeffrey et al. 2008	Klondike, OR	Johnson et al. 2002a	Invenergy_Vantage, WA	WEST 2007
Windy Flats, WA	Johnson et al. 2007	Stateline, WA/OR	Erickson et al. 2002b	North Valley, MT	WEST 2006b
Combine Hills, OR	Young et al. 2003c	Condon, OR	Erickson et al. 2002b	Tehachapi Pass, CA	Erickson et al. 2002b
Desert Claim, WA	Young et al. 2003b	Zintel Canyon, WA	Erickson et al. 2002a	Sunshine, AZ	WEST and the CPRS 2006
Hopkin's Ridge, WA	Young et al. 2003a	Homestead, CA	WEST et al. 2007	Dry Lake, AZ	Young et al. 2007c
Reardon, WA	WEST 2005b	Nine Canyon, WA	Erickson et al. 2001b	San Gorgonio, CA	Erickson et al. 2002b



Overall Raptor Use 0.28
Predicted Fatality Rate zero fatalities/MW/year
90.0% Prediction Interval (0, 0.25 fatalities/MW/year)

Figure 8. Regression analysis comparing raptor use estimates versus estimated raptor mortality.

Data from the following sources:

Study and Location	Raptor Use (birds/plot /20-min survey)	Source	Raptor Mortality (fatalities/MW/yr)	Source
Buffalo Ridge, MN	0.64	Erickson et al. 2002b	0.02	Erickson et al. 2002b
Combine Hills, OR	0.75	Young et al. 2003c	0.00	Young et al. 2005
Diablo Winds, CA	2.161	WEST 2006a	0.87	WEST 2006a
Foote Creek Rim, WY	0.55	Erickson et al. 2002b	0.04	Erickson et al. 2002b
High Winds, CA	2.34	Kerlinger et al. 2005	0.39	Kerlinger et al. 2006
Hopkins Ridge, WA	0.70	Young et al. 2003a	0.14	Young et al. 2007a
Klondike II, OR	0.50	Johnson 2004	0.11	NWC and WEST 2007
Klondike, OR	0.50	Johnson et al. 2002a	0.00	Johnson et al. 2003
Stateline, WA/OR	0.48	Erickson et al. 2002b	0.09	Erickson et al. 2002b
Vansycle, OR	0.66	WCIA and WEST 1997	0.00	Erickson et al. 2002b
Wild Horse, WA	0.29	Erickson et al. 2003a	0.09	Erickson et al. 2008
Zintel, WA	0.43	Erickson et al. 2002a	0.05	Erickson et al. 2002b
Bighorn, WA	0.51	Johnson and Erickson 2004	0.15	Kronner et al. 2008

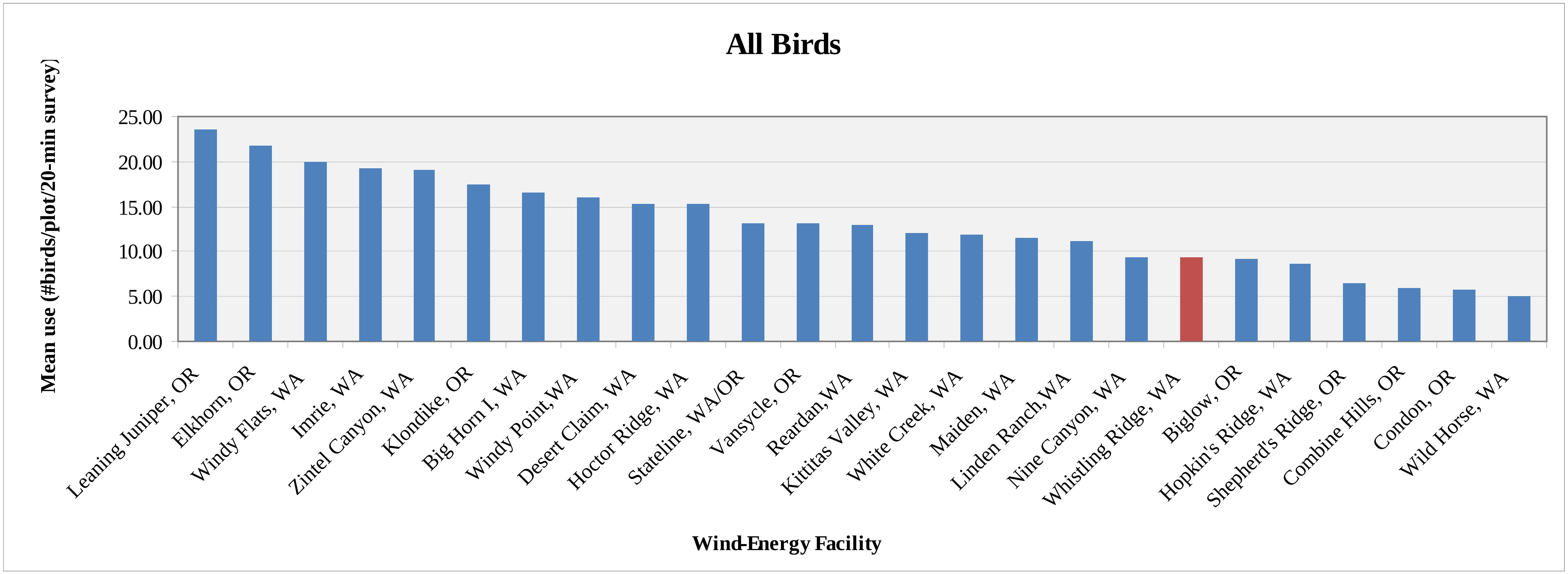


Figure 9. Comparison of mean overall bird use between the Whistling Ridge Wind Resource Area and other Pacific Northwest wind resource areas.

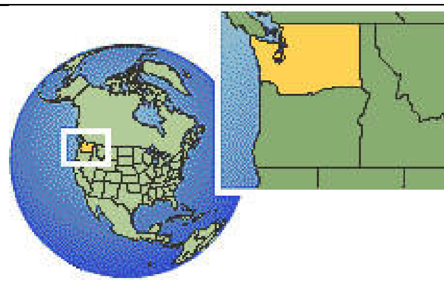
C-5

Final Report: Northern Spotted Owl, Northern Goshawk, Western Gray Squirrel Survey Results Conducted for the Saddleback Wind Energy Project. Submitted to CH2M HILL.

Turnstone Environmental Consultants, Inc. 2004

FINAL REPORT

NORTHERN SPOTTED OWL
NORTHERN GOSHAWK
WESTERN GRAY SQUIRREL
SURVEY RESULTS CONDUCTED FOR THE SADDLEBACK WIND ENERGY PROJECT



Submitted to:

CH2MHILL
Natural Resource Division

Submitted by:

Turnstone Environmental Consultants, Inc.
October 2004

INTRODUCTION

PPM Energy, Inc. (PPM) with guidance from CH2MHILL retained the services of Turnstone Environmental Consultants Inc. (TECI) to perform wildlife studies as part of the proposed Saddleback Wind Energy Project. PPM performs extensive environmental impact studies evaluating existing land use as well as impacts on birds, bats, rare plants and waterways to determine whether a site is suitable for wind power generation. PPM is committed to minimize impacts on natural resources by selecting wind development sites that are designed to be as environmentally friendly to the land and communities as it is to the air. Wind energy, the least-cost renewable technology, is a remarkable, sustainable resource for electricity generation. Wind power is the fastest growing area of power generation in the world. PPM Energy Inc. is leading the market to make this green power source as dependable and affordable as any other form of energy.

TECI performed surveys for the northern spotted owl (Strix occidentalis caurina), northern goshawk (Accipiter gentilis), and western gray squirrel (Sciurus griseus) in consultation with CH2MHILL for the Saddleback Wind Energy Project. Throughout Oregon and the Pacific Northwest, TECI specializes in natural resource inventory, assessment and analysis. TECI is committed to providing the highest quality work product for our clients in the field of natural resource management - assisting land owners and managers in the decision making process. TECI is an Oregon based company founded in 1995 with offices in Portland and Corvallis. The TECI staff has extensive experience in a wide variety of wildlife and fisheries survey, inventory, rehabilitation and research projects, and has worked with federal, state and tribal governments as well as private landowners.

Northern Spotted Owl

The northern spotted owl (*Strix occidentalis caurina*) was listed in 1990 as a “threatened” species under the Endangered Species Act (ESA) of 1973 by both the U.S. Fish and Wildlife Service and the State of Washington. Both federal and state agencies determined that the northern spotted owl was likely to become an endangered species in the foreseeable future throughout all or a significant portion of its existing range. The physiographic range and habitat requirements of the northern spotted owl are located within the forestlands of the PPM Saddleback Wind Energy Project. As part of the process to avoid a “take” of any northern spotted owls under the ESA, PPM with guidance from CH2MHILL had surveys completed for northern spotted owls in and around suitable habitat prior to any management activity.

Suitable Habitat
In Washington, northern spotted owls inhabit the Eastern and Western Cascades, Western Lowlands and Olympic Peninsula Provinces. Within these regions, the northern spotted owl requires a multitude of habitat types for nesting, roosting, foraging and dispersal. The species seeks forests composed of a multi-layered, multi-species canopy with a high incidence of large trees with appropriate structure for nesting and roosting. Northern spotted owls generally rely on large home ranges and use large tracts of land containing older forest to meet their biological needs. Fragmented habitats may be used for dispersal and foraging. Spotted owls nest primarily in stick nests of northern goshawks, on clumps of mistletoe, in large tree cavities, on broken tops of large trees, on large branches or cavities in banks and rock faces.

Survey Locations
With the guidance of CH2MHILL, TECI conducted northern spotted owl surveys within and adjacent to properties managed by SDS Lumber Co. (SDS) and other willing adjacent landowners. Surveys were conducted in suitable habitat in four core project sections located in Township 3N, Range 10E, Sections 5, 6, 7, and 8. The provincial home range radius surrounding the core area appropriate for this physiographic location is 1.8 miles. Surveys were conducted in suitable habitat in the provincial home range radius in Township 3N, Range 10E, Sections 4, 9,10,17,19,20,21; Township 4N, Range 10E, Sections 28,29,30,31,32,33,34; Township 4N, Range 09E, Sections 25,35,36; Township 3N, Range 09E, Sections 1,2,11,12,13,24.

Survey Methods
Potential habitat was surveyed in 2003-2004 in accordance to the 1992 Revised Version of "Protocol for Surveying Proposed Management Activities That May Impact Northern Spotted Owls" endorsed by the U.S. Fish and Wildlife Service. TECI used the 1-year survey methodology, surveying the project area six times from March 24, 2003 to July 23, 2003 and used the 2-year survey methodology, surveying three times from March 31, 2004 to August 18, 2004. TECI surveyed again in 2004 to lengthen the time period in which management activities could occur in the area of potential impact before northern spotted owl surveys would again be required. TECI collected information on northern spotted owl historical sites and potential owl activity in proposed areas of future management projects. CH2MHILL and the Washington Department of Fish and Wildlife (WDFW) will use this survey information to assess occupancy and reproductive status of the northern spotted owl within areas of proposed management activities.

TECI biologists analyzed the project area using topographic maps and aerial photography to determine suitable habitat and potential spot calling station placement. Spot calling stations were place along ridges and away from streams to maximize coverage by enhancing sound transmission. Spot calling stations and survey routes were situated to achieve complete coverage of the area, preferably with coverage from more than one calling point. Stations were spaced approximately 1/4 to 1/2 mile apart where access was permitted and suitable habitat warranted. Most spot calling stations were surveyed at night when owls are more active and are thought to be more responsive to standard survey techniques (USDI 1992b). Some stations were called during daylight in remote/difficult to access areas. TECI biologist used ten-minute calling periods for each station. Voice hooting and "hoot flutes" were used to broadcast both male and female spotted owl vocalizations that included four note contact calls and agitated calls. TECI conducted surveys between March 15 and August 31 as stipulated by the protocol.

During the 2003/2004 survey season, TECI recorded all owl species responses in the field from each calling station during each site visit on the field data forms. Barred owls have been thought to displace spotted owls; therefore, special attention was given to any responses recorded in the survey area. Barred owl responses were recorded on the field data and mapped (locations are approximate) to provide additional information to help direct any future management decisions (map 6).

Survey Results

TECI conducted northern spotted owl surveys in and adjacent to SDS properties (maps 1-6). During the 2003 northern spotted owl survey season, TECI completed six site visits to protocol (survey dates are found in Table 2). During the 2004 northern spotted owl survey season, three site visits were completed to protocol. Calling stations were strategically set throughout the proposed area of impact with the inclusion of a 1.8-mile radius around the potential area of future management activities.

- In 2003, during the first two site visits, 64 calling stations were originally set and called. During the remaining four site visits, 63 calling stations were surveyed after consultation with the SDS foresters. (One calling station, B-17, was dropped due to a logging operation.) No northern spotted owl responses were recorded during any of the six site visits for 2003. Nine barred owl responses were recorded during the six site visits (map 6).

- In 2004, 64 calling stations were surveyed during the first site visits. During the remaining two site visits, 62 calling stations were surveyed. (Two calling stations were dropped, B-17 and B-19, due to logging operations.) No northern spotted owl responses were recorded during any of the three site visits for 2004. Three barred owl responses were recorded during the three site visits (map 6).

Two historical owl sites were surveyed to obtain information on the presence of northern spotted owls. TECI combined efforts with National Council for Air and Stream Improvement (NCASI) to investigate the status of northern spotted owls at the Moss Creek and Mill Creek sites.

- In 2003, three-day site visits were performed at the historical nest sites of both Moss Creek and Mill Creek with no northern spotted owl observations or responses. TECI continued to call the two historical nest sites in the evening six more times with no northern spotted owl responses. On May 5, 2003, a NCASI surveyor observed an unidentified *Strix* owl at dusk (barred or northern spotted owl observation). Five surveys were conducted after the *Strix* observation with no visual conformation or audible responses to confirm the *Strix* presence. Eight of the nine barred owl responses for 2003 occurred within 1.5 miles of the Mill Creek historical nest site. No barred owls were observed while conducting the Moss Creek nest status day surveys.

- In 2004, three site visits were performed at the historical nest sites of both Moss Creek and Mill Creek with no northern spotted owl observations or responses. Two of the three barred owl responses for 2004 occurred within 1.5 miles of the Mill Creek historical nest site. One of the three barred owl responses for 2004 occurred within 1.5 miles of the Moss Creek historical nest site.

With the consistent barred owl responses during the evening surveys so close to the historical nest sites, it appears that barred owls are using areas once inhabited by northern spotted owls.

The following tables summarize all survey site results for the project area including the 1.8 mile radius around the proposed project area of future management activities. Table 1 depicts the Survey Summary Results for 2003 - 2004 and Table 2 depicts the historical site information for Moss Creek and Mill Creek.

NORTHERN SPOTTED OWL
Survey Summary Results 2003-2004

Table 1: Northern spotted owl survey and results summary 2003-2004

	Visit #	Dates	# of Stations	Northern Spotted Owl Response	Barred Owl Response	Comments
2003	1	3/18/03 -3/24/03	64	None	2	Barred owl detected from station: A11/B17
2003	2	4/21/03-4/24/03	64	None	2	Barred owl detected from station: A6/B6
2003	3	5/23/03-5/26/03	63	None	1	Barred owl detected from station: A10. B-17 not surveyed (logging)
2003	4	6/18/03-6/21/03	63	None	2	Barred owl detected from station: A9/A11. B-17 not surveyed (logging)
2003	5	6/29/03-7/2/03	63	None	1	Barred owl detected from station: A6. B-17 not surveyed (logging)
2003	6	7/20/03-7/23/03	63	None	1	Barred owl detected from station: A10. B-17 not surveyed (logging)
2004	1	3/31/04-4/3/04	64	None	0	
2004	2	6/14/04-6/17/04	62	None	1	Barred owl detected from station: A12. B-17 & B-19 not surveyed (logging)
2004	3	8/16/04-8/18/04	62	None	2	Barred owl detected from station: A6 (incidental while camping)/A26. B-17 & B-19 not surveyed (logging)

NORTHERN SPOTTED OWL
Historical Site Observations Summary 2003 - 2004

Table 2: Northern spotted owl historical site observations 2003-2004

	Visit #	Date	Name of Station	Northern Spotted Owl Response	*Barred Owl Response
2003	1	3/24/03 Day	Mill Creek	None	None
		3/20/03 Day	Moss Creek	None	None
	2	4/22/03 Night	Mill Creek	None	None
		4/21/03 Night	Moss Creek	None	None
	3	5/24/03 Day	Mill Creek	None	None
		5/26/03 Day	Moss Creek	None	None
	4	6/20/03 Night	Mill Creek	None	None
		6/21/03 Night	Moss Creek	None	None
	5	7/1/03 Night	Mill Creek	None	None
		7/2/03 Night	Moss Creek	None	None
	6	7/22/03 Night	Mill Creek	None	None
		7/23/03 Night	Moss Creek	None	None
2004	1	4/2/2004Night	Mill Creek	None	None
		4/3/04 Night	Moss Creek	None	None
	2	6/17/04 Day	Mill Creek	None	None
		6/16/04 Night	Moss Creek	None	None
	3	8/16/04 Day	Mill Creek	None	None
		8/18/04 Night	Moss Creek	None	None

**TECI recorded no barred owl responses at the historical nest sites*

NORTHERN SPOTTED OWL
Historic Site Summary 1994 - 2004

Table 3: Northern spotted owl historic site summary 1994- 2004

Year	Mill Creek Results	Moss Creek Results
2004	Barred Owl Pair Observed (NCASI)	Barred Owl Pair with 1+ Juvenile Observed (NCASI)
2003	No Responses	Unknown Strix Observed (NCASI)
2002	Male Barred Owl Observed	Barred Owl Pair with 1 Juvenile Observed
2001	No Responses	Barred Owl Pair Observed
2000	Non-nesting Spotted Owl Pair Observed	Spotted Owl Pair with 1 Juvenile Observed
1999	Female Spotted Owl Observed	Spotted Owl Pair with 1 Juvenile Observed
1998	Non-nesting Spotted Owl Pair Observed with Female Barred Owl	Spotted Owl Pair with 2 Juveniles Observed
1997	Non-nesting Spotted Owl Pair Observed	No Responses Observed
1996	Spotted Owl Pair with 2 Juveniles Observed	Spotted Owl Pair with 3 Juveniles Observed
1995	No Responses	Male Spotted Owl Observed
1994	Spotted Owl Pair with 2 Juveniles Observed	N/A

Any inquiries on site-specific information should be directed to Tracy Flemming of NCASI (360.896.8013)

Northern Goshawk

The northern goshawk (*Accipiter gentilis*) is categorized as a "species of concern" by the U.S. Fish and Wildlife Service and as a "listing candidate" for sensitive, threatened or endangered species by the State of Washington Department of Fish and Wildlife. The physiographic range and habitat requirements of the northern goshawk are located within the forestlands of the PPM Saddleback Wind Energy Project.

Suitable Habitat

Goshawks inhabit a wide variety of forest habitats, including true fir (red fir, white fir, and subalpine fir), mixed conifer, lodgepole pine, ponderosa pine, Jeffrey pine, montane riparian deciduous forest and Douglas fir. They are occasionally found nesting in coast redwood and mixed hardwood forest. Goshawk nest sites tend to be associated with patches of relatively larger, denser forest than the surrounding landscape; however, home ranges often consist of a wide range of forest age classes and conditions. Numerous habitat studies and modeling efforts have found nest sites to be associated with similar factors including proximity to water or meadow habitat, forest openings, level terrain or "benches" of gentle slope, northerly aspects and patches of larger, denser trees, but these factors vary widely. (USDI 2002).

Survey Locations

With the guidance of CH2MHILL, TECI conducted northern goshawk surveys within and adjacent to properties managed by SDS and other willing adjacent landowners. Surveys were conducted in suitable habitat in four core project sections located in Township 4N, Range 10E, Sections 5, 6, 7, and 8. The provincial home range radius surrounding the core area appropriate for this physiographic location is 0.5 miles. Surveys were conducted in suitable habitat in the provincial home range radius in Township 3N, Range 09E, Sections 13, 24; Township 3N, Range 10E, Section 18.

Survey Methods

Potential habitat was surveyed in accordance to the 2002 “Survey Methodology for Northern Goshawks in the Pacific Southwest Region” developed by the United States Forest Service (USFS 2002). TECI biologists analyzed the project area using topographic maps and aerial photography to determine suitable habitat and potential station placement. TECI biologists established stations in the field at approximately 350 yards (0.2 miles) apart on roads and trails in suitable habitat within 0.5 miles of the proposed wind turbine location. Call stations were established to achieve complete coverage in all portions of the project area. At each station, calls were broadcast for 10 seconds; TECI biologists would then stop and listen for 30 seconds. This sequence was repeated four times at each station, broadcasting in four cardinal directions. Surveys started ½ hour before sunrise continued through the day and concluded ½ hour before sunset as specified by the protocol. During the 2004 survey season, TECI recorded all raptor species responses from every calling station during each site visit on the field data forms.

Survey Results

Turnstone Environmental Consultants Inc. conducted northern goshawk surveys in and adjacent to SDS properties (map 7), all calling stations were strategically set throughout the proposed area of impact with the inclusion of a 0.5-mile radius around the potential area of future management activities. TECI completed two site visits to protocol during the 2004 northern goshawk survey season (survey dates are found in Table 6). One hundred eighty five calling stations were surveyed for both protocol visits. No northern goshawk responses were recorded during any of the two site visits.

NORTHERN GOSHAWK
Survey and Results Summary 2004

Table 4: Northern goshawk survey and results summary results 2004

Visit #	# of Stations	Date	Northern Goshawk Response	Other Raptors Observed	Comments
1	47	6/15/04	None	COHA (1) near station 102. RTHA (1) near station 172	Western gray squirrel visuals at station 88 and near station 99
	36	6/16/04	None	RTHA(1) near station 9	
	17	6/17/04	None		
	85	6/18/04	None	RTHA(2) near station 199	RTHA pair was observed no nest ever located
2	103	8/29/04	None	RTHA(1) near station 222	
	82	8/30/04	None		

COHA = Cooper's hawk; RTHA = Red-tailed hawk

Western Gray Squirrel

The western gray squirrel (*Sciurus griseus)* is listed as a "threatened" species by the Washington State Department of Fish and Wildlife (WDFW). The physiographic range and habitat requirements of the western gray squirrel are located within the forestlands of the PPM Saddleback Wind Energy Project.

Suitable Habitat

Western gray squirrels are arboreal (adapted for living in trees) and, although they forage on the ground, they rarely stray far from trees. They use tree canopies for escape, cover and nesting. Western gray squirrels can move rapidly and cover long distances among tree canopies when canopy conditions permit. A contiguous tree canopy that allows arboreal travel for at least 198 feet (60 meters) around the nest is an important feature of western gray squirrel habitat (Ryan and Carey 1995a). Western gray squirrels are active throughout the day but are most active in the morning. Western gray squirrels are most active in August and September, when they are collecting and storing food for winter, and they are less visible in June and July (Ryan and Carey 1995a).

Currently in Washington, the western gray squirrel distribution has been reduced to three geographically isolated western gray squirrel populations in Washington: the ``Puget Trough'' population, now centered in Thurston and Pierce counties in the Puget Sound region; the ``South Cascades'' population in extreme eastern Skamania County and Klickitat and Yakima counties; and the ``North Cascades'' population in Chelan and Okanogan counties.

In Washington, and elsewhere within the subspecies' range, the principal food is acorns, although the seeds of Douglas-fir and other conifers are also eaten (Dalquest 1948). While pine nuts and acorns are considered essential foods for storing body fat and conditioning western gray squirrels for winter, green vegetation, seeds and nuts of trees and shrubs, fleshy fruits, mushrooms and other foods are also consumed. Hypogeous fungi (underground fungi such as truffles) comprise a large portion of the western gray squirrel diet (WDW 1993; Carraway and Verts 1994; Ryan and Carey 1995a).

Survey Locations
With the guidance of CH2MHILL, TECI conducted general western gray squirrel surveys while conducting northern goshawk surveys within and adjacent to properties managed by SDS and other willing adjacent land owners. General surveys were conducted during station placement and surveys for the northern goshawk (see northern goshawk section for location description). Intensive surveys were performed in oak stands in Township 4N, Range 10E, Sections 28, 33, 28; Township 3N, Range 10E, Section 4.

Survey Methods
TECI conducted western gray squirrel surveys in and adjacent to SDS properties (maps 8-10). Surveys were modeled according to the WDFW report "Surveys for western gray squirrel nests on sites harvested under approved forest practice guidelines: analysis of nest use and operator compliance" (Haegen, Van Leuven, and Anderson 2004). TECI biologists performed a general search for western gray squirrels and nests while conducting northern goshawk station placement and surveys. During the general search, TECI's biologists identified two adult western gray squirrels. Intensive walk-through surveys using serpentine transects were conducted in oak and oak/conifer stands but no squirrels or nests were located.

Survey Results
Turnstone Environmental Consultants, Inc. conducted western gray squirrel surveys in and adjacent to SDS properties (map 7). TECI completed two general site visits and one intensive site visit to protocol during the 2004 western gray squirrel survey season. Two adult western gray squirrels were sighted on June 15th foraging during a goshawk general survey. An intensive search occurred for nest sites in the area where the western gray squirrels were observed. No nests were ever located in the area of the western gray squirrel observations or any other area where intensive surveys were conducted.

WESTERN GRAY SQUIRREL
Survey and Results Summary 2004

Table 5: Western gray squirrel survey and results summary 2004

Visit #	Date	Type Of Visit	Results
1	6/15/2004	General	Western gray squirrel visuals at station 88 and near station 99
1	6/16/2004	General	No squirrel or squirrel nest located
1	6/17/2004	General	No squirrel or squirrel nest located
1	6/18/2004	General	No squirrel or squirrel nest located
2	8/29/2004	General	No squirrel or squirrel nest located

2	8/30/2004	General	No squirrel or squirrel nest located
3	8/16/2004	Intensive	No squirrel or squirrel nest located
3	8/17/2004	Intensive	No squirrel or squirrel nest located

Conclusions

Northern Spotted Owl
During the 2003-2004 northern spotted owl breeding season, TECI conducted 9 site visits in the Saddleback Wind Energy Project area. TECI recorded no northern spotted owl observations or responses on any of the 9 site visits during the 2003-2004 field seasons. Based on the surveying parameters of the 1992 Revised Version of "Protocol for Surveying Proposed Management Activities That May Impact Northern Spotted Owls" endorsed by the U.S. Fish and Wildlife and the survey results documented by TECI in the 2 breeding seasons. PPM will not be required to conduct northern spotted owl surveys again until the March 15, 2007. NCASI will continue to monitor the Moss Creek and Mill Creek northern spotted owl historical sites.

Northern Goshawk
No northern goshawk responses or observations were recorded during the 2 site visits during the 2004 breeding season. The 2002 "Survey Methodology for Northern Goshawks in the Pacific Southwest Region" developed by the United States Forest Service (USFS 2002) recommends a two year survey effort. CH2MHILL has negotiated a 1-year survey effort with WDFW. Therefore, no surveys will be conducted in the 2005 northern goshawk breeding season.

Western Gray Squirrel
TECI proposed a 1-year search effort for western gray squirrel nests while conducting northern goshawk surveys. Intensive surveys in oak dominated forests were also conducted in areas of potential impact. No western gray squirrel nests were ever found while conducting these searches. However, while conducting the northern goshawk surveys 2 western gray squirrels were observed. The 2 western gray squirrels were documented in different locations; both were on the ground possibly foraging at the edge of clear-cuts (Map 9). Based on harvest maps provided by CH2MHILL, the first western gray squirrel observation is approximately 3,520 ft from the most easterly wind turbine stringer well outside of the home range of a western gray squirrel (.2 -.47 hectares WDFW "Status of the Western Gray Squirrel (Sciurus griseus) in Washington" July 1993). The second western gray squirrel observation was documented approximately 440ft north of the most easterly stringer. This stringer maybe in the observed western gray squirrel home range based on the .47 hectare home range suggested by WDFW. An intensive survey effort was conducted in and around the western gray squirrel visual with no nests observed.

References

Carraway, L., B. Verts. December 2, 1994. Verts. Sciurus griseus. Mammalian Species 474: 1-7

Dalquest, W.W. 1948. Mammals of Washington. Vol. 2. Univ. Kans., Mus. Nat. Hist., Lawrence. 444pp.

Ryan, L.A. and A.B. Carey. 1995a. Distribution and habitat of the western gray (Sciurus griseus) squirrel on Fort Lewis, Washington. Northwest Science 69: 204-216

U.S. Fish and Wildlife Service 1992b. Revised Version of Protocol For Surveying Proposed Management Activities That May Impact Northern Spotted. Unpubl. rpt. 20 pp.

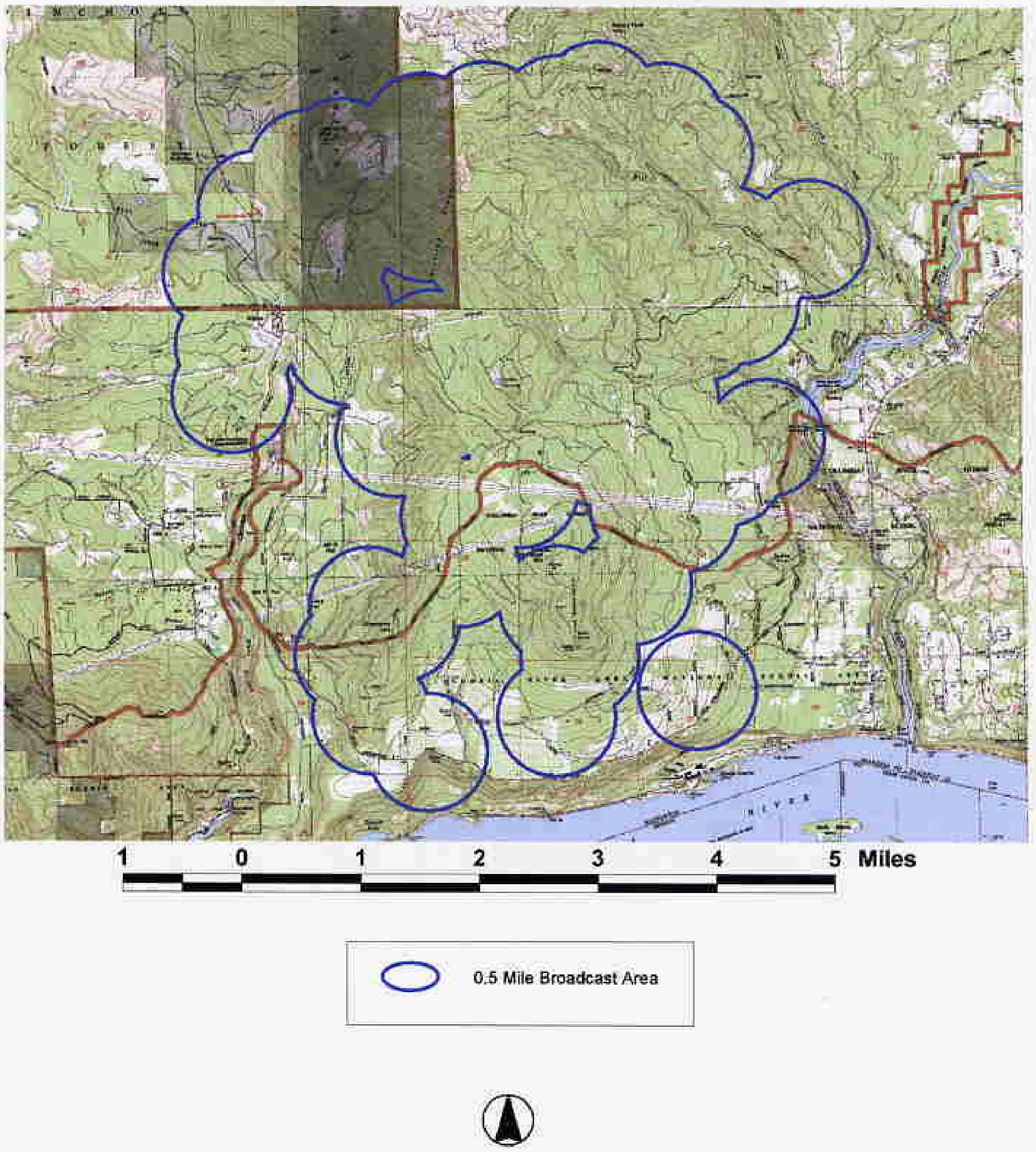
U.S FOREST SERVICE. 14 May 2002. Survey Methodology For Northern Goshawks In The Pacific Southwest Region.

United States Forest Service 2002. Survey Methodology for Northern Goshawks in the Pacific Southwest Region"

Vander Haegen, M., S. Van Leuven, and D. Anderson. 2004. Surveys for western gray squirrel nests on sites harvested under approved forest practice guidelines: analysis of nest use and operator compliance. Wildlife Research Report. Washington Department of Fish and Wildlife, Olympia, Washington, USA.

APPENDIX A: MAPS

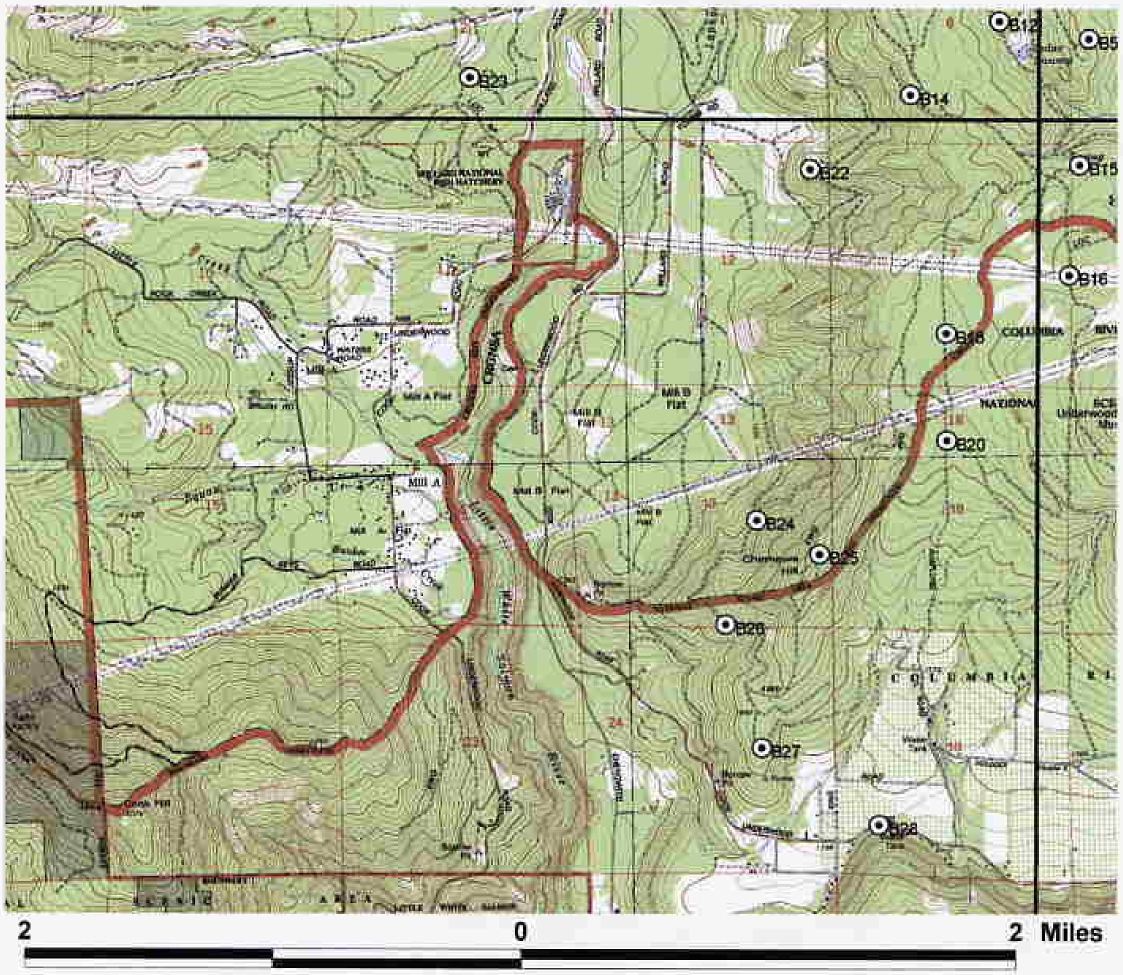
Saddleback Wind Power Project
Northern Spotted Owl
Calling Point Coverage



TECI GIS LAB

Map 1

Saddleback Wind Power Project
Northern Spotted Owl Survey Stations
Southwest Quadrant

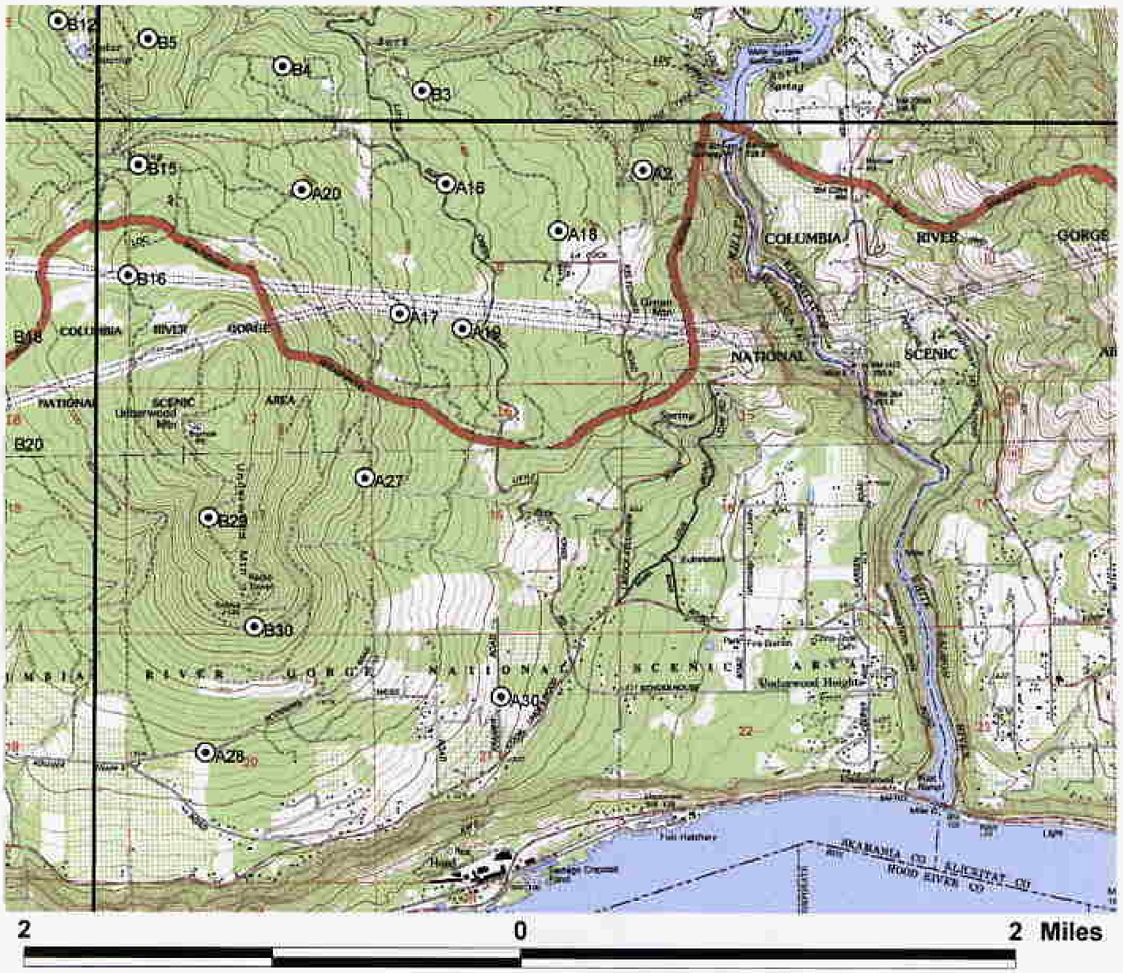


Calling Points
Quadrant Boundary

TECI GIS LAB

Map 2

Saddleback Wind Power Project
Northern Spotted Owl Survey Stations
Southeast Quadrant

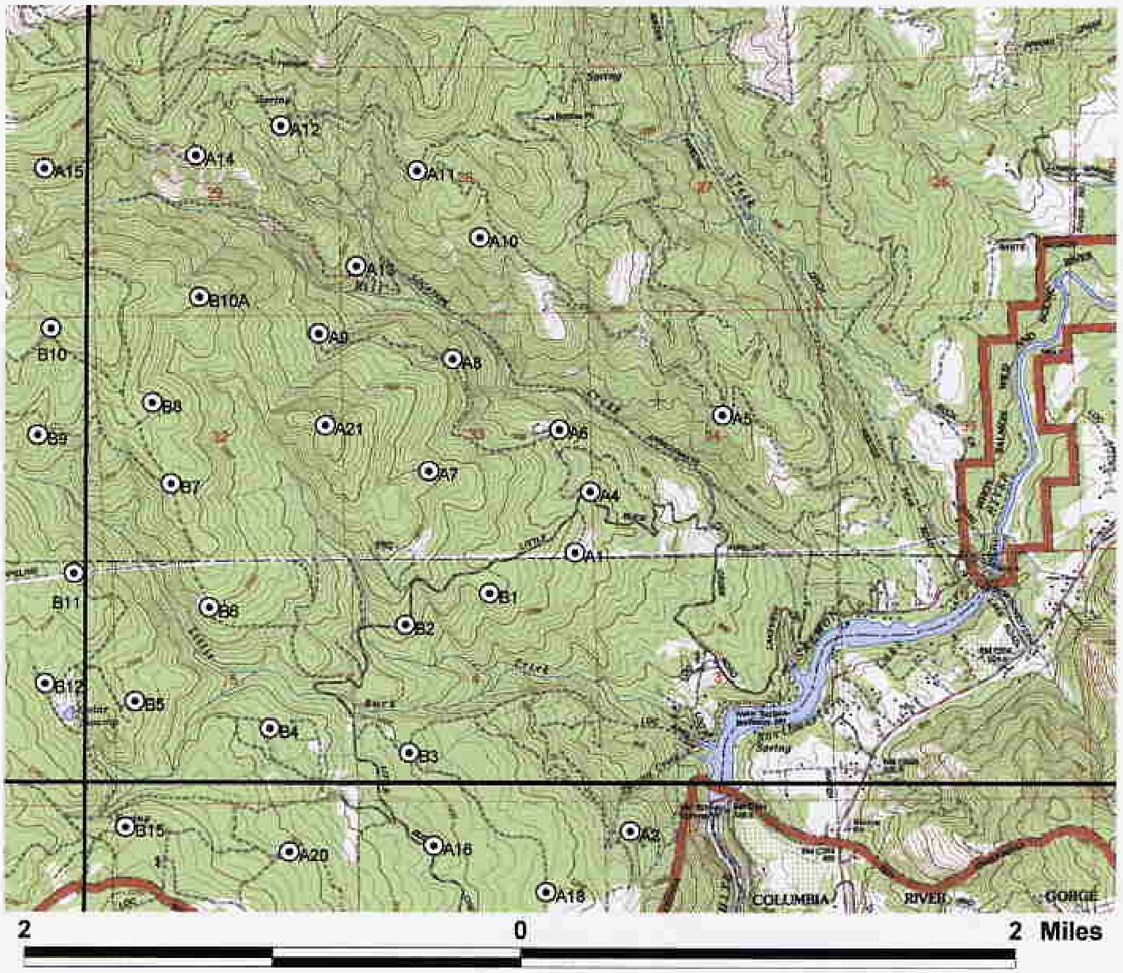


⊙	Calling Points
———	Quadrant Boundary

TECI GIS LAB

Map 3

Saddleback Wind Power Project
Northern Spotted Owl Survey Stations
Northeast Quadrant

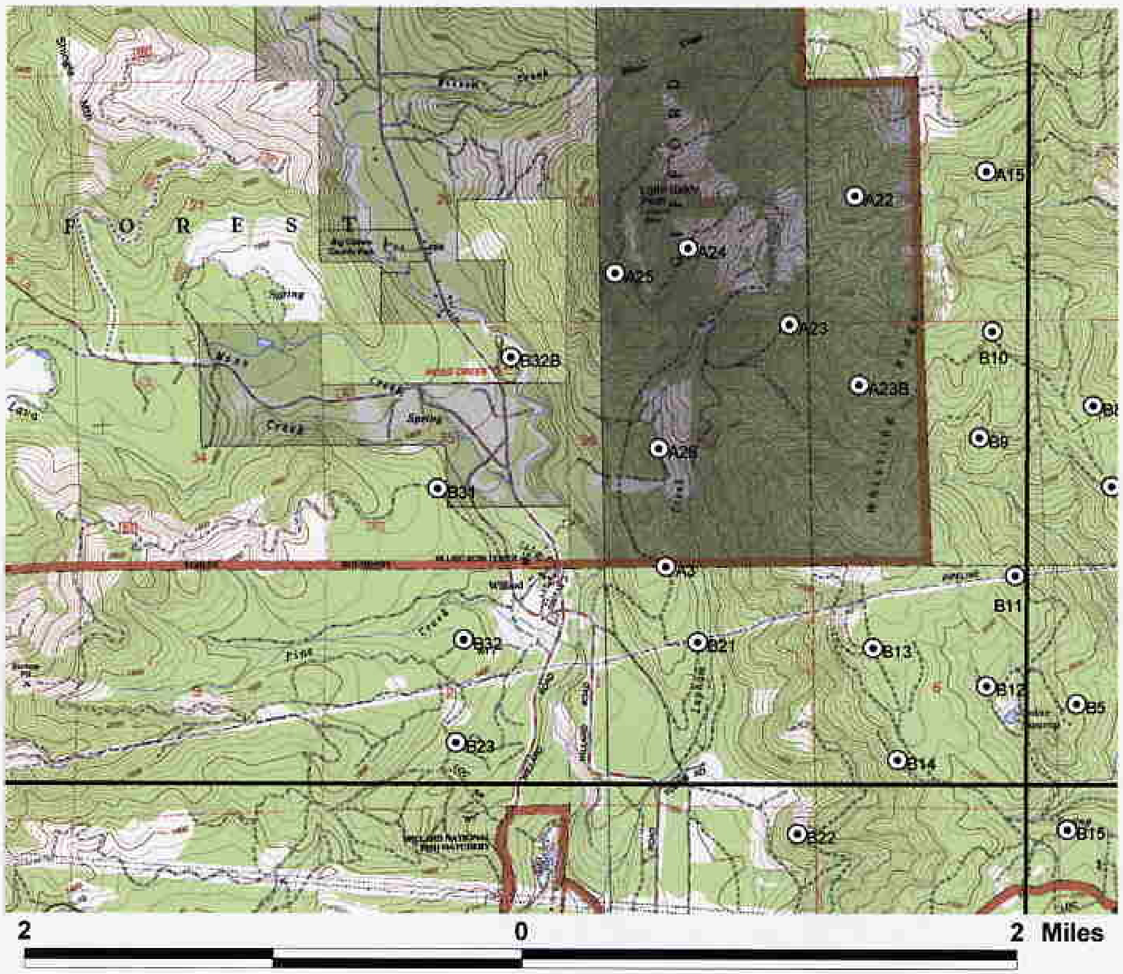


⊙	Calling Points
——	Quadrant Boundary

TECI GIS LAB

Map 4

Saddleback Wind Power Project
Northern Spotted Owl Survey Stations
Northwest Quadrant

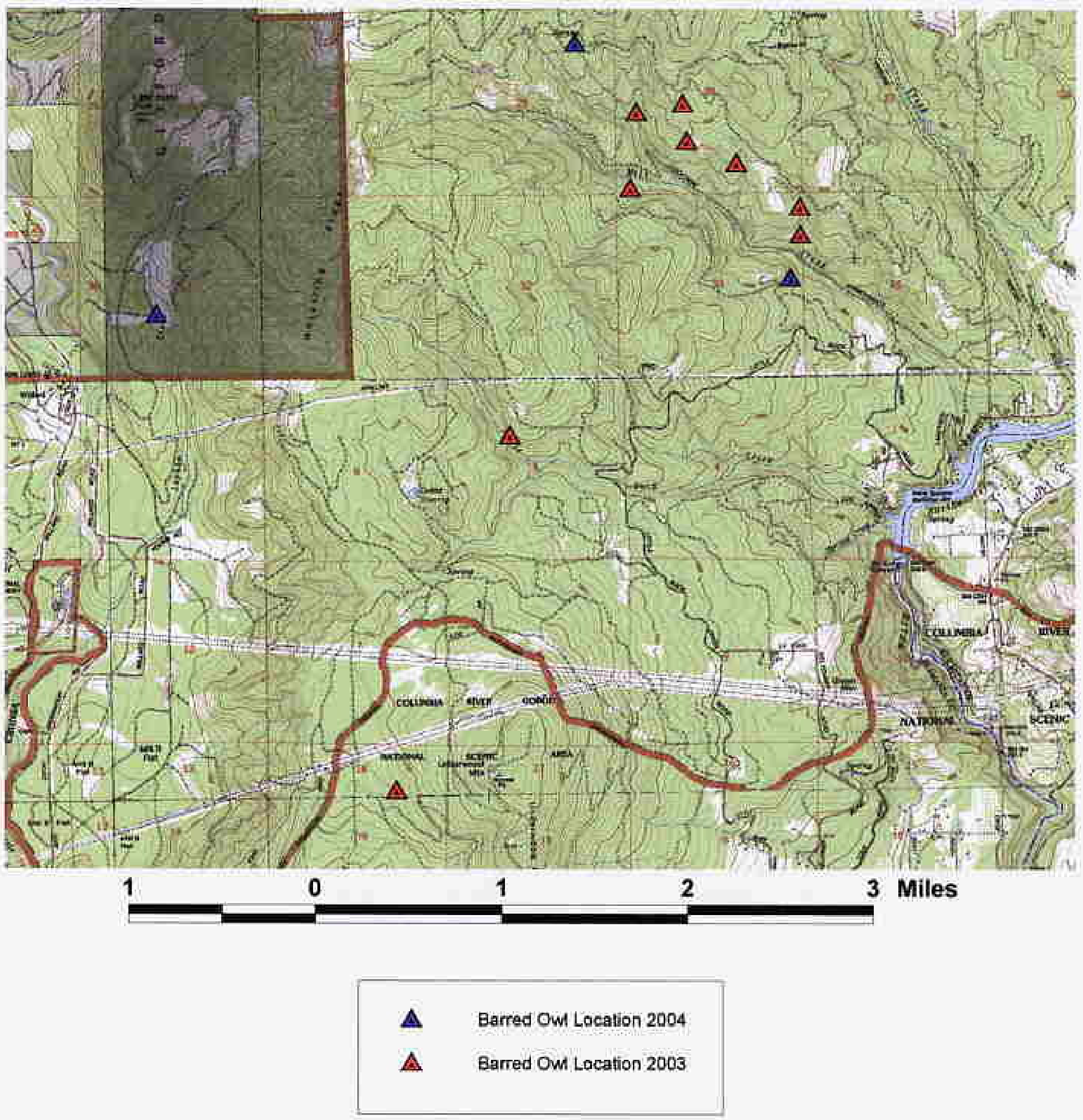


⦿	Calling Points
—	Quadrant Boundary

TECI GIS LAB

Map 5

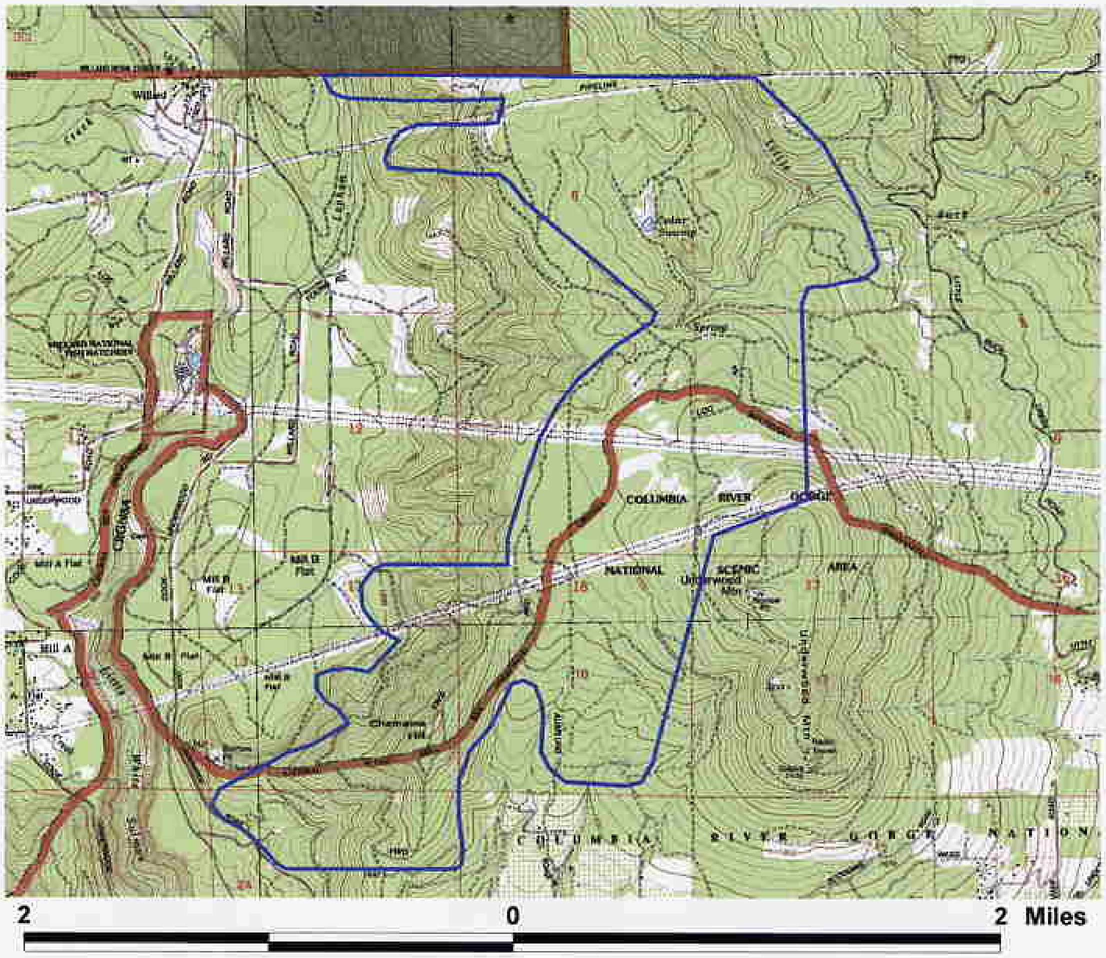
Saddleback Wind Power Project
Barred Owl Locations



TECI GIS LAB

Map 6

Saddleback Wind Power Project
Northern Goshawk Survey Area

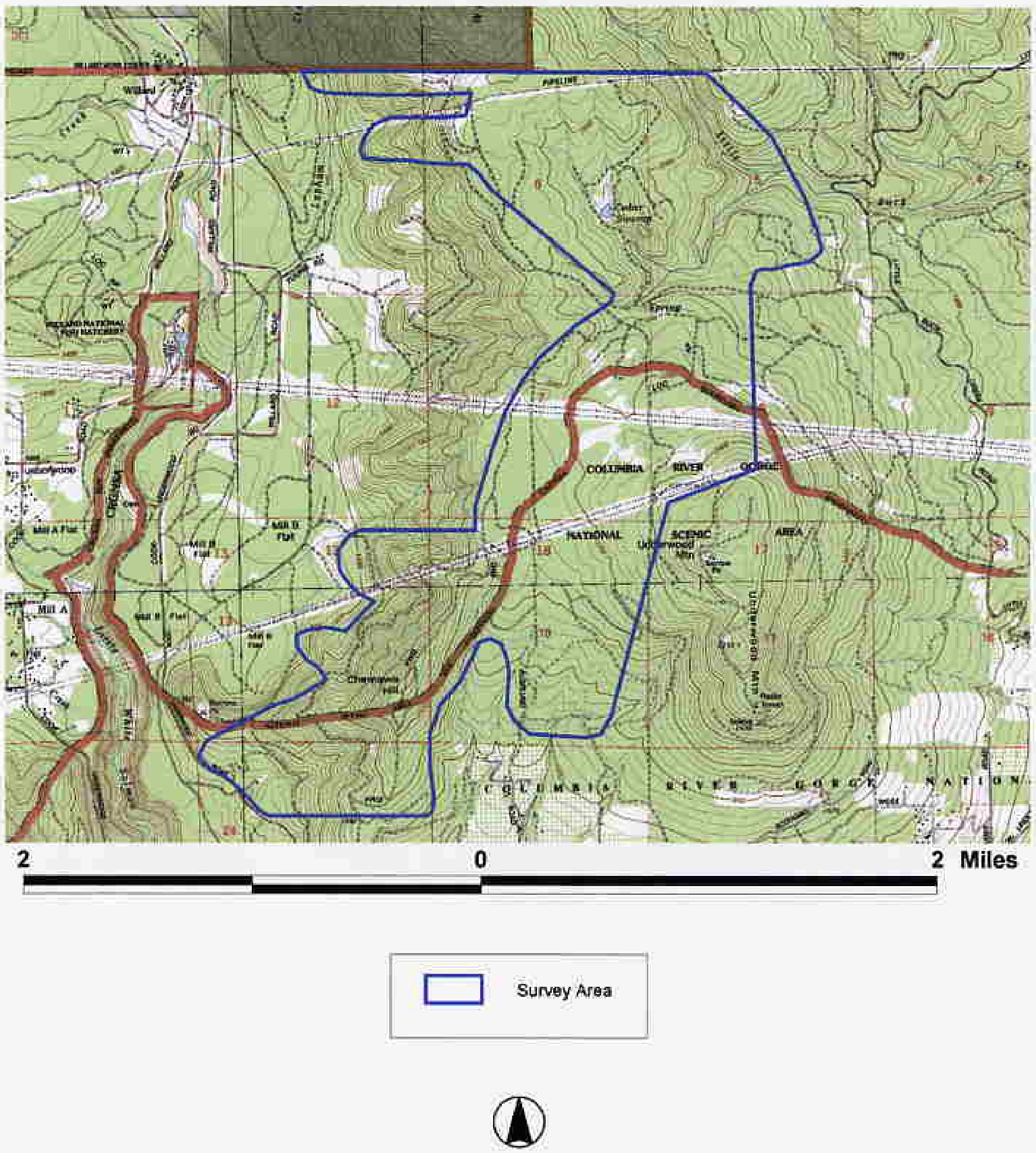


Survey Area

TECI GIS LAB

Map 7

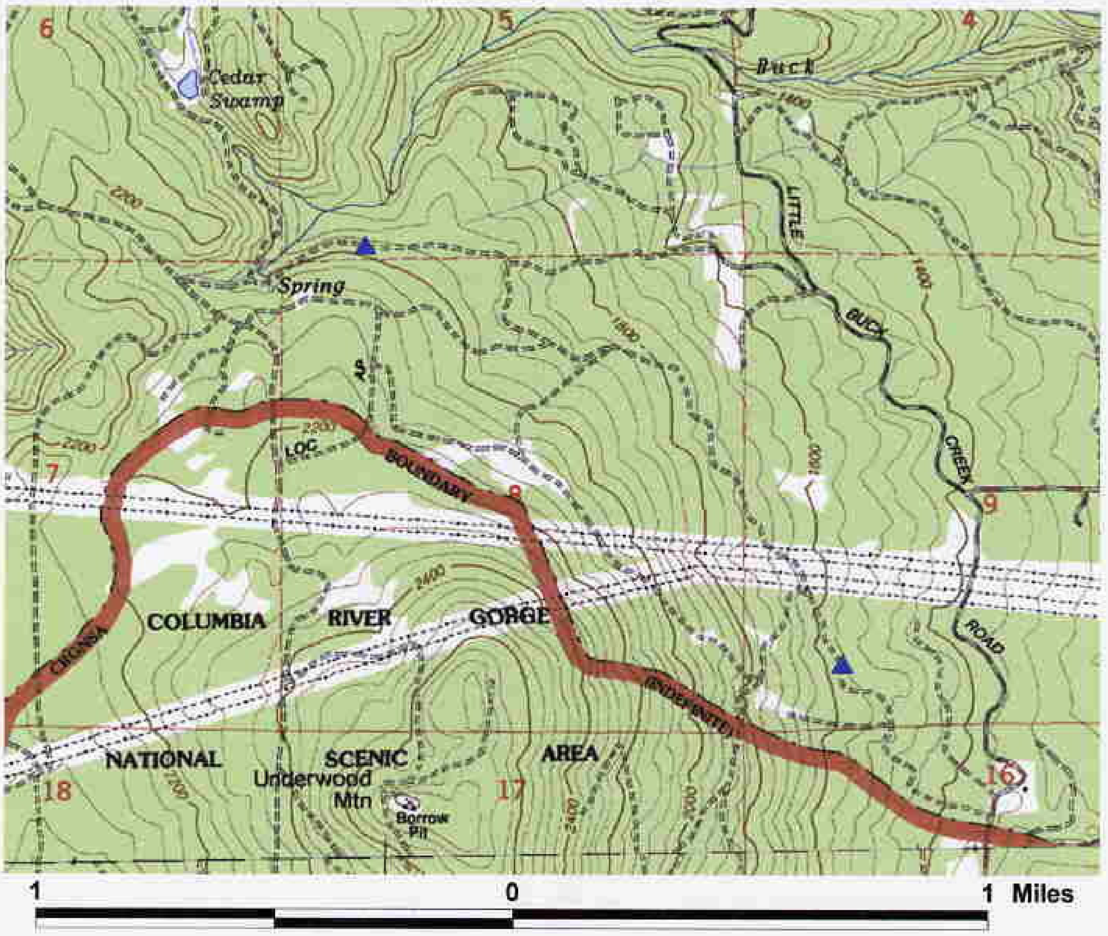
Saddleback Wind Power Project
Western Gray Squirrel
General Survey Area



TECI GIS LAB

Map 8

Saddleback Wind Power Project
Western Gray Squirrel Locations

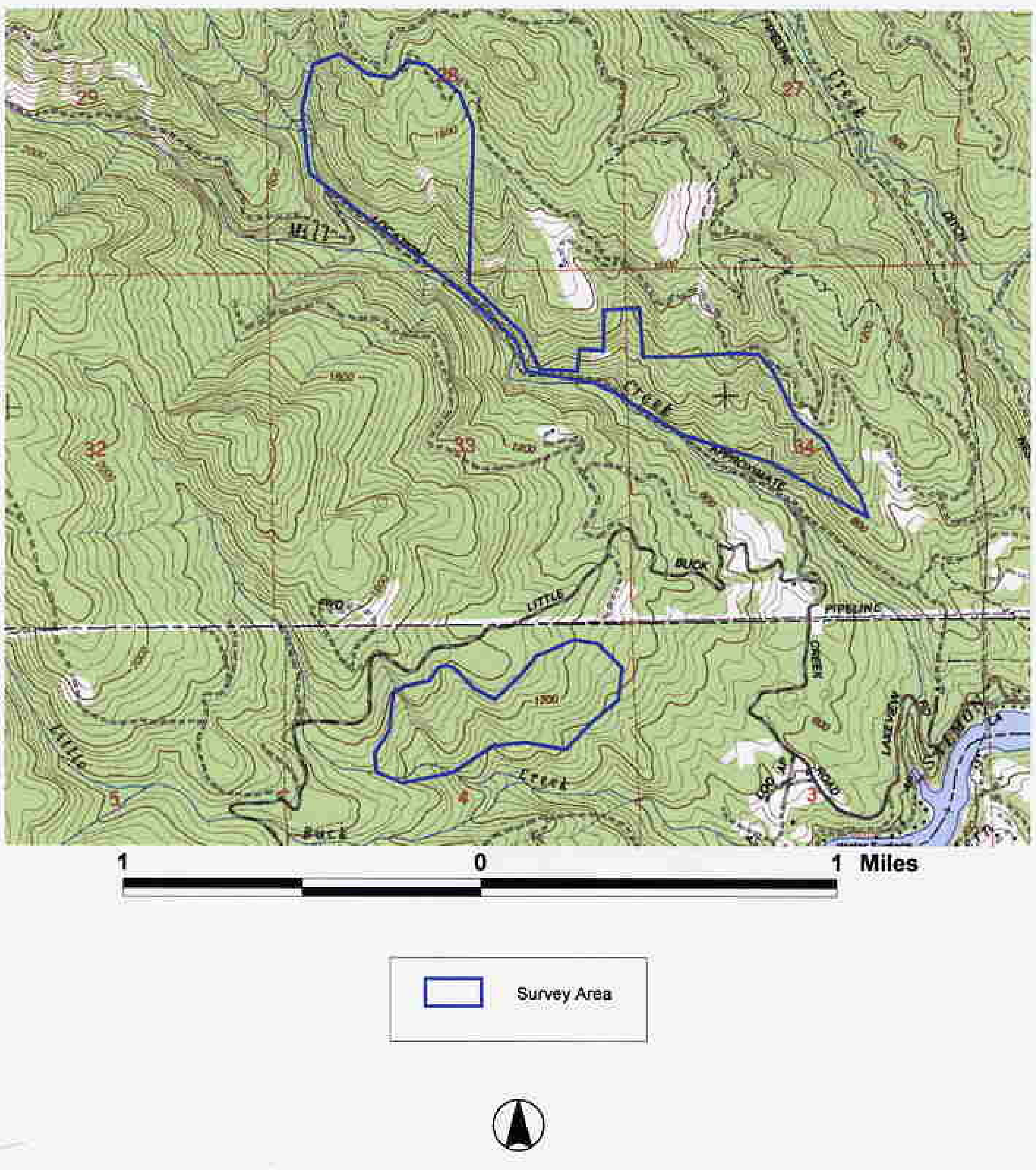


Squirrel Location

TECI GIS LAB

Map 9

Saddleback Wind Power Project
Western Gray Squirrel
Intensive Survey Area



Map 10

APPENDIX B:
2004 NORTHERN SPOTTED OWL SURVEY DATA

APPENDIX C:
2004 NORTHERN SPOTTED OWL CALLING STATION LOCATIONS
NAD 1927 UTM

STATION NUMBER	X COORDINATE	Y COORDINATE
A01	612809.74626	5070718.96470
A02	613169.26479	5068897.20043
A03	607286.17970	5070634.17310
A04	612906.65094	5071118.69649
A05	613766.67994	5071621.38950
A06	612706.78504	5071524.48482
A07	611858.86912	5071251.94042
A08	612010.28268	5071984.78203
A09	611144.19713	5072148.30867
A10	612185.92240	5072778.18907
A11	611780.13407	5073214.26012
A12	610895.87890	5073504.97415
A13	611386.45882	5072590.43626
A14	610344.73355	5073311.16479
A15	609363.57370	5073226.37320
A16	611890.57048	5068802.04178
A17	611593.19971	5067951.56138
A18	612622.10258	5068498.72360
A19	611997.62396	5067856.40273
A20	610956.82626	5068760.40987
A21	611186.59293	5071548.71099
A22	608509.60124	5073062.84656
A23	608085.64328	5072220.98718
A23B	608539.88395	5071827.31193
A24	607425.48017	5072717.62365
A25	606953.06987	5072554.09701
A26	607237.72736	5071409.41052
A27	611368.28920	5066879.11689
A28	610338.67701	5065080.32383
A30	612252.54437	5065449.77291
B01	612252.54437	5070452.47684
B02	611707.45556	5070246.55440
B03	611731.68173	5069410.75156
B04	610829.25693	5069568.22166
B05	609957.11484	5069743.86139
B06	610435.58168	5070355.57216
B07	610187.26345	5071167.14883
B08	610066.13261	5071694.06800

STATION NUMBER	X COORDINATE	Y COORDINATE
B09	609321.17790	5071482.08902
B10	609405.96950	5072178.59139
B10A	610368.95972	5072384.51382
B11	609557.38305	5070579.66422
B12	609369.63024	5069858.93569
B13	608630.73208	5070107.25393
B14	608789.81169	5069375.00731
B15	609896.54942	5068920.17164
B16	609829.92746	5068199.44311
B18	609024.40733	5067817.88094
B20	609030.46387	5067115.32204
B21	607492.10214	5070143.59318
B22	608140.15216	5068889.88893
B23	605923.45768	5069483.43007
B24	607794.92925	5066594.45940
B25	608206.77412	5066370.36734
B26	607595.06335	5065910.07012
B27	607831.26850	5065104.55000
B28	608594.39283	5064601.85699
B29	610356.84663	5066618.68557
B30	610653.61721	5065904.01358
B31	605802.32684	5071142.92266
B32	605971.91002	5070155.70626
B32B	606274.73714	5072002.95166

APPENDIX D:
NORTHERN GOSHAWK DATA FORMS

APPENDIX E:
WESTERN GRAY SQUIRREL DATA FORMS

C-6

Final Report: Results of Northern Spotted Owl, Northern Goshawk, Western Gray Squirrel Surveys Conducted for the Saddleback Wind Energy Project. Prepared for SDS Lumber.

Turnstone Environmental Consultants, Inc. 2008

2008 Final Report

Results of Northern Spotted Owl, Western Gray Squirrel and Northern Goshawk Surveys Conducted for the Saddleback Wind Energy Project

Prepared for:

SDS Lumber Company

Prepared by:

Turnstone Environmental Consultants, Inc.
10902 NW Skyline Blvd
Portland, Oregon 97231

March, 2009

Table of Contents

APPENDIX D - WESTERN GRAY SQUIRREL SURVEY FORMSERROR! BOOKMARK NOT DEFINED.

1. PROJECT OVERVIEW

SDS Lumber Company (SDS) retained the services of Turnstone Environmental Consultants, Inc. (Turnstone) to perform Northern spotted owl (spotted owl), Western gray squirrel (gray squirrel) and Northern goshawk (goshawk) surveys in potential habitat for the Saddleback Wind Energy Project, located in Skamania County, Washington. Survey information will be used to assess the presence, occupancy and reproductive status of spotted owl, gray squirrel and goshawk individuals and populations within areas of proposed management activities.
The physiographic range of spotted owl, gray squirrel and goshawk populations are potentially located within the forestlands of the Saddleback Wind Energy Project. As part of the process to avoid "take" of any state or federally listed species, landowners must conduct surveys to determine the presence of any potentially listed species, prior to conducting any management activities.

Wildlife surveys were conducted using the best information available at the time, following strict adherence to protocol guidelines and habitat requirements to obtain full compliance with agency requirements. All potential habitat and buffers were determined based on the proposed location of the proposed wind turbine locations. In late October of 2008, the final proposed turbine alignment was released and the locations of the turbines were slightly altered from their original location. Following the analysis of the new alignment, Turnstone biologists determined that a few areas that were surveyed for spotted owls, goshawks and gray squirrels in 2008, now did not require surveys, while other areas now required additional survey effort. The survey implications caused by the adjustments to the turbine locations, will be discussed in further detail in the results sections of this document.

2. NORTHERN SPOTTED OWL

Under the federal Endangered Species Act of 1973, the Northern spotted owl (*Strix occidentalis caurina*) was listed in 1990 as "threatened" by the United States Fish and Wildlife Service. The Washington Fish and Wildlife commission listed the Northern spotted owl as a state endangered species in 1988 (Buchanan and Swedeen, 2004). Both federal and state agencies determined that the spotted owl is likely to become an endangered species in the foreseeable future throughout all or a significant portion of its existing range. The northern spotted owl's range extends from Washington State to Northern California. A recently revised species recovery plan is in effect for the northern spotted owl (USFWS 2008).

2.1. Suitable Habitat

In Washington, spotted owls inhabit the Eastern and Western Cascades, Western Lowlands, and Olympic Peninsula Provinces. Within these regions, the spotted owl has specific habitat requirements for nesting, roosting, foraging and dispersal. The species utilizes forests with multi-layered canopies and a high incidence of large trees for nesting and roosting. Fragmented habitats may be used for dispersal and foraging. Spotted owls nest primarily in large tree cavities and on broken tops of large trees. Spotted owls have also been reported as nesting on clumps of mistletoe, on large branches, in abandoned stick nests of Northern goshawks and in cavities of embankments and rock faces (LaHaye 1999).

For the purposes of this project, potentially suitable spotted owl habitat was determined to be coniferous stands with average tree DBH greater than 12 inches and canopy closure of at least 60% or greater. Cut areas or young coniferous plantations that did not meet the minimum DBH or canopy closure parameters were excluded from the survey effort. The resulting designated survey areas would contain nesting roosting, foraging and, dispersal habitat.

2.2. Survey Locations

Turnstone conducted spotted owl surveys within and adjacent to properties managed by SDS and cooperating adjacent landowners. Surveys were conducted in all potentially suitable habitat within the 1.8 mile provincial home range radius of the proposed project area. To determine the potential spotted owl survey areas, the proposed turbine alignments were buffered out to a 1.8 mile radius. This created a large polygon of potential survey area that included 14,901 acres of land area. This polygon did not contain a contiguous area of potentially suitable spotted owl habitat. Suitable habitat within the overall polygon resembled a patchwork of stands that would require survey.

The delineated potential survey area polygon intersected 2 owl activity centers where historic spotted owl individuals once resided. A designated spotted owl activity center in this area of Washington is equal to a circle with a 1.8 mile radius. The spotted owl activity centers are located on public land north of the project area. The nest cores of these activity centers reside on public land managed by the Washington Department of Natural Resources (WDNR) and the U.S. Forest Service (USFS). Typically spotted owl activity centers will have their status changed to historic after three consecutive years of not being occupied by spotted owls. Currently the state of Washington has a moratorium on changing the status of a known spotted owl activity center to a historic status. The activity center areas intersect (1.8 mile radius provincial range), the northern reach of the delineated potential survey area polygon. The Mill Creek activity center (MSNO# 0991) was located and designated in 1992 and was last considered to have spotted owls present in 2000. The Moss Creek activity center (MSNO#1003) was located and established in 1994 and was last considered to have spotted owls present in 2002. Table 4, in the results section of this document, represents the survey summaries for these activity centers for 1994 thru 2008. These two activity centers are adjacent to one another and overlap by approximately 15%. Due to the adjacency of these spotted owl activity centers, it was decided to survey potential suitable habitat within the activity centers in addition to the survey area determined by 1.8 mile buffer of the proposed turbine alignments. This added an additional 7,222 acres of area that was included in the overall potential survey area. Within this 7,222 acres of area there was a patchwork mix of potentially suitable spotted owl habitat and non-habitat

Table 1. Township and Range information for northern spotted owl survey areas.

Legal Descriptions for Spotted Owl Survey Areas		
Township	**Range**	**Section**
3N	9E	1,2,11,12,12,14,23,24,25
3N	10E	4-6,7-9,16-18,19,20,30

4N	9E	23,24,25,26,27,34,35,36
4N	10E	19-22, 27-30,31-34

2.3. Survey Methods

Potential northern spotted owl habitat was surveyed in 2008 in accordance with the 1992, revised version of "Protocol for Surveying Proposed Management Activities That May Impact Northern Spotted Owls". This survey protocol is endorsed by the U.S. Fish and Wildlife Service. Under this protocol, Turnstone initiated the 2-year survey effort in early May of 2008. Under the two year survey methodology, a minimum of 3 visits must be performed for 2 consecutive years in order to determine presence/absence of the spotted owl.

Prior to initiating field surveys, Turnstone biologists analyzed the project area using topographic maps, aerial photography and stand classification data to determine suitable habitat for potential broadcast calling station placement. When possible, broadcast calling stations were placed along ridges and away from streams to maximize coverage by enhancing sound transmission. Broadcast calling stations and survey routes were situated to achieve complete coverage of the potential survey area, preferably with coverage from more than one calling point. Stations were spaced approximately ¼ to ½ mile apart where access was possible and permitted and suitable habitat was present. All broadcast calling stations were surveyed at night when owls are more active and are thought to be more responsive to standard survey techniques (USDI 1992). Per protocol guidelines, Turnstone biologists used ten-minute calling periods at each designated broadcast calling station. Voice hooting, amplified PA systems and "hoot flutes" were used to broadcast both male and female spotted owl vocalizations that included four-note contact calls and various agitated calls. Turnstone conducted surveys between March 15th and August 31st, 2008, as stipulated by the protocol.

During the first round of spot calling, an additional day visit was made to each of the two spotted owl activity centers adjacent to the main project (Mill Crk, and Moss Crk.). The day visits conducted by Turnstone staff were made in addition to the 3 required survey visits per the protocol guidelines. The intent of these day visits was to further verify if spotted owls were occupying the historic spotted owl nest cores. Turnstone biologists hiked into the historic nest cores and hiked intuitive meandering survey transects, broadcasting spotted owl vocalizations with an amplified PA system while listening for responses.

The Mill Creek and Moss Creek nest cores are currently being surveyed as part of a long term demography study conducted by the Washington Department of Natural Resources on lands within the Klickitat Habitat Conservation Plan Planning Unit. The study was initiated in 2001 and was slated to run for 5 years. In 2007, a new 3 year contract was initiated to extend the survey effort for another 3 years. The fieldwork for the project is carried out by staff from the National Council for Air and Stream Improvement (NCASI), and follows a different standardized survey protocol. Each year NCASI performs a minimum of 6 day/night survey visits to the monitored owl cores. Survey summary details of the survey results for each of these spotted owl cores can be reviewed in Table 4 of this document.

During the 2008 survey season, Turnstone recorded all owl species responses from each calling station during each site visit. Turnstone biologists also recorded all sightings of or responses by potential spotted owl predators to include: barred owls, great horned owls, northern goshawks and other raptor species. The presence of any of these species may affect northern spotted owl responses.

3. Western Gray Squirrel

The western gray squirrel (*Sciurus griseus*) was listed as a “threatened” species by the Washington Fish and Wildlife Commission in 1993. In November of 2007, the State of Washington adopted a species recovery plan for the Western Gray Squirrel which is currently in effect.

In January of 2001, a petition was filed with the United States Fish and Wildlife Service to list the Washington State population of the western gray squirrel as a distinct population segment (DPS) in an effort to secure protection for the species under the Endangered Species Act of 1973 (ESA). The petition underwent a 12 month period of review and a ruling was announced May 30, 2003. This ruling stated the petition action was not warranted because the Washington population of the Western Gray Squirrel is not a DPS therefore, no protection under the ESA would be granted (Federal Register, 2003). There is currently no federal protection for the western gray squirrel.

The physiographic range and habitat requirements of the western gray squirrel are located within the forestlands of the Saddleback Wind Energy Project.

3.1. Suitable Habitat

Western gray squirrels are arboreal (adapted for living in trees) and, although they forage on the ground, they rarely stray far from trees. They use tree canopies for escape, cover and nesting. Western gray squirrels can move rapidly and cover long distances among tree canopies when canopy conditions permit. A contiguous tree canopy that allows arboreal travel for at least 198 feet (60 meters) around the nest is an important feature of western gray squirrel habitat (Ryan and Carey 1995a). Western gray squirrels are active throughout the day but are most active in the morning. Western gray squirrels are most active in August and September, when they are collecting and storing food for winter, and they are less visible in June and July (Ryan and Carey 1995a).

Currently in Washington, the western gray squirrel distribution has been reduced to three geographically isolated western gray squirrel populations in Washington: the “Puget Trough” population, now centered in Thurston and Pierce counties in the Puget Sound region; the “South Cascades” population in extreme eastern Skamania County and Klickitat and Yakima counties; and the “North Cascades” population in Chelan and Okanogan counties.

In Washington, and elsewhere within the subspecies’ range, the principal food is acorns, although the seeds of Douglas-fir and other conifers are also eaten (Dalquest 1948). While pine nuts and acorns are considered essential foods for storing body fat and conditioning western gray squirrels for winter, green vegetation, seeds and nuts of trees and shrubs, fleshy fruits, mushrooms and other foods are also consumed. Hypogeous fungi (underground fungi such as truffles) comprise a large portion of the western gray squirrel diet (WDW 1993; Carraway and Verts 1994; Ryan and Carey 1995a).

For the purposes of this project, potentially suitable western gray squirrel potential habitat was defined as any coniferous, deciduous or mixed stands of trees that contained trees with an average diameter at breast height (DBH) of at least 10 inches or greater

3.2. Survey Locations

Turnstone conducted western gray squirrel nest surveys on approximately 738 acres of potentially suitable habitat within the project area. The survey methodology was determined with consultation with a WDFW staff biologist. Within the project area, potential gray squirrel survey areas were determined by using GIS analysis and ground-truthing. The GIS analysis was used to determine areas of potentially suitable squirrel habitat prior to conducting field visits and the ground-truthing was used to validate and finalize the initial GIS analysis.

Western gray squirrel nest surveys were required in any areas where project activities would remove potential western gray squirrel habitat or possibly impact habitat due to structural modification, including stand thinning. Surveys would be required on all habitat that would be altered and continue 400 feet into unaltered habitat. To determine the areas to be surveyed, the proposed energy project infrastructure (primarily proposed wind turbines), was buffered out 150 feet (150 foot radius) to establish a work zone. Then an additional 500 feet of buffer was added, to encompass any areas that may need to be altered due to obstructions (tall trees) within wind corridors of the proposed turbines. Finally an additional 400 feet was buffered onto this distance to satisfy the guideline to survey 400 feet into unaltered habitat. Adding all buffers together, totaled 1,050 foot radius of area to be surveyed. The overall area delineated out by using this buffering process was equal to 1,420 acres. Within this area 738 acres was determined to be potentially suitable western gray squirrel habitat. The remaining 682 acres was determined to be non-habitat for the western gray squirrel.

The survey area was broken up into smaller discrete units to facilitate an efficient survey effort by Turnstone biologists. The discrete units were referred to as polygons and each got a unique identifier. A map of the western gray squirrel survey area polygons is located in Appendix A.

3.3. Survey Methods

Surveys were conducted according to the guidelines in the WDFW report, "Surveys for western gray squirrel nests on sites harvested under approved forest practice guidelines: analysis of nest use and operator compliance" (Haegen, Van Leuven, and Anderson 2004). Turnstone biologists performed a general search for western gray squirrels nests and western gray squirrel individuals in the fall of 2008.

Walk-through surveys using meandering transects were conducted in all conifer, deciduous, and mixed composition stands within the designated survey area that met the minimum DBH threshold of 10 inches. Surveyors were looking for squirrel nests and squirrel individuals of any species but focusing their attention on evidence of the western gray squirrel. Transects were oriented to parallel the topographic features of the survey polygons when possible. All transect were laid out systematically to ensure that they were evenly spaced and located close enough together so that no habitat areas were excluded from the survey.

4. NORTHERN GOSHAWK

The northern goshawk *(Accipiter gentiles)* is classified as a "species of concern" by the U.S. Fish and Wildlife Service and as a "listed candidate" for sensitive, threatened or endangered species by the Washington Fish and Wildlife Commission. Physiographic range and habitat requirements of the northern goshawk can be found within the forest lands of the Saddleback Wind Energy Project.

4.1. Suitable Habitat

Northern goshawks inhabit a wide variety of forest habitats, including true fir (red fir, white fir, and subalpine fir), mixed conifer, lodgepole pine, ponderosa pine, Jeffrey pine, montane riparian deciduous forest and Douglas fir. Occasionally, goshawks nest in coastal redwood and mixed hardwood forests. Goshawk nest sites are associated with patches of forest that are larger and denser than the surrounding landscape. However, home ranges often consist of a wide range of forest age classes and conditions. Numerous habitat studies and modeling efforts have found nest sites to be associated with similar factors, including proximity to water or meadow habitat, forest openings, level terrain or “benches” of gentle slope, northerly aspects and patches of larger, denser trees, but these factors vary widely (Woodbridge 2006).

4.2. Survey Locations

During the 2008 northern goshawk survey window, Turnstone conducted northern goshawk surveys within properties managed by SDS Lumber Co. These surveys covered approximately 1,100 acres of potential goshawk habitat. The potential survey area for the northern goshawk was determined by protocol parameters, consultation with biologists from the Washington Department of Fish and Wildlife and GIS analysis. Survey protocol methodology was outlined in the United States Forest Service document, “*Northern Goshawk Inventory and Monitoring Technical Guide, July 2006.”* Table 2 depicts the legal descriptions of the where the goshawk survey areas occurred.

Table 2. Township and Range information for northern goshawk survey areas.

Legal Descriptions for Goshawk Survey Areas		
Township	**Range**	**Section**
4N	9E	1, 36
4N	10E	31,32
3N	9E	12,13,24
3N	10E	5,6,7,8,18

It was determined that the ‘Broadcast Acoustical Survey” methodology outlined in this protocol would best suit the needs of the project. This approach requires a one or a two year survey effort determined by the characteristics of the site and the project. Due to the size of the goshawk survey area and the potential level of initial disturbance, a 2 year survey effort will be used for the original 1,100 acres of potential goshawk habitat. The survey effort for goshawks will be complete after the 2009 surveys are complete.

To determine the area that would require goshawk surveys, a GIS analysis was executed using protocol parameters and available data. The proposed wind energy project infrastructure was buffered out 150 feet to establish a work area that would likely be permanently disturbed. Then an additional 2,624 feet, per protocol recommendations, was added to this initial buffer to establish an area that was considered the potential northern goshawk survey area. Within this area, GIS data was analyzed to identify stands of conifers that may contain suitable habitat structure based on an age class of greater than 25 years and average tree DBH of at least 12 inches. The resulting suitable habitat areas, or polygons, were then overlaid on current aerial photography (2006), to verify that the stands were still intact. This exercise created an initial potential survey area of 3,013 acres of land area. Of this area 1,093 acres was determined to be forested and contain the habitat characteristics needed to support goshawks. Initial calling points and survey transects were then established in GIS to adequately cover the 1,093 acres of potential goshawk habitat that would require survey. During the first goshawk survey field visit additional refinements were made to the goshawk survey areas based on ground-truthing of the potential habitat that was delineated out in GIS.

4.3. Survey Methods

The "broadcast acoustical" survey methodology requires 2 visits to the survey area in a season. The first site visit occurs in the 'nestling period', alarm and wail calls are broadcast at the designated calling points. During the second site visit in the 'fledgling period', wail and begging calls are broadcast. At each station, goshawk calls were broadcast with a portable amplified PA system for ten seconds. Turnstone biologists pause for thirty seconds to listen for goshawk responses, immediately following the broadcast calls. The sequence of broadcasting and listening for responses was repeated four times at each station, directed toward each of the four cardinal directions. During foot travel between broadcast points, the surveyor is staying alert and listening for potential goshawk calls and looking for potential goshawk nests. The surveyor is also documenting observations of other raptors species.

Survey periods begin ½ hour before sunrise and conclude ½ hour before sunset, as specified by protocol. If there was a goshawk detected in the project area, then a search for an active nest would ensue, following the ‘intensive search’ protocol. Locating an active nest is recommended immediately following any goshawk detections; however, reviewing results from several surveys and stations can be advantageous for locating active nests. Turnstone also recorded all other incidental raptor species observed during site visit on the field data forms, which are included in *Appendix C*.

5. Survey Results

5.1. Northern Spotted Owl

Turnstone conducted the first year of spotted owl surveys with a minimum of three visits per calling station on SDS property and some adjacent property (*Appendix A).* Two spotted owl nest cores located public lands (WDNR, USFS) to the north of the project area were also surveyed. The Mill Creek (MSNO#: 0991) and Moss Creek (MSNO#: 1003) cores are located in Township 4N and Range 10E section 28 and Township 4N and Range 9E section 35, respectively. A total of 80 calling stations were established and surveyed with no northern spotted owl responses or observations. Responses from single barred owls and barred owl pairs were recorded during the three site visits from several different calling stations. The following table summarizes all of the Turnstone survey site results for the project area for the 2008 survey season. A map depicting the locations of the calling stations and locations of other owl observations is available for review in Appendix A of this document.

Table 3. Survey Summary Results for 2008.

Visit #	Dates	# of Stations	Northern Spotted Owl Response	Comments
1	21-May	12	None	No owl responses
1	22-May	20	None	No owl responses
1	24-May	18	None	Barred owls (2) one adult male, one adult female; near Stations #45 & #82
1	25-May	22	None	Barred owls (2) likely pair; near Stations #74 & #86
1	26-May	8	None	No owl responses
2	10-Jun	22	None	Barred owls (2) Male and unk. sex Barred owl; likely a pair, near Stations #74 & #86
2	11-Jun	20	None	No owl responses
2	15-Jun	17	None	No owl responses
2	16-Jun	21	None	Barred owl (1) Unk. Adult Barred owl from Stations #44 & #45
3	27-Jul	15	None	No owl responses
3	28-Jul	20	None	Barred owl (1) Male adult Barred owl detected from Station #82
3	29-Jul	24	None	No owl responses
3	30-Jul	22	None	No owl responses

Table 3 outlines the results of the northern spotted owl surveys at each of the two historic nest cores that intersect the project area. Results in the table were derived from combining data collected by the WDFW, NCASI demography study and Turnstone. The data shows no spotted owls were detected in the Mill Creek core since the 2000 breeding season. The Moss Creek core has not had a spotted owl detected since the 2002 breeding season. Both cores show an increased presence of barred owls detected while conducting the surveys for spotted owls in these areas.

Table 4. NSO Activity Center Survey Details and Results

Year	Mill Creek NSO Core Survey Results		Moss Creek NSO Core Survey Results	
	STOC	STVA	STOC	STVA
2008	No response	Present	No response	Present
2007	No response	Present	No response	Male observed
2006	No response	Present	No response	Male observed
2005	No response	Present	No response	Pair observed
2004	No response	Pair observed	No response	Pair with juvenile observed
2003	No response	None observed	No response	Pair observed
2002	No response	Male observed	Male	Pair with juvenile observed
2001	No response	None observed	No response	Pair observed
2000	Non-nesting pair observed	None observed	Reproducing pair with 1 juvenile	None observed
1999	Female observed	None observed	Reproducing pair with 1 juvenile	None observed
1998	Non-nesting pair observed	Female observed	Reproducing pair with 2 juveniles	None observed
1997	Non-nesting pair observed	None observed	No response	None observed
1996	Reproducing pair with 2 juveniles	N/A	Reproducing pair with 3 juveniles	N/A
1995	No response	N/A	Reproducing pair	N/A
1994	Reproducing pair with 2 juveniles	N/A	Reproducing pair	N/A

5.2. Alterations to the Northern Spotted Owl Survey Area

The final turbine alignment was released in late October of 2008 did not effect the survey coverage for the areas that were surveyed for spotted owls during the 2008 survey season. Micro-sighting adjustments were made to the north of the project area. Stations were already set and surveyed due to the two activity centers at the northern reach of the project area.

5.3. Western Gray Squirrel

Three field visits were made the western gray squirrel survey areas by a total of three different biologists over a 12 day period. These visits together constituted a complete round of surveys to cover all potential habitat within the survey polygons. During the round of surveys, efforts were made to determine if western gray squirrels were currently using or had historically used any potential habitat within the potential survey area by conducting systematic nest search surveys. The potential survey area was determined using guidelines provided by WDFW staff biologists and GIS analysis. Western gray squirrel surveys were required on any potential western gray squirrel habitat that would be altered by the proposed energy project and include surveys a minimum of 400 feet into adjacent undisturbed potentially suitable squirrel habitat (per WDFW protocol guidelines).

All 26 survey polygons (appendix A) were examined and a formal nest search for western gray squirrel nest structures was performed using guidelines outlined by the protocol, *Surveys for western gray squirrel nests on sites harvested under approved forest practice guidelines, WDFW 2004*. During these visits, no western gray squirrels or western gray squirrel nest structures were observed.

Table 5. Western Gray Squirrel Survey Areas and Results

Survey Polygon Visited	Date	Surveyor	Notes
A1, A3, A7	10/14/2008	D. Sahl	No nests or WGS observed
A4, A5, A10	10/14/2008	J.Kolozar	No nests or WGS observed
A2, A6, A9	10/14/2008	J.Kolozar	No nests or WGS observed
A12, A13	10/15/2008	D.Sahl	No nests or WGS observed
A14	10/15/2008	D. Bolen	No nests or WGS observed
A15	10/15/2008	J. Kolozar	No nests or WGS observed
A11, A17, A18	10/15/2008	D. Sahl, D. Bolen, J. Kolozar	No nests or WGS observed
B1-B8	11/18/2008	D.Sahl, D. Bolen	No nests or WGS observed
C1	10/9/2008	D. Sahl	No nests or WGS observed

5.4. Alterations to the Western Gray Squirrel Survey Area

The final turbine alignment that was released in late October of 2008 did not affect the survey coverage for the areas that were surveyed for western gray squirrels during the 2008 survey season. The changes made in the final turbine alignment did create additional western gray squirrel survey areas. The survey window to conduct western gray squirrels was still open when the new areas were determined and an additional field visit was conducted and the new areas were surveyed.

5.5. Northern Goshawk

Turnstone conducted protocol northern goshawk surveys on SDS properties during the 2008 goshawk survey window. The survey protocol methodology used was the "broadcast acoustical" methodology, outlined in the protocol; "*Northern Goshawk*

Inventory and Monitoring Technical Guide, USFS, July 2006." Calling stations were strategically placed throughout the potential survey area, which was all suitable habitat within 2,624 feet of the designated work areas. Turnstone completed two protocol site visits to 136 calling stations during the 2008 goshawk survey season. One site visit was conducted during the nestling period and the second during the fledgling period as suggested in the protocol. No northern goshawk responses were documented during either of the two site visits. Survey dates and other incidental raptor observations are summarized in Table 6. Maps of the areas surveyed for northern goshawks are available for review in Appendix A. Copies of the field data sheets are available for review in Appendix C.

Table 6. Northern goshawk survey results summary 2008.

Visit #	# of Stations	Date	N. Goshawk Response	Other Raptors Observed
1	14	6/23	None	OSPR (1) near station 46 RTHA (1) near station 46
1	21	6/24	None	RTHA (1) near station 36
1	22	6/25	None	
1	25	6/26	None	
1	25	6/27	None	
1	11	7/15	None	TUVU (1) near station 62
1	15	7/16	None	COHA (1) near station 26
1	3	7/28	None	
2	7	7/28	None	
2	14	7/30	None	RTHA (1) near station 67
2	22	7/31	None	TUVU (1) near station 95 TUVU (1) near station 78
2	16	8/01	None	
2	23	8/04	None	RTHA (1) near station 22
2	25	8/05	None	SSHA (1) near station 9 TUVU (8) near station 12
2	19	8/06	None	
2	10	8/07	None	
COHA = Cooper's hawk *(Accipiter cooperii)* OSPR = Osprey *(Pandion haliaetus)* RTHA = Red-tailed hawk *(Buteo jamaicensis)* SSHA = Sharp-shinned hawk *(Accipter striatus)* TUVU = Turkey vulture *(Cathartes aura)*				

5.6. Alterations to the Northern Goshawk Survey Area

The final turbine alignment that was released in late October of 2008, did affect the survey coverage for the areas that were surveyed for northern goshawks during the 2008 survey season. The changes made in the final turbine alignment created an additional 367 acres of potential survey area. The survey window to conduct northern goshawks was closed when the new survey areas were determined. These new survey areas will be included in the overall survey effort. The new survey area acreage may be reduced, if ground-truthing efforts in 2009 determine that some areas are composed of non-habitat. Due to the additional survey areas being determined after the close of the 2008 goshawk survey window, and the small size of the areas, a one year survey effort will be initiated in 2009, to the newly designated survey area. The survey methodology used will be the "Intensive Search Survey" protocol as outlined in the United States Forest Service document, "*Northern Goshawk Inventory and Monitoring Technical Guide, July 2006."* Under this protocol methodology, the new survey areas will only need to receive a single year of goshawk surveys in order to determine goshawk presence.

Maps of the original and adjusted northern goshawk survey areas can be reviewed in appendix A of this document.

6. CONCLUSION

6.1. Northern Spotted Owl

During the 2008 Northern spotted owl survey season, Turnstone conducted three site visits in each of the designated spotted owl calling points and an additional day visit to two separate nest cores where spotted owls once resided. This survey effort covered potentially suitable northern spotted owl habitat within the approximately 22,123 acre survey area. A total of 80 calling stations were established and surveyed. Turnstone recorded no Northern spotted owl observations or responses during any of these visits. Under the direction of SDS, Turnstone will utilize the calling stations established in 2008 and continue to survey potential habitat within the project area in 2009 in order to ensure proper adherence to the US Fish and Wildlife northern spotted owl survey protocol.

6.2. Western Gray Squirrel

During the 2008 western gray squirrel survey season, Turnstone biologists conducted nest searches to 26 different polygons of potential western gray squirrel habitat. These polygons totaled 738 acres of potentially suitable western gray squirrel habitat. All visits were conducted within the guidelines outlined the appropriate survey protocol. Turnstone biologists did not observe any Western gray squirrels or their nest structures during any of these visits.

Acorn crops from oak trees are an important food source for western gray squirrels. It should be noted that very few oak trees were observed in the project area. The few that were observed within the western gray squirrel survey area boundaries were small (less than 20 feet tall), stunted, and growing in openings on exposed rocky slopes in shallow soils.

6.3. Northern Goshawk

During the 2008 northern goshawk survey season, turnstone conducted surveys at 138 calling points covering 1,100 acres of potentially suitable goshawk habitat. No northern goshawk responses or observations were recorded during the two site visits during the 2008 breeding season. The 2006 “Northern Goshawk Inventory and Monitoring Technical Guide” developed for the United States Forest Service (USFS) recommends a two year survey effort for assessing the occupancy and reproductive status northern goshawks when surveying large tracts of land with the “broadcast acoustical” survey methodology. Under the direction of SDS, Turnstone will conduct surveys in two visits at the same calling stations that were established in 2008 in 2009. Additional survey areas that were added after the close of the 2008 goshawk survey season, will be surveyed in 2009, with a one or two year effort depending on project parameters and consultation with WDFW.

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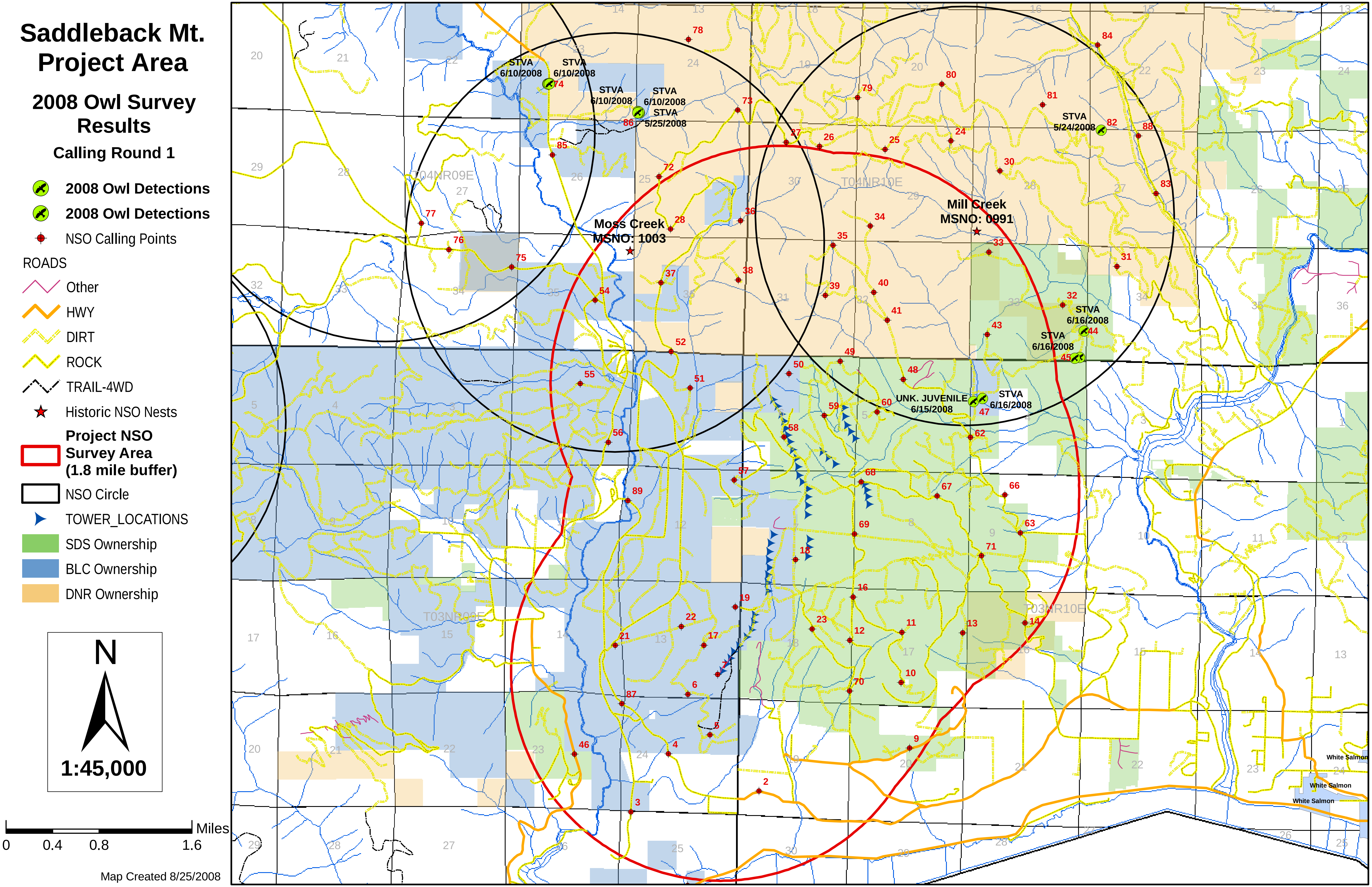
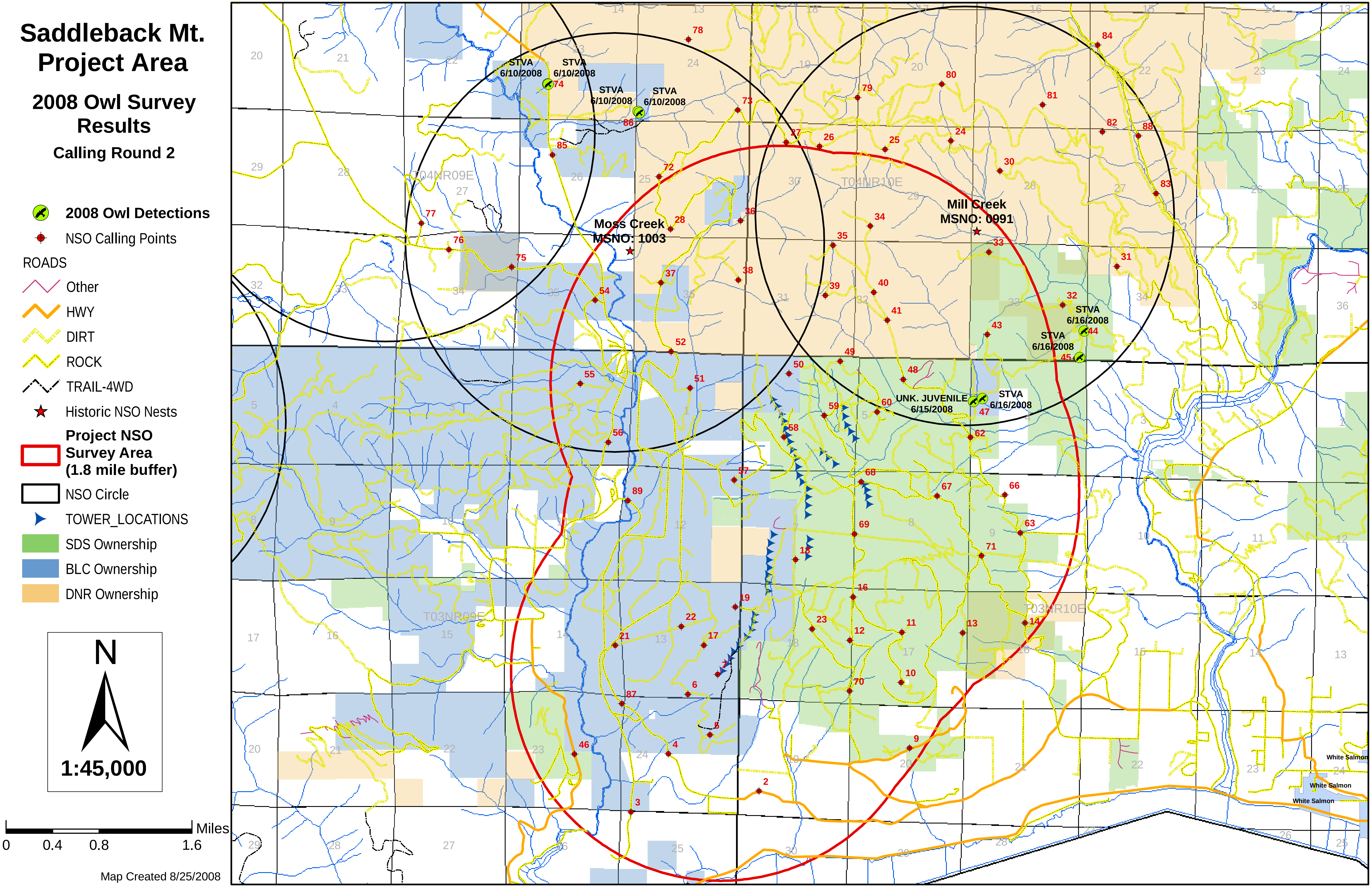
Appendix A – Maps


Saddleback Mt. Project Area
2008 Owl Survey Results
Calling Round 1
2008 Owl Detections
2008 Owl Detections
NSO Calling Points
ROADS
Other
HWY
DIRT
ROCK
TRAIL-4WD
Historic NSO Nests
Project NSO Survey Area (1.8 mile buffer)
NSO Circle
TOWER_LOCATIONS
SDS Ownership
BLC Ownership
DNR Ownership
N
1:45,000
0 0.4 0.8 1.6 Miles
Map Created 8/25/2008
Moss Creek MSNO: 1003
Mill Creek MSNO: 0991
T04NR09E
T04NR10E
T03NR09E
T03NR10E
STVA 6/10/2008
STVA 6/10/2008
STVA 6/10/2008
STVA 6/10/2008
STVA 5/25/2008
STVA 5/24/2008
STVA 6/16/2008
STVA 6/16/2008
UNK. JUVENILE 6/15/2008
STVA 6/16/2008
White Salmon
White Salmon
White Salmon


Saddleback Mt. Project Area
2008 Owl Survey Results
Calling Round 2
2008 Owl Detections
NSO Calling Points
ROADS
Other
HWY
DIRT
ROCK
TRAIL-4WD
Historic NSO Nests
Project NSO Survey Area (1.8 mile buffer)
NSO Circle
TOWER_LOCATIONS
SDS Ownership
BLC Ownership
DNR Ownership
N
1:45,000
Miles
0
0.4
0.8
1.6
Map Created 8/25/2008
T04NR09E
T04NR10E
T03NR09E
T03NR10E
Moss Creek
MSNO: 1003
Mill Creek
MSNO: 0991
STVA
6/10/2008
STVA
6/10/2008
STVA
6/10/2008
STVA
6/10/2008
STVA
6/16/2008
STVA
6/16/2008
UNK. JUVENILE
6/15/2008
STVA
6/16/2008
White Salmon
White Salmon
White Salmon

Saddleback Mt. Project Area

2008 Owl Survey Results

Calling Round 3

2008 Owl Detections
NSO Calling Points

ROADS

- Other
- HWY
- DIRT
- ROCK
- TRAIL-4WD

Historic NSO Nests

Project NSO Survey Area (1.8 mile buffer)

NSO Circle

TOWER_LOCATIONS

SDS Ownership

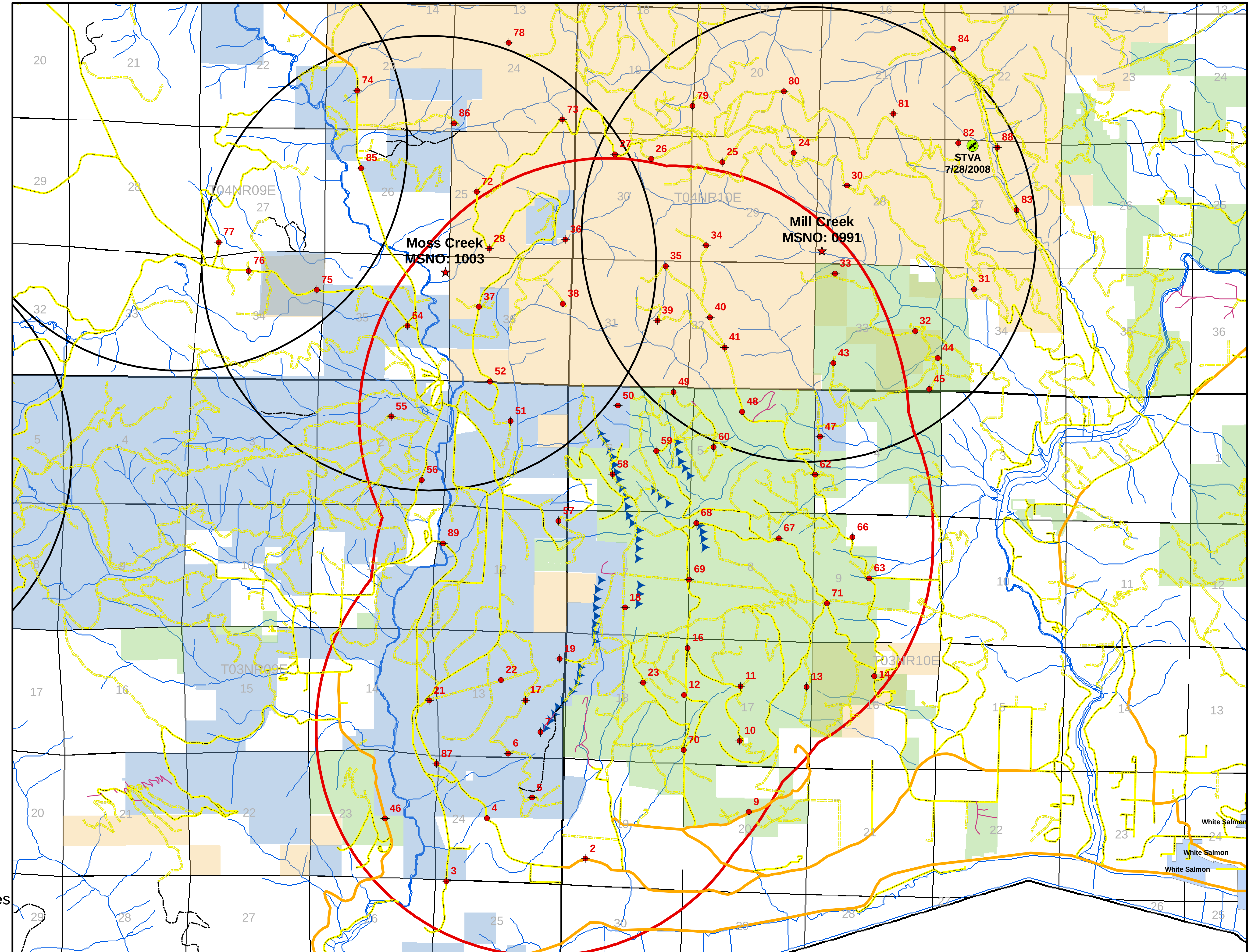
BLC Ownership

DNR Ownership

N

1:45,000

0 0.4 0.8 1.6 Miles



Map Created 8/25/2008

Saddleback Mt. Project Area

2008 Northern Goshawk Survey Areas Overview Map

Final Proposed Turbine Alignment

Original Proposed Turbine Alignment

Northern Goshawk Survey Points

New Goshawk Survey Areas (not surveyed in 2008)

Original Goshawk Survey Areas

Roads

Other

HWY

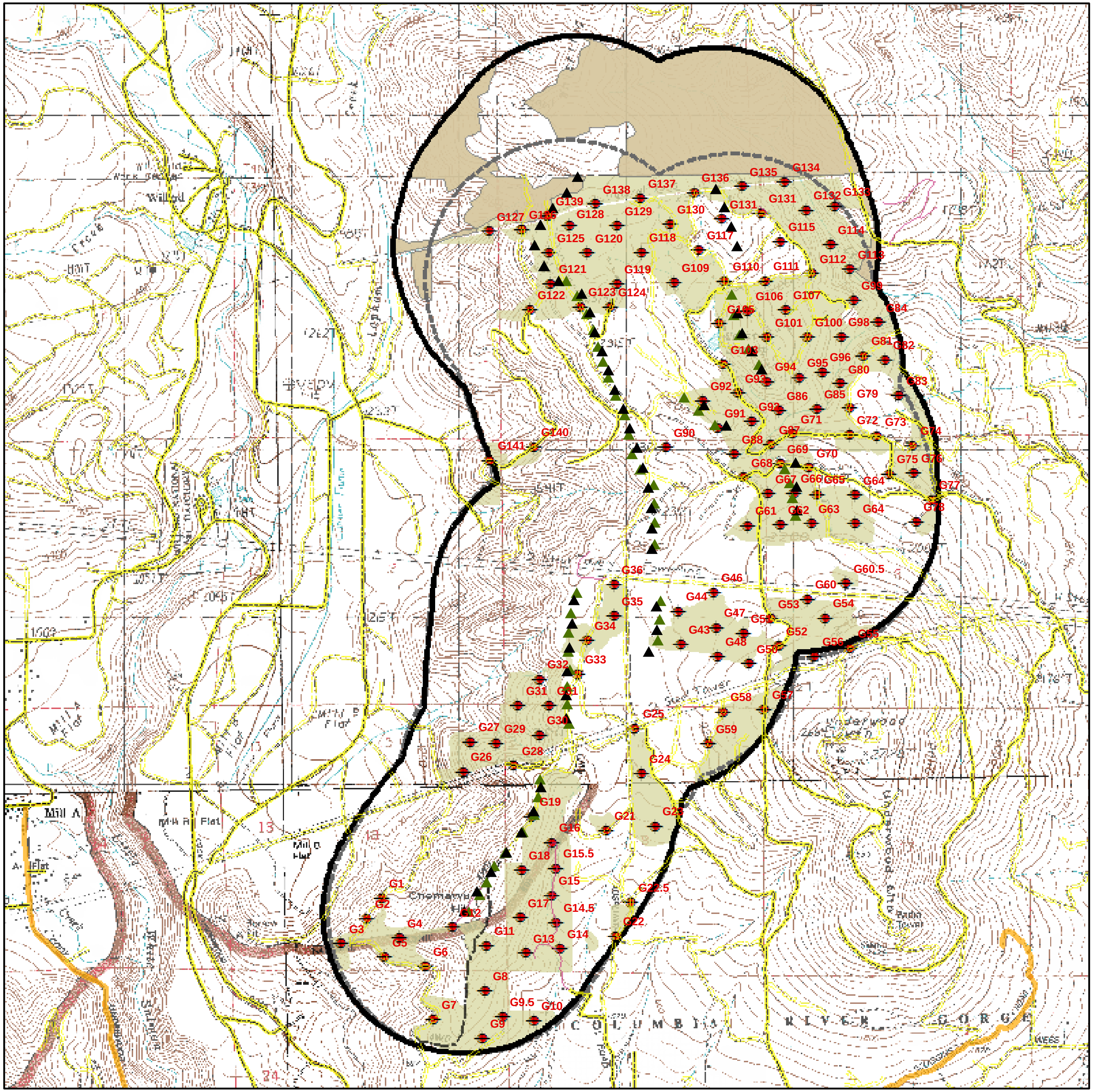
DIRT

ROCK

TRAIL-4WD

0 1,375 2,750 5,500 Feet

TURNSTONE
ENVIRONMENTAL CONSULTANTS



Map Created 12/4/2008

Saddleback Mt. Project Area

2008 Western Gray Squirrel Survey Areas Overview Map

Final Proposed Turbine Locations

Original Proposed Turbine Locations

WGS Survey Areas

Non-habitat or Clearcut Areas

Roads

Other

HWY

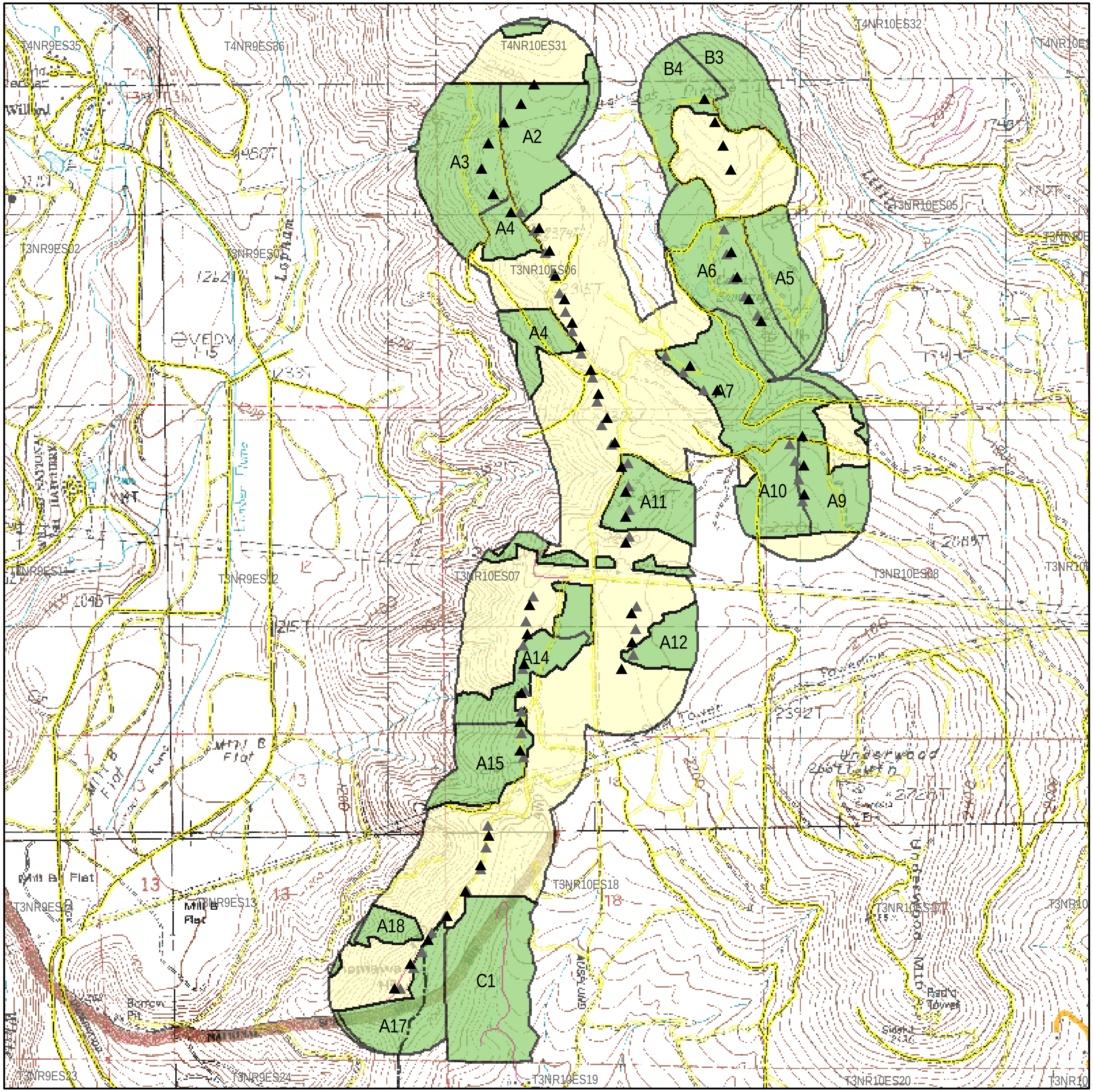
DIRT

ROCK

TRAIL-4WD

0 1,100 2,200 4,400 Feet

TURNSTONE ENVIRONMENTAL CONSULTANTS



Map Created 11/21/2008

APPENDIX B - NSO SURVEY FORMS

Turnstone Environmental Consultants
NSO Survey Form

Survey Area: SDS Lumber **Owl Site(s):** **Visit #** 1

Project Area: Saddleback Mt. Project **Crew:** DANA N. McCoskey **Month:** 05 **Day:** 21, **2008**

Tape Voice Flute Other: **Block/Area ID:**

Wind Codes: **0** = Calm (<1 mph), **1** = Light air (1-3 mph) **2** = Light breeze (4-7 mph) **3** = Gentle breeze (8-12 mph) **4+** =Unsuitable (13+ mph)
Weather Codes: **CL** = Clear **FG** = Fog **PC** = Partly Cloudy **OC** = Overcast, **DR** = Drizzle **LR** = Light Rain **HR** = Heavy Rain (unsuitable) **SN** = Snow, **H** = Hail

ST#	Hike	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	¼	UTMX (NAD83-GPS data only)	UTMY (NAD83-GPS data only)
2		2202	2212	3	DR	N														
4		2214	2224	3	DR	N														
3		2227	2237	3	DR	N														
87		2239	2249	3	DR	N														
21		2252	2302	3	DR	N														
22		2304	2314	3	DR	N														
19		2318	2328	3	DR	N														
17		2332	2342	3	DR	N														
6		2345	2355	3	DR	N														
5		0009	0019	3	DR	N														
46		0031	0041	3	DR	N														
8		0056	0106	3	DR	N														

Time: Military format (midnight is 0000). **Resp. Codes:** **N** = no owl response, **A** = audio response only, **V** = visual response only, **B** (or A, V) = both audio and visual response. **Sex: M** = male, **F** = female, **U** = unknown. **Age: A** = adult. **S** = subadult, **J** = juvenile **Species.** **Codes: STOC** = Northern Spotted Owl, **STVA** = Barred Owl, **STRIX** = *Strix*-species unknown, STNE = Great Gray Owl, **BUVI** = Great Horned Owl, **AEAC** = Northern Saw-whet Owl, **OTKE** = Western Screech Owl, **GLGN** = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. **Call Type(s):** **4** = 4 Note Call (STOC Only), **A** = Agitated, **B** = Bark, **CO** = Contact Call, JB = Juvenile Begging, **W** = Whistle/Nest Call, **8** = 8 Note call (STVA only), **Stan** = (standard) other non-*Strix* owls

Comments:

Turnstone Environmental Consultants
NSO Survey Form

Page 1 of 2 (including maps)

Survey Area: SDS LUMBER **Owl Site(s):** ______ **Visit #** 1

Project Area: Saddleback Mt. Project **Crew:** DANA N. McLOSKEY **Month:** 05 **Day:** 22, 2008

Tape Voice Flute Other: ______ **Block/Area ID:** ______

Wind Codes: 0 = Calm (<1 mph), 1 = Light air (1-3 mph) 2 = Light breeze (4-7 mph) 3 = Gentle breeze (8-12 mph) 4+ =Unsuitable (13+ mph)
Weather Codes: CL = Clear FG = Fog PC = Partly Cloudy OC = Overcast, DR = Drizzle LR = Light Rain HR = Heavy Rain (unsuitable) SN = Snow, H = Hail

ST#	Hike	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	Location ¼	UTMX NAD83-GPS data only	UTMY NAD83-GPS data only
14		2031	2041	3	CL	N														
64		2048	2058	3	CL	N														
63		2101	2111	3	CL	N														
66		2112	2122	3	CL	N														
62		2124	2134	3	CL	N														
47		2137	2147	3	CL	N														
49		2152	2202	3	CL	N														
41		2205	2215	3	CL	N														
40		2217	2227	3	CL	N														
35		2231	2241	3	CL	N														
39		2245	2255	3	CL	N														
71		2321	2331	3	CL	N														
13		2333	2343	3	CL	N														
67		2347	2357	3	CL	N														
68		2359	0009	3	PC	N														
58		0012	0022	2	PC	N														
50		0026	0036	Ø	DR	N														
23		0049	0059	Ø	DR	N														
70		0102	0112	Ø	DR	N														
19		0123	0133	Ø	DR	N														

Time: Military format (midnight is 0000). **Resp. Codes:** N = no owl response, A = audio response only, V = visual response only, B (or A, V) = both audio and visual response. **Sex: M** = male, **F** = female, **U** = unknown. **Age: A** = adult. **S** = subadult, **J** = juvenile **Species**. **Codes: STOC** = Northern Spotted Owl, **STVA** = Barred Owl, **STRIX** = *Strix*-species unknown, STNE = Great Gray Owl, **BUVI** = Great Horned Owl, **AEAC** = Northern Saw-whet Owl, **OTKE** = Western Screech Owl, **GLGN** = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. **Call Type(s):** 4 = 4 Note Call (STOC Only), **A** = Agitated, **B** = Bark, **CO** = Contact Call, JB = Juvenile Begging, **W** = Whistle/Nest Call, **8** = 8 Note call (STVA only), **Stan** = (standard) other non-*Strix* owls

Comments:

Turnstone Environmental Consultants
NSO Survey Form

Survey Area: SDS Lumber **Owl Site(s):** **Visit #** 1

Project Area: Saddleback Mt. Project **Crew:** DANA N. McCoskey **Month:** 05 **Day:** 22, 2008

Tape Voice Flute Other: **Block/Area ID:**

Wind Codes: **0** = Calm (<1 mph), **1** = Light air (1-3 mph) **2** = Light breeze (4-7 mph) **3** = Gentle breeze (8-12 mph) **4+** =Unsuitable (13+ mph)
Weather Codes: **CL** = Clear **FG** = Fog **PC** = Partly Cloudy **OC** = Overcast, **DR** = Drizzle **LR** = Light Rain **HR** = Heavy Rain (unsuitable) **SN** = Snow, **H** = Hail

ST#	Hike	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	Location ¼	UTMX NAD83-GPS data only	UTMY NAD83-GPS data only
7		0141	0151	Ø	DR	N														

Time: Military format (midnight is 0000). **Resp. Codes:** **N** = no owl response, **A** = audio response only, **V** = visual response only, **B** (or A, V) = both audio and visual response. **Sex: M** = male, **F** = female, **U** = unknown. **Age: A** = adult. **S** = subadult, **J** = juvenile **Species. Codes: STOC** = Northern Spotted Owl, **STVA** = Barred Owl, **STRIX** = *Strix*-species unknown, STNE = Great Gray Owl, **BUVI** = Great Horned Owl, **AEAC** = Northern Saw-whet Owl, **OTKE** = Western Screech Owl, **GLGN** = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. **Call Type(s): 4** = 4 Note Call (STOC Only), **A** = Agitated, **B** = Bark, **CO** = Contact Call, JB = Juvenile Begging, **W** = Whistle/Nest Call, **8** = 8 Note call (STVA only), **Stan** = (standard) other non-*Strix* owls

Comments:

Turnstone Environmental Consultants
NSO Survey Form

Survey Area: SDS LUMBER **Owl Site(s):** — **Visit #** 1

Project Area: SADDLEBACK Mt. PROJECT **Crew:** D. SAHL **Month:** 05 **Day:** 24, 2008

Tape Voice Flute Other: **Block/Area ID:** —

Wind Codes: 0 = Calm (<1 mph), 1 = Light air (1-3 mph) 2 = Light breeze (4-7 mph) 3 = Gentle breeze (8-12 mph) 4+ =Unsuitable (13+ mph)
Weather Codes: CL = Clear FG = Fog PC = Partly Cloudy OC = Overcast, DR = Drizzle LR = Light Rain HR = Heavy Rain (unsuitable) SN = Snow, H = Hail

ST#	Hike	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	¼	UTMX NAD83-GPS data only	UTMY
43	X	2130	2140	1	PC	N														
45		2212	2242	1	PC	B	F	A	STVA	8/A	2220	2242	270	30	4N	10E	33	SE		
44		2252	2303	1	PC	N														
84		2330	2341	1	PC	N														
88		2345	2356	1	PC	N														
83		2358	0409	1	PC	N														
31		0020	0031	2	PC	N														
82		0052	0115	1	PC	V	M	A	STVA	8/A	0100	0115	290	80	4N	10E	27	NW		
81		0130	0141	1	PC	N														
30		0147	0158	1	PC	N														
24		0203	0214	1	PC	N														
25		0220	0231	1	PC	N														
26		0235	0246	1	PC	N														
27		0249	0259	1	PC	N														
73		0304	0314	1	PC	N														
78		0336	0346	2	PC	N														
79		0407	0417	1	PC	N														
80		0437	0447	1	PC	N														

Time: Military format (midnight is 0000). **Resp. Codes:** N = no owl response, A = audio response only, V = visual response only, B (or A, V) = both audio and visual response. **Sex:** M = male, F = female, U = unknown. **Age:** A = adult. S = subadult, J = juvenile **Species. Codes:** STOC = Northern Spotted Owl, **STVA** = Barred Owl, **STRIX** = *Strix*-species unknown, STNE = Great Gray Owl, **BUVI** = Great Horned Owl, **AEAC** = Northern Saw-whet Owl, **OTKE** = Western Screech Owl, **GLGN** = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. **Call Type(s):** 4 = 4 Note Call (STOC Only), A = Agitated, B = Bark, CO = Contact Call, JB = Juvenile Begging, W = Whistle/Nest Call, 8 = 8 Note call (STVA only), **Stan** = (standard) other non-*Strix* owls

Comments: 43, short Hike due to Ruts/ would be Accessible by ATV.
45: Bird Came in silent and flew off and dissapeared for ~ 5min. then Returned + vocalized, Bird that returned may Have been a different bird due to inability to sex bird before it dissapeared.

Turnstone Environmental Consultants
NSO Survey Form

Survey Area: SDS LUMBER
Owl Site(s):
Visit # 1

Project Area: Saddleback Mt. Project
Crew: D. SAHL
Month: 05 Day: 25, 2008

Tape Voice Flute Other:
Block/Area ID:

Wind Codes: 0 = Calm (<1 mph), 1 = Light air (1-3 mph) 2 = Light breeze (4-7 mph) 3 = Gentle breeze (8-12 mph) 4+ =Unsuitable (13+ mph)
Weather Codes: CL = Clear FG = Fog PC = Partly Cloudy OC = Overcast, DR = Drizzle LR = Light Rain HR = Heavy Rain (unsuitable) SN = Snow, H = Hail

ST#	Hike	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	¼	UTMX NAD83-GPS data only	UTMY
49		2010	2020	Ø	PC	N														
60		2023	2033	Ø	PC	N														
59		2039	2049	Ø	PC	N														
69		2109	2119	2	PC	N														
10		2141	2151	2	PC	N														
11		2155	2205	2	PC	N														
16		2210	2220	Ø	PC	N														
12		2223	2233	Ø	PC	N														
9		2242	2252	Ø	PC	N														
57		2322	2332	Ø	PC	N														
74		2354	0009	Ø	PC	B	M	A	STVA	A/B	0003	0009	360	20	4N	9E	23	SW		
74		2354	0009	Ø	PC	B	F	A	STVA	A/B	0006	0009	360	20	4N	9E	23	SW		
86		0024	0034	Ø	PC	B	M	A	STVA	A/B	0031	0034	20	10	4N	9E	24	SW		
86		0024	0034	Ø	PC	B	F	A	STVA	B	0030	0034	20	10	4N	9E	24	SW		
76		0100	0110	Ø	PC	N														
75		0125	0135	Ø	PC	N														
54		0138	0148	Ø	PC	N														
85		0151	0201	1	DR	N														
56		0208	0218	1	DR	N														
52		0223	0233	1	DR	N														

Time: Military format (midnight is 0000). Resp. Codes: N = no owl response, A = audio response only, V = visual response only, B (or A, V) = both audio and visual response. Sex: M = male, F = female, U = unknown. Age: A = adult. S = subadult, J = juvenile Species. Codes: STOC = Northern Spotted Owl, STVA = Barred Owl, STRIX = *Strix*-species unknown, STNE = Great Gray Owl, BUVI = Great Horned Owl, AEAC = Northern Saw-whet Owl, OTKE = Western Screech Owl, GLGN = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. Call Type(s): 4 = 4 Note Call (STOC Only), A = Agitated, B = Bark, CO = Contact Call, JB = Juvenile Begging, W = Whistle/Nest Call, 8 = 8 Note call (STVA only), Stan = (standard) other non-*Strix* owls

Comments: 74: Birds appear to be a pair, very vocal + agitated
86: Likely same Birds as # 74

Turnstone Environmental Consultants
NSO Survey Form

Survey Area: SDS LUMBER　　**Owl Site(s):** ______　　**Visit #** 1

Project Area: Saddleback Mt. Project　　**Crew:** P. SAHL　　**Month:** 05 **Day:** 25, **2008**

Tape Voice Flute Other: ______　　**Block/Area ID:** ______

Wind Codes: **0** = Calm (<1 mph), **1** = Light air (1-3 mph) **2** = Light breeze (4-7 mph) **3** = Gentle breeze (8-12 mph) **4+** =Unsuitable (13+ mph)
Weather Codes: CL = Clear FG = Fog PC = Partly Cloudy OC = Overcast, DR = Drizzle LR = Light Rain HR = Heavy Rain (unsuitable) SN = Snow, H = Hail

ST#	Hike	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	Location ¼	UTMX NAD83-GPS data only	UTMY NAD83-GPS data only
37		0238	0248	1	DR	N														
36		0253	0303	1	DR	N														
28		0310	0320	0	DR	N														
72		0323	0333	0	DR	N														

Time: Military format (midnight is 0000). **Resp. Codes:** N = no owl response, **A** = audio response only, **V** = visual response only, **B** (or A, V) = both audio and visual response. **Sex: M** = male, **F** = female, **U** = unknown. **Age: A** = adult. **S** = subadult, **J** = juvenile **Species**. **Codes: STOC** = Northern Spotted Owl, **STVA** = Barred Owl, **STRIX** = *Strix*-species unknown, STNE = Great Gray Owl, **BUVI** = Great Horned Owl, **AEAC** = Northern Saw-whet Owl, **OTKE** = Western Screech Owl, **GLGN** = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. **Call Type(s):** 4 = 4 Note Call (STOC Only), **A** = Agitated, **B** = Bark, **CO** = Contact Call, JB = Juvenile Begging, **W** = Whistle/Nest Call, 8 = 8 Note call (STVA only), **Stan** = (standard) other non-*Strix* owls

Comments:

Turnstone Environmental Consultants
NSO Survey Form

Survey Area: SPS LUMBER **Owl Site(s):** ______ **Visit #** 1

Project Area: SADDLEBACK Mt. PROJECT **Crew:** D. SAHL **Month:** 05 **Day:** 26, 2008

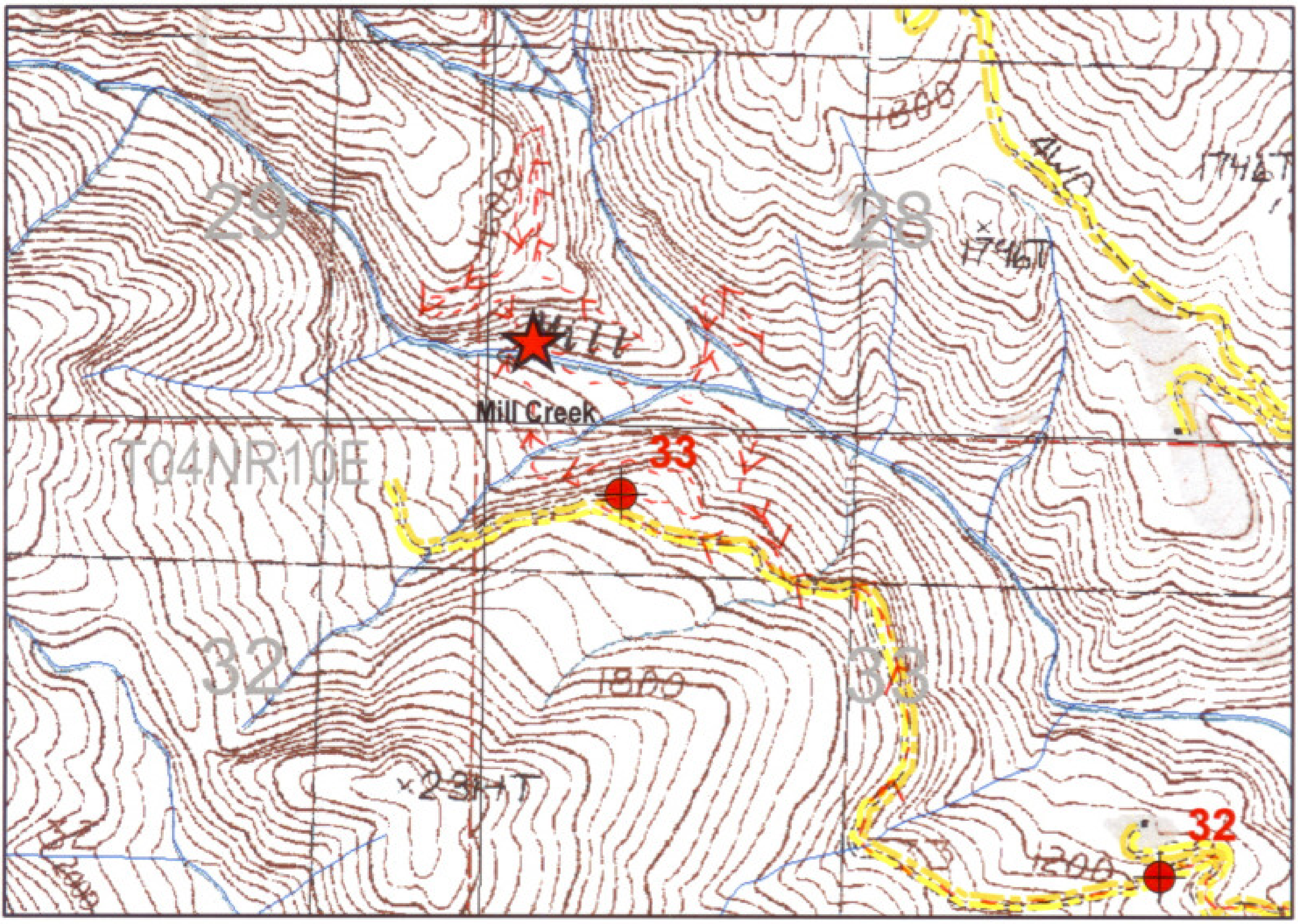
Tape Voice Flute Other: ______ **Block/Area ID:** ______

Wind Codes: 0 = Calm (<1 mph), 1 = Light air (1-3 mph) 2 = Light breeze (4-7 mph) 3 = Gentle breeze (8-12 mph) 4+ =Unsuitable (13+ mph)
Weather Codes: CL = Clear FG = Fog PC = Partly Cloudy OC = Overcast, DR = Drizzle LR = Light Rain HR = Heavy Rain (unsuitable) SN = Snow, H = Hail

ST#	Hike	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	¼	UTMX NAD83-GPS data only	UTMY NAD83-GPS data only
33		2001	2011	1	DR	N														
32		2022	2032	1	DR	N														
34		2121	2131	1	DR	N														
55		2209	2219	2	DR	N														
77		2232	2242	2	DR	N														
49		2254	2304	2	DR	N														
51		2315	2325	2	DR	N														
38		2349	2359	1	DR	N														

Time: Military format (midnight is 0000). **Resp. Codes:** N = no owl response, A = audio response only, V = visual response only, B (or A, V) = both audio and visual response. **Sex: M** = male, **F** = female, **U** = unknown. **Age: A** = adult, **S** = subadult, **J** = juvenile **Species. Codes: STOC** = Northern Spotted Owl, **STVA** = Barred Owl, **STRIX** = *Strix*-species unknown, STNE = Great Gray Owl, **BUVI** = Great Horned Owl, **AEAC** = Northern Saw-whet Owl, **OTKE** = Western Screech Owl, **GLGN** = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. **Call Type(s): 4** = 4 Note Call (STOC Only), **A** = Agitated, **B** = Bark, **CO** = Contact Call, JB = Juvenile Begging, **W** = Whistle/Nest Call, **8** = 8 Note call (STVA only), **Stan** = (standard) other non-*Strix* owls

Comments: STA. 33/32 Requires Hiking Due to Decom. Road (Road is Accessable by ATV).
38: RD to 38 May need more Clearing due to some hanging Small DBH TREES.



TWN: 4N RNG: 10E Sec: 28 1/4 Sec: — 1/16 Sec: — Date: 5/24/2008 Obs: D. SAHL

Resp T: — *Start T:* 1335 *End T:* 1623 *Wind:* 0 *Weather:* PC *Time(D/N):* D *Visit Type:* OC *Resp Type:* N

 # Mice out: — *# Mice taken:* —

 # Adults/Sub: Males (spp.):_______ Females (spp.):_____ Pair Status:_____ Sex Unk: ____ # Juveniles:____

#Fledglings:______ Nest: Status____ NestLoc ___ Num ____

Male: Obs Type: ____________ Age: _______ Tip Color: __________ Tip Shape: __________

USFWS #: ________________ Leg(R/L): _______ Weights: ______________

Color Band - Primary Color:________ Leg (R/L): _____ Pat: ______ Sec. Color: ________ Tab: _______

Female: Obs Type: ____________ Age: _______ Tip Color: __________ Tip Shape: __________

USFWS #: ____________________ Leg(R/L): _______ Weights: ______________

Color Band - Primary Color:________ Leg (R/L): _____ Pat: _______ Sec. Color: ________ Tab: _______

Y1: Obs Type: ____________ Age: _______ Tip Color: __________ Tip Shape: __________

USFWS #: ___________________________ Leg(R/L): _______ Weights: ______________

Color Band - Primary Color:________ Leg (R/L): _____ Pat: _______ Sec. Color: ________ Tab: _______

Y2: Obs Type: ____________ Age: _______ Tip Color: __________ Tip Shape: __________

USFWS #: ____________________ Leg(R/L): _______ Weights: ______________

Color Band - Primary Color:________ Leg (R/L): _____ Pat: _______ Sec. Color: ________ Tab: _______

N

1:12,000

Feet

0 375 750 1,500

SDS NSO Calling Points

Other

HWY

DIRT

ROCK

TRAIL-4WD

TURNSTONE

Observation Location UTM (nad83) Xcoord:________ Ycoord:________

Please Provide Notes & Description of Events on Reverse

See Comments on Reverse

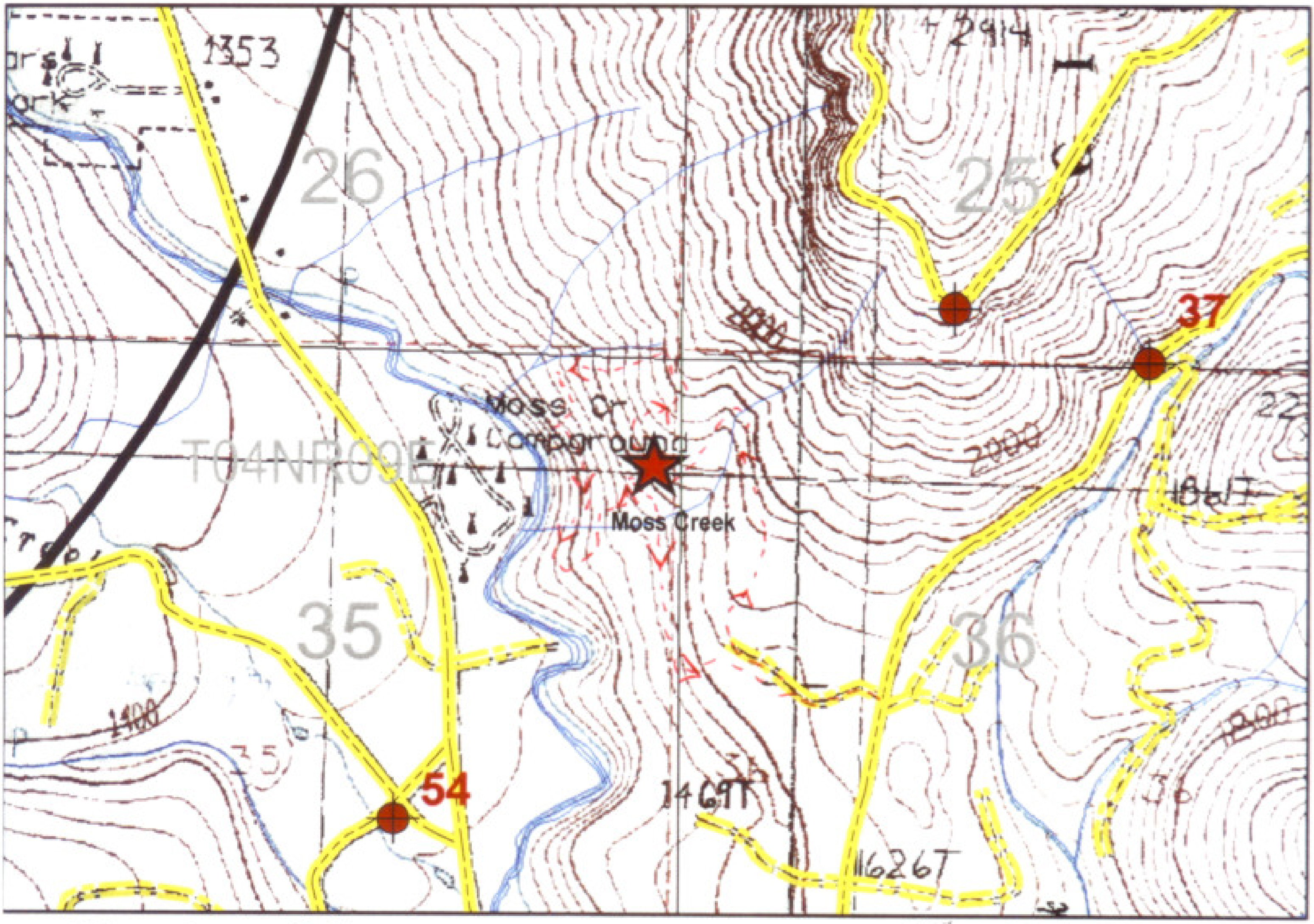
From field notes:

5/24/2008 Mill Creek NSO core Observer D. Sahl

1335: started hike into historic Mill creek core down overgrown SDS road. Road becomes undriveable quickly. Would be able to travel with 4 wheeler. Started broadcast calling with PA from the beginning of hike.

1427: dropped of roadbed to meander towards old nest tree/nest tree area. Meandered around stand looking for quality nesting habitat. Found several possible nest trees (large snags), cavities, continued to broadcast with PA and hoot flute, no NSO response.

1623: returned to trailhead (start of old road), no response from any species of owl.



TWN: 4N RNG: 9E Sec: 35 1/4 Sec: — 1/16 Sec: — Date: 5/25/2008 Obs: D. SAHL

Resp T: — Start T: 1230 End T: 1450 Wind: 1 Weather: CL Time(D/N): D Visit Type: DC Resp Type: N

Mice out: — # Mice taken: —

Adults/Sub: Males (spp.):_______ Females (spp.):_____ Pair Status:_____ Sex Unk: ____ # Juveniles:____

#Fledglings:______ Nest: Status____ NestLoc ___ Num ____

Male: Obs Type: ____________ Age: _______ Tip Color: __________ Tip Shape: __________

USFWS #: _______________ Leg(R/L): _______ Weights: ______________

Color Band - Primary Color:________ Leg (R/L): _____ Pat: ______ Sec. Color: ________ Tab: _______

Female: Obs Type: ____________ Age: _______ Tip Color: __________ Tip Shape: __________

USFWS #: _____________________ Leg(R/L): _______ Weights: ______________

Color Band - Primary Color:________ Leg (R/L): _____ Pat: _______ Sec. Color: ________ Tab: _______

Y1: Obs Type: ____________ Age: _______ Tip Color: __________ Tip Shape: __________

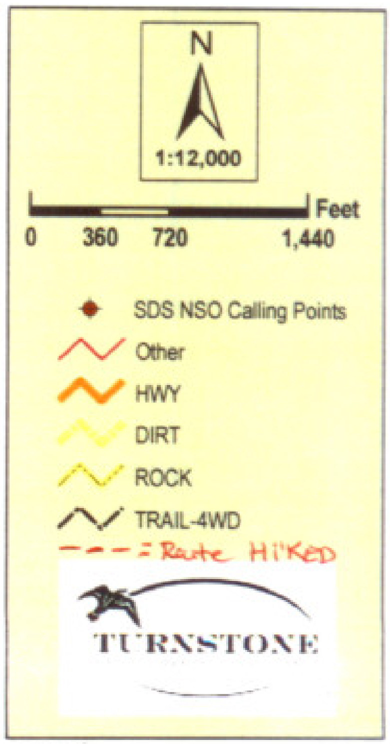
USFWS #: ___________________________ Leg(R/L): _______ Weights: ______________

Color Band - Primary Color:________ Leg (R/L): _____ Pat: _______ Sec. Color: ________ Tab: _______

Y2: Obs Type: ____________ Age: _______ Tip Color: __________ Tip Shape: __________

USFWS #: __________________ Leg(R/L): _______ Weights: ______________

Color Band - Primary Color:________ Leg (R/L): _____ Pat: _______ Sec. Color: ________ Tab: _______



Observation Location UTM (nad83) Xcoord:_________ Ycoord:_________

Please Provide Notes & Description of Events on Reverse

SEE COMMENTS ON REVERSE

From field notes:

5/25/2008 Moss Creek NSO core Observer D. Sahl

1230: started hike into historic Moss Creek core down overgrown road off of the mainline road. Was broadcasting with a PA while hiking in a meandering fashion looking for potential NSO nesting habitat/structures Little nesting habitat until you get near the historic nest tree area. Several nice large trees and one great broken topped remnant that may have been an old nest tree. Should be noted that a USFS campground is just downslope and on the other side of the creek from the historic nest tree area. Campground had campers in it at the time of the survey.

1435: PA battery died

1450: returned to trailhead (start of old road), no response from any species of owls.

Turnstone Environmental Consultants
NSO Survey Form

Survey Area: SPS Lumber **Owl Site(s):** **Visit #** 2

Project Area: Saddleback Mt. Project **Crew:** D. SAHL **Month:** 06 **Day:** 10, **2008**

Tape Voice **Flute** Other: **Block/Area ID:**

Wind Codes: 0 = Calm (<1 mph), 1 = Light air (1-3 mph), 2 = Light breeze (4-7 mph), 3 = Gentle breeze (8-12 mph), 4+ =Unsuitable (13+ mph)
Weather Codes: CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow

ST#	Hike	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	Location ¼	UTMX (NAD83-GPS data only)	UTMY (NAD83-GPS data only)
86	N	2005	2021	1	OC	B	U*	A	STVA	W	2008	2021	360	20	4N	9E	24	SW		
" "		2005	2021	1	OC	B	M	A	STVA	B	2019	2021	070	30	4N	9E	24	SW		
74		2036	2046	Ø	OC	B	U*	A	STVA	W	2041	2046	220	40	4N	9E	23	SW		
" "		2036	2046	Ø	OC	B	M	A	STVA	B	2045	2046	240	50	4N	9E	23	SW		
54		2055	2105	Ø	OC	N														
75		2108	2118	1	OC	N														
76		2120	2130	1	OC	N														
77		2133	2143	1	OC	N														
85		2148	2158	2	OC	N														
55		2205	2215	3	OC	N														
56		2219	2229	1	OC	N														
89		2233	2243	2	OC	N														
57		2255	2305	1	OC	N														
52		2321	2331	Ø	OC	N														
38		2340	2350	1	OC	N														
37		2354	0004	1	OC	N														
36		0007	0017	3	OC	N														
28		0022	0032	3	OC	N														
72		0036	0046	2	OC	N														
93		0051	0101	3	OC															

Time: Military format (midnight is 0000). **Resp. Codes:** **N** = no owl response, **A** = audio response only, **V** = visual response only, **B** (or A, V) = both audio and visual response. **Sex: M** = male, **F** = female, **U** = unknown. **Age: A** = adult. **S** = subadult, **J** = juvenile **Species. Codes: STOC** = Northern Spotted Owl, **STVA** = Barred Owl, **STRIX** = *Strix*-species unknown, STNE = Great Gray Owl, **BUVI** = Great Horned Owl, **AEAC** = Northern Saw-whet Owl, **OTKE** = Western Screech Owl, **GLGN** = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. **Call Type(s):** 4 = 4 Note Call (STOC Only), **A** = Agitated, **B** = Bark, **CO** = Contact Call, JB = Juvenile Begging, **W** = Whistle/Nest Call, **8** = 8 Note call (STVA only), **Stan** = other non-*Strix* owls

Comments: Unk Bird 72
*86/74 Likely Female/whistle only/ Probably same Birds @ both pts (likely a STVA pair)
*55 is in a large Clearcut/little to no Habitat NEAR Station.

Turnstone Environmental Consultants
NSO Survey Form

Survey Area: SPS Lumber **Owl Site(s):** **Visit #** 2

Project Area: Saddle Back Mt. Project **Crew:** D. Sahl **Month:** 06 **Day:** 10, **2008**

Tape Voice Flute Other: **Block/Area ID:**

Wind Codes: 0 = Calm (<1 mph), 1 = Light air (1-3 mph), 2 = Light breeze (4-7 mph), 3 = Gentle breeze (8-12 mph), 4+ =Unsuitable (13+ mph)
Weather Codes: CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow

ST#	Hike	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	¼	UTMX NAD83-GPS data only	UTMY NAD83-GPS data only
27		0106	0116	2	OC	N														
26		0116	0128	2	OC	N														
79		0131	0141	2	OC	N														
78		0150	0200	3-4	OC	N														

Time: Military format (midnight is 0000). **Resp. Codes:** **N** = no owl response, **A** = audio response only, **V** = visual response only, **B** (or A, V) = both audio and visual response. **Sex: M** = male, **F** = female, **U** = unknown. **Age: A** = adult. **S** = subadult, **J** = juvenile **Species. Codes: STOC** = Northern Spotted Owl, **STVA** = Barred Owl, **STRIX** = *Strix*-species unknown, STNE = Great Gray Owl, **BUVI** = Great Horned Owl, **AEAC** = Northern Saw-whet Owl, **OTKE** = Western Screech Owl, **GLGN** = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. **Call Type(s):** **4** = 4 Note Call (STOC Only), **A** = Agitated, **B** = Bark, **CO** = Contact Call, JB = Juvenile Begging, **W** = Whistle/Nest Call, **8** = 8 Note call (STVA only), **Stan** = other non-*Strix* owls

Comments:

Turnstone Environmental Consultants
NSO Survey Form

Survey Area: SDS LUMBER
Owl Site(s):
Visit # 2
Project Area: SADDLEBACK Mt. Project
Crew: D. SAHL
Month: 06 **Day:** 11 **, 2008**
Tape Voice Flute Other:
Block/Area ID:

Wind Codes: 0 = Calm (<1 mph), 1 = Light air (1-3 mph), 2 = Light breeze (4-7 mph), 3 = Gentle breeze (8-12 mph), 4+ =Unsuitable (13+ mph)
Weather Codes: CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow

ST#	Hike	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	¼	UTMX NAD83-GPS data only	UTMY NAD83-GPS data only
21		2040	2050	2-3	PC	N														
22		2052	2102	2	PC	N														
17		2108	2118	1	PC	N														
6		2123	2133	1	PC	N														
5		2139	2149	2-4	PC	N														
3		2206	2216	1	PC	N														
47		2219	2229	2	PC	N														
4		2231	2241	1	PC	N														
2		2243	2253	2	PC	N														
9		2303	2313	2-3	PC	N														
70		2316	2326	1-2	PC	N														
23		2332	2342	1	PC	N														
19		2353	0003	3	PC	N														
7		0014	0024	3	PC	N														
18		0105	0115	3	PC	N														
69		0124	0134	2	PC	N														
16		0137	0147	1	CL	N														
11		0150	0200	3	CL	N														
10		0204	0214	3-4	CL	N														
12		0222	0232	2	CL	N														

Time: Military format (midnight is 0000). **Resp. Codes:** **N** = no owl response, **A** = audio response only, **V** = visual response only, **B** (or A, V) = both audio and visual response. **Sex: M** = male, **F** = female, **U** = unknown. **Age: A** = adult. **S** = subadult, **J** = juvenile **Species. Codes: STOC** = Northern Spotted Owl, **STVA** = Barred Owl, **STRIX** = *Strix*-species unknown, STNE = Great Gray Owl, **BUVI** = Great Horned Owl, **AEAC** = Northern Saw-whet Owl, **OTKE** = Western Screech Owl, **GLGN** = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. **Call Type(s):** **4** = 4 Note Call (STOC Only), **A** = Agitated, **B** = Bark, **CO** = Contact Call, JB = Juvenile Begging, **W** = Whistle/Nest Call, **8** = 8 Note call (STVA only), **Stan** = other non-*Strix* owls

Comments: #21 poor Habitat / Power line Row
#7 Poor Habitat / Entire Ridge Has Been clearcut / very windy
* wind was Gusty at times but not usually sustained at over a wind code of 3

Turnstone Environmental Consultants
NSO Survey Form

Survey Area: SBS Lumber
Owl Site(s):
Visit # 2

Project Area: Saddle Back Mt. Project
Crew: P. Sahl
Month: 06 **Day:** 15, **2008**

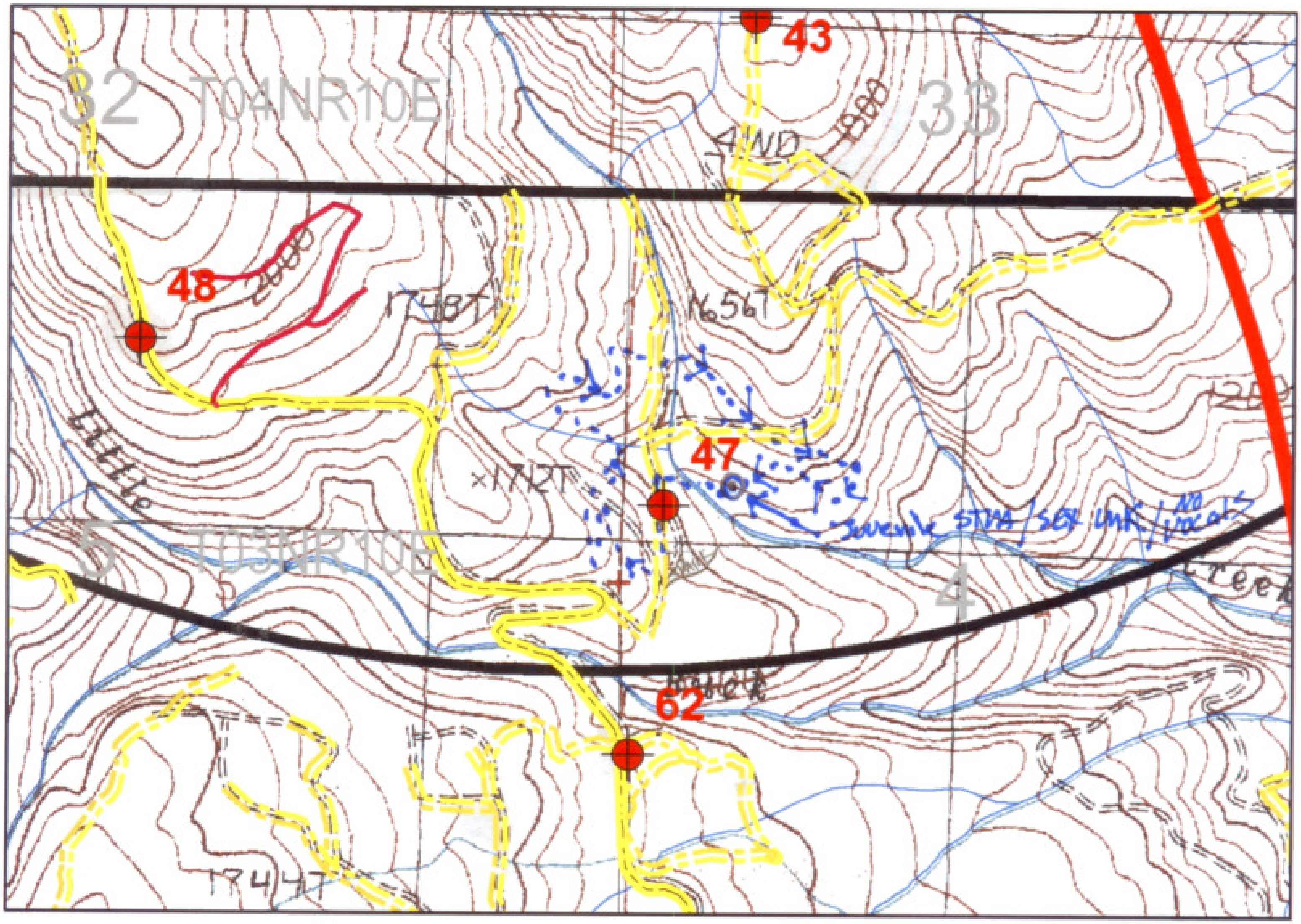
Tape Voice Flute Other:
Block/Area ID:

Wind Codes: 0 = Calm (<1 mph), 1 = Light air (1-3 mph), 2 = Light breeze (4-7 mph), 3 = Gentle breeze (8-12 mph), 4+ =Unsuitable (13+ mph)
Weather Codes: CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow

ST#	Hike	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	Location ¼	UTMX NAD83-GPS data only	UTMY NAD83-GPS data only
14		2100	2110	1	CL	N														
63		2114	2124	Ø	CL	N														
66		2128	2136	1	CL	N														
62		2143	2153	1	CL	N														
47		2200	2215	1	CL	A	U	J	UNK	JB	2203	2215	270	150	3N	10E	4	NW		
* 48.5		2223	2233	2	CL	N														
48		2236	2246	3	CL	N														
41		2250	2300	3	CL	N														
40		2303	2313	2	CL	N														
34		2309	2319	2	CL	N														
35	Y	2336	2346	2	CL	N														
39		0004	0014	3	CL	N														
71		0032	0044	1	CL	N														
13		0050	0100	2	CL	N														
67		0109	0119	2	CL	N														
60		0123	0133	2-3	CL	N														
46		0201	0211	3	CL	N														
51		0226	0236	3	CL	N														
8		0303	0313	3+	CL	N														

Time: Military format (midnight is 0000). **Resp. Codes:** **N** = no owl response, **A** = audio response only, **V** = visual response only, **B** (or A, V) = both audio and visual response. **Sex: M** = male, **F** = female, **U** = unknown. **Age: A** = adult. **S** = subadult, **J** = juvenile **Species. Codes: STOC** = Northern Spotted Owl, **STVA** = Barred Owl, **STRIX** = *Strix*-species unknown, STNE = Great Gray Owl, **BUVI** = Great Horned Owl, **AEAC** = Northern Saw-whet Owl, **OTKE** = Western Screech Owl, **GLGN** = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. **Call Type(s):** 4 = 4 Note Call (STOC Only), **A** = Agitated, **B** = Bark, **CO** = Contact Call, JB = Juvenile Begging, **W** = Whistle/Nest Call, **8** = 8 Note call (STVA only), **Stan** = other non-*Strix* owls

Comments: Almost a full moon on a Clear Night / Great Survey Conditions
47: Begging Juv. / unknown spp. / Could not locate in Dark / sounded stationary / may not have fledged yet / will revisit tomorrow during daylight and attempt to Relocate and ID. (STVA Juvenile contact on 6/16)
48.5: Extra Sta. Due to Fly over of large Bird while driving by, no Response / likely same Bird as #47, likely a Juvenile owl of same spp.



TWN: 3N RNG: 10E Sec: 4 1/4 Sec: NW 1/16 Sec: SW Date: 06/16/08 Obs: D. SAHL

Resp T: 1810 Start T: 1635 End T: 1830 Wind: 1 Weather: CL Time(D/N): D Visit Type: Follow-up Resp Type: B

Mice out: Ø # Mice taken: —

Adults/Sub: Males (spp.): ____ Females (spp.): ____ Pair Status: ____ Sex Unk: ____ # Juveniles: 1 STVA

#Fledglings: ____ Nest: Status ____ NestLoc ____ Num ____

Male: Obs Type: ____ Age: ____ Tip Color: ____ Tip Shape: ____

USFWS #: ____ Leg(R/L): ____ Weights: ____

Color Band - Primary Color: ____ Leg (R/L): ____ Pat: ____ Sec. Color: ____ Tab: ____

Female: Obs Type: ____ Age: ____ Tip Color: ____ Tip Shape: ____

USFWS #: ____ Leg(R/L): ____ Weights: ____

Color Band - Primary Color: ____ Leg (R/L): ____ Pat: ____ Sec. Color: ____ Tab: ____

Y1: Obs Type: B Age: ? Tip Color: ____ Tip Shape: SQUARE

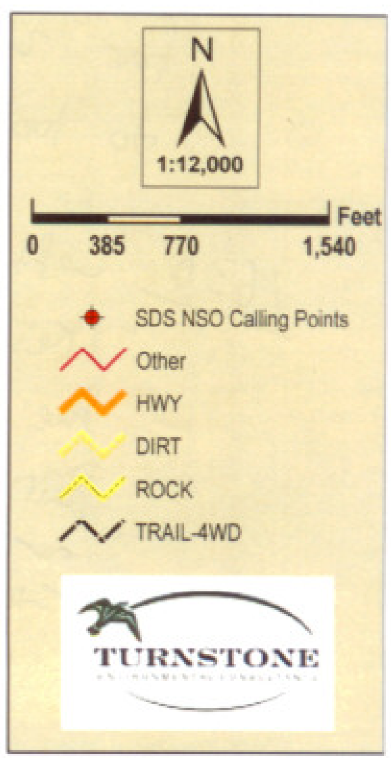
USFWS #: NO BAND Leg(R/L): ____ Weights: ____

Color Band - Primary Color: ____ Leg (R/L): ____ Pat: ____ Sec. Color: ____ Tab: ____

Y2: Obs Type: ____ Age: ____ Tip Color: ____ Tip Shape: ____

USFWS #: ____ Leg(R/L): ____ Weights: ____

Color Band - Primary Color: ____ Leg (R/L): ____ Pat: ____ Sec. Color: ____ Tab: ____



Observation Location UTM (nad83) Xcoord: 611440 **Ycoord:** 3870321

Please Provide Notes & Description of Events on Reverse

6/16/2008 Day follow-up of unk Juvenile @ Station # 47 DGS

1635 went back to sta# 47 and Hiked around stand Broadcasting + observing in area that unk. Juvenile was heard begging the night before.

1810 Located Juvenile STVA, Bird was very skitish and would not vocalize. Bird would fly from tree to tree when I would approach. followed the Bird around for ~20 minutes Continue to broadcast and attempting to look for a leg band or another STVA or other STRIX.

1830 Left Site, Young STVA was a very Good flier and Can likely hunt on it's own. Unable to Determine sex of bird Due to it not vocalizing at all. No Bands observed. Pair of adult STVA's have been observed/documented ~0.95 miles to the NE of where this Juvenile STVA was observed.

Turnstone Environmental Consultants
NSO Survey Form

Survey Area: SDS Lumber **Owl Site(s):** **Visit #** 2

Project Area: Saddle back Mt. Project **Crew:** D. SAHL **Month:** 06 **Day:** 16, **2008**

Tape Voice Flute Other: **Block/Area ID:**

Wind Codes: 0 = Calm (<1 mph), **1** = Light air (1-3 mph) **2** = Light breeze (4-7 mph) **3** = Gentle breeze (8-12 mph) **4+** =Unsuitable (13+ mph)
Weather Codes: **CL** = Clear **FG** = Fog **PC** = Partly Cloudy **OC** = Overcast, **DR** = Drizzle **LR** = Light Rain **HR** = Heavy Rain (unsuitable) **SN** = Snow, **H** = Hail

ST#	Hike	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	Location ¼	UTMX (NAD83-GPS data only)	UTMY (NAD83-GPS data only)
32	X	2005	2015	Ø	CL	N														
33	ATV	2055	2105	Ø	CL	N														
44	ATV	2115	2135	Ø	CL	B	U	A	STVA	A/CO*	2124	2124	350	40	4N	10E	33	SE		
45	ATV	2137	2155	Ø	CL	A	U	A	STVA	A/[illegible]	2133	2133	070	200	4N	10E	33	SE		
43	ATV	2206	2216	Ø	CL	N														
47		2225	2235	Ø	CL	N														
59		2301	2311	2	CL	N														
60		2314	2324	2	CL	N														
49		2330	2340	2	CL	N														
50		0011	0021	3	CL	N														
58		0033	0043	3	CL	N														
81		0138	0148	2	CL	N														
30		0152	0202	3	CL	N														
24		0205	0215	2	CL	N														
80		0225	0235	2-3	CL	N														
25		0241	0251	2+	CL	N														
82		0311	0321	1	CL	N														
31		0342	0352	1	CL	N														
83		0402	0412	Ø	CL	N														
88		0414	0424	Ø	CL	N														

Time: Military format (midnight is 0000). **Resp. Codes:** **N** = no owl response, **A** = audio response only, **V** = visual response only, **B** (or A, V) = both audio and visual response. **Sex: M** = male, **F** = female, **U** = unknown. **Age: A** = adult. **S** = subadult, **J** = juvenile **Species.** **Codes: STOC** = Northern Spotted Owl, **STVA** = Barred Owl, **STRIX** = *Strix*-species unknown, STNE = Great Gray Owl, **BUVI** = Great Horned Owl, **AEAC** = Northern Saw-whet Owl, **OTKE** = Western Screech Owl, **GLGN** = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. **Call Type(s):** 4 = 4 Note Call (STOC Only), **A** = Agitated, **B** = Bark, **CO** = Contact Call, **JB** = Juvenile Begging, **W** = Whistle/Nest Call, **8** = 8 Note call (STVA only), **Stan** = (standard) other non-*Strix* owls

Comments: 44: only got 2 brief agitated screams then a STVA FLEW thru and down Road / unable to Relocate or get the bird to Respond again.
45: Likely the same bird as #44 / to brief to get a positive determination on sex of Bird.
80: Bobcat observed on RD. Just before Sta. #80
83/88/84: CREEK IS fairly loud by these PTS.

Turnstone Environmental Consultants
NSO Survey Form

Survey Area: SPS Lumber **Owl Site(s):** ______ **Visit #** 2

Project Area: Saddleback Mt. Project **Crew:** D. SAHL **Month:** 06 **Day:** 16, **2008**

Tape Voice Flute Other: ______ **Block/Area ID:** ______

Wind Codes: **0** = Calm (<1 mph), **1** = Light air (1-3 mph) **2** = Light breeze (4-7 mph) **3** = Gentle breeze (8-12 mph) **4+** =Unsuitable (13+ mph)
Weather Codes: **CL** = Clear **FG** = Fog **PC** = Partly Cloudy **OC** = Overcast, **DR** = Drizzle **LR** = Light Rain **HR** = Heavy Rain (unsuitable) **SN** = Snow, **H** = Hail

ST#	Hike	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	¼	UTMX (NAD83-GPS data only)	UTMY (NAD83-GPS data only)
4H		0426	0436	Ø	CL	N														

Time: Military format (midnight is 0000). **Resp. Codes:** **N** = no owl response, **A** = audio response only, **V** = visual response only, **B** (or A, V) = both audio and visual response. **Sex: M** = male, F = female, U = unknown. **Age: A** = adult. **S** = subadult, **J** = juvenile **Species. Codes: STOC** = Northern Spotted Owl, **STVA** = Barred Owl, **STRIX** = *Strix*-species unknown, STNE = Great Gray Owl, **BUVI** = Great Horned Owl, **AEAC** = Northern Saw-whet Owl, **OTKE** = Western Screech Owl, **GLGN** = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. **Call Type(s):** 4 = 4 Note Call (STOC Only), **A** = Agitated, **B** = Bark, **CO** = Contact Call, JB = Juvenile Begging, **W** = Whistle/Nest Call, **8** = 8 Note call (STVA only), **Stan** = (standard) other non-*Strix* owls

Comments:

Turnstone Environmental Consultants
NSO Survey Form

Survey Area: SDS Lumber **Owl Site(s):** **Visit #** 3

Project Area: Saddleback Mt. Project **Crew:** DANA N. MCCOSKEY **Month:** 07 **Day:** 27, **2008**

Tape Voice Flute Other: **Block/Area ID:**

Wind Codes: 0 = Calm (<1 mph), 1 = Light air (1-3 mph), 2 = Light breeze (4-7 mph), 3 = Gentle breeze (8-12 mph), 4+ =Unsuitable (13+ mph)
Weather Codes: CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow

ST#	Hike	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	¼	UTMX NAD83-GPS data only	UTMY NAD83-GPS data only
34		2100	2110	2	CL	N														
40		2112	2122	2	CL	N														
35	X	2132	2142	1	CL	N														
41		2145	2155	1	CL	N														
39		2158	2208	0	CL	N														
48		2212	2222	0	CL	N														
47		2226	2236	0	CL	N														
62		2238	2248	0	CL	N														
66		2251	2301	0	CL	N														
63		2304	2314	0	CL	N														
14		2317	2327	0	CL	N														
64		2350	0000	1	CL	N														
⊛ 10		0010	0020	1	CL	N														
9		0021	0031	0	CL	N														
8		0043	0053	1	CL	N														

Time: Military format (midnight is 0000). **Resp. Codes:** N = no owl response, A = audio response only, V = visual response only, B (or A, V) = both audio and visual response. **Sex: M** = male, F = female, U = unknown. **Age: A** = adult. S = subadult, J = juvenile **Species. Codes: STOC** = Northern Spotted Owl, **STVA** = Barred Owl, **STRIX** = *Strix*-species unknown, STNE = Great Gray Owl, **BUVI** = Great Horned Owl, **AEAC** = Northern Saw-whet Owl, **OTKE** = Western Screech Owl, **GLGN** = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. **Call Type(s):** 4 = 4 Note Call (STOC Only), A = Agitated, B = Bark, CO = Contact Call, JB = Juvenile Begging, W = Whistle/Nest Call, 8 = 8 Note call (STVA only), **Stan** = other non-*Strix* owls

Comments:

⊛ 10 = called at gate

Turnstone Environmental Consultants
NSO Survey Form

Page 1 of 1 (including maps)

Survey Area: SDS LUMBER **Owl Site(s):** ______ **Visit #** 3

Project Area: Saddleback Mt. Project **Crew:** DANA MCCOSKEY **Month:** 07 **Day:** 28, **2008**

Tape Voice Flute Other: ______ **Block/Area ID:** ______

Wind Codes: 0 = Calm (<1 mph), 1 = Light air (1-3 mph), 2 = Light breeze (4-7 mph), 3 = Gentle breeze (8-12 mph), 4+ =Unsuitable (13+ mph)
Weather Codes: CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow

ST#	Hike	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	Location ¼	UTMX (NAD83-GPS data only)	UTMY (NAD83-GPS data only)
31		2011	2021	1	CL	N														
82		2032	2042	0	CL	A	M	A	STVA	8	2041	2042	110	600						
81		2054	2104	0	CL	N														
30		2112	2122	1	CL	N														
24		2128	2138	1	CL	N														
80		2148	2158	2	CL	N														
25		2207	2217	1	CL	N														
79		2227	2237	0	CL	N														
78		2252	2302	3	CL	N														
26		2314	2324	2	CL	N														
27		2327	2337	0	CL	N														
73		2341	2351	1	CL	N														
72		2354	0004	2	CL	N														
28		0006	0016	2	CL	N														
36		0020	0030	2	CL	N														
1:37		0031	0041	2	CL	N														
52		0052	0102	1	CL	N														
51		0108	0118	0	CL	N														
56		0122	0132	1	CL	N														
46		0143	0153	0	CL	N														

Time: Military format (midnight is 0000). **Resp. Codes:** **N** = no owl response, **A** = audio response only, **V** = visual response only, **B** (or A, V) = both audio and visual response. **Sex: M** = male, **F** = female, **U** = unknown. **Age: A** = adult. **S** = subadult, **J** = juvenile **Species. Codes: STOC** = Northern Spotted Owl, **STVA** = Barred Owl, **STRIX** = *Strix*-species unknown, STNE = Great Gray Owl, **BUVI** = Great Horned Owl, **AEAC** = Northern Saw-whet Owl, **OTKE** = Western Screech Owl, **GLGN** = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. **Call Type(s):** 4 = 4 Note Call (STOC Only), A = Agitated, B = Bark, CO = Contact Call, JB = Juvenile Begging, W = Whistle/Nest Call, 8 = 8 Note call (STVA only), **Stan** = other non-*Strix* owls

Comments:

Turnstone Environmental Consultants
NSO Survey Form

Survey Area: SDS LUMBER **Owl Site(s):** **Visit #** 3

Project Area: Saddleback Mt. Project **Crew:** DANA N. MCCOSKEY **Month:** 07 **Day:** 29, 2008

Tape Voice Flute Other: **Block/Area ID:**

Wind Codes: 0 = Calm (<1 mph), 1 = Light air (1-3 mph), 2 = Light breeze (4-7 mph), 3 = Gentle breeze (8-12 mph), 4+ =Unsuitable (13+ mph)
Weather Codes: CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow

ST#	Hike	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	¼	UTMX (NAD83-GPS data only)	UTMY (NAD83-GPS data only)
38	X	2002	2012	1	OC	N														
74		2047	2057	1	OC	N														
86		2105	2115	1	RN	N														
85		2127	2137	1	DR	N														
54		2140	2150	1	DR	N														
75		2156	2206	1	DR	N														
76		2207	2217	1	DR	N														
77		2223	2233	1	RN	N														
*55		2241	2251	2	DR	N														
57		2256	2306	1	DR	N														
87		2311	2321	1	RN	N														
4		2323	2333	1	DR	N														
2		2336	2346	1	RN	N														
70		2350	0000	1	DR	N														
12		0003	0013	1	RN	N														
16		0014	0024	1	RN	N														
11	X	0028	0038	2	DR	N														
69		0043	0053	1	DR	N														
68		0056	0106	1	OC	N														
23		0109	0119	1	DR	N														

Time: Military format (midnight is 0000). **Resp. Codes:** N = no owl response, A = audio response only, V = visual response only, B (or A, V) = both audio and visual response. **Sex:** M = male, F = female, U = unknown. **Age:** A = adult, S = subadult, J = juvenile **Species.** **Codes:** **STOC** = Northern Spotted Owl, **STVA** = Barred Owl, **STRIX** = *Strix*-species unknown, STNE = Great Gray Owl, **BUVI** = Great Horned Owl, **AEAC** = Northern Saw-whet Owl, **OTKE** = Western Screech Owl, **GLGN** = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. **Call Type(s):** 4 = 4 Note Call (STOC Only), A = Agitated, B = Bark, CO = Contact Call, JB = Juvenile Begging, W = Whistle/Nest Call, 8 = 8 Note call (STVA only), **Stan** = other non-*Strix* owls

Comments:

* 55 = called on main road (not private drive)

* 38 = old nest core hike

Turnstone Environmental Consultants
NSO Survey Form

Survey Area: SDS Lumber **Owl Site(s):** ______ **Visit #** 3

Project Area: Saddle back Mt. Project **Crew:** DANA N. MCCOSKEY **Month:** 07 **Day:** 29, 2008

Tape Voice Flute Other: ______ **Block/Area ID:** ______

Wind Codes: 0 = Calm (<1 mph), 1 = Light air (1-3 mph), 2 = Light breeze (4-7 mph), 3 = Gentle breeze (8-12 mph), 4+ =Unsuitable (13+ mph)
Weather Codes: CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow

ST#	Hike	Time		Wind	Weather	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time		Bearing	Dist	Location				UTMX	UTMY
		Begin	End	Code	Code						Initial	Final	(Azimuth)	(feet)	Town	Range	Sect	¼	NAD83-GPS data only	
3		0132	0142	1	DR	N														
21		0156	0206	1	DR	N														
22		0208	0218	1	DR	N														
89		0232	0242	2	DR	N														

Time: Military format (midnight is 0000). **Resp. Codes:** N = no owl response, A = audio response only, V = visual response only, B (or A, V) = both audio and visual response. **Sex: M** = male, F = female, U = unknown. **Age: A** = adult. **S** = subadult, J = juvenile **Species. Codes: STOC** = Northern Spotted Owl, **STVA** = Barred Owl, **STRIX** = *Strix*-species unknown, STNE = Great Gray Owl, **BUVI** = Great Horned Owl, **AEAC** = Northern Saw-whet Owl, **OTKE** = Western Screech Owl, **GLGN** = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. **Call Type(s):** **4** = 4 Note Call (STOC Only), **A** = Agitated, **B** = Bark, **CO** = Contact Call, **JB** = Juvenile Begging, **W** = Whistle/Nest Call, **8** = 8 Note call (STVA only), **Stan** = other non-*Strix* owls

Comments:

Page 1 of 2 (including maps)

Turnstone Environmental Consultants
NSO Survey Form

Survey Area: SDS Lumber **Owl Site(s):** ______ **Visit #** 3

Project Area: Saddleback Mt. project **Crew:** DANA N. MCCOSKEY **Month:** 07 **Day:** 30, **2008**

Tape Voice Flute Other: ______ **Block/Area ID:** ______

Wind Codes: 0 = Calm (<1 mph), 1 = Light air (1-3 mph), 2 = Light breeze (4-7 mph), 3 = Gentle breeze (8-12 mph), 4+ =Unsuitable (13+ mph)
Weather Codes: CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow

ST#	Hike	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	¼	UTMX (NAD83-GPS data only)	UTMY (NAD83-GPS data only)
33	X	2001	2011	0	CL	N														
32	X	2032	2042	0	CL	N														
44		2051	2101	0	CL	N														
45		2106	2116	0	CL	N														
43		2135	2145	0	CL	N														
84		2218	2228	1	CL	N														
88		2231	2241	0	CL	N														
83		2242	2252	0	CL	N														
71		2313	2323	1	CL	N														
13		2327	2337	0	CL	N														
67		2343	2353	2	CL	N														
49		0004	0014	2	CL	N														
59		0016	0026	2	CL	N														
60		0034	0044	2	CL	N														
58		0055	0105	2	CL	N														
50	X	0111	0121	2	CL	N														
17		0153	0203	1	CL	N														
6		0206	0216	1	CL	N														
7		0220	0230	1	CL	N														
5		0233	0243	1	CL	N														

Time: Military format (midnight is 0000). **Resp. Codes:** N = no owl response, A = audio response only, V = visual response only, B (or A, V) = both audio and visual response. **Sex: M** = male, F = female, U = unknown. **Age: A** = adult, S = subadult, J = juvenile **Species. Codes: STOC** = Northern Spotted Owl, **STVA** = Barred Owl, **STRIX** = *Strix*-species unknown, STNE = Great Gray Owl, **BUVI** = Great Horned Owl, **AEAC** = Northern Saw-whet Owl, **OTKE** = Western Screech Owl, **GLGN** = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. **Call Type(s):** 4 = 4 Note Call (STOC Only), **A** = Agitated, **B** = Bark, **CO** = Contact Call, JB = Juvenile Begging, **W** = Whistle/Nest Call, **8** = 8 Note call (STVA only), **Stan** = other non-*Strix* owls

Comments:

Turnstone Environmental Consultants
NSO Survey Form

Survey Area: SDS LUMBER
Owl Site(s): ______
Visit # 3

Project Area: Saddleback Mt. Project
Crew: DANA N. MCCOSKEY
Month: 07 Day: 30, 2008

Tape Voice Flute Other: ______
Block/Area ID: ______

Wind Codes: **0** = Calm (<1 mph), **1** = Light air (1-3 mph), **2** = Light breeze (4-7 mph), **3** = Gentle breeze (8-12 mph), **4+** =Unsuitable (13+ mph)
Weather Codes: **CL** = Clear, **FG** = Fog, **PC** = Partly Cloudy, **OC** = Overcast, **DR** = Drizzle, **RN** = Rain, **SN** = Snow

ST#	Hike	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	¼	UTMX (NAD83-GPS data only)	UTMY (NAD83-GPS data only)
19	X	0301	0311	2	CL	N														
19		0319	0329	2	CL	N														

Time: Military format (midnight is 0000). **Resp. Codes:** **N** = no owl response, **A** = audio response only, **V** = visual response only, **B** (or A, V) = both audio and visual response. **Sex: M** = male, **F** = female, **U** = unknown. **Age: A** = adult. **S** = subadult, **J** = juvenile **Species. Codes: STOC** = Northern Spotted Owl, **STVA** = Barred Owl, **STRIX** = *Strix*-species unknown, STNE = Great Gray Owl, **BUVI** = Great Horned Owl, **AEAC** = Northern Saw-whet Owl, **OTKE** = Western Screech Owl, **GLGN** = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. **Call Type(s):** **4** = 4 Note Call (STOC Only), **A** = Agitated, **B** = Bark, **CO** = Contact Call, JB = Juvenile Begging, **W** = Whistle/Nest Call, **8** = 8 Note call (STVA only), **Stan** = other non-*Strix* owls

Comments:

Appendix C - Northern Goshawk Survey Forms

Survey Time: Start 1407 End 174?
Intensive Nest Search Time: Start — End —
Temperature (°F): Begin 75 End 60

Turnstone Environmental Consultants
Goshawk Survey Form

Survey Area/Project Area: SDS / Hood River **Crew:** WCB **Month:** June **Day:** 23, 2008 **Visit #** 1

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: ______ **Cloud Cover (midpoint of survey):** 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%, 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 = Light Wind (8-12 mph), 5 = Wind (>12 mph)
Weather Codes: CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow

Det._ID	ST#	Sta. Time Begin	Sta. Time End	Wind Code	Weather Code	Cloud Cover	Detection Code	Detection Location	Sex	Age	Species	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (meters)	Location Town	Location Range	Location Sect	Location ¼	UTMX NAD83-GPS data only	UTMY NAD83-GPS data only
062308-II									U	A	OSPR	1149	1150	110	20	3N	10E	8	SW	0609710	5065535
062308-II									U	A	RTHA	1216	1217	60	50	3N	10E	8	SW	0609816	5067177
	G46	1407	1411	2	PC	4															
	G44	1430	1434	2	PC	4															
	G43	1445	1449	2	PC	4															
	G47	1505	1509	2	PC	4															
	G48	1517	1521	2	PC	4															
	G50	1530	1534	2	PC	4															
	G51	1545	1549	2	OC	6															
	G52	1557	1601	2	OC	6															
	G56	1620	1624	2	OC	6															
	G55	1636	1640	2	OC	6															
	G65	1648	1702	2	OC	6															
	G54	1713	1717	2	OC	6															
	G60	1725	1729	2	OC	6															
	G53	1739	1743	2	OC	6															

Det._ID: unique detection identifier; date and seqential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military forma
Comments:

Period: Nesting / Fledgling **Calls Used:** Alarm / Wail / Begging

Survey Year: 1st 2nd

Turnstone Environmental Consultants

Goshawk Survey Form

Survey Time: Start 0753 End 1604
Intensive Nest Search Time: Start – End –
Temperature (°F): Begin 55 End 80

Survey Area/Project Area: SDS / Hood River **Crew:** WLB **Month:** June **Day:** 24, **2008** **Visit #** 1

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: ______ **Cloud Cover (midpoint of survey):** 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 = Light Wind (8-12 mph), 5 = Wind (>12 mph)
Weather Codes: CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow

Det._ID	ST#	Sta. Time Begin	Sta. Time End	Wind Code	Weather Code	Cloud Cover	Detection Code	Detection Location	Sex	Age	Species	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (meters)	Location Town	Location Range	Location Sect	Location ¼	UTMX NAD83-GPS data only	UTMY
	G1	0753	0757	2	CL	0															
	G2	0804	0808	2	CL	0															
	G3	0817	0821	2	CL	0															
	G4	0838	0842	2	CL	0															
	G5	0857	0901	2	CL	0															
	G6	0914	0918	2	CL	0															
	G7	0928	0932	2	CL	0															
	G33	1023	1027	2	CL	20															
	G34	1038	1042	2	CL	20															
	G35	1055	1059	2	CL	20															
	G36	1116	1120	3	CL	20															
[illegible]-1									U	A	RTHA	1145	1140	36	150m	3N	9E	7	SW	5?? NE of G32	
	G32	1156	1200	2	CL	20															
	G31.1	1219	1223	2	CL	20															
	G30	1238	1242	2	CL	0															
	G31	1300	1304	2	CL	0															
	G29	1327	1331	2	CL	20															
	G27	1345	1349	1	CL	10															
	G26	1407	1411	3	CL	10															
	G28	1436	1440	2	CL	5															
	G25	1526	1530	3	CL	5															
	G21	1600	1604	2	CL	0															

Det._ID: unique detection identifier; date and seqential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format.
Comments:

Period: Nestling / Fledgling **Calls Used:** Alarm / Wail / Begging

Survey Year: 1st 2nd

Turnstone Environmental Consultants
Goshawk Survey Form

Survey Time: Start 0801 End 1653
Intensive Nest Search Time: Start — End —
Temperature (°F): Begin 54 End 71

Survey Area/Project Area: SDS / Hood River **Crew:** WLB **Month:** June **Day:** 25, **2008** **Visit #** 1

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: ____ **Cloud Cover (midpoint of survey):** 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 = Light Wind (8-12 mph), 5 = Wind (>12 mph)
Weather Codes: CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow

Det._ID	ST#	Sta. Time Begin	Sta. Time End	Wind Code	Weather Code	Cloud Cover	Detection Code	Detection Location	Sex	Age	Species	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (meters)	Location Town	Location Range	Location Sect	Location ¼	UTMX NAD83-GPS data only	UTMY
	G22	0801	0805	1	PC	40															
	G22.5	0814	0818	1	CL	0															
	G21	0846	0850	1	CL	10															
	G23	0911	0915	1	CL	0															
	G19	0958	1002	1	CL	0															
	G12	1029	1033	3	PC	30															
	G11	1050	1054	1	CL	0															
	G8	1120	1124	1	CL	0															
	G9.5	1137	1141	1	CL	0															
	G10	1156	1200	1	CL	0															
	G9	1220	1224	1	CL	10															
	G18	1333	1337	2	PC	30															
	G16	1355	1359	3	PC	50															
	G15.5	1412	1416	2	PC	50															
	G15	1429	1433	3	PC	50															
	G14.5	1442	1446	3	PC	50															
	G14	1455	1459	2	PC	50															
	G13	1510	1514	2	PC	50															
	G17	1529	1533	2	PC	40															
	G61	1623	1627	3	PC	30															
	G67	1636	1640	4	CL	10															
	G68	1649	1653	4	CL	10															

Det._ID: unique detection identifier; date and seqential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format
Comments:

Period: Nesting / Fledgling **Calls Used:** Alarm / Wail / Begging

Survey Year: 1st 2nd

Survey Time: Start 0857 End 1634
Intensive Nest Search Time: Start — End —
Temperature (°F): Begin 52 End 64

Turnstone Environmental Consultants
Goshawk Survey Form

Survey Area/Project Area: SDS / Hood River **Crew:** WCB **Month:** June **Day:** 26, 2008 **Visit #** 1

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: ______ **Cloud Cover (midpoint of survey):** 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 = Light Wind (8-12 mph), 5 = Wind (>12 mph)
Weather Codes: CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow

Det._ID	ST#	Sta. Time Begin	Sta. Time End	Wind Code	Weather Code	Cloud Cover	Detection Code	Detection Location	Sex	Age	Species	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (meters)	Location Town	Location Range	Location Sect	Location ¼	UTMX NAD83-GPS data only	UTMY
	G132	0857	0901	2	PC	50															
	G133	0914	0928	4	PC	60															
	G114	0948	0952	2	PC	60															
	G113	1009	1013	1	CL	10															
	G99	1033	1037	2	PC	40															
	G112	1058	1102	4	PC	40															
	G115	1115	1119	4	PC	60															
	G131	1155	1159	4	PC	80															
	G134	1239	1243	2	PC	80															
	G135	1301	1305	2	PC	70															
	G136	1317	1321	3	PC	70															
	G137	1335	1339	2	PC	80															
	G138	1347	1351	2	PC	70															
	G129	1405	1409	2	PC	40															
	G118	1424	1428	2	PC	50															
	G120	1442	1446	2	PC	60															
	G117	1501	1505	2	PC	90															
	G116	1513	1517	3	PC	90															
	G93	1529	1533	3	PC	90															
	G87	1541	1545	3	PC	90															
	G71	1550	1554	3	PC	90															
	G72	1601	1605	3	PC	90															
	G73	1610	1614	3	PC	90															
	G75	1620	1624	4	PC	90															
	G77	1630	1634	4	PC	90															

Det._ID: unique detection identifier; date and seqential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format.
Comments:

Period: Nesting / Fledgling **Calls Used:** Alarm / Wail / Begging

Survey Year: 1st 2nd

Survey Time: Start 0740 End 1709
Intensive Nest Search Time: Start — End —
Temperature (°F): Begin 63 End 80

Turnstone Environmental Consultants
Goshawk Survey Form

Survey Area/Project Area: SDS / Hood River **Crew:** WLB **Month:** June **Day:** 27, **2008** **Visit #** 1

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: ______ **Cloud Cover (midpoint of survey):** 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 = Light Wind (8-12 mph), 5 = Wind (>12 mph)
Weather Codes: CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow

Det._ID	ST#	Sta. Time Begin	Sta. Time End	Wind Code	Weather Code	Cloud Cover	Detection Code	Detection Location	Sex	Age	Species	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (meters)	Location Town	Location Range	Location Sect	Location ¼	UTMX NAD83-GPS data only	UTMY
	G79	0740	0744	1	CL	1															
	G85	0801	0805	1	CL	1															
	G86	0821	0825	1	CL	1															
	G94	0845	0849	1	CL	1															
	G75	0905	0909	1	CL	1															
	G96	0925	0929	1	CL	1															
	G80	0943	0947	1	CL	1															
	G98	1008	1012	1	CL	1															
	G84	1034	1038	1	CL	1															
	G81	1107	1111	2	CL	1															
	G82	1118	1122	1	CL	1															
	G83	1135	1139	1	CL	1															
	G74	1206	1210	2	CL	1															
	G91	1244	1248	2	CL	1															
	G92	1301	1305	1	CL	1															
	G103	1319	1323	2	CL	1															
	G92.1	1345	1349	1	CL	1															
	G11	1445	1449	1	CL	1															
	G107	1506	1510	1	CL	1															
	G107.5	1540	1544	2	CL	1															
	G100	1554	1558	2	CL	1															
	G101	1610	1614	2	CL	1															
	G106	1622	1626	2	CL	1															
	G69	1655	1659	2	CL	1															
	G70	1705	1709	2	CL	1															

Det._ID: unique detection identifier; date and seqential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format.
Comments:

Period: Nestling / Fledgling **Calls Used:** Alarm / Wail / Begging

Survey Year: 1st 2nd

Survey Time: Start 1551 End 1921
Intensive Nest Search Time: Start — End —
Temperature (°F): Begin 80 End 74

Turnstone Environmental Consultants
Goshawk Survey Form

Survey Area/Project Area: Hood River / SDS **Crew:** W. Beard **Month:** 7 **Day:** 15, 2008 **Visit #** 1

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: — **Cloud Cover (midpoint of survey):** 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 = Light Wind (8-12 mph), 5 = Wind (>12 mph)
Weather Codes: CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow

Det._ID	ST#	Sta. Time Begin	Sta. Time End	Wind Code	Weather Code	Cloud Cover	Detection Code	Detection Location	Sex	Age	Species	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (meters)	Town	Range	Sect	¼	UTMX NAD83-GPS data only	UTMY
	G66	1547	1551	2	CL	1															
	G62	1601	1605	2	CL	1															
071508-01				2	CL	1			U	U	TUVU	1603	1604	156	50	3N	10E	8	NW	0609925	5069560
	G63	1616	1620	2	PC	1															
	G64.1	1633	1637	2	PC	2															
	G64	1647	1651	2	PC	2															
	G65	1704	1708	3	PC	3															
	G105	1745	1749	3	PC	3															
071508-02	1			3	PC	3			U	A	RTHA	1747	1749	80	30	3N	10E	5	SW	0609561	5069377
	G105.5	1802	1806	2	PC	3															
	G109	1821	1825	2	PC	3															
	G76	1901	1905	2	PC	2															
	G78	1917	1921	2	PC	2															

Det._ID: unique detection identifier; date and seqential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format.
Comments:

Period: Nestling / Fledgling **Calls Used:** Alarm / Wail / Begging

Survey Year: 1st 2nd

Turnstone Environmental Consultants
Goshawk Survey Form

Survey Time: Start 0900 End 1453
Intensive Nest Search Time: Start — End —
Temperature (°F): Begin 72 End 84

Survey Area/Project Area: Hood River / SOS **Crew:** W. Beard **Month:** 7 **Day:** 16, **2008** **Visit #** 1

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: —
Cloud Cover (midpoint of survey): 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 =Light Wind (8-12 mph), 5 =Wind (>12 mph)
Weather Codes: CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow

Det._ID	ST#	Sta. Time Begin	Sta. Time End	Wind Code	Weather Code	Cloud Cover	Detection Code	Detection Location	Sex	Age	Species	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (meters)	Location Town	Location Range	Location Sect	Location ¼	UTMX NAD83-GPS data only	UTMY NAD83-GPS data only
	G90	0856	0900	2	CL	1															
	G[illegible]	0919	0923	2	CL	1															
	G124	0956	1000	2	CL	1															
	G119	1008	1012	3	CL	1															
	G120	1022	1026	2	CL	1															
	G128	1036	1040	2	CL	1															
	G139	1054	1058	2	CL	1															
	G25	1115	1119	1	CL	1															
	G26	1145	1149	2	CL	1															
071[illegible]-01				2	CL	1			U	J	COHA	1154	[illegible]	186	30	3N	10E	6	NJ	[illegible]	5070039
	G[illegible]	1210	1214	2	CL	1															
	G[illegible]	1226	1230	3	CL	1															
	G22	1241	1245	3	CL	1															
	G127	1341	1345	3	CL	1															
	G140	1436	1440	2	CL	1															
	G141	1449	1453	3	CL	1															

Det._ID: unique detection identifier; date and seqential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format.
Comments:

Period: Nestling / Fledgling **Calls Used:** Alarm / Wail / Begging

Survey Year: 1st 2nd

Survey Time: Start 1021 End 1313
Intensive Nest Search Time: Start – End –
Temperature (°F): Begin 58 End 74

Turnstone Environmental Consultants
Goshawk Survey Form

Page 1 of 1 (including maps)

Survey Area/Project Area: Hood River / SDS **Crew:** W. Beard **Month:** 7 **Day:** 28, **2008** **Visit #** 1/2

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: ______ **Cloud Cover (midpoint of survey):** 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 = Light Wind (8-12 mph), 5 = Wind (>12 mph)
Weather Codes: CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow

Round 1

Round 2

Det._ID	ST#	Sta. Time		Wind	Weather	Cloud	Detection	Detection	Sex	Age	Species	Contact Time		Bearing	Dist	Location				UTMX	UTMY
		Begin	End	Code	Code	Cover	Code	Location				Initial	Final	(Azimuth)	(meters)	Town	Range	Sect	¼	NAD83-GPS data only	
	G57	1021	1025	2	CL	1															
	G59	1050	1054	2	CL	1															
	G58	1110	1114	2	CL	1															
	G48	1132	1136	2	CL	1															
	G43	1152	1156	2	CL	1															
	G44	1208	1212	2	CL	1															
	G46	1223	1227	2	CL	1															
	G47	1240	1244	2	CL	1															
	G51	1254	1258	2	CL	1															
	G50	1309	1313	3	CL	1															

Det._ID: unique detection identifier; date and seqential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format.
Comments:

Period: Nesting / Fledgling **Calls Used:** Alarm / Wail / Begging

Survey Year: 1st 2nd

Survey Time: Start 1436 End 1739

Intensive Nest Search Time: Start — End —

Temperature (°F): Begin 64 End 62

Turnstone Environmental Consultants

Goshawk Survey Form

Survey Area/Project Area: Hood River/SDS **Crew:** W Beard **Month:** 7 **Day:** 30, **2008** **Visit #** 2

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: — **Cloud Cover (midpoint of survey):** 1 = <5%, 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 = Light Wind (8-12 mph), 5 = Wind (>12 mph)

Weather Codes: CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow

Det._ID	ST#	Sta. Time Begin	Sta. Time End	Wind Code	Weather Code	Cloud Cover	Detection Code	Detection Location	Sex	Age	Species	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (meters)	Location Town	Location Range	Location Sect	Location ¼	UTMX NAD83-GPS data only	UTMY
	G56	1436	1440	3	CL	1															
	G55	1449	1453	4	CL	1															
	G34	1506	1510	3	CL	1															
	G60.5	1518	1522	3	CL	1															
	G60	1530	1534	4	CL	1															
	G53	1544	1548	3	CL	1															
	G58	1559	1603	2	CL	1															
	G68	1620	1624	4	CL	1															
	G61	1636	1640	2	CL	1															
	G62	1648	1652	2	CL	1															
	G63	1700	1704	2	CL	1															
	G66	1712	1716	2	CL	1															
	G67	1722	1726	2	CL	1															
073008 01				2	CL	1			U	A	RTHA	1724	1724	80	30	3N	10E	7	NE	0609[illegible]6	5068754
	G69	1735	1739	2	CL	1															

Det._ID: unique detection identifier; date and seqential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format.

Comments:

Period: Nestling Fledgling **Calls Used:** Alarm Wail/Begging

Survey Year: 1st 2nd

Turnstone Environmental Consultants
Goshawk Survey Form

Survey Time: Start 0739 End 1407
Intensive Nest Search Time: Start — End ____
Temperature (°F): Begin 52 End 74

Survey Area/Project Area: Hood River / SOS Crew: W Beard Month: 7 Day: 31, 2008 Visit # 1 2

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: —— Cloud Cover (midpoint of survey): 1 = <5% 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 = Light Wind (8-12 mph), 5 = Wind (>12 mph)
Weather Codes: CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow

Det._ID	ST#	Sta. Time Begin	Sta. Time End	Wind Code	Weather Code	Cloud Cover	Detection Code	Detection Location	Sex	Age	Species	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (meters)	Location Town	Location Range	Location Sect	¼	UTMX NAD83-GPS data only	UTMY
	G79	0739	0743	1	CL	1															
	G83	0801	0805	1	CL	1															
	G82	0816	0820	1	CL	1															
	G81	0829	0833	2	CL	1															
	G84	0852	0856	1	CL	1															
	G99	0914	0918	1	CL	1															
	G98	0937	0941	1	CL	1															
	G96	1002	1006	2	CL	1															
	G95	1017	1021	1	CL	1															
073108-01				1	CL	1			U	U	TOUU	1018	1018	220	70	3N	10E	5	SW	0610045	[illegible]9446
	G94	1043	1047	3	CL	1															
	G86	1106	1110	1	CL	1															
	G85	1126	1130	2	CL	1															
	G80	1142	1146	2	CL	1															
	G78	1212	1216	3	CL	1															
073108-02				3	CL	1			U	U	TUVU	1213	1213	240	100	3N	10E	8	NE	0610745	5067588
	G77	1226	1230	3	CL	1															
	G76	1240	1244	2	CL	1															
	G74	1251	1255	3	CL	1															
	G75	1307	1311	3	CL	1															
	G70	1324	1328	2	CL	1															
	G65	1333	1337	2	CL	1															
	G64	1351	1355	2	CL	1															
	G64	1403	1407	2	CL	1															

Det._ID: unique detection identifier; date and seqential det. # for the day, (061208-1, 061208-2, ect) Time: Military format.
Comments:

Period: Nestling Fledgling Calls Used: Alarm / Wail Begging

Survey Year: 1st 2nd

Survey Time: Start 0741 End 1250
Intensive Nest Search Time: Start — End —
Temperature (°F): Begin 54 End 62

Turnstone Environmental Consultants
Goshawk Survey Form

Survey Area/Project Area: Hood River / SDS **Crew:** W. Beard **Month:** 8 **Day:** 1, **2008** **Visit #** 2

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: — **Cloud Cover (midpoint of survey):** 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 = Light Wind (8-12 mph), 5 = Wind (>12 mph)
Weather Codes: CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow

Det._ID	ST#	Sta. Time Begin	Sta. Time End	Wind Code	Weather Code	Cloud Cover	Detection Code	Detection Location	Sex	Age	Species	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (meters)	Location Town	Location Range	Location Sect	¼	UTMX NAD83-GPS data only	UTMY
	G73	0741	0745	2	DR	6															
	G72	0755	0759	2	DR	6															
	G71	0835	0839	2	DR	6															
	G87	0843	0847	2	DR	6															
	G88	0900	[illegible]	2	DR	6															
	[illegible]	0920	0924	2	DR	6															
	G91	0937	0941	2	DR	6															
	[illegible]	0953	0957	2	DR	6															
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6															
	G103	1038	1042	2	DR	6															
	G92	1048	[illegible]	2	DR	6															
	G36	1130	1134	2	DR	6															
	[illegible]	1144	1148	2	DR	6															
	[illegible]	1217	1221	2	DR	6															
	G33	1226	1230	2	[illegible]	6															
	[illegible]	1246	1250	2	[illegible]	6															

Det._ID: unique detection identifier; date and seqential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format.
Comments:

Period: Nestling / Fledgling **Calls Used:** Alarm / Wail / Begging

Survey Year: 1st 2nd

Survey Time: Start 0920 End 1735
Intensive Nest Search Time: Start — End —
Temperature (°F): Begin 68 End 87

Turnstone Environmental Consultants
Goshawk Survey Form

Survey Area/Project Area: Hood River / SDS **Crew:** W. Beard **Month:** 8 **Day:** 4, **2008** **Visit #** 2

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: —— **Cloud Cover (midpoint of survey):** 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 = Light Wind (8-12 mph), 5 = Wind (>12 mph)
Weather Codes: CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow

Det._ID	ST#	Sta. Time Begin	Sta. Time End	Wind Code	Weather Code	Cloud Cover	Detection Code	Detection Location	Sex	Age	Species	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (meters)	Location Town	Location Range	Location Sect	Location ¼	UTMX NAD83-GPS data only	UTMY
	G85	0920	0924	1	CL	1															
	G26	0946	0950	1	CL	1															
	G27	1002	1006	1	CL	1															
	G29	1017	1021	1	CL	1															
	G36	1037	1041	1	CL	1															
	G32	1054	1059	1	CL	1															
	G31	1113	1117	1	CL	1															
	G30	1127	1131	1	CL	1															
	G24	1230	1234	2	CL	1															
	G21	1248	1252	2	CL	1															
	G23	1305	1309	2	CL	1															
	G25	1327	1331	1	CL	1															
	G22	1338	1342	1	CL	1															
080408-01				1	CL	1			U	A	RTHA	1410	1410	350	100	3N	9E	18	NW	0609...	5067077
	G57	1428	1432	2	CL	1															
	G58	1443	1447	2	CL	1															
	G59	1455	1459	2	CL	1															
	G3	1555	1559	2	CL	1															
	G4	1619	1623	1	CL	1															
	G5	1643	1647	2	CL	1															
	G6	1647	1651	2	CL	1															
	G7	1658	1702	2	CL	1															
	G2	1721	1725	2	CL	1															
	G1	1731	1735	2	CL	1															

Det._ID: unique detection identifier; date and seqential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format.
Comments:

Period: Nestling / Fledgling **Calls Used:** Alarm / Wail / Begging

Survey Year: 1st 2nd

Survey Time: Start 0858 End 1700

Intensive Nest Search Time: Start — End —

Temperature (°F): Begin 76 End 86

Turnstone Environmental Consultants
Goshawk Survey Form

Survey Area/Project Area: Hood River /SOS **Crew:** W. Beard **Month:** 8 **Day:** 5, **2008** **Visit #** 2

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: — **Cloud Cover (midpoint of survey):** 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 = Light Wind (8-12 mph), 5 = Wind (>12 mph)

Weather Codes: CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow

Det._ID	ST#	Sta. Time Begin	Sta. Time End	Wind Code	Weather Code	Cloud Cover	Detection Code	Detection Location	Sex	Age	Species	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (meters)	Location Town	Location Range	Location Sect	Location ¼	UTMX NAD83-GPS data only	UTMY NAD83-GPS data only
	G19	0858	0902	3	CL	1															
	G18	0920	0924	1	CL	1															
	G16	0937	0941	2	CL	1															
	G15.5	0950	0954	1	CL	1															
	G15	1004	1008	1	CL	1															
	G14.5	1018	1022	1	CL	1															
	G14	1037	1041	1	CL	1															
	G13	1052	1056	1	CL	1															
	G17	1111	1115	2	CL	1															
	G11	1133	1137	2	CL	1															
	G8	1151	1155	2	CL	1															
	G9.5	1205	1209	2	CL	1															
	G10	1220	1224	2	CL	1															
	G9	1242	1246	2	CL	1															
[illegible]-01				2	CL	1			U	U	SSHA	1239	1239	300	10	2N	9E	13	SE	0607934	50659[illegible]
	G12	1333	1337	1	CL	1															
[illegible]-02				1	CL	1			U	U	TUVU	1404	1404	60	200	3N	10E	17	NW	0609901	50665[illegible]
	G111	1448	1452	1	CL	1															
	G112	1501	1505	1	CL	1															
	G107.5	1518	1522	2	CL	1															
	G100	1533	1537	2	CL	1															
	G107	1550	1554	1	CL	1															
	G101	1604	1608	1	CL	1															
	G106	1610	1614	1	CL	1															
	G105	1639	1643	1	CL	1															

+3 TUVU

Det._ID: unique detection identifier; date and seqential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format.

Comments:

G103.5 1646 1650 1 CL 1

[illegible] 16[illegible] 170[illegible] 1 [illegible] 1

Period: Nestling / Fledgling **Calls Used:** Alarm Wail / Begging

Survey Year: 1st 2nd

Turnstone Environmental Consultants
Goshawk Survey Form

Page 1 of 1 (including maps)

Survey Time: Start 0902 End 1503
Intensive Nest Search Time: Start — End —
Temperature (°F): Begin 73 End 78

Survey Area/Project Area: Hood River / SDS **Crew:** Wibeard **Month:** 8 **Day:** 6, **2008** **Visit #** 2

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: — **Cloud Cover (midpoint of survey):** 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 = Light Wind (8-12 mph), 5 = Wind (>12 mph)
Weather Codes: CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow

Det._ID	ST#	Sta. Time Begin	Sta. Time End	Wind Code	Weather Code	Cloud Cover	Detection Code	Detection Location	Sex	Age	Species	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (meters)	Location Town	Location Range	Location Sect	¼	UTMX NAD83-GPS data only	UTMY
	G115	0902	0906	1	OC	5															
	G131	0912	0916	1	OC	5															
	G135	0930	0934	1	OC	6															
	G134	0945	0949	1	OC	6															
	G132	1005	1009	2	OC	6															
	G133	1032	1036	1	OC	5															
	G111	1056	1100	1	OC	6															
	G113	1119	1123	1	OC	6															
	G109	1216	1220	1	OC	6															
	G117	1230	1234	2	DR	6															
	G136	1250	1254	1	DR	6															
	G[illegible]	1306	1310	1	DR	6															
	G130	1323	1327	2	RN	6															
	G129	1345	1349	1	OC	6															
	G138	1402	1406	1	OC	6															
	G139	1417	1421	1	OC	6															
	G128	1529	1533	1	OC	6															
	G120	1543	1547	2	OC	6															
	G119	1459	1503	1	OC	6															

Det._ID: unique detection identifier; date and seqential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format.
Comments:

Period: Nestling / Fledgling **Calls Used:** Alarm / Wail / Begging

Survey Year: 1st 2nd

Survey Time: Start 0930 End 1227
Intensive Nest Search Time: Start – End –
Temperature (°F): Begin 65 End 74

Turnstone Environmental Consultants
Goshawk Survey Form

Survey Area/Project Area: Hard River 1505 **Crew:** W. Beard **Month:** 8 **Day:** 7, **2008** **Visit #** 2

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: —

Cloud Cover (midpoint of survey): 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 = Light Wind (8-12 mph), 5 = Wind (>12 mph)
Weather Codes: CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow

Det._ID	ST#	Sta. Time Begin	Sta. Time End	Wind Code	Weather Code	Cloud Cover	Detection Code	Detection Location	Sex	Age	Species	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (meters)	Location Town	Location Range	Location Sect	Location ¼	UTMX NAD83-GPS data only	UTMY NAD83-GPS data only
	G140	0930	0934	1	OC	5															
	G141	0941	0945	1	OC	5															
	G122	1013	1017	1	OC	5															
	G126	1029	1033	1	OC	5															
	G127	1048	1052	2	PC	4															
	G125	1131	1135	1	OC	6															
	G121	1144	114[illegible]	1	OC	6															
	G123	1159	1203	2	OC	5															
	G119	1213	1217	2	OC	5															
	G124	1223	1227	2	OC	5															

Det._ID: unique detection identifier; date and seqential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format.
Comments:

Period: Nestling Fledgling **Calls Used:** Alarm / Wail Begging

Survey Year: 1st 2nd

Appendix D - Western Gray Squirrel Survey Forms

WESTERN GRAY SQUIRREL SURVEY - COVER SHEET

Use one cover sheet per stand surveyed. Attach the map(s) on which you mark squirrel nests and show the transect(s) or area(s) surveyed. For each map, attach one Map Label and one or more Western Gray Squirrel Survey Data Sheets. If you see or hear a western gray squirrel please fill out a wildlife observation form and attach.

Mark Water Sources and Survey Transect or Survey Polygon on Attached Map.

Name of Area Surveyed: Polygons:A1, A3, A7 (See Map)

(Use a generic geographic name like "Yahne Canyon". Add the timber sale name/number if available.)

Location (TRS): **T** **3N** **R** **10E** **S** 5,6,7,8 **County:** Skamania

T **4N** **R** **10E** **S** 31 **County:** Skamania

Date(s) Surveyed: 10/14/2008

Start/Stop time(s): 0847-Start/1635-Stop

Surveyor Names and Affiliations: Devin Sahl (TECI)

Contact Name, Address, & Phone:

TECI
Turnstone Environmental Consultants Inc.
18000 NW lucy Reeder Rd Portland, OR 97231
503-621-9613

Directions to Site: Be specific enough to allow someone unfamiliar with the site to find it.

From the Jct. of Cook Underwood Rd. and Knapp Rd. Go NW on Knapp Rd. for ~0.1miles to Scoggins Rd., Turn right onto Scoggins Rd. and ~100 yards to Jct. with private drive on left (Signed as CG 2930). Proceed up CG 2930 to access SDS and WDNR lands.

Description of Habitat at Site: Include approximate age/size (dbh) of stand, dominant overstory species, percent oak in stand, slope position and aspect, and distance to nearest water.

All polygons surveyed were composed of mixed conifer/hardwoods, primarily *PSME* with some scattered *THPL/TSHE*. The majority of the overstory PSME appears to be >25 years of age, with some scattered remnant *PSME* >70 years. A few small patches of *Quercus* SPP (likely Quercus Garryana), were observed within the boundaries of the A3 polygon. The trees were not > than 15ft. in height and growing in a few steep, rocky, open areas with a westerly aspect. In Polygons A3 and A7 there were numerous *ACMA present, especially towards the toe of the slope.* Slopes within the polygon boundaries vary between ~0% to 85%. The aspect of each polygon also varies. The A1 polygon has a southern aspect, A3 has a predominantley western aspect and several insised drainages. The A7 polygon has a variety of aspects, primarily eastern and northern. Water was present in seasonally intermittent streams in polygon A3 on the north end and in A7 in a broader drainage that runs through the center of the polygon. Both contained some water at time of survey, streambanks indicte that the water level increases signifiganlty during the wet season. No areas of standing water were observed in any of the polygons.

No Western Gray squirrels, or thier nest structures were observed during the survey. Several bird nests were observed and numerous douglas squirrels were heard and a few were observed.

WESTERN GRAY SQUIRREL SURVEY - COVER SHEET

Use one cover sheet per stand surveyed. Attach the map(s) on which you mark squirrel nests and show the transect(s) or area(s) surveyed. For each map, attach one Map Label and one or more Western Gray Squirrel Survey Data Sheets. If you see or hear a western gray squirrel please fill out a wildlife observation form and attach.

Mark Water Sources and Survey Transect or Survey Polygon on Attached Map.

Name of Area Surveyed: Polygons:A4, A5, A10 (See Map)

(Use a generic geographic name like "Yahne Canyon". Add the timber sale name/number if available.)

Location (TRS): **T** **3N** **R** **10E** **S** 5,6,7,8 **County:** Skamania

Date(s) Surveyed: 10/14/2008

Start/Stop time(s): 0845-Start/1635-Stop

Surveyor Names and Affiliations: John Kolozar (TECI)

Contact Name, Address, & Phone:

TECI
Turnstone Environmental Consultants Inc.
18000 NW lucy Reeder Rd Portland, OR 97231
503-621-9613

Directions to Site: Be specific enough to allow someone unfamiliar with the site to find it.

From the Jct. of Cook Underwood Rd. and Knapp Rd. Go NW on Knapp Rd. for ~0.1miles to Scoggins Rd., Turn right onto Scoggins Rd. and ~100 yards to Jct. with private drive on left (Signed as CG 2930). Proceed up CG 2930 to access SDS and WDNR lands.

Description of Habitat at Site: Include approximate age/size (dbh) of stand, dominant overstory species, percent oak in stand, slope position and aspect, and distance to nearest water.

All polygons surveyed were composed of mixed conifer/hardwoods, primarily *PSME* with some scattered *THPL/TSHE*. The majority of the overstory PSME appears to be >25 years of age, with some scattered remnant *PSME* >70 years. No patches of *Quercus* SPP. were observed within the boundaries of the A4,A5 or A10 polygons. In all the Polygons there were *ACMA and ACCI* present within the polygons. Slopes within the polygon boundaries vary between ~0% to 45%. The aspect of each polygon also varies. The A4 polygon has a southwest aspect, A5 has a predominantly eastern aspect. The A10 polygon was fairly flat and had a subtle northern aspect. No standing water or active drainages were observed in the polygons.

No Western Gray squirrels, or thier nest structures were observed during the survey. Several bird nests were observed and numerous douglas squirrels were heard and a few were observed.

WESTERN GRAY SQUIRREL SURVEY - COVER SHEET

Use one cover sheet per stand surveyed. Attach the map(s) on which you mark squirrel nests and show the transect(s) or area(s) surveyed. For each map, attach one Map Label and one or more Western Gray Squirrel Survey Data Sheets. If you see or hear a western gray squirrel please fill out a wildlife observation form and attach.

Mark Water Sources and Survey Transect or Survey Polygon on Attached Map.

Name of Area Surveyed: Polygons:A2, A6, A9 (See Map)

(Use a generic geographic name like "Yahne Canyon". Add the timber sale name/number if available.)

Location (TRS): **T** **3N** **R** **10E** **S** 5,6,8 **County:** Skamania
T **4N** **R** **10E** **S** 31 **County:** Skamania

Date(s) Surveyed: 10/14/2008

Start/Stop time(s): 0832-Start/1635-Stop

Surveyor Names and Affiliations: John Kolozar (TECI)

Contact Name, Address, & Phone:

TECI
Turnstone Environmental Consultants Inc.
18000 NW lucy Reeder Rd Portland, OR 97231
503-621-9613

Directions to Site: Be specific enough to allow someone unfamiliar with the site to find it.

From the Jct. of Cook Underwood Rd. and Knapp Rd. Go NW on Knapp Rd. for ~0.1miles to Scoggins Rd., Turn right onto Scoggins Rd. and ~100 yards to Jct. with private drive on left (Signed as CG 2930). Proceed up CG 2930 to access SDS and WDNR lands.

Description of Habitat at Site: Include approximate age/size (dbh) of stand, dominant overstory species, percent oak in stand, slope position and aspect, and distance to nearest water.

All polygons surveyed were composed of mixed conifer/hardwoods, primarily *PSME* with some scattered *THPL/TSHE* . The majority of the overstory PSME appears to be >25 years of age, with some scattered remnant *PSME* >70 years. No patches of *Quercus* SPP. were observed within the boundaries of the A2,A6 or A9 polygons. In all the Polygons there were *ACMA present.* Slopes within the polygon boundaries vary between ~0% to 45%. The aspect of each polygon also varies. The A2 polygon has a southern aspect, A6 has a predominantley southwestern aspect and an active drainage. The A9 polygon was fairly flat and had a slight northeastern aspect. Water was present in seasonally intermittent stream and a small roundish pond (~30 feet across at time of survey) in polygon A6. Water in the pond appeared to be present year round. Both contained some water at time of survey, streambanks indicte that the water level increases signifiganlty during the wet season.

No Western Gray squirrels, or thier nest structures were observed during the survey. Several bird nests were observed and numerous douglas squirrels were heard and a few were observed.

WESTERN GRAY SQUIRREL SURVEY - COVER SHEET

Use one cover sheet per stand surveyed. Attach the map(s) on which you mark squirrel nests and show the transect(s) or area(s) surveyed. For each map, attach one Map Label and one or more Western Gray Squirrel Survey Data Sheets. If you see or hear a western gray squirrel please fill out a wildlife observation form and attach.

Mark Water Sources and Survey Transect or Survey Polygon on Attached Map.

Name of Area Surveyed: Polygons:A12,A13 (See Map)

(Use a generic geographic name like "Yahne Canyon". Add the timber sale name/number if available.)

Location (TRS): **T** **3N** **R** **10E** **S** 7 **County:** Skamania

Date(s) Surveyed: 10/15/2008

Start/Stop time(s): 1206-Start/1500-Stop

Surveyor Names and Affiliations: Devin Sahl (TECI)

Contact Name, Address, & Phone:

TECI
Turnstone Environmental Consultants Inc.
18000 NW lucy Reeder Rd Portland, OR 97231
503-621-9613

Directions to Site: Be specific enough to allow someone unfamiliar with the site to find it.

From the Jct. of Cook Underwood Rd. and Knapp Rd. Go NW on Knapp Rd. for ~0.1miles to Scoggins Rd., Turn right onto Scoggins Rd. and ~100 yards to Jct. with private drive on left (Signed as CG 2930). Proceed up CG 2930 to access SDS and WDNR lands.

Description of Habitat at Site: Include approximate age/size (dbh) of stand, dominant overstory species, percent oak in stand, slope position and aspect, and distance to nearest water.

The A12 and A13 polygons were composed of mixed conifer/hardwoods, primarily PSME with some scattered THPL/TSHE. The majority of the overstory in the stands in these polygons was PSME and appears to be mixed age, most was >20 years of age with a few older remnant trees present. No patches of Quercus SPP. were observed within the boundaries of the polygons. There was some ACMA and ACCI present within the polygons. Both polygons are very flat with slopes within the polygon boundaries vary between ~0% to 5%. Both polygons had very marginal potential WGS habitat. There were no drainages or areas of standing water present within the polygons.

No Western Gray squirrels, or thier nest structures were observed during the survey. Several bird nests were observed and numerous douglas squirrels were heard and a few were observed.

WESTERN GRAY SQUIRREL SURVEY - COVER SHEET

Use one cover sheet per stand surveyed. Attach the map(s) on which you mark squirrel nests and show the transect(s) or area(s) surveyed. For each map, attach one Map Label and one or more Western Gray Squirrel Survey Data Sheets. If you see or hear a western gray squirrel please fill out a wildlife observation form and attach.

Mark Water Sources and Survey Transect or Survey Polygon on Attached Map.

Name of Area Surveyed: Polygons:A14 (See Map)

(Use a generic geographic name like "Yahne Canyon". Add the timber sale name/number if available.)

Location (TRS): **T** **3N** **R** **10E** **S** 7 **County:** Skamania

Date(s) Surveyed: 10/15/2008

Start/Stop time(s): 0827-Start/1445-Stop

Surveyor Names and Affiliations: Darren Bolen (TECI)

Contact Name, Address, & Phone:

TECI
Turnstone Environmental Consultants Inc.
18000 NW lucy Reeder Rd Portland, OR 97231
503-621-9613

Directions to Site: Be specific enough to allow someone unfamiliar with the site to find it.

From the Jct. of Cook Underwood Rd. and Knapp Rd. Go NW on Knapp Rd. for ~0.1miles to Scoggins Rd., Turn right onto Scoggins Rd. and ~100 yards to Jct. with private drive on left (Signed as CG 2930). Proceed up CG 2930 to access SDS and WDNR lands.

Description of Habitat at Site: Include approximate age/size (dbh) of stand, dominant overstory species, percent oak in stand, slope position and aspect, and distance to nearest water.

The A14 polygon was composed of mixed conifer/hardwoods, primarily PSME with some scattered THPL/TSHE. The majority of the overstory PSME appears to be >25 years of age, stand appeared to be even aged. No patches of Quercus SPP. were observed within the boundaries of the polygon. There was some ACMA and ACCI present within the polygon. Slopes within the polygon boundaries vary between ~0% to 60%. The A14 polygon has a westerly aspect and one seasonal drainage. The drainage was dry at the time of the survey. No standing water or active drainages were observed at the time of survey.

No Western Gray squirrels, or thier nest structures were observed during the survey. Several bird nests were observed and numerous douglas squirrels were heard and a few were observed.

WESTERN GRAY SQUIRREL SURVEY - COVER SHEET

Use one cover sheet per stand surveyed. Attach the map(s) on which you mark squirrel nests and show the transect(s) or area(s) surveyed. For each map, attach one Map Label and one or more Western Gray Squirrel Survey Data Sheets. If you see or hear a western gray squirrel please fill out a wildlife observation form and attach.

Mark Water Sources and Survey Transect or Survey Polygon on Attached Map.

Name of Area Surveyed: Polygons:A15 (See Map)
(Use a generic geographic name like "Yahne Canyon". Add the timber sale name/number if available.)

Location (TRS): **T** **3N** **R** **10E** **S** 18 **County:** Skamania

Date(s) Surveyed: 10/15/2008
Start/Stop time(s): 1220-Start/1410-Stop

Surveyor Names and Affiliations: John Kolozar (TECI)

Contact Name, Address, & Phone:
TECI
Turnstone Environmental Consultants Inc.
18000 NW lucy Reeder Rd Portland, OR 97231
503-621-9613

Directions to Site: Be specific enough to allow someone unfamiliar with the site to find it.
From the Jct. of Cook Underwood Rd. and Knapp Rd. Go NW on Knapp Rd. for ~0.1miles to Scoggins Rd., Turn right onto Scoggins Rd. and ~100 yards to Jct. with private drive on left (Signed as CG 2930). Proceed up CG 2930 to access SDS and WDNR lands.

Description of Habitat at Site: Include approximate age/size (dbh) of stand, dominant overstory species, percent oak in stand, slope position and aspect, and distance to nearest water.
The A15 polygon was composed of mixed conifer/hardwoods, primarily PSME with some scattered THPL/TSHE. The majority of the overstory PSME appears to be >25 years of age, stand appeared to be even aged. No patches of Quercus SPP. were observed within the boundaries of the polygon. There was some ACMA and ACCI present within the polygon. Slopes within the polygon boundaries vary between ~20% to 80%. The A15 polygon has a westerly aspect and two seasonal drainages. Both of the drainages wer dry at the time of the survey. No standing water or active drainages were observed at the time of survey.

No Western Gray squirrels, or thier nest structures were observed during the survey. Several bird nests were observed and numerous douglas squirrels were heard and a few were observed.

WESTERN GRAY SQUIRREL SURVEY - COVER SHEET

Use one cover sheet per stand surveyed. Attach the map(s) on which you mark squirrel nests and show the transect(s) or area(s) surveyed. For each map, attach one Map Label and one or more Western Gray Squirrel Survey Data Sheets. If you see or hear a western gray squirrel please fill out a wildlife observation form and attach.

Mark Water Sources and Survey Transect or Survey Polygon on Attached Map.

Name of Area Surveyed: Polygons:A11,A17,A18 (See Map)

(Use a generic geographic name like "Yahne Canyon". Add the timber sale name/number if available.)

Location (TRS): **T 3N** **R 10E** **S** 7 **County:** Skamania

T 3N **R 9E** **S** 13 **County:** Skamania

Date(s) Surveyed: 10/15/2008

Start/Stop time(s): 0827-Start/1445-Stop

Surveyor Names and Affiliations: Devin Sahl (TECI), Darren Bolen (TECI), John Kolozar (TECI)

Contact Name, Address, & Phone:

TECI
Turnstone Environmental Consultants Inc.
18000 NW lucy Reeder Rd Portland, OR 97231
503-621-9613

Directions to Site: Be specific enough to allow someone unfamiliar with the site to find it.

From the Jct. of Cook Underwood Rd. and Knapp Rd. Go NW on Knapp Rd. for ~0.1miles to Scoggins Rd., Turn right onto Scoggins Rd. and ~100 yards to Jct. with private drive on left (Signed as CG 2930). Proceed up CG 2930 to access SDS and WDNR lands.

Description of Habitat at Site: Include approximate age/size (dbh) of stand, dominant overstory species, percent oak in stand, slope position and aspect, and distance to nearest water.

These polygons were lumped together because they were visited by three surveyors simultaneously on the same day. The A11, A17 and A18 polygons were composed of mixed conifer/hardwoods, primarily PSME with some scattered THPL/TSHE. The majority of the overstory in the stands in these polygons was PSME and appears to be mixed age, most was >20 years of age. No patches of Quercus SPP. were observed within the boundaries of the polygons. There was some ACMA and ACCI present within the polygons. Slopes within the polygon boundaries vary between ~0% to 60%. The A11 polygon has multiple pieces all of which contained very marginal potential WGS habitat. There are two seasonal drainages within the area of the polygons and both were dry at the time of the survey. The A17 and A18 polygons were on the extreme southern end of the project area. A18 has a northwestern aspect on a fairly steep slope and a seasonal drainage that was dry at the time of the survey. The A17 polygon had a south and southeast exposure and no significant drainages. It had trees older than the other 2 polygons in the overstory and a few remnant PSME present that were greater than 70yrs of age. The A17 polygon is adjacent to the C1 polygon that had a seasonal stream present in it that had several pools of water present but no f

No Western Gray squirrels, or thier nest structures were observed during the survey. Several bird nests were observed and numerous douglas squirrels were heard and a few were observed.

WESTERN GRAY SQUIRREL SURVEY - COVER SHEET

Use one cover sheet per stand surveyed. Attach the map(s) on which you mark squirrel nests and show the transect(s) or area(s) surveyed. For each map, attach one Map Label and one or more Western Gray Squirrel Survey Data Sheets. If you see or hear a western gray squirrel please fill out a wildlife observation form and attach.

Mark Water Sources and Survey Transect or Survey Polygon on Attached Map.

Name of Area Surveyed: Polygons: B1,B2,B3,B4,B5,B6,B7,B8 (See Map)

(Use a generic geographic name like "Yahne Canyon". Add the timber sale name/number if available.)

	T 3N	**R 9E**	**S** 13	**County:** Skamania
Location (TRS):	**T 3N**	**R 10E**	**S** 5,6,8	**County:** Skamania
	T 4N	**R 10E**	**S** 31,32	**County:** Skamania

Date(s) Surveyed: 11/18/2008

Start/Stop time(s): 0920-Start/1545-Stop

Surveyor Names and Affiliations: Devin Sahl (TECI), Darren Bolen (TECI)

Contact Name, Address, & Phone:

TECI
Turnstone Environmental Consultants Inc.
18000 NW lucy Reeder Rd Portland, OR 97231
503-621-9613

Directions to Site: Be specific enough to allow someone unfamiliar with the site to find it.

From the Jct. of Cook Underwood Rd. and Knapp Rd. Go NW on Knapp Rd. for ~0.1miles to Scoggins Rd., Turn right onto Scoggins Rd. and ~100 yards to Jct. with private drive on left (Signed as CG 2930). Proceed up CG 2930 to access SDS and WDNR lands.

This set of "B" polygons was surveyed after the "A" polygons due to alterations in the alingment of the proposed turbine strings.

Description of Habitat at Site: Include approximate age/size (dbh) of stand, dominant overstory species, percent oak in stand, slope position and aspect, and distance to nearest water.

All polygons surveyed were composed of mixed conifer/hardwoods, primarily *PSME* with some scattered *THPL/TSHE* . The majority of the overstory PSME appears to be >25 years of age, with some scattered remnant *PSME* >70 years. No *Quercus* SPP. Were observed within the boundaries of the polygons surveyed. In Polygons B3, B4 and B5 there were numerous *ACMA present.* Slopes within the polygon boundaries vary between ~0% to 70%. The aspect of each polygon also varies. Water is present in seasonally intermittent streams in polygons B4 and B5. The intermittent stream in B5 was active at time of survey, the intermittent stream in B4 was not.

T

No Western Gray squirrels, or thier nest structures were observed during the survey. One potential nest structure was examined from the ground and determined to have potential to be a douglas squirrel nest. The structure was quite small and constructed ~25 feet up in a small ACMA. The structure appeared to be a small ball (less than 14" in diameter) constructed primarily of lichen, twigs and a few ACMA leaves. Several douglas squirrel cone middens were located in the immediate vicinity. while exploreing the immediate area of the nest looking for other possible nest structures, the surveyor observed 3 distintct douglas squirrel individuals.

WESTERN GRAY SQUIRREL SURVEY - COVER SHEET

Use one cover sheet per stand surveyed. Attach the map(s) on which you mark squirrel nests and show the transect(s) or area(s) surveyed. For each map, attach one Map Label and one or more Western Gray Squirrel Survey Data Sheets. If you see or hear a western gray squirrel please fill out a wildlife observtion form and attach.

Mark Water Sources and Survey Transect or Survey Polygon on Attached Map.

Name of Area Surveyed: Polygon: C1

(Use a generic geographic name like "Yahne Canyon". Add the timber sale name/number if available.)

Location (TRS): **T** **3N** **R** **10E** **S** 18 **County:** Skamania

Date(s) Surveyed: 10/9/2008

Start/Stop time(s): 0930-Start/1645-Stop

Surveyor Names and Affiliations: Devin Sahl

Contact Name, Address, & Phone:

Devin Sahl
Turnstone Environmental Consultants Inc.
18000 NW lucy Reeder Rd Portland, OR 97231
503-621-9613

Directions to Site: Be specific enough to allow someone unfamiliar with the site to find it.

From the Jct. of Cook Underwood Rd. and Knapp Rd. Go NW on Knapp Rd. for ~0.1miles to Scoggins Rd., Turn right onto Scoggins Rd. and ~100 yards to Jct. with private drive on left (Signed as CG 2930). Proceed up CG 2930 for ~2.8 miles to powerline ROW. Turn Left onto the powerline ROW road and proceed ~100 yards to unmarked spur on Left. Continue down Spur road ~0.25 to just before it's end and park. You are parked just outside the NE corner of the polygon.

Description of Habitat at Site: Include approximate age/size (dbh) of stand, dominant overstory species, percent oak in stand, slope position and aspect, and distance to nearest water.

Polygon is a stand of mixed conifer/hardwood, primarily *PSME* with some scattered *THPL/TSHE*. The polygon encompasses both sides of a small intermittent stream. The majority of the overstory PSME appears to be >50 years of age, with some scattered remnant *PSME* >70 years. No *Quercus* SPP. Were observed within the boundaries of the polygon but may be present just outside the boundary at the transition to agricultural land (fruit orchard). Slopes within the polygon boundary vary between ~0% to 60% depending on location. The aspect is predominantly SE facing on the western portion of the tract and SSW facing on the eastern portion of the tract, with the intermittent stream being the divider between. Water is present in a seasonally intermittent stream that runs through the middle of the polygon. The stream was predominantly dry at the time of the survey expect for a few small puddles and some water in a maintained penstock that supplies water to landowners downslope. A small, shallow pond was present backed-up behind a non-maintained irrigation structure just outside the SE corner of the polygon.The irrigation structure is designed to impound water form the seasonaly intermittenent stream.It is possible that the irrigation structure would hold some amount of water year round that would be available for wildlife.

No Western Gray squirrels were observed during the survey of this polygon. One potential nest structure was examined from the ground and determined to have potential to be a western gray squirrel nest structure. A subsequent visit to the site 7 days after this visit determined that the structure was a broom type growth emanating form the bole of the PSME. The structure was examined by climbing an adjacent tree and determined to not be a squirrel nest. Several douglas squirrels were heard and obseved within the boundaries of the polygon during the time of the survey and on subsequent visits.

C-7

Final Report: Results of Northern Spotted Owl, Northern Goshawk, Western Gray Squirrel Surveys Conducted for the Saddleback Wind Energy Project. Prepared for SDS Lumber.

Turnstone Environmental Consultants, Inc. 2009

2009 Final Report

Results of Northern Spotted Owl, Western Gray Squirrel and Northern Goshawk Surveys Conducted for the Whistling Ridge Wind Energy Project



Prepared for:

SDS Lumber Company

Prepared by:

TURNSTONE
ENVIRONMENTAL CONSULTANTS

Turnstone Environmental Consultants, Inc.
18000 NW Lucy Reeder Rd.
Portland, Oregon 97231

October, 2009

Table of Contents

1. PROJECT OVERVIEW

SDS Lumber Company (SDS) retained the services of Turnstone Environmental Consultants, Inc. (Turnstone) to perform Northern spotted owl (spotted owl), Western gray squirrel (gray squirrel) and Northern goshawk (goshawk) surveys in potential habitat for the Whistling Ridge Wind Energy Project formally known as the Saddleback Wind Energy Project, located in Skamania County, Washington. Survey information will be used to assess the presence, occupancy and reproductive status of spotted owl, gray squirrel and goshawk individuals and populations within areas of proposed wind energy development.

The physiographic range of spotted owl, gray squirrel and goshawk populations are potentially located within the forestlands of the Whistling Ridge Wind Energy Project. As part of the process to avoid “take” of any state or federally listed species, landowners must conduct surveys to determine the presence of listed species, prior to conducting any management activities.

This report summarizes the Wildlife surveys that were conducted in both 2008 and 2009 at the Whistling Ridge Wind Energy Project. All Wildlife surveys were conducted using the best information available during this time period. Turnstone staff followed strict adherence to protocol guidelines and habitat requirements to obtain full compliance with agency requirements and recommendations. All potential habitat and buffers were determined based on the sighting of the proposed wind turbine locations. In late October of 2008, the final proposed turbine alignment was released and the locations of the turbines were slightly altered from their original location. Turnstone re-analyzed the new alignment, confirming all additional buffers were covered and that the adherence to protocols for all species surveyed were sufficient. The survey implications of the adjustments to the proposed turbine locations will be discussed in further detail in the *survey locations* sections for each of the respective species surveyed.

2. NORTHERN SPOTTED OWL

Under the federal Endangered Species Act of 1973, the Northern spotted owl (*Strix occidentalis caurina*) was listed in 1990 as "threatened" by the United States Fish and Wildlife Service. The Washington Fish and Wildlife commission listed the Northern spotted owl as a state endangered species in 1988 (Buchanan and Swedeen, 2004). Both federal and state agencies determined that the spotted owl is likely to become an endangered species in the foreseeable future throughout all or a significant portion of its existing range. The northern spotted owl's range extends from Washington State to Northern California. A recently revised USFWS species recovery plan is in effect for the northern spotted owl (USFWS 2008).

2.1. Suitable Habitat

In Washington, spotted owls inhabit the Eastern and Western Cascades, Western Lowlands, and Olympic Peninsula Provinces. Within these regions, the spotted owl has specific habitat requirements for nesting, roosting, foraging and dispersal. The species utilizes forests with multi-layered canopies and a high incidence of large trees for nesting and roosting. Fragmented habitats may be used for dispersal and foraging. Spotted owls nest primarily in large tree cavities and on broken tops of large trees. Spotted owls have also been reported as nesting on clumps of mistletoe, on large branches, in abandoned stick nests of Northern goshawks, and in cavities on embankments and rock faces (LaHaye 1999).

For the purposes of this project, potentially suitable spotted owl habitat was determined to be coniferous stands with average tree DBH (diameter at breast height) greater than 12 inches and canopy closure of 60% or greater. These standards for suitable spotted owl habitat were based on the availability of forest stand classification GIS data from SDS. By using GIS data that was readily available, initial spotted owl survey areas could be efficiently determined in the office and verified in the field when setting up the survey stations.

The 12" average DBH and 60% canopy closure standards could be considered conservative as compared to the nesting and roosting habitat characteristics that are discussed in the 2008 USFWS recovery plan. This plan states, "Features that support nesting and roosting typically include a moderate to high canopy closure (60 to 90 percent); a multilayered, multi-species canopy with large overstory trees (with diameter at breast height [dbh] of greater than 30 inches); a high incidence of large trees with various deformities (large cavities, broken tops, mistletoe infections, and other evidence of decadence); large snags; large accumulations of fallen trees and other woody debris on the ground; and sufficient open space below the canopy for spotted owls to fly (Thomas *et al.* 1990)." These types of habitats are typically not present over large areas on managed commercial forest lands. Recently cut areas or young conifer plantations that did not meet the minimum average DBH or canopy closure parameters were excluded from the survey effort. The resulting designated survey areas did contain varying types of habitat that could potentially be used by spotted owls.

2.2. Survey Locations

Turnstone conducted spotted owl surveys within and adjacent to properties managed by SDS and cooperating adjacent landowners. Surveys were conducted in all potentially suitable habitat within the 1.8 mile spotted owl provincial home range radius of the proposed project area. To determine the potential spotted owl survey areas, the proposed turbine alignments were buffered out to a 1.8 mile radius. This created a large polygon of potential survey area that included 14,901 acres. This initial query of potential habitat that fell within the provincial range was not contiguous, it resembled a patchwork of stands that met the survey threshold and would require spotted owl surveys.

The delineated potential survey area polygon intersected two owl activity centers where spotted owls historically lived. A designated spotted owl activity center in this geographical region of Washington is equal to a circle with a 1.8 mile radius. The two spotted owl activity centers are located primarily on public lands north of the project area. The nest cores of these activity centers reside on public land managed by the Washington Department of Natural Resources (WDNR) and the U.S. Forest Service (USFS).

The activity centers intersect (1.8 mile radius provincial range) the northern reach of the proposed wind turbine survey area polygon. The Mill Creek activity center (MSNO# 0991) was located and designated in 1992 and was last considered to have spotted owls present in 2000. The Moss Creek activity center (MSNO#1003) was located and established in 1994 and was last considered to have spotted owls present in 2002. Table 4, in the results section of this document, represents the survey summaries for these activity centers for 1994 thru 2009. These two activity centers are adjacent to one another and overlap by approximately 15%. Because of the close proximity of the spotted owl activity centers all suitable habitat within a 1.8 mile buffer of the nest site was surveyed. This increased the potential survey area to 7,222 acres. Much of this habitat was a patchwork of timber stands that contained potentially suitable and non-suitable habitat.

The final proposed turbine alignment released in late October of 2008 did not affect the survey coverage area for spotted owls during the 2008 survey season. The additional turbines were located to the north end of the project area where surveys were already being conducted in the Mill and Moss Creek activity centers.

Table 1.Township and Range information for northern spotted owl survey areas.

Legal Descriptions for Spotted Owl Survey Areas		
Township	**Range**	**Section***
3N	9E	1,2,11,12,12,14,23,24,25
3N	10E	4-6,7-9,16-18,19,20,30
4N	9E	23,24,25,26,27,34,35,36
4N	10E	19-22, 27-30,31-34

*some sections only had portions of their respective area covered for NSO survey in 2008-2009

2.3. Survey Methods

Potential northern spotted owl habitat was surveyed in 2008 and 2009 in accordance with the 1992, revised version of *"Protocol for Surveying Proposed Management Activities That May Impact Northern Spotted Owls".* This survey protocol is endorsed by the U.S. Fish and Wildlife Service. Under this protocol, Turnstone initiated the 2-year survey effort in early May of 2008 and completed the second year of spotted owl surveys in August of 2009. Under the two year survey methodology, a minimum of 3 protocol visits must be performed for 2 consecutive years in order to determine probable presence/absence of the spotted owl.

Prior to initiating field surveys, Turnstone biologists analyzed the project area using topographic maps, aerial photography and stand classification data to determine suitable habitat for potential broadcast calling station placement. Calling stations were placed in differing topographies across the survey area of potential habitat. When possible, broadcast calling stations were placed along ridges and prominent points to maximize coverage and increase the probability of hearing distant owl responses. Broadcast calling stations and survey routes were situated to achieve complete coverage of the potential survey area, preferably with coverage from more than one calling point. Stations were spaced approximately ¼ to ½ mile apart where access was possible and permitted. Broadcast calling stations were surveyed at night when owls are more active and are thought to be more responsive to standard survey techniques (USDI 1992). Per protocol guidelines, Turnstone biologists used a minimum of ten-minute calling periods at each designated broadcast calling station. Amplified PA systems were the primary means used to broadcast both male and female spotted owl vocalizations that included four-note contact calls and various agitated calls. Voice hooting and "hoot flutes" were occasionally used to supplement the Amplified PA systems and were also used when conducting daytime visits to historic nest cores. Turnstone conducted surveys between March 15th and August 31st during each survey year, as stipulated by the protocol.

During the first round of broadcast calling in the 2008 survey season, an additional day visit was made to each of the two spotted owl nest core activity centers north of the project area, (Mill Crk, and Moss Crk.). During the 2009 survey season, three additional day visits were made to each of the two spotted owl nest core activity centers.

After consulting with WDFW staff, additional day visits were added in 2009. The intent of these day visits was to further verify if spotted owls were "quietly" occupying the historic spotted owl nest cores but not responding during night surveys. The three day visits conducted by Turnstone staff were made in addition to the three required night surveys outlined in the survey protocol guidelines. These visits involved hiking into the historic nest core areas and conducting an intensive survey of the area using meandering survey transects in areas of suitable habitat. Turnstone staff attempted to elicit responses from spotted owls using various means while conducting these surveys. Surveys near the nest cores would typically start out with subtle voice or hoot flute calling and then proceed into more aggressive and louder calling using amplified PA systems when no responses or observations occurred. The visits varied in length but typically lasted from two to six hours.

Both the Mill and Moss Creek nest cores are also being surveyed as part of a long term demography study conducted by the Washington Department of Natural Resources on lands within the Klickitat Habitat Conservation Plan Planning Unit. The study was initiated in 2001 and was slated to run for five years. In 2007, a new three year contract was signed to extend the survey effort for another three years. The fieldwork for the project is carried out by staff from the National Council for Air and Stream Improvement (NCASI). Each year NCASI performs a minimum of three visits and as many as 10 survey visits a year to the spotted owl nest cores. These visits involve both day calling the historic nest cores and night calling in the same areas. Survey summary details of the survey results for each of these spotted owl cores can be reviewed in Table 4 of this document.

During the 2008 and 2009 survey seasons, Turnstone biologists recorded all owl species encountered and the sightings of or responses by, potential spotted owl predators. This included barred owls, great horned owls, northern goshawks and other raptor species. There is some evidence that the presence of these species may affect northern spotted owl responses.

3. Western Gray Squirrel

The western gray squirrel (*Sciurus griseus*) was listed as a “threatened” species by the Washington Fish and Wildlife Commission in 1993. In November of 2007, the State of Washington adopted a species recovery plan for the Western Gray Squirrel which is currently in effect.

In January of 2001, a petition was filed with the United States Fish and Wildlife Service to list the Washington State population of the western gray squirrel as a distinct population segment (DPS) in an effort to secure protection for the species under the Endangered Species Act of 1973 (ESA). The petition underwent a 12 month review with a ruling announced on May 30, 2003. This ruling stated the petition action was not warranted because the Washington population of the Western Gray Squirrel is not a DPS therefore, no protection under the ESA would be granted (Federal Register, 2003). There is currently no federal protection for the western gray squirrel.

The physiographic range and habitat requirements of the western gray squirrel are located within the forestlands of the Whistling Ridge Wind Energy Project.

3.1. Suitable Habitat

Western gray squirrels are arboreal (adapted for living in trees) and, although they forage on the ground, they rarely stray far from trees. They use tree canopies for escape, cover and nesting. Western gray squirrels can move rapidly and cover long distances among tree canopies when canopy conditions permit. A contiguous tree canopy that allows arboreal travel for at least 198 feet (60 meters) around the nest is an important feature of western gray squirrel habitat (Ryan and Carey 1995a). Western gray squirrels are active throughout the day but are most active in the morning. Western gray squirrels are most active in August and September, they are less visible in June and July (Ryan and Carey 1995a) while collecting and storing food for winter.

In Washington the western gray squirrel distribution has been reduced to three geographically isolated western gray squirrel populations: the “Puget Trough” population now centered in Thurston and Pierce counties in the Puget Sound region; the “South Cascades” population in extreme eastern Skamania County and Klickitat and Yakima counties; and the “North Cascades” population in Chelan and Okanogan counties.

In Washington, and elsewhere within the gray squirrels range, the principal food is acorns, although the seeds of Douglas-fir and other conifers are also eaten (Dalquest 1948). While pine nuts and acorns are considered essential foods for storing body fat and conditioning western gray squirrels for winter, green vegetation, seeds and nuts of trees and shrubs, fleshy fruits, mushrooms and other foods are also consumed. Hypogeous fungi (underground fungi such as truffles) comprise a large portion of the western gray squirrel diet (WDW 1993; Carraway and Verts 1994; Ryan and Carey 1995a).

For the purposes of this project, potentially suitable western gray squirrel habitat was defined as any coniferous, deciduous or mixed stands of trees that have an average diameter at breast height (DBH) of at least 10 inches or greater. This criterion was used to ensure a conservative approach in determining survey areas.

3.2. Survey Locations

Turnstone conducted 2 rounds of western gray squirrel nest surveys within the project area. Approximately 738 acres of potentially suitable habitat within the project area were surveyed in the fall of 2008. The survey area was adjusted slightly in 2009 removing 46 acres from the overall survey effort. This area turned out to be outside the established buffers. In the Spring of 2009, a total 692 acres were surveyed for western gray squirrels.

Within the project area, potential gray squirrel survey areas were selected by identifying appropriate stand inventories using GIS analysis and ground-truthing. The initial GIS analysis was used to efficiently determine areas of potentially suitable squirrel habitat prior to conducting the field visits. Ground-truthing was used to validate and finalize the initial GIS analysis while setting up the squirrel survey area blocks.

Western gray squirrel nest surveys were completed in any areas where project activities would remove or structurally modify forest stands. To determine survey areas the proposed wind turbine string was buffered out 150 feet (150 foot radius) to establish a work zone. Then an additional 500 feet of buffer was added, to encompass any areas that may be altered due to obstructions (tall trees) within wind corridors of the proposed turbines. Finally, an additional 400 feet was added as an unaltered habitat buffer. Adding all buffers created a 1,050 foot radius around the turbine string to be surveyed.

Including all buffers the entire survey area of possible habitat was nearly 1,361 acres. Within this area 738 acres were determined to be potentially suitable western gray squirrel habitat in 2008 and 692 acres in 2009. The remaining area within the overall buffer was not surveyed and determined to be non-habitat.

The survey area was broken up into smaller discrete units to facilitate an efficient and systematic survey effort by Turnstone biologists. The discrete units were referred to as polygons and each polygon was given a unique identifier. A map of the western gray squirrel survey area polygons is located in Appendix A.

The final proposed turbine alignment released in late October of 2008 did change the survey coverage for western gray squirrels. The changes made in the final turbine alignment did add additional habitat. These stands were a patchwork of small isolated forests that needed an additional survey. The survey window to conduct western gray squirrel surveys was still open when the new areas were identified. An additional field visit was conducted in early November using the same survey methodology as the first round of squirrel surveys in 2008.

3.3. Survey Methods

Surveys were conducted according to the guidelines in the WDFW report, "*Surveys for western gray squirrel nests on sites harvested under approved forest practice guidelines: analysis of nest use and operator compliance"* (Haegen, Van Leuven, and Anderson 2004). Turnstone biologist also worked with WDFW staff biologists to configure the best survey methodology for the area.

Turnstone biologists performed a general search for western gray squirrels and their nests in the fall of 2008 and the spring of 2009. Walk-through surveys using meandering transects were conducted in all conifer, deciduous, and mixed composition stands within the designated survey area that met the minimum DBH threshold of 10 inches. Surveyors identified all species of squirrels, evidence of squirrel activity and squirrel nests while walking transects. Transects were oriented to parallel the topographic features of the survey polygons when possible to facilitate safe and efficient travel on foot. All transects were laid out systematically in GIS to ensure that they were evenly spaced and located close enough together so that no habitat areas were excluded from the survey effort. Surveyors would use the plotted transects as general guidelines for a route of travel. The survey was conducted using an intuitive meander of the survey area. Surveyors would deviate from the designated transect to investigate areas of potential habitat or the evidence of squirrel sign.

4. NORTHERN GOSHAWK

The northern goshawk *(Accipiter gentiles)* is classified as a “species of concern” by the U.S. Fish and Wildlife Service and as a “listed candidate” for a state sensitive, threatened, or endangered species by the Washington Fish and Wildlife Commission. The physiographic range and habitat requirements of the northern goshawk can be found within the forest lands of the Whistling Ridge Wind Energy Project.

4.1. Suitable Habitat

Northern goshawks inhabit a wide variety of forest habitats, including true fir (red fir, white fir, and subalpine fir), mixed conifer, lodgepole pine, ponderosa pine, Jeffrey pine, montane riparian deciduous forest and Douglas fir. Occasionally, goshawks nest in coastal redwood and mixed hardwood forests. Goshawk nest sites are associated with patches of forest that are larger and denser than the surrounding landscape. However, home ranges often consist of a wide range of forest age classes and conditions. Numerous habitat studies and modeling efforts have found nest sites to be associated with similar factors, including proximity to water or meadow habitat, forest openings, level terrain or “benches” of gentle slope, northerly aspects and patches of larger, denser trees, but these factors vary widely (Woodbridge 2006).

4.2. Survey Locations

During the 2008 and 2009 northern goshawk survey windows, Turnstone staff conducted northern goshawk surveys within properties managed by SDS Lumber Co. and on lands managed by WDNR. These surveys covered approximately 1,493 acres of potential goshawk habitat. The objective of our survey effort was to determine the presence of northern goshawks.

The potential survey area for the northern goshawk was determined by protocol parameters, consultation with biologists from the WDFW, and GIS analysis. Survey protocol methodology was outlined in the United States Forest Service document, "*Northern Goshawk Inventory and Monitoring Technical Guide, July 2006.*" Table 2 depicts the legal descriptions of the where the goshawk survey areas occurred.

Table 2. Township and Range information for northern goshawk survey areas.

Legal Descriptions for Goshawk Survey Areas		
Township	**Range**	**Section**
4N	9E	1, 36
4N	10E	31,32
3N	9E	12,13,24
3N	10E	5,6,7,8,18,19

To determine the area that would require goshawk surveys, a GIS analysis was conducted following the protocol parameters and best available data. The proposed wind turbine right of way was buffered out 150 feet to establish a work area that would likely be permanently disturbed. Then an additional 2,624 feet (800 meters), per protocol recommendations, was added to 50ft buffer to establish an area that was considered the potential northern goshawk survey area. Within this area, GIS data was analyzed to identify conifer stands that may contain suitable habitat structure based on an age class of greater than 25 years and average tree DBH of at least 12 inches.

The resulting suitable habitat areas, or polygons, were then overlaid on current aerial photography (2006), to eliminate any recently harvested stands. This exercise created an initial survey area of 3,013 acres of potential habitat. Of this area approximately 1,100 acres were determined to be forested and contain the habitat characteristics needed to support goshawks. Initial calling points and survey transects were then established in GIS to adequately cover the 1,100 acres of potential goshawk habitat that would require survey.

In order to adequately survey the approximately 1,100 acres of potential goshawk habitat, Turnstone biologists conducted field reconnaissance in areas of all potential habitat that was delineated out in GIS. After ground-truthing the area 136 calling points were set. The areas to be surveyed had irregular shapes and establishing standardized transect strings was not feasible. Survey areas were covered with individual calling points that were placed within the potential goshawk habitat. The objective was to place stations within 150 meters of all potential habitat and to not place stations more than 200 meters apart.

The final proposed turbine alignment was released in late October of 2008. This re-alignment affected the survey coverage to the north of the project site. The changes made in the alignment created an additional 367 acres in the buffered area of potential habitat. The survey window to conduct northern goshawk surveys during the 2008 breeding season had closed making it impossible to survey the additional habitat intersected by the re-alignment. Because the new area was small, Turnstone biologists chose a different survey methodology in the 2009 northern goshawk survey window. The "Intensive Search Survey" methodology was chosen and initiated in summer of 2009. The details of this survey methodology are outlined in the USFS document, "*Northern Goshawk Inventory and Monitoring Technical Guide, July 2006.*" This methodology was selected because it could be initiated and completed in a single survey season. Under this rigorous approach, the new survey areas would receive two successive survey visits using a more intense survey methodology in order to determine potential goshawk presence.

During the 2009 survey effort, approximately 34 acres of non-habitat was eliminated from the original 367 acres. An additional 56 acres was added adjacent to the area because of its potential habitat qualities making the total approximately 389 acres of potential habitat. These areas were surveyed using the intensive search methodology while approximately 1,100 acres were surveyed for the second year using the broadcast acoustic methodology.

4.3. Survey Methods

Two different survey methodologies were used during the 2008 and 2009 goshawk survey windows. In 2008 and 2009, two rounds of the “Broadcast Acoustic” surveys were conducted. In 2009 two rounds of the “Intensive Search” survey methodology was conducted where the turbine alignment was extended to the north.

The “broadcast acoustical” survey methodology requires 2 visits to the survey area within a breeding season. The first site visit occurs in the ‘nestling period’, where adult alarm calls are broadcast at the designated calling points. During the second site visit, in the ‘fledgling period’, wail and fledgling begging calls are broadcast at the same survey points.

At each station, goshawk calls are broadcast with a portable amplified PA system for ten second periods. Turnstone biologists pause for thirty seconds to listen for goshawk responses, immediately following the broadcast calls. The sequence of broadcasting and listening for responses was repeated two more times, rotating 120 degrees from the last broadcast. The three-call sequence was repeated again, so that each direction received two sets of broadcast calls. During foot travel between broadcast points, the surveyors stayed alert observing and listening for potential goshawks. Surveyors also documented observations of other raptor species when encountered.

Survey periods begin ½ hour before sunrise and conclude ½ hour before sunset, as specified by protocol. If there was a goshawk detected in the project area, then a search for an active nest would ensue, following the ‘intensive search’ protocol. Locating an active nest is recommended immediately following any goshawk detections. Turnstone also recorded all other incidental raptor species observed during site visits on the field data forms, which are included in *Appendix C*.

The second methodology used in 2009 was the “Intensive Search Survey” methodology. This approach requires one or more visits to the survey area in a breeding season to determine goshawk occupancy. Turnstone biologists chose two site visits in 2009 to reach a high level of assurance that they were not missing goshawks. This survey method combines an intensive visual search with the methods of the “broadcast acoustic" protocol. The visual search involves multiple surveyors looking for any possible goshawk sign, which could include: nests (active or abandoned), whitewash, prey remains, plucking posts, or molted feathers. Goshawk calls are broadcast while conducting the visual search as recommended in the guidelines in the "broadcast acoustic" protocol.

To be most effective the survey requires the use of multiple observers simultaneously walking the stands. All intensive search surveys conducted used a minimum of three simultaneous observers and sometimes four when necessary to adequately cover the area. Survey transects were established to cover the entire 389 acre site. These transects were overlaid on topographic base maps and aerial photographs in GIS. Start points and end points of the survey transects were then derived and loaded into GPS units to be used as reference tools in the field while conducting the surveys. GPS units also served as a reliable method to mark and map any goshawk observations.

Turnstone biologists began their survey effort later in the nesting period in an attempt to cause fewer disturbances to potential nesting goshawks. Surveys were conducted walking parallel transects in unison with multiple observers looking for goshawk sign and broadcasting goshawk calls. Survey transects were established approximately 20-30 meters apart depending on the terrain and the amount of understory vegetation present. The observer walking the middle transect would broadcast goshawk calls approximately every 250 meters apart along the transect. Observers traveled at a slow pace to increase the level of safety and to give ample time to scan the area for any potential goshawk or goshawk sign. On every third set of transects, all three observers would broadcast goshawk calls, using the same broadcasting procedure recommended in the "broadcast acoustic" survey protocol.

All goshawk sign encountered was analyzed and scrutinized in the field by a team of biologists. Any potential goshawk sign encountered would elicit an intensive search of the area by all biologists. The intensive search would cover an area of at least a 300 meter radius from the goshawk sign observed. All raptor feathers encountered were reviewed in the field and collected in case they needed further review in the lab. The "intensive search survey" methodology is time-consuming and physically demanding of the biologists. The results however, give us a very high likelihood of detecting the presence of goshawks.

5. Survey Results

5.1. Northern Spotted Owl

Turnstone conducted two consecutive years of spotted owl surveys in 2008 and 2009 with a minimum of three site visits per calling station on and adjacent to SDS properties, (*Appendix A).* Two spotted owl activity centers located on public lands (WDNR, USFS) to the north of the project area were also surveyed. The Mill Creek (MSNO#: 0991) and Moss Creek (MSNO#: 1003) cores are located in Township 4N and Range 10E section 28 and Township 4N and Range 9E section 35, respectively. A total of 80 calling stations were established and surveyed in 2008 and 2009 with no northern spotted owl responses or observations. Seven supplemental stations were added in 2009 adjacent to areas that were determined to have potential habitat. There were no observations or detections of spotted owls at any of the 87 established calling stations in 2008 or 2009.

In 2008, Turnstone conducted an additional day visit to the two Moss and Mill Creek nest cores where spotted owls historically lived. No spotted owl observations or responses were recorded. In 2009, Turnstone added three additional day visits in addition to the required night visits to each nest core with no spotted owl observations or responses.

Tables 3A and 3B summarize all of the Turnstone survey response/observation results for the survey efforts in the 2008 and 2009 survey seasons. A map depicting the locations of the calling stations and locations of all barred owl responses/observations is available for review in Appendix A of this document.

Table 3A. Survey Summary Results for 2008.

Visit #	Dates	# of Stations	Northern Spotted Owl Response	Comments
1	21-May	12	None	No owl responses
1	22-May	20	None	No owl responses
1	24-May	18	None	Barred owls & M/F pair near stations #45 & #82
1	25-May	22	None	Barred owls, likely pair; near stations #74 & #86
1	26-May	8	None	No owl responses
2	10-Jun	22	None	Barred owls (2) from station #74, Barred owls, likely pair from station #86
2	11-Jun	20	None	No owl responses
2	15-Jun	17	None	No owl responses
2	16-Jun	21	None	Barred owl from stations #44 & #45, Unknown begging Juvenile from station #47 (confirmed as barred owl on day visit)
3	27-Jul	15	None	No owl responses
3	28-Jul	20	None	Barred owl from Station #82
3	29-Jul	24	None	No owl responses
3	30-Jul	22	None	No owl responses

Table 3B. Survey Summary Results for 2009.

Visit #	Dates	# of Stations	Northern Spotted Owl Response	Comments
1	5/11/09	22	None	N. Pygmy owl from station #46
1	5/12/09	20	None	N. Pygmy owl from station #63, N. Saw-Whet from station #75
1	5/13/09	23	None	Barred owl from station #37 & #72, N. Pygmy owl from station #38
1	5/14/09	22	None	Barred owl from station #43, N. Saw-Whet from station #82
*2	06/17/09	45	None	Barred owl from station #7 & M/F pair station #28

Visit #	Dates	# of Stations	Northern Spotted Owl Response	Comments
*2	06/18/09	42	None	Barred owl from station #5,#37,#48,#85,#86,32A & M/F pair station #74, N. Pygmy owl from station #77
3	07/21/09	21	None	Barred owl from station #72
3	07/22/09	24	None	N. Pygmy owl from station #11
3	07/23/09	22	None	Barred owl from station #48A, N. Pygmy owl from station #39
3	07/24/09	20	None	No owl responses

* =two observers conducted surveys concurrently on these nights.

Table 4A outlines the results of the northern spotted owl surveys at each of the two nest cores that intersect the project area. Results were derived from data collected by the WDNR southeast Washington NSO demography study and NACASI. The data shows no spotted owl detections in the Mill Creek core since the 2000 breeding season. The Moss Creek core has not had a spotted owl detected since the 2002 breeding season. Table 4B shows the results of the Turnstone survey effort at the two activity centers for the 2003, 2004, 2008 and 2009 survey seasons. Both cores show an increased presence of barred owls detected while conducting surveys for spotted owls.

Table 4A. Spotted Owl Nest Core Survey Details and Results from WDNR and NACASI Data Sources

Year	Mill Creek Spotted Owl Nest Core Survey Results		Moss Creek Spotted Owl Nest Core Survey Results	
	STOC	STVA	STOC	STVA
2009	No response	Pair	No response	Male and Unk. STVA observed
2008	No response	Pair	No response	Male observed
2007	No response	None observed	No response	Male observed
2006	No response	Pair	No response	Male observed
2005	No response	Male	No response	Pair observed
2004	No response	Pair observed	No response	Pair with juvenile observed
2003	No response	None observed	No response[1]	No response[1]
2002	No response	Male observed	Male observed	Pair with juvenile observed
2001	No response	None observed	No response	Pair observed
2000	Non-nesting pair observed	None observed	Reproducing pair with 1 juvenile	None observed
1999	Female observed	None observed	Reproducing pair with 1 juvenile	None observed
1998	Non-nesting pair observed	Female observed	Reproducing pair with 2 juveniles	None observed
1997	Non-nesting pair observed	None observed	No response	None observed
1996	Reproducing pair with 2 juveniles	Unknown	Reproducing pair with 3 juveniles	Unknown
1995	No response	Unknown	Reproducing pair with 2 juveniles	Unknown
1994	Reproducing pair with 2 juveniles	Unknown	Reproducing pair with 2 juveniles	Unknown

[1] =an unknown Strix was detected at Moss Creek in 2003

Table 4B. Spotted Owl Activity Center Survey Details and Results From Turnstone Environmental Consultants

Year	Mill Creek Spotted Owl Activity Center Results*		Moss Creek Spotted Owl Activity Center Results*	
	Spotted Owl	Barred Owl	Spotted Owl	Barred Owl
2009	No response	Male observed	No response	Pair observed
2008	No response	Male & Female observed	No response	Pair observed
2004	No response	Present[1]	No response	Present[1]
2003	No response	Present[1]	No response	No response

* =Activity Center constitutes the entire 1.8 mile provincial range

1 =Surveyor unable to determine sex of barred owl detected

5.2. Western Gray Squirrel

Western gray squirrel nest surveys were conducted in the fall of 2008 and again in the spring of 2009. These surveys constituted two complete rounds of survey covering all potential habitat within the survey polygons. The objective of this survey effort was to determine western gray squirrel use and/or sign of historical use on any potential habitat within the project buffers. A systematic nest search occurred on 26 polygons at the proposed energy project and 400 ft buffers into adjacent undisturbed suitable squirrel habitat (per WDFW protocol guidelines). No western gray squirrels or western gray squirrel nest structures were observed during the three site visits that occurred over two years.

Table 5A. 2008 Western Gray Squirrel Survey Areas and Results

Survey Polygon Visited	Date	Surveyor	Notes
A1, A3, A7	10/14/2008	D. Sahl	No nests or WGS observed
A4, A5, A10	10/14/2008	J.Kolozar	No nests or WGS observed
A2, A6, A9	10/14/2008	J.Kolozar	No nests or WGS observed
A12, A13	10/15/2008	D.Sahl	No nests or WGS observed
A14	10/15/2008	D. Bolen	No nests or WGS observed
A15	10/15/2008	J. Kolozar	No nests or WGS observed
A11, A17, A18	10/15/2008	D. Sahl, D. Bolen, J. Kolozar	No nests or WGS observed
B1-B8	11/18/2008	D.Sahl, D. Bolen	No nests or WGS observed
C1	10/9/2008	D. Sahl	No nests or WGS observed

Table 5B. 2009 Western Gray Squirrel Survey Areas and Results

Survey Polygon Visited	Date	Surveyor	Notes
A5, B5	3/12/09	D. Bolen	No nests or WGS observed
A6, B4	3/12/09	W. Perkins	No nests or WGS observed
A9, A10	3/10/09	D. Sahl, D. Bolen, W. Perkins	No nests or WGS observed
A12, A13, A14	3/10/09	D.Sahl, W. Perkins	No nests or WGS observed
A15	3/10/09	D.Bolen	No nests or WGS observed
A1, A2, B1, B2	3/11/09	D.Sahl	No nests or WGS observed
A3	3/11/09	D. Bolen	No nests or WGS observed

Survey Polygon Visited	Date	Surveyor	Notes
A4, A11	3/11/09	W. Perkins	No nests or WGS observed
A7	3/12/09	D. Sahl	No nests or WGS observed
A17, A18, B6, B7, C1	3/10/09	D. Sahl, D. Bolen, W. Perkins	No nests or WGS observed
B3	3/12/09	D. Sahl, D. Bolen, W. Perkins	No nests or WGS observed

5.3. Northern Goshawk

Turnstone conducted protocol northern goshawk surveys on SDS properties during the 2008 and 2009 goshawk survey windows. The survey protocol methodology used was the "broadcast acoustical survey" and "Intensive search survey" methodology, outlined in the protocol; "*Northern Goshawk Inventory and Monitoring Technical Guide, USFS, July 2006."* Calling stations were strategically placed throughout the survey area in all suitable habitat within 2,624 feet (800 meters) of the turbine right of way. Turnstone completed two protocol site visits at 136 calling stations, using the "broadcast acoustic survey", during the 2008 and 2009 goshawk survey seasons. One site visit was conducted during the nestling period and the second during the fledgling period as recommended in the protocol. No northern goshawk responses were documented during either of the two site visits in either the 2008 or 2009 survey seasons. Survey dates for the "broadcast acoustic" surveys and incidental raptor observations are summarized in Table 6A and 6B.

Table 6A. Northern Goshawk Broadcast Acoustic Survey Results Summary 2008.

Visit #	# of Stations	Date	N. Goshawk Response	Other Raptors Observed
1	14	6/23	None	OSPR (1) near station 46 RTHA (1) near station 46
1	21	6/24	None	RTHA (1) near station 36
1	22	6/25	None	None observed
1	25	6/26	None	None observed
1	25	6/27	None	None observed
1	11	7/15	None	TUVU (1) near station 62

Visit #	# of Stations	Date	N. Goshawk Response	Other Raptors Observed
1	15	7/16	None	COHA (1) near station 26
1	3	7/28	None	None observed
2	7	7/28	None	None observed
2	14	7/30	None	RTHA (1) near station 67
2	22	7/31	None	TUVU (1) near station 95 TUVU (1) near station 78
2	16	8/01	None	None observed
2	23	8/04	None	RTHA (1) near station 22
2	25	8/05	None	SSHA (1) near station 9 TUVU (8) near station 12
2	19	8/06	None	None observed
2	10	8/07	None	None observed
COHA = Cooper's hawk *(Accipiter cooperii)* OSPR = Osprey *(Pandion haliaetus)* RTHA = Red-tailed hawk *(Buteo jamaicensis)* SSHA = Sharp-shinned hawk *(Accipter striatus)* TUVU = Turkey vulture *(Cathartes aura)*				

Table 6B. Northern Goshawk Broadcast Acoustic Survey Results Summary 2009

Visit #	# of Stations	Date	N. Goshawk Response	Other Raptors Observed
1	11	06/24/09	None	BAEA (1) near station 57
1	34	06/25/09	None	RTHA (2) near station 124 & 127
1	40	06/26/09	None	TUVU (2) near station 28 & 36, Unk. Owl (likely pygmy or saw-whet) at station G13
1	40	06/29/09	None	TUVU (3) near station 68 & 90 & 91
1	11	06/30/09	None	RTHA (1) near station 60.5
2	33	07/09/09	None	None observed
2	46	07/10/09	None	TUVU (1) near station 73
2	27	07/15/09	None	TUVU (2) near station 48 & 46
2	30	07/16/09	None	None observed
BAEA = Bald Eagle (*Haliaeetus leucocephalus)* COHA = Cooper's hawk *(Accipiter cooperii)* OSPR = Osprey *(Pandion haliaetus)* RTHA = Red-tailed hawk *(Buteo jamaicensis)* SSHA = Sharp-shinned hawk *(Accipter striatus)* TUVU = Turkey vulture *(Cathartes aura)*				

Changes in the proposed alignment of the project area intersected additional goshawk habitat in October of 2008. These changes occurred after the goshawk survey window in 2008. In 2009, additional goshawk habitat was surveyed using a different survey methodology. The "Intensive search survey" methodology was used to survey approximately 389 acres in 2009. This survey effort involved two rounds of survey effort using a minimum of three biologists simultaneously. No northern goshawk responses or goshawk sign was documented during either of the two site visits.

Survey dates for the "intensive search survey" and incidental raptor observations are summarized in Table 6C. Maps of the survey areas for northern goshawks in 2008 and 2009 are available for review in Appendix A. Copies of the field data sheets for the 2009 survey effort are available for review in Appendix C.

Table 6C. Northern Goshawk Intensive Search Survey Results Summary 2009

Visit #	# of Stations	Date	N. Goshawk Response	Other Raptors Observed
1	C24-1	07/13/09	None	STVA (1) seen only, no audio response
1	A48	07/15/09	None	SSHA (1) heard only
2	B33	07/28/09	None	RTHA (1) seen only
2	C49	07/29/09	None	SSHA (1) seen and heard, plucking post observed near bird location

RTHA = Red-tailed hawk *(Buteo jamaicensis)*
SSHA = Sharp-shinned hawk *(Accipter striatus)*
STVA= Barred Owl (*Strix varia)*

6. CONCLUSION

6.1. Northern Spotted Owl

During the 2008 and 2009 Northern spotted owl survey seasons, Turnstone conducted six site visits to each of the established spotted owl calling points. A total of 80 calling stations were established and surveyed in 2008 and 2009. Seven supplemental stations were added in 2009 adjacent to areas that were determined to have potential habitat. There were no observations or detections of spotted owls at any of the calling stations in

2008 or 2009. Turnstone also conducted an additional day visit to both nest cores (Mill Creek, Moss Creek) in 2008. In 2009 three additional day visits up and beyond the required three night visits were conducted. These visits were spread strategically throughout the nesting season in an attempt to see or hear spotted owls. The survey effort covered potentially suitable northern spotted owl habitat within the approximately 22,123 acres of survey area. Turnstone recorded no northern spotted owl observations or responses during any of the 10 site visits.

6.2. Western Gray Squirrel

During the 2008 and 2009 western gray squirrel survey windows, Turnstone biologists conducted nest searches on 26 different polygons of potential western gray squirrel habitat. The first round of surveys occurred in the fall of 2008 with the second round soon to follow the spring of 2009. Approximately 738 acres of potential western gray squirrel habitat was surveyed in 2008 and 692 acres were surveyed in 2009. Turnstone biologists did not observe any Western gray squirrels or their nest structures during two site visits.

It should be noted that very few oak trees, a prime source of food for gray squirrels, were observed in the project area. . The few that were observed within the western gray squirrel survey area boundaries were small (less than 20 feet tall), stunted, and growing in openings on exposed rocky slopes in shallow soils. Sources of year round water are also important to populations of western gray squirrels. There were few observed year round water sources with the exception of a few drainages and one wetland area.

6.3. Northern Goshawk

Turnstone conducted protocol northern goshawk surveys on SDS properties during the 2008 and 2009 goshawk survey windows. The survey protocol methodology used was the “broadcast acoustical survey” and “Intensive search survey” methodology, outlined in the protocol; “*Northern Goshawk Inventory and Monitoring Technical Guide, USFS, July 2006.”* Turnstone completed two protocol site visits at 136 calling stations, using the “broadcast acoustic survey”, during the 2008 and 2009 goshawk survey seasons. One site visit was conducted during the nestling period and the second during the fledgling period as recommended in the protocol. No northern goshawk responses were documented during either of the two site visits.

The "Intensive search survey" methodology was used to survey approximately 389 acres on SDS and WDNR property. This survey effort involved two rounds of survey using three to four biologists simultaneously. No northern goshawk observations, responses or goshawk sign was documented during either of these two site visits.

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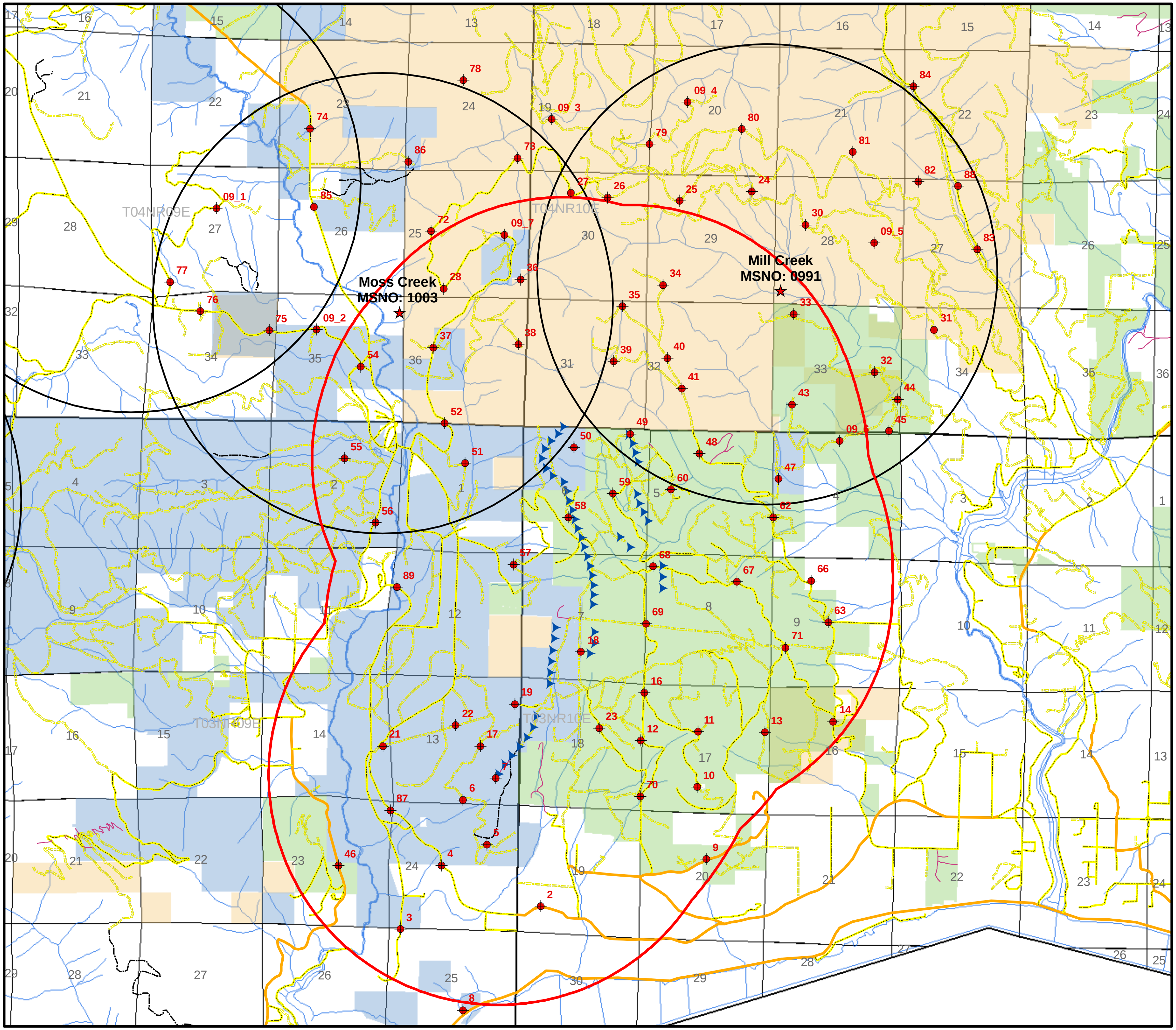
Appendix A – Maps

Whistling Ridge NSO Survey 2008/2009 Spotted Owl Calling Points



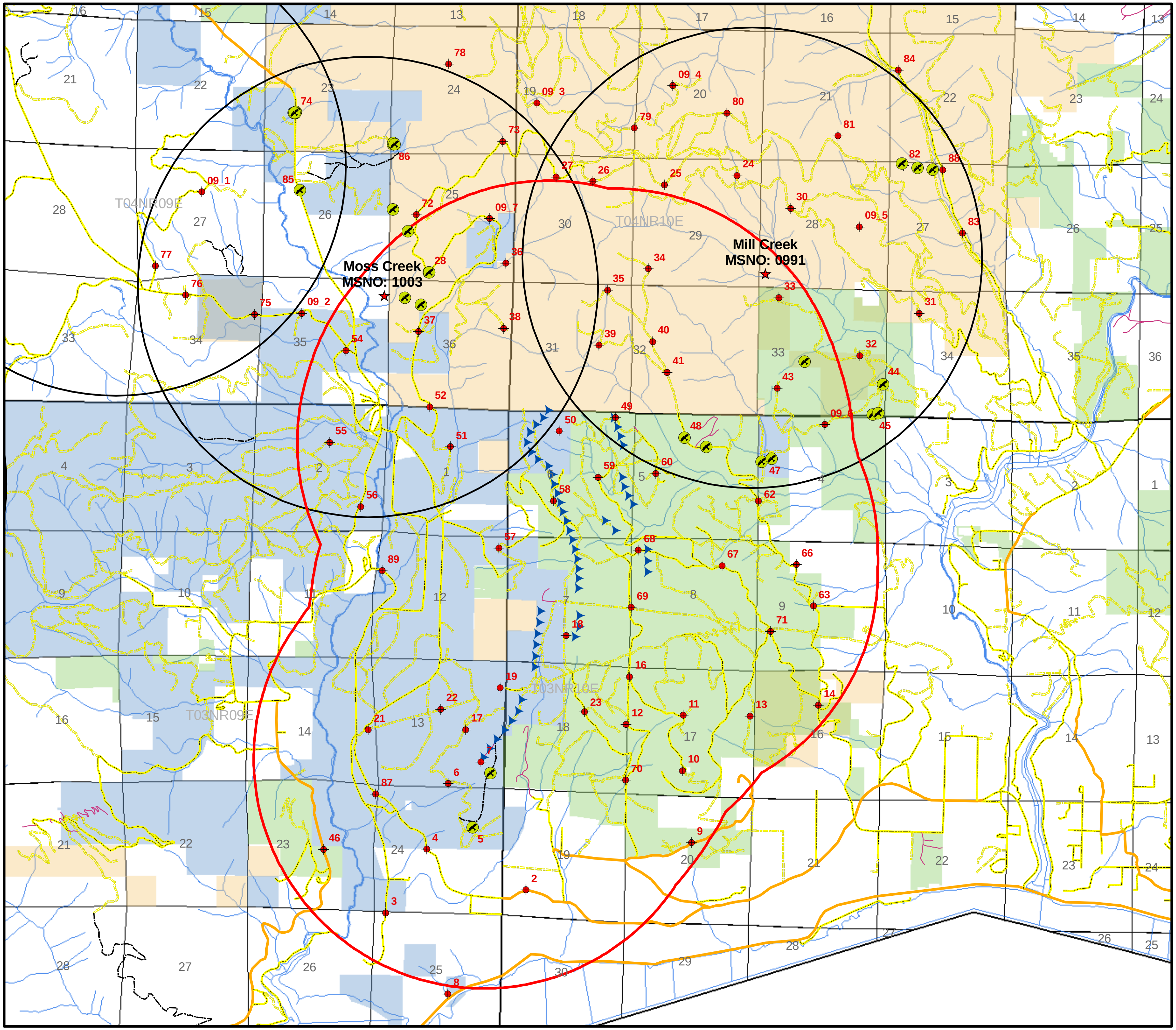
Legend

- NSO Calling Points
- Historic NSO Nests
- **Proposed Turbine Locations**
- Project Area (1.8 mile)
- Historic NSO Nest Provincial Range
- Other
- HWY
- DIRT
- ROCK
- TRAIL-4WD
- SDS Ownership
- BLC Ownership
- DNR Ownership

N

1:65,000

Whistling Ridge NSO Survey 2008/2009 Barred Owl Detections



Legend

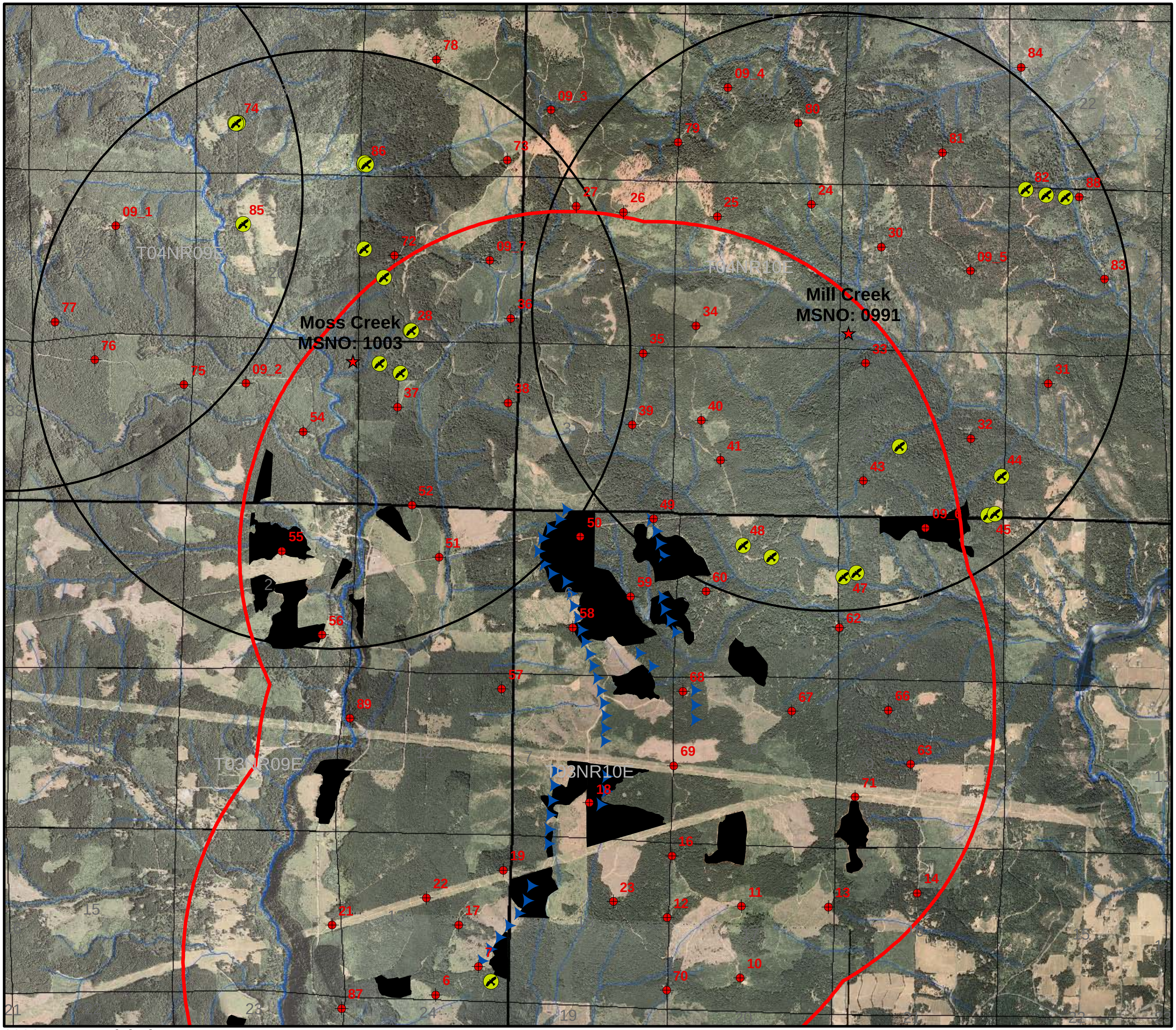
- SDS 2008/2009 Barred Owl Detections
- NSO Calling Points
- Proposed Turbine Locations
- Historic NSO Nests
- Other
- HWY
- DIRT
- ROCK
- TRAIL-4WD
- Project Area (1.8 mile)
- Historic NSO Nest Provincial Range
- SDS Ownership
- BLC Ownership
- DNR Ownership

N

1:65,000

Whistling Ridge NSO Survey 2008/2009 Barred Owl Detections

Aerial Photo North Half



2006 NAIP Aerial Photo

Legend

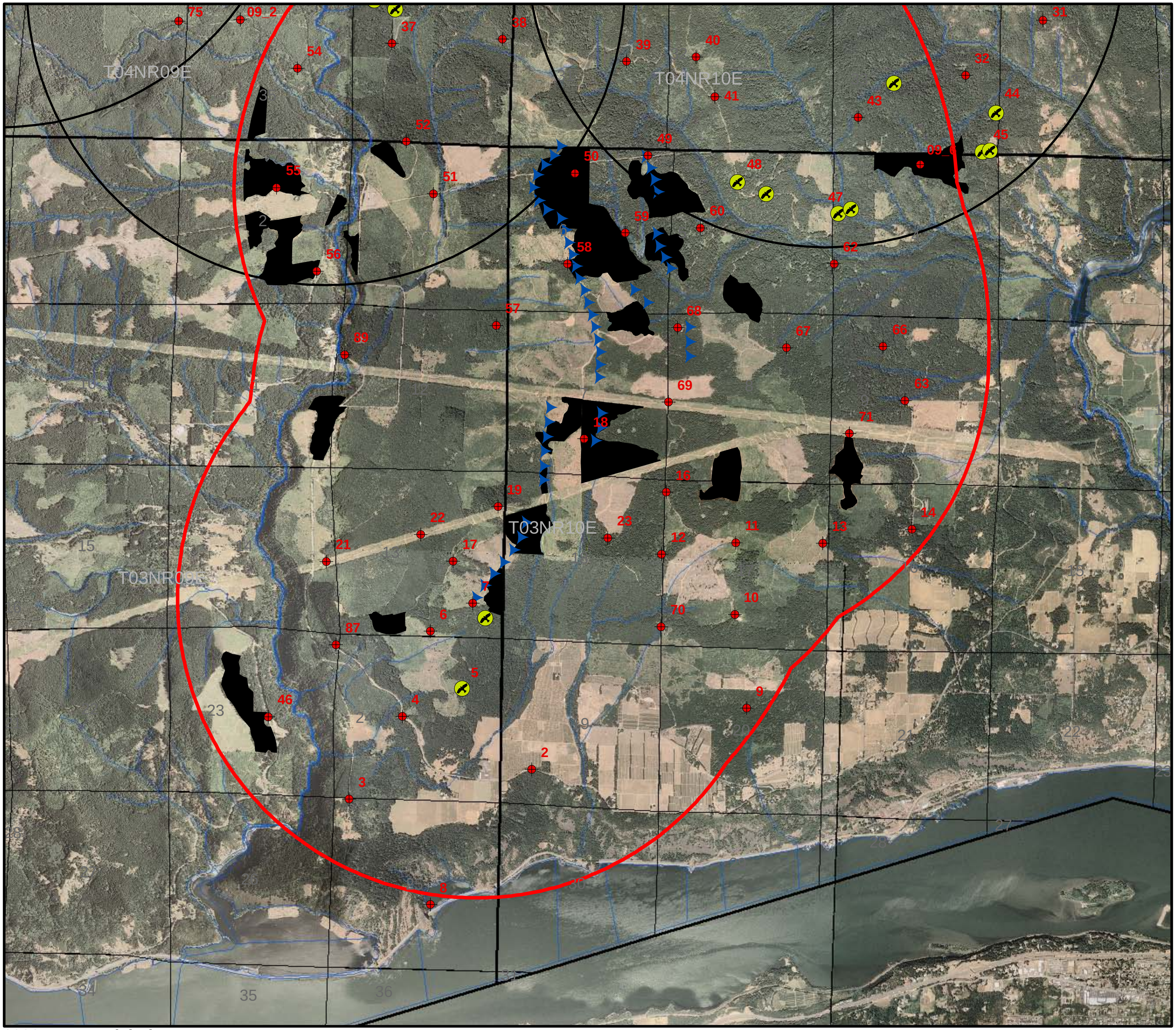
- SDS 2008/2009 Barred Owl Detections
- NSO Calling Points
- Historic NSO Nests
- Proposed Turbine Locations
- Project Area (1.8 mile)
- Historic NSO Nest Provincial Range
- Recent SDS Harvest (since 2006)

N

1:50,000

Whistling Ridge NSO Survey 2008/2009 Barred Owl Detections

Aerial Photo South Half



Legend

- SDS 2008/2009 Barred Owl Detections
- NSO Calling Points
- Historic NSO Nests
- Proposed Turbine Locations
- Project Area (1.8 mile)
- Historic NSO Nest Provincial Range
- Recent SDS Harvest (since 2006)

N

1:50,000

2006 NAIP Aerial Photo

Whistling Ridge Project Area 2008/2009 Northern Goshawk Survey Areas

Intensive Search Survey Transects

Intensive Search Survey Area

Broadcast Acoustic Survey Points

Broadcast Acoustic Potential Survey Area Boundary

Proposed Wind Turbine Locations

Recent Harvest Blocks

ROADS

Other

HWY

DIRT

ROCK

TRAIL-4WD

Miles

0 0.2 0.4 0.8

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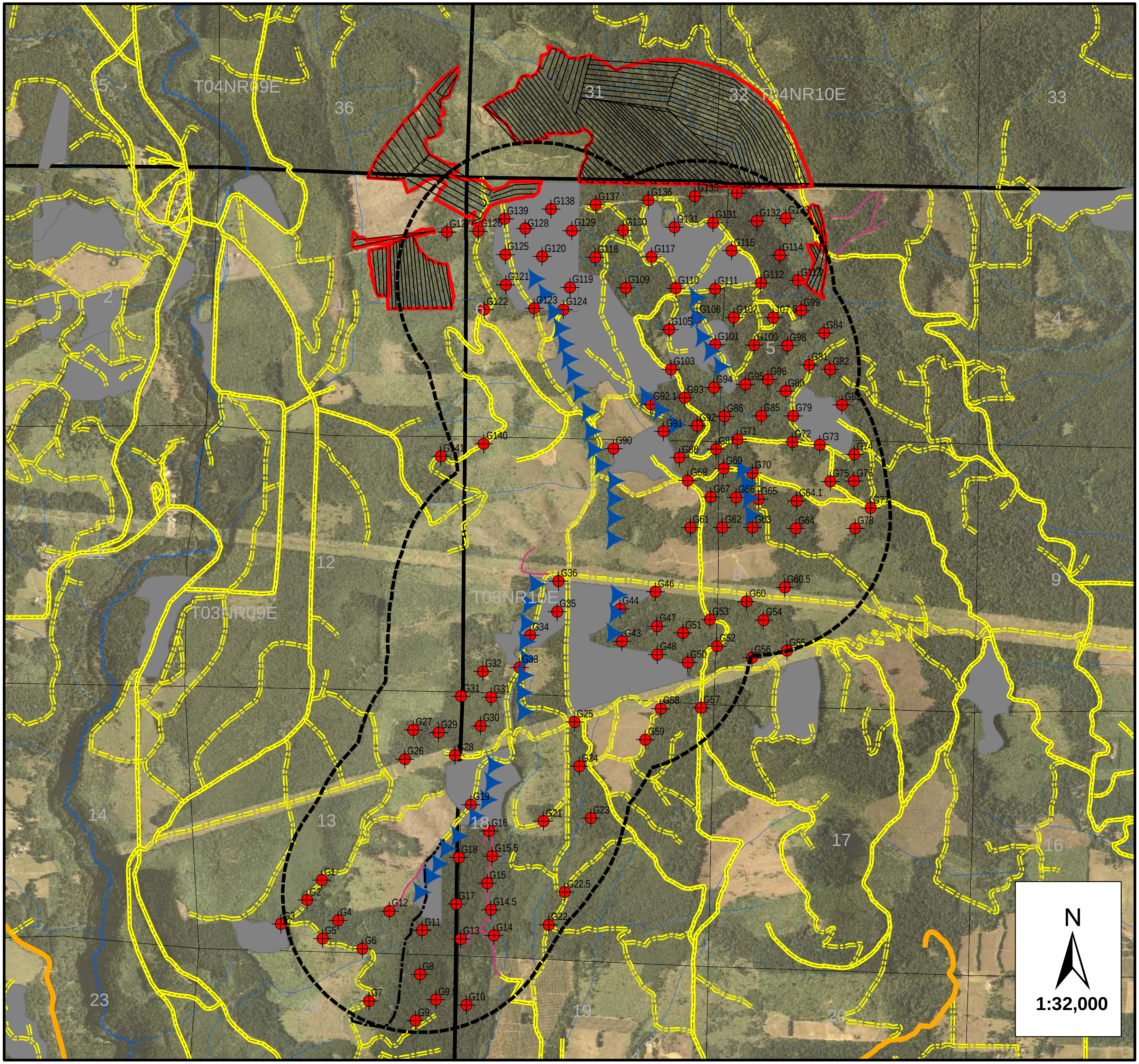
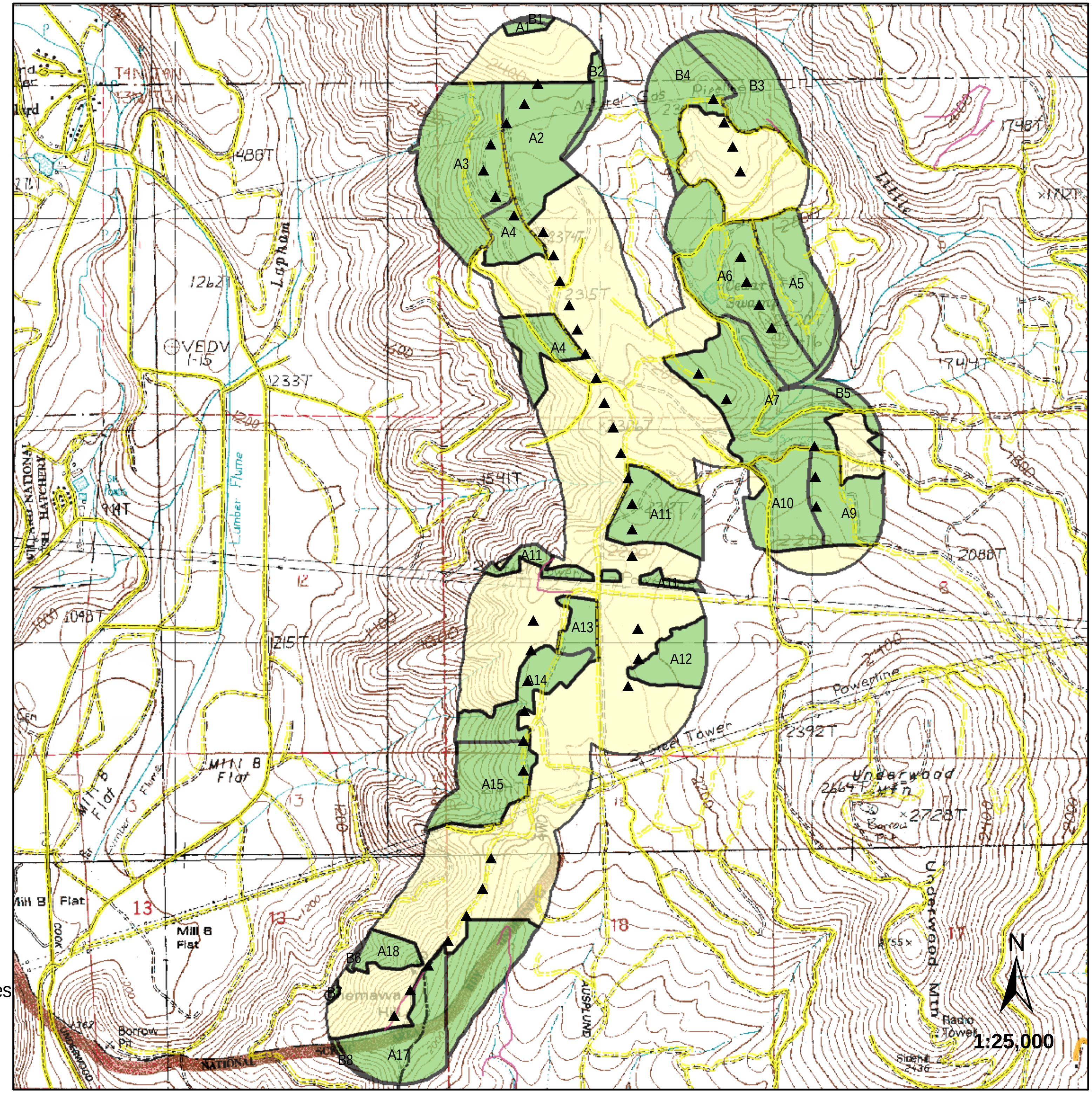


Whistling Ridge Project Area

Western Gray Squirrel Survey Areas Overview Map



▲ Proposed Wind Turbine Locations

Western Gray Squirrel Survey Areas

Non-habitat or Clearcut Areas

Roads

- Other
- HWY
- DIRT
- ROCK
- TRAIL-4WD

0 0.2 0.4 0.8 Miles

Appendix B – Northern Spotted Owl Survey Forms

Turnstone Environmental Consultants
NSO Survey Form

Survey Area: SDS **Owl Site(s):** ______ **Visit #** 1

Project Area: WHISTLING RIDGE **Crew:** Wade Perkins **Month:** 5 **Day:** 11, **2009**

Tape Voice Flute Other: ______ **Block/Area ID:** ______

Wind Codes: **0** = Calm (<1 mph), **1** = Light air (1-3 mph) **2** = Light breeze (4-7 mph) **3** = Gentle breeze (8-12 mph) **4+** =Unsuitable (13+ mph)
Weather Codes: **CL** = Clear **FG** = Fog **PC** = Partly Cloudy **OC** = Overcast **DR** = Drizzle **LR** = Light Rain **HR** = Heavy Rain (unsuitable) **SN** = Snow, **H** = Hail

ST#	Hike	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	¼	UTMX NAD83-GPS data only	UTMY NAD83-GPS data only
2		2035	2045	2	OC	N														
4		2050	2100	2	OC	N														
3		2106	2116	2	OC	N														
87		2121	2131	2	OC	N														
21		2135	2145	2	OC	N														
89		2153	2203	2	OC	N														
46		2221	2231	2	OC	A	U	A	GLGN	Stan	2223	2231	75°	800ft	3N	10E	23	NE		
22		2257	2307	3	OC	N														
17		2312	2322	3	OC	N														
6	X	1820	1830	3	OC	N														
5	X	1858	1908	3	OC	N														
23		0009	0019	3	OC	N														
19		0030	0040	3	PC	N														
7		0046	0056	3	PC	N														
18		0104	0114	3	PC	N														
57		0128	0138	3	PC	N														
58		0147	0157	3	PC	N														
50		0203	0213	3	PC	N														
59		0217	0227	3	PC	N														
49		0235	0245	3	PC	N														

Time: Military format (midnight is 0000). **Resp. Codes:** **N** = no owl response, **A** = audio response only, **V** = visual response only, **B** (or A, V) = both audio and visual response. **Sex: M** = male, **F** = female, **U** = unknown. **Age: A** = adult. **S** = subadult, **J** = juvenile **Species. Codes: STOC** = Northern Spotted Owl, **STVA** = Barred Owl, **STRIX** = *Strix*-species unknown, STNE = Great Gray Owl, **BUVI** = Great Horned Owl, **AEAC** = Northern Saw-whet Owl, **OTKE** = Western Screech Owl, **GLGN** = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. **Call Type(s): 4** = 4 Note Call (STOC Only), **A** = Agitated, **B** = Bark, **CO** = Contact Call, JB = Juvenile Begging, **W** = Whistle/Nest Call, **8** = 8 Note call (STVA only), **Stan** = (standard) other non-*Strix* owls

Comments:

Turnstone Environmental Consultants
NSO Survey Form

Survey Area: SDS **Owl Site(s):** **Visit #** 1

Project Area: WHISTLING RIDGE **Crew:** Wade Perkins **Month:** 5 **Day:** 11, **2009**

Tape Voice Flute Other: **Block/Area ID:**

Wind Codes: **0** = Calm (<1 mph), **1** = Light air (1-3 mph) **2** = Light breeze (4-7 mph) **3** = Gentle breeze (8-12 mph) **4+** =Unsuitable (13+ mph)
Weather Codes: **CL** = Clear **FG** = Fog **PC** = Partly Cloudy **OC** = Overcast **DR** = Drizzle **LR** = Light Rain **HR** = Heavy Rain (unsuitable) **SN** = Snow, **H** = Hail

ST#	Hike	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	¼	UTMX (NAD83-GPS data only)	UTMY (NAD83-GPS data only)
60		0250	0300	3	PC	N														
8		0326	0336	3	PC	N														

Time: Military format (midnight is 0000). **Resp. Codes:** **N** = no owl response, **A** = audio response only, **V** = visual response only, **B** (or A, V) = both audio and visual response. **Sex: M** = male, **F** = female, **U** = unknown. **Age: A** = adult. **S** = subadult, **J** = juvenile **Species. Codes: STOC** = Northern Spotted Owl, **STVA** = Barred Owl, **STRIX** = *Strix*-species unknown, STNE = Great Gray Owl, **BUVI** = Great Horned Owl, **AEAC** = Northern Saw-whet Owl, **OTKE** = Western Screech Owl, **GLGN** = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. **Call Type(s):** **4** = 4 Note Call (STOC Only), **A** = Agitated, **B** = Bark, **CO** = Contact Call, JB = Juvenile Begging, **W** = Whistle/Nest Call, **8** = 8 Note call (STVA only), **Stan** = (standard) other non-*Strix* owls

Comments:

Turnstone Environmental Consultants
NSO Survey Form

Survey Area: SDS **Owl Site(s):** **Visit #** 1
Project Area: WHISTLING RIDGE **Crew:** Wade Perkins **Month:** 5 **Day:** 12, 2009
Tape Voice Flute Other: **Block/Area ID:**

Wind Codes: 0 = Calm (<1 mph), 1 = Light air (1-3 mph) 2 = Light breeze (4-7 mph) 3 = Gentle breeze (8-12 mph) 4+ =Unsuitable (13+ mph)
Weather Codes: CL = Clear FG = Fog PC = Partly Cloudy OC = Overcast, DR = Drizzle LR = Light Rain HR = Heavy Rain (unsuitable) SN = Snow, H = Hail

ST#	Hike	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	¼	UTMX NAD83-GPS data only	UTMY
9		2025	2035	2	DR	N														
70		2044	2054	3	DR	N														
12		2059	2109	2	DR	N														
16		2113	2123	2	PC	N														
69		2128	2138	3	PC	N														
68		2142	2152	3	PC	N														
67		2158	2208	3	PC	N														
62		2214	2224	3	DR	N														
66		2231	2241	3	DR	N														
63		2245	2255	3	DR	A	U	U	GLGN	Stan	2247	2255	270°	500	3N	10E	9	NW		
71		2301	2311	3	DR	N														
14		2318	2328	3	PC	N														
13		2350	0000	3	PC	N														
10		0011	0021	3	PC	N														
11		0031	0041	3	PC	N														
56		0129	0139	2	DR	N														
55		0144	0154	1	DR	N														
54		0201	0211	2	DR	N														
09-2		0216	0226	2	PC	N														
75		0230	0240	2	PC	A	U	U	AEAC	Stan	0230	0236	170°	150	4N	10E	34	NE		

Time: Military format (midnight is 0000). **Resp. Codes:** **N** = no owl response, **A** = audio response only, **V** = visual response only, **B** (or A, V) = both audio and visual response. **Sex: M** = male, **F** = female, **U** = unknown. **Age: A** = adult. **S** = subadult, **J** = juvenile **Species. Codes: STOC** = Northern Spotted Owl, **STVA** = Barred Owl, **STRIX** = *Strix*-species unknown, STNE = Great Gray Owl, **BUVI** = Great Horned Owl, **AEAC** = Northern Saw-whet Owl, **OTKE** = Western Screech Owl, **GLGN** = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. **Call Type(s):** 4 = 4 Note Call (STOC Only), **A** = Agitated, **B** = Bark, **CO** = Contact Call, JB = Juvenile Begging, **W** = Whistle/Nest Call, **8** = 8 Note call (STVA only), **Stan** = (standard) other non-*Strix* owls

Comments:

Turnstone Environmental Consultants
NSO Survey Form

Survey Area: SDS **Owl Site(s):** Moss Creek **Visit #** 1

Project Area: WHISTLING RIDGE **Crew:** Wade Perkins **Month:** 5 **Day:** 13, **2009**

Tape Voice Flute Other: **Block/Area ID:**

Wind Codes: 0 = Calm (<1 mph), 1 = Light air (1-3 mph) 2 = Light breeze (4-7 mph) 3 = Gentle breeze (8-12 mph) 4+ =Unsuitable (13+ mph)
Weather Codes: CL = Clear FG = Fog PC = Partly Cloudy OC = Overcast, DR = Drizzle LR = Light Rain HR = Heavy Rain (unsuitable) SN = Snow, H = Hail

ST#	Hike	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	Location ¼	UTMX (NAD83-GPS data only)	UTMY (NAD83-GPS data only)
76		2036	2046	1	PC	N														
77		2051	2101	2	PC	N														
09-1		2111	2121	2	PC	N														
86	X	1905	1915	2	PC	N														
74		2133	2143	2	PC	N														
85		2147	2157	2	PC	N														
51		2209	2219	2	DR	N														
52		2224	2234	2	DR	N														
37		2238	2248	2	DR	A	U	A	STVA	8	2242	2248	340°	1500	4N	10E	6	NW		
38		2257	2307	2	PC	A	U	U	GLGN	Stan	2300	2307	20°	300	4N	10E	6	NE		
36		2313	2323	2	PC	N														
09-7		2328	2338	2	PC	N														
28		2342	2352	2	PC	N														
72		2357	0007	3	PC	A	U	A	STVA	A	2359	0006	210°	800ft	4N	10E	25	SW		
73		0012	0022	3	PC	N														
27		0028	0038	3	PC	N														
26		0042	0052	3	PC	N														
09-3		0102	0112	3	PC	N														
78		0129	0139	3	PC	N														
79		0204	0214	3	PC	N														

Time: Military format (midnight is 0000). **Resp. Codes:** N = no owl response, **A** = audio response only, **V** = visual response only, **B** (or A, V) = both audio and visual response. **Sex: M** = male, **F** = female, **U** = unknown. **Age: A** = adult. **S** = subadult, **J** = juvenile **Species. Codes: STOC** = Northern Spotted Owl, **STVA** = Barred Owl, **STRIX** = *Strix*-species unknown, STNE = Great Gray Owl, **BUVI** = Great Horned Owl, **AEAC** = Northern Saw-whet Owl, **OTKE** = Western Screech Owl, **GLGN** = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. **Call Type(s): 4** = 4 Note Call (STOC Only), **A** = Agitated, **B** = Bark, **CO** = Contact Call, JB = Juvenile Begging, **W** = Whistle/Nest Call, **8** = 8 Note call (STVA only), **Stan** = (standard) other non-*Strix* owls

Comments:

Turnstone Environmental Consultants

NSO Survey Form

Survey Area: SDS

Owl Site(s): Moss Creek

Visit #: 1

Project Area: WHISTLING RIDGE

Crew: Wade Perkins

Month: 5 Day: 13, 2009

Tape Voice Flute Other: ____________

Block/Area ID: ____________

Wind Codes: **0** = Calm (<1 mph), **1** = Light air (1-3 mph) **2** = Light breeze (4-7 mph) **3** = Gentle breeze (8-12 mph) **4+** =Unsuitable (13+ mph)
Weather Codes: **CL** = Clear **FG** = Fog **PC** = Partly Cloudy **OC** = Overcast, **DR** = Drizzle **LR** = Light Rain **HR** = Heavy Rain (unsuitable) **SN** = Snow, **H** = Hail

ST#	Hike	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	¼	UTMX (NAD83-GPS data only)	UTMY (NAD83-GPS data only)
09-4		0219	0229	3	PC	N														
25		0239	0249	3	PC	N														
80		0256	0306	3	PC	N														

Time: Military format (midnight is 0000). **Resp. Codes:** **N** = no owl response, **A** = audio response only, **V** = visual response only, **B** (or A, V) = both audio and visual response. **Sex: M** = male, **F** = female, **U** = unknown. **Age: A** = adult. **S** = subadult, **J** = juvenile **Species.** **Codes: STOC** = Northern Spotted Owl, **STVA** = Barred Owl, **STRIX** = *Strix*-species unknown, STNE = Great Gray Owl, **BUVI** = Great Horned Owl, **AEAC** = Northern Saw-whet Owl, **OTKE** = Western Screech Owl, **GLGN** = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. **Call Type(s):** **4** = 4 Note Call (STOC Only), **A** = Agitated, **B** = Bark, **CO** = Contact Call, JB = Juvenile Begging, **W** = Whistle/Nest Call, **8** = 8 Note call (STVA only), **Stan** = (standard) other non-*Strix* owls

Comments:

Turnstone Environmental Consultants
NSO Survey Form

Survey Area: SDS **Owl Site(s):** Mill Creek **Visit #** 1

Project Area: WHISTLING RIDGE **Crew:** Wade Perkins **Month:** 5 **Day:** 14, 2009

Tape Voice Flute Other: ____________ **Block/Area ID:** ____________

Wind Codes: 0 = Calm (<1 mph), 1 = Light air (1-3 mph) 2 = Light breeze (4-7 mph) 3 = Gentle breeze (8-12 mph) **4+** =Unsuitable (13+ mph)
Weather Codes: **CL** = Clear **FG** = Fog **PC** = Partly Cloudy **OC** = Overcast, **DR** = Drizzle **LR** = Light Rain **HR** = Heavy Rain (unsuitable) **SN** = Snow, **H** = Hail

ST#	Hike	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	Location ¼	UTMX (NAD83-GPS data only)	UTMY (NAD83-GPS data only)
48		2052	2102	2	PC	N														
41		2107	2117	2	PC	N														
39		2123	2133	2	PC	N														
40		2139	2149	2	PC	N														
35		2158	2208	2	PC	N														
34		2214	2224	2	PC	N														
47		2246	2256	2	PC	N														
43	X	2315	2325	2	CL	A	U	A	STVA	8	2317	2320	10°	800	4N	10E	33	SW		
09-6		2350	0000	1	CL	N														
45		0007	0017	1	PC	N														
44	X	1805	1815	1	CL	N														
32	X	1836	1846	1	CL	N														
33	X	1921	1931	1	CL	N														
31		0038	0048	2	PC	N														
30		0059	0109	2	PC	N														
09-5		0117	0127	2	PC	N														
24		0139	0149	2	PC	N														
81		0206	0216	2	PC	N														
82		0223	0233	2	PC	A	U	U	AEAC	Stan	0226	0231	150°	500	4N	10E	27	NW		
83		0253	0303	3	PC	N														

Time: Military format (midnight is 0000). **Resp. Codes:** N = no owl response, **A** = audio response only, **V** = visual response only, **B** (or A, V) = both audio and visual response. **Sex: M** = male, **F** = female, **U** = unknown. **Age: A** = adult. **S** = subadult, **J** = juvenile **Species. Codes: STOC** = Northern Spotted Owl, **STVA** = Barred Owl, **STRIX** = *Strix*-species unknown, STNE = Great Gray Owl, **BUVI** = Great Horned Owl, **AEAC** = Northern Saw-whet Owl, **OTKE** = Western Screech Owl, **GLGN** = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. **Call Type(s): 4** = 4 Note Call (STOC Only), **A** = Agitated, **B** = Bark, **CO** = Contact Call, JB = Juvenile Begging, **W** = Whistle/Nest Call, **8** = 8 Note call (STVA only), **Stan** = (standard) other non-*Strix* owls

Comments:

Turnstone Environmental Consultants
NSO Survey Form

Survey Area: SDS **Owl Site(s):** Mill Creek **Visit #** 1

Project Area: WHBHLING RIDGE **Crew:** Wade Perkins **Month:** 5 **Day:** 14, **2009**

Tape Voice Flute Other: ______ **Block/Area ID:** ______

Wind Codes: **0** = Calm (<1 mph), **1** = Light air (1-3 mph) **2** = Light breeze (4-7 mph) **3** = Gentle breeze (8-12 mph) **4+** =Unsuitable (13+ mph)
Weather Codes: **CL** = Clear **FG** = Fog **PC** = Partly Cloudy **OC** = Overcast, **DR** = Drizzle **LR** = Light Rain **HR** = Heavy Rain (unsuitable) **SN** = Snow, **H** = Hail

ST#	Hike	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	Location ¼	UTMX (NAD83-GPS data only)	UTMY (NAD83-GPS data only)
88		0308	0318	2	PC	N														
84		0326	0336	2	PC	N														

Time: Military format (midnight is 0000). **Resp. Codes:** **N** = no owl response, **A** = audio response only, **V** = visual response only, **B** (or A, V) = both audio and visual response. **Sex: M** = male, **F** = female, **U** = unknown. **Age: A** = adult. **S** = subadult, **J** = juvenile **Species. Codes: STOC** = Northern Spotted Owl, **STVA** = Barred Owl, **STRIX** = *Strix*-species unknown, STNE = Great Gray Owl, **BUVI** = Great Horned Owl, **AEAC** = Northern Saw-whet Owl, **OTKE** = Western Screech Owl, **GLGN** = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. **Call Type(s): 4** = 4 Note Call (STOC Only), **A** = Agitated, **B** = Bark, **CO** = Contact Call, JB = Juvenile Begging, **W** = Whistle/Nest Call, **8** = 8 Note call (STVA only), **Stan** = (standard) other non-*Strix* owls

Comments:

Page 1 of 2 (including maps)

Turnstone Environmental Consultants
NSO Survey Form

Survey Area: SDS **Owl Site(s):** **Visit #** 2

Project Area: WHISTLING RIDGE **Crew:** DARREN BOLEY **Month:** 06 **Day:** 17 **, 2009**

Tape Voice Flute Other: **Block/Area ID:**

Wind Codes: 0 = Calm (<1 mph), 1 = Light air (1-3 mph) 2 = Light breeze (4-7 mph) 3 = Gentle breeze (8-12 mph) 4+ =Unsuitable (13+ mph)
Weather Codes: CL = Clear FG = Fog PC = Partly Cloudy OC = Overcast, DR = Drizzle LR = Light Rain HR = Heavy Rain (unsuitable) SN = Snow, H = Hail

ST#	Hike	Time		Wind	Weather	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time		Bearing	Dist	Location				UTMX	UTMY
		Begin	End	Code	Code						Initial	Final	(Azimuth)	(feet)	Town	Range	Sect	¼	NAD83-GPS data only	
2		1950	2000	3	PC	NR														
4		2003	2013	3	PC	NR														
3		2017	2027	3	PC	NR														
		@ 2028 approached by man in truck asking questions who I was with (said he made them wildlife refuge)																		
87		2033	2043	2	PC	NR														
21		2046	2056	2	PC	NR														
22		2101	2111	3	PC	NR														
17		2117	2127	3	PC	NR														
19		2140	2150	3	PC	NR														
7		2159	2209	3	PC	A	U	A	STVA	8	2206	2209	130	600	03N	09E	13	SE		
18		2235	2245	3	PC	NR														
23		2250	2300	2	PC	NR														
70		2305	2315	2	CL	NR														
12		2319	2329	2	CL	NR														
16		2332	2342	2	CL	NR														
11		2348	2358	2	CL	NR														
10		0002	0012	2	CL	NR														
69		0035	0045	1	CL	NR														
68		0048	0058	1	CL	NR														
67		0102	0112	1	CL	NR														

Time: Military format (midnight is 0000). **Resp. Codes:** N = no owl response, A = audio response only, V = visual response only, B (or A, V) = both audio and visual response. **Sex: M** = male, F = female, U = unknown. **Age: A** = adult. S = subadult, J = juvenile **Species. Codes: STOC** = Northern Spotted Owl, **STVA** = Barred Owl, **STRIX** = *Strix*-species unknown, STNE = Great Gray Owl, **BUVI** = Great Horned Owl, **AEAC** = Northern Saw-whet Owl, **OTKE** = Western Screech Owl, **GLGN** = Northern Pygmy, **TYAL** = Barn Owl. **OTFL** = Flammulated Owl. **Call Type(s):** 4 = 4 Note Call (STOC Only), A = Agitated, B = Bark, CO = Contact Call, JB = Juvenile Begging, W = Whistle/Nest Call, 8 = 8 Note call (STVA only), **Stan** = (standard) other non-*Strix* owls

Comments: BEAR ON ROAD BELOW STATION 7

Turnstone Environmental Consultants
NSO Survey Form

Survey Area: SOS **Owl Site(s):** ______ **Visit #** 2

Project Area: WHISTLING RIDGE **Crew:** DARREN BOLEN **Month:** 06 **Day:** 17 **, 2009**

Tape Voice Flute Other: ______ **Block/Area ID:** ______

Wind Codes: 0 = Calm (<1 mph), 1 = Light air (1-3 mph) 2 = Light breeze (4-7 mph) 3 = Gentle breeze (8-12 mph) 4+ =Unsuitable (13+ mph)
Weather Codes: CL = Clear FG = Fog PC = Partly Cloudy OC = Overcast, DR = Drizzle LR = Light Rain HR = Heavy Rain (unsuitable) SN = Snow, H = Hail

ST#	Hike	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	¼	UTMX NAD83-GPS data only	UTMY NAD83-GPS data only
13		0120	0130	1	CL	NR														
71		0135	0145	1	CL	NR														
14		0149	0159	1	CL	NR														
9		0207	0217	1	CL	NR														

Time: Military format (midnight is 0000). **Resp. Codes:** N = no owl response, A = audio response only, V = visual response only, B (or A, V) = both audio and visual response. **Sex:** M = male, F = female, U = unknown. **Age:** A = adult. S = subadult, J = juvenile **Species Codes:** STOC = Northern Spotted Owl, STVA = Barred Owl, STRIX = *Strix*-species unknown, STNE = Great Gray Owl, BUVI = Great Horned Owl, AEAC = Northern Saw-whet Owl, OTKE = Western Screech Owl, GLGN = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. **Call Type(s):** 4 = 4 Note Call (STOC Only), A = Agitated, B = Bark, CO = Contact Call, JB = Juvenile Begging, W = Whistle/Nest Call, 8 = 8 Note call (STVA only), Stan = (standard) other non-*Strix* owls

Comments:

Turnstone Environmental Consultants
NSO Survey Form

Survey Area: SPS
Owl Site(s):
Visit # 2
Project Area: WHISTLING RIDGE
Crew: D. SAHL
Month: 06 **Day:** 17, [redacted] 2009
Tape Voice Flute Other:
Block/Area ID:

Wind Codes: 0 = Calm (<1 mph), 1 = Light air (1-3 mph), 2 = Light breeze (4-7 mph), 3 = Gentle breeze (8-12 mph), 4+ =Unsuitable (13+ mph)
Weather Codes: CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow

ST#	Hits	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	¼	[redacted]
84		2034	2044	Ø	PC	N													
88		2048	2100	Ø	PC	A	U	A	STVA	8	2051	2100	270	400					
83		2104	2114	Ø	PC	N													
31		2038	2048	1	PC	N													
82		2106	2116	1	PC	N													
09-5		2138	2148	3	PC	N													
30		2152	2202	2	CL	N													
81		2215	2225	1	CL	N													
24		2233	2243	1	CL	N													
40		2250	2300	3	CL	N													
25		2306	2316	1	CL	N													
79		2326	2336	1	CL	N													
09-4		2346	2356	3	CL	N													
09-3		0018	0028	1	CL	N													
78		0039	0049	3	CL	N													
26		0105	0115	2	CL	N													
27		0118	0128	3	CL	N													
73		0132	0142	3	CL	N													
72		0146	0156	2	CL	N													
29		0159	0213	1	CL	A	M	A	STVA	A/CO	0209	0212	180	50					

Time: Military format (midnight is 0000). **Resp. Codes:** N = no owl response, A = audio response only, V = visual response only, B (or A, V) = both audio and visual response. **Sex:** M = male, F = female, U = unknown. **Age:** A = adult, S = subadult, J = juvenile **Species Codes:** STOC = Northern Spotted Owl, STVA = Barred Owl, STRIX = *Strix*-species unknown, STNE = Great Gray Owl, BUVI = Great Horned Owl, AEAC = Northern Saw-whet Owl, OTKE = Western Screech Owl, GLGN = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. **Call Type(s):** 4 = 4 Note Call (STOC Only), A = Agitated, B = Bark, CO = Contact Call, JB = Juvenile Begging, W = Whistle/Nest Call, 8 = 8 Note call (STVA only), Stan = other non-*Strix* owls

Comments: SOME NOISE FROM BUCK CRK. @ STA. #'S 84/88/83
09-5: wind GUSTS OF 3-4

Turnstone Environmental Consultants
NSO Survey Form

Survey Area: SDS **Owl Site(s):** ______ **Visit #** 2

Project Area: WHISTLING RIDGE **Crew:** D. SAHL **Month:** 06 **Day:** 17, [redacted] 2009

Tape Voice Flute Other: ______ **Block/Area ID:** ______

Wind Codes: 0 = Calm (<1 mph), 1 = Light air (1-3 mph), 2 = Light breeze (4-7 mph), 3 = Gentle breeze (8-12 mph), 4+ =Unsuitable (13+ mph)
Weather Codes: CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow

ST#	Mile	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	¼	[redacted]
28		0159	0213	1	CL	A	F	A	STVA	A/CO	0210	0212	180	50					
27		0217	0227	1	CL	N													
36		0235	0245	1	CL	N													

Time: Military format (midnight is 0000). **Resp. Codes:** N = no owl response, A = audio response only, V = visual response only, B (or A, V) = both audio and visual response. **Sex: M** = male, F = female, U = unknown. **Age:** A = adult, S = subadult, J = juvenile **Species Codes:** STOC = Northern Spotted Owl, STVA = Barred Owl, STRIX = *Strix*-species unknown, STNE = Great Gray Owl, BUVI = Great Horned Owl, AEAC = Northern Saw-whet Owl, OTKE = Western Screech Owl, GLGN = Northern Pygmy, TYAL = Barn Owl, OTFL = Flammulated Owl. **Call Type(s):** 4 = 4 Note Call (STOC Only), A = Agitated, B = Bark, CO = Contact Call, JB = Juvenile Begging, W = Whistle/Nest Call, 8 = 8 Note call (STVA only), Stan = other non-*Strix* owls

Comments:

Turnstone Environmental Consultants
NSO Survey Form

Survey Area: SDS
Owl Site(s):
Visit # 2

Project Area: WHISTLING RIDGE
Crew: D. SAHL
Month: 06 **Day:** 18, **2009**

Tape Voice Flute Other:
Block/Area ID:

Wind Codes: **0** = Calm (<1 mph), **1** = Light air (1-3 mph) **2** = Light breeze (4-7 mph) **3** = Gentle breeze (8-12 mph) **4+** =Unsuitable (13+ mph)
Weather Codes: **CL** = Clear **FG** = Fog **PC** = Partly Cloudy **OC** = Overcast, **DR** = Drizzle **LR** = Light Rain **HR** = Heavy Rain (unsuitable) **SN** = Snow, **H** = Hail

ST#	Hike	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	Location ¼	UTMX (NAD83-GPS data only)	UTMY (NAD83-GPS data only)
32A	Y	1956	2010	1	PC	A	M	A	STVA	8, A	1958	2008	200	600						
33	Y	2027	2037	1	PC	N														
32	Y	2055	2105	0	PC	N														
44		2112	2122	1	PC	N														
45		2125	2135	2	PC	N														
09-6		2138	2148	3	PC	N														
43	Y	2206	2216	3	PC	N														
47		2229	2239	1	PC	N														
48		2244	2254	2	PC	A	U	A	STVA	A	2253	2254	250	40						
34		2305	2315	3	PC	N														
35		2324	2334	2	PC	N														
40		2340	2350	2	OC	N														
41		2353	0003	2	OC	N														
39		0008	0018	1	OC	N														
50		0049	0059	1	OC	N														
49		0103	0113	1	OC	N														
60		0134	0144	1	OC	N														
59	Y	0157	0207	2	OC	N														
63		0220	0230	1	DR	N														
66		0233	0243	1	DR	N														

Time: Military format (midnight is 0000). **Resp. Codes:** **N** = no owl response, **A** = audio response only, **V** = visual response only, **B** (or A, V) = both audio and visual response. **Sex: M** = male, **F** = female, **U** = unknown. **Age: A** = adult. **S** = subadult, **J** = juvenile **Species. Codes: STOC** = Northern Spotted Owl, **STVA** = Barred Owl, **STRIX** = *Strix*-species unknown, STNE = Great Gray Owl, **BUVI** = Great Horned Owl, **AEAC** = Northern Saw-whet Owl, **OTKE** = Western Screech Owl, **GLGN** = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. **Call Type(s):** **4** = 4 Note Call (STOC Only), **A** = Agitated, **B** = Bark, **CO** = Contact Call, JB = Juvenile Begging, **W** = Whistle/Nest Call, **8** = 8 Note call (STVA only), **Stan** = (standard) other non-*Strix* owls

Comments: 32A: Incidental station, CALLED Continuously on Hike into Sta. 32/33 @ Dusk, Started Hike @ 1922.
45: Moved Sta. up Road due to new clear cut + Tank Trap. (Most adjacent Habitat has been cut).
48: BIRD In TREE Just off Road.
* Pg. 3 is a map of where Sta. 32A was located

Turnstone Environmental Consultants
NSO Survey Form

Survey Area: SDS **Owl Site(s):** ______ **Visit #** 2

Project Area: WHISTLING RIDGE **Crew:** D. SAHL **Month:** 06 **Day:** 18, **2009**

Tape Voice Flute Other: ______ **Block/Area ID:** ______

Wind Codes: 0 = Calm (<1 mph), 1 = Light air (1-3 mph) 2 = Light breeze (4-7 mph) 3 = Gentle breeze (8-12 mph) 4+ =Unsuitable (13+ mph)
Weather Codes: CL = Clear FG = Fog PC = Partly Cloudy OC = Overcast, DR = Drizzle LR = Light Rain HR = Heavy Rain (unsuitable) SN = Snow, H = Hail

ST#	Hike	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	¼	UTMX NAD83-GPS data only	UTMY NAD83-GPS data only
62		0247	0257	1	DR	N														

Time: Military format (midnight is 0000). **Resp. Codes:** **N** = no owl response, **A** = audio response only, **V** = visual response only, **B** (or A, V) = both audio and visual response. **Sex: M** = male, **F** = female, **U** = unknown. **Age: A** = adult. **S** = subadult, **J** = juvenile **Species. Codes: STOC** = Northern Spotted Owl, **STVA** = Barred Owl, **STRIX** = *Strix*-species unknown, STNE = Great Gray Owl, **BUVI** = Great Horned Owl, **AEAC** = Northern Saw-whet Owl, **OTKE** = Western Screech Owl, **GLGN** = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. **Call Type(s): 4** = 4 Note Call (STOC Only), **A** = Agitated, **B** = Bark, **CO** = Contact Call, JB = Juvenile Begging, **W** = Whistle/Nest Call, **8** = 8 Note call (STVA only), **Stan** = (standard) other non-*Strix* owls

Comments:

Turnstone Environmental Consultants
NSO Survey Form

Survey Area: SDS **Owl Site(s):** **Visit #** 2

Project Area: WHISTLING RIDGE **Crew:** DARREN BOLEN **Month:** 06 **Day:** 18, 2009

Tape Voice Flute Other: **Block/Area ID:**

Wind Codes: 0 = Calm (<1 mph), 1 = Light air (1-3 mph) 2 = Light breeze (4-7 mph) 3 = Gentle breeze (8-12 mph) 4+ =Unsuitable (13+ mph)
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ST#	Hike	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	Location ¼	UTMX (NAD83-GPS data only)	UTMY (NAD83-GPS data only)
5	X	1840	1850	3	PC	B	U	A	STVA	8, A	1843	1850	60	50	03 N	09E	24	SE		
6	X	1903	1913	3	PC	NR														
57		1935	1945	2	PC	NR														
38		2010	2020	2	PC	NR														
37		2030	2040	2	PC	A	U	A	STVA	8	2036	2038	12	1000	04N	09E	36	NW		
52		2044	2054	2	PC	NR														
51		2104	2114	2	PC	NR														
54		2122	2132	1	PC	NR														
09-2		2135	2145	1	PC	NR														
75		2147	2157	1	PC	NR														
76		2159	2209	1	PC	NR														
77		2213	2223	1	PC	A	U	A	GLGN	STAN	2316	2322	230	500	04 N	09E	27	SW		
09-1		2231	2241	1	PC	NR														
85		2300	2310	1	PC	B	U	A	STVA	B	2308	2310	90	20	04N	09E	26	NW		
74		2314	2324	1	PC	B	M	A	STVA	8	2321	2324	20	20	04N	09E	23	SW		
74		2314	2324	1	PC	B	F	A	STVA	8, A	2321	2324	20	20	04N	09E	23	SW		
86		2334	2344	1	PC	NR														
55		2355	0005	1	PC	NR														
56		0010	0020	1	PC	NR														
89		0025	0035	1	PC	NR														

Time: Military format (midnight is 0000). **Resp. Codes:** N = no owl response, **A** = audio response only, **V** = visual response only, **B** (or A, V) = both audio and visual response. **Sex: M** = male, **F** = female, **U** = unknown. **Age: A** = adult. **S** = subadult, **J** = juvenile **Species. Codes: STOC** = Northern Spotted Owl, **STVA** = Barred Owl, **STRIX** = *Strix*-species unknown, STNE = Great Gray Owl, **BUVI** = Great Horned Owl, **AEAC** = Northern Saw-whet Owl, **OTKE** = Western Screech Owl, **GLGN** = Northern Pygmy, TYAL = Barn Owl. **OTFL** = Flammulated Owl. **Call Type(s):** 4 = 4 Note Call (STOC Only), **A** = Agitated, **B** = Bark, **CO** = Contact Call, JB = Juvenile Begging, **W** = Whistle/Nest Call, **8** = 8 Note call (STVA only), **Stan** = (standard) other non-*Strix* owls

Comments: -HIKED STATIONS 5 + 6 WITH CHAINSAW, CLEARED ROAD FOR NEXT SURVEY
-09-1 NEEDS SMALL VEHICLE
-CALLED 57 TWICE DUE TO early START

Turnstone Environmental Consultants
NSO Survey Form

Survey Area: SD3 **Owl Site(s):** ______ **Visit #** 2

Project Area: WHISTLING RIDGE **Crew:** DARREN BOLEN **Month:** 06 **Day:** 18, **2009**

Tape Voice Flute Other: ______ **Block/Area ID:** ______

Wind Codes: 0 = Calm (<1 mph), 1 = Light air (1-3 mph) 2 = Light breeze (4-7 mph) 3 = Gentle breeze (8-12 mph) 4+ =Unsuitable (13+ mph)
Weather Codes: CL = Clear FG = Fog PC = Partly Cloudy OC = Overcast, DR = Drizzle LR = Light Rain HR = Heavy Rain (unsuitable) SN = Snow, H = Hail

ST#	Hike	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	¼	UTMX NAD83-GPS data only	UTMY NAD83-GPS data only
58		0058	0108	1	PC	NR														
57		0120	0130	1	PC	NR														
46		0141	0151	1	PC	NR														
8		0159	0209	1	PC	NR														

Time: Military format (midnight is 0000). **Resp. Codes:** N = no owl response, A = audio response only, V = visual response only, B (or A, V) = both audio and visual response. **Sex: M** = male, F = female, U = unknown. **Age:** A = adult. S = subadult, J = juvenile **Species. Codes:** STOC = Northern Spotted Owl, STVA = Barred Owl, STRIX = *Strix*-species unknown, STNE = Great Gray Owl, BUVI = Great Horned Owl, AEAC = Northern Saw-whet Owl, OTKE = Western Screech Owl, GLGN = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. **Call Type(s):** 4 = 4 Note Call (STOC Only), A = Agitated, B = Bark, CO = Contact Call, JB = Juvenile Begging, W = Whistle/Nest Call, 8 = 8 Note call (STVA only), Stan = (standard) other non-*Strix* owls

Comments:

Turnstone Environmental Consultants
NSO Survey Form

Survey Area: SDS **Owl Site(s):** **Visit #** 3

Project Area: WHISTLING RIDGE **Crew:** Wade Perkins **Month:** 7 **Day:** 21, **2009**

Tape Voice Flute Other: **Block/Area ID:** Moss Creek MSNO 1003

Wind Codes: **0** = Calm (<1 mph), **1** = Light air (1-3 mph) **2** = Light breeze (4-7 mph) **3** = Gentle breeze (8-12 mph) **4+** =Unsuitable (13+ mph)
Weather Codes: **CL** = Clear **FG** = Fog **PC** = Partly Cloudy **OC** = Overcast, **DR** = Drizzle **LR** = Light Rain **HR** = Heavy Rain (unsuitable) **SN** = Snow, **H** = Hail

ST#	Hike	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	Location ¼	UTMX NAD83-GPS data only	UTMY NAD83-GPS data only
09-1		2038	2048	2	Cl	N														
77		2053	2103	2	Cl	N														
76		2107	2117	2	Cl	N														
75		2121	2131	2	Cl	N														
09-2		2134	2144	2	Cl	N														
54		2149	2159	2	Cl	N														
85		2206	2216	2	PC	N														
86		2227	2237	2	PC	N														
74		2247	2257	2	PC	N														
78		2319	2329	3	PC	N														
09-3		2336	2346	3	PC	N														
27		2353	0003	3	PC	N														
73		0008	0018	3	PC	N														
72		0025	0035	3	PC	A	U	A	STVA	A	0029	0035	280°	900ft	4N	9E	25	NW		
28		0039	0049	3	PC	N														
09-7		0055	0105	3	Cl	N														
36		0112	0122	2	Cl	N														
38		0132	0142	2	Cl	N														
37		0151	0201	2	Cl	N														
52		0205	0215	2	Cl	N														

Time: Military format (midnight is 0000). **Resp. Codes:** **N** = no owl response, **A** = audio response only, **V** = visual response only, **B** (or A, V) = both audio and visual response. **Sex: M** = male, **F** = female, **U** = unknown. **Age: A** = adult. **S** = subadult, **J** = juvenile **Species. Codes: STOC** = Northern Spotted Owl, **STVA** = Barred Owl, **STRIX** = *Strix*-species unknown, STNE = Great Gray Owl, **BUVI** = Great Horned Owl, **AEAC** = Northern Saw-whet Owl, **OTKE** = Western Screech Owl, **GLGN** = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. **Call Type(s): 4** = 4 Note Call (STOC Only), **A** = Agitated, **B** = Bark, **CO** = Contact Call, **JB** = Juvenile Begging, **W** = Whistle/Nest Call, **8** = 8 Note call (STVA only), **Stan** = (standard) other non-*Strix* owls

Comments:

Turnstone Environmental Consultants
NSO Survey Form

Survey Area: SDS
Owl Site(s):
Visit # 3

Project Area: WHISTLING RIDGE
Crew: Wade Perkins
Month: 7 **Day:** 21, **2009**

Tape Voice Flute Other:
Block/Area ID: Moss Creek MSNO 1003

Wind Codes: **0** = Calm (<1 mph), **1** = Light air (1-3 mph) **2** = Light breeze (4-7 mph) **3** = Gentle breeze (8-12 mph) **4+** =Unsuitable (13+ mph)
Weather Codes: **CL** = Clear **FG** = Fog **PC** = Partly Cloudy **OC** = Overcast, **DR** = Drizzle **LR** = Light Rain **HR** = Heavy Rain (unsuitable) **SN** = Snow, **H** = Hail

ST#	Hike	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	¼	UTMX NAD83-GPS data only	UTMY NAD83-GPS data only
51		0219	0229	2	Cl	N														

Time: Military format (midnight is 0000). **Resp. Codes:** **N** = no owl response, **A** = audio response only, **V** = visual response only, **B** (or A, V) = both audio and visual response. **Sex: M** = male, **F** = female, **U** = unknown. **Age: A** = adult. **S** = subadult, **J** = juvenile **Species. Codes: STOC** = Northern Spotted Owl, **STVA** = Barred Owl, **STRIX** = *Strix*-species unknown, STNE = Great Gray Owl, **BUVI** = Great Horned Owl, **AEAC** = Northern Saw-whet Owl, **OTKE** = Western Screech Owl, **GLGN** = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. **Call Type(s):** **4** = 4 Note Call (STOC Only), **A** = Agitated, **B** = Bark, **CO** = Contact Call, JB = Juvenile Begging, **W** = Whistle/Nest Call, **8** = 8 Note call (STVA only), **Stan** = (standard) other non-*Strix* owls

Comments:

Turnstone Environmental Consultants
NSO Survey Form

Survey Area: SDS **Owl Site(s):** **Visit #** 3

Project Area: WHISTLING RIDGE **Crew:** Wade Perkins **Month:** 7 **Day:** 22, **2009**

Tape Voice Flute Other: **Block/Area ID:**

Wind Codes: 0 = Calm (<1 mph), 1 = Light air (1-3 mph) 2 = Light breeze (4-7 mph) 3 = Gentle breeze (8-12 mph) 4+ =Unsuitable (13+ mph)
Weather Codes: CL = Clear FG = Fog PC = Partly Cloudy OC = Overcast, DR = Drizzle LR = Light Rain HR = Heavy Rain (unsuitable) SN = Snow, H = Hail

ST#	Hike	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	Location ¼	UTMX NAD83-GPS data only	UTMY NAD83-GPS data only
49		2032	2042	3	PC	N														
50		2047	2057	3	PC	N														
60		2101	2111	3	PC	N														
59		2116	2126	3	PC	N														
68		2132	2142	2	PC	N														
67		2146	2156	2	PC	N														
69		2203	2213	2	PC	N														
16		2217	2227	2	PC	N														
11		2231	2241	3	PC	A	U	U	GLGN	Stan	2234	2240	190°	600ft	3N	10E	17	NW		
10		2245	2255	3	PC	N														
18		2304	2314	3	PC	N														
19		2320	2330	3	PC	N														
7		2335	2345	3	PC	N														
23		2350	0000	3	PC	N														
12		0009	0019	3	PC	N														
70		0024	0034	3	PC	N														
9		0041	0051	3	PC	N														
13		0106	0116	2	PC	N														
71		0120	0130	2	PC	N														
14		0135	0145	2	PC	N														

Time: Military format (midnight is 0000). **Resp. Codes:** **N** = no owl response, **A** = audio response only, **V** = visual response only, **B** (or A, V) = both audio and visual response. **Sex: M** = male, **F** = female, **U** = unknown. **Age: A** = adult. **S** = subadult, **J** = juvenile **Species. Codes: STOC** = Northern Spotted Owl, **STVA** = Barred Owl, **STRIX** = *Strix*-species unknown, STNE = Great Gray Owl, **BUVI** = Great Horned Owl, **AEAC** = Northern Saw-whet Owl, **OTKE** = Western Screech Owl, **GLGN** = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. **Call Type(s): 4** = 4 Note Call (STOC Only), **A** = Agitated, **B** = Bark, **CO** = Contact Call, JB = Juvenile Begging, **W** = Whistle/Nest Call, **8** = 8 Note call (STVA only), **Stan** = (standard) other non-*Strix* owls

Comments:

Turnstone Environmental Consultants
NSO Survey Form

Page 2 of 2 (including maps)

Survey Area: SDS **Owl Site(s):** ____________ **Visit #** 3

Project Area: WHISTLING RIDGE **Crew:** Wade Perkins **Month:** 7 **Day:** 22, **2009**

Tape Voice Flute Other: ____________ **Block/Area ID:** ____________

Wind Codes: **0** = Calm (<1 mph), **1** = Light air (1-3 mph) **2** = Light breeze (4-7 mph) **3** = Gentle breeze (8-12 mph) **4+** =Unsuitable (13+ mph)
Weather Codes: **CL** = Clear **FG** = Fog **PC** = Partly Cloudy **OC** = Overcast, **DR** = Drizzle **LR** = Light Rain **HR** = Heavy Rain (unsuitable) **SN** = Snow, **H** = Hail

ST#	Hike	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	Location ¼	UTMX NAD83-GPS data only	UTMY NAD83-GPS data only
63		0150	0200	2	PC	N														
66		0203	0213	3	PC	N														
62		0218	0228	3	PC	N														
47		0235	0245	3	PC	N														

Time: Military format (midnight is 0000). **Resp. Codes:** **N** = no owl response, **A** = audio response only, **V** = visual response only, **B** (or A, V) = both audio and visual response. **Sex: M** = male, **F** = female, **U** = unknown. **Age: A** = adult. **S** = subadult, **J** = juvenile **Species.** **Codes: STOC** = Northern Spotted Owl, **STVA** = Barred Owl, **STRIX** = *Strix*-species unknown, STNE = Great Gray Owl, **BUVI** = Great Horned Owl, **AEAC** = Northern Saw-whet Owl, **OTKE** = Western Screech Owl, **GLGN** = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. **Call Type(s):** **4** = 4 Note Call (STOC Only), **A** = Agitated, **B** = Bark, **CO** = Contact Call, JB = Juvenile Begging, **W** = Whistle/Nest Call, **8** = 8 Note call (STVA only), **Stan** = (standard) other non-*Strix* owls

Comments:

Turnstone Environmental Consultants
NSO Survey Form

Survey Area: SDS **Owl Site(s):** ______ **Visit #** 3

Project Area: WHISTLING RIDGE **Crew:** Wade Perkins **Month:** 7 **Day:** 23, **2009**

Tape Voice Flute Other: ______ **Block/Area ID:** ______

Wind Codes: **0** = Calm (<1 mph), **1** = Light air (1-3 mph) **2** = Light breeze (4-7 mph) **3** = Gentle breeze (8-12 mph) **4+** =Unsuitable (13+ mph)
Weather Codes: **CL** = Clear **FG** = Fog **PC** = Partly Cloudy **OC** = Overcast, **DR** = Drizzle **LR** = Light Rain **HR** = Heavy Rain (unsuitable) **SN** = Snow, **H** = Hail

ST#	Hike	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	¼	UTMX NAD83-GPS data only	UTMY NAD83-GPS data only
55		2036	2046	3	PC	N														
56		2051	2101	3	PC	N														
89		2106	2116	3	PC	N														
57		2127	2137	3	PC	N														
58		2144	2154	3	PC	N														
21		2214	2224	2	PC	N														
22		2229	2239	2	PC	N														
17		2243	2253	2	PC	N														
6		2258	2308	2	PC	N														
5		2313	2323	2	PC	N														
87		2338	2348	2	PC	N														
4		2352	0002	2	PC	N														
3		0012	0022	2	PC	N														
2		0040	0050	2	Cl	N														
46		0108	0118	2	Cl	N														
8		0126	0136	2	Cl	N														
48		0158	0208	2	Cl	N														
41		0212	0222	2	Cl	N														
39		0226	0236	2	Cl	A	U	U	GLGN	Stan	0229	0236	220°	1000	4N	10E	31	SE		
40		0242	0252	2	Cl	N														

Time: Military format (midnight is 0000). **Resp. Codes:** **N** = no owl response, **A** = audio response only, **V** = visual response only, **B** (or A, V) = both audio and visual response. **Sex: M** = male, **F** = female, **U** = unknown. **Age: A** = adult. **S** = subadult, **J** = juvenile **Species.** **Codes: STOC** = Northern Spotted Owl, **STVA** = Barred Owl, **STRIX** = *Strix*-species unknown, STNE = Great Gray Owl, **BUVI** = Great Horned Owl, **AEAC** = Northern Saw-whet Owl, **OTKE** = Western Screech Owl, **GLGN** = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. **Call Type(s):** 4 = 4 Note Call (STOC Only), **A** = Agitated, **B** = Bark, **CO** = Contact Call, JB = Juvenile Begging, **W** = Whistle/Nest Call, **8** = 8 Note call (STVA only), **Stan** = (standard) other non-*Strix* owls

Comments: STVA visual 0155 flying off road before STA 48
Unknown sex - Unknown age

Turnstone Environmental Consultants
NSO Survey Form

Survey Area: SDS **Owl Site(s):** **Visit #** 3

Project Area: WHISTLING RIDGE **Crew:** Wade Perkins **Month:** 7 **Day:** 23, **2009**

Tape Voice Flute Other: **Block/Area ID:**

Wind Codes: **0** = Calm (<1 mph), **1** = Light air (1-3 mph) **2** = Light breeze (4-7 mph) **3** = Gentle breeze (8-12 mph) **4+** =Unsuitable (13+ mph)
Weather Codes: **CL** = Clear **FG** = Fog **PC** = Partly Cloudy **OC** = Overcast, **DR** = Drizzle **LR** = Light Rain **HR** = Heavy Rain (unsuitable) **SN** = Snow, **H** = Hail

ST#	Hike	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	Location ¼	UTMX NAD83-GPS data only	UTMY NAD83-GPS data only
35		0257	0307	2	Cl	N														
34		0314	0324	2	Cl	N														

Time: Military format (midnight is 0000). **Resp. Codes:** **N** = no owl response, **A** = audio response only, **V** = visual response only, **B** (or A, V) = both audio and visual response. **Sex: M** = male, **F** = female, **U** = unknown. **Age: A** = adult. **S** = subadult, **J** = juvenile **Species. Codes: STOC** = Northern Spotted Owl, **STVA** = Barred Owl, **STRIX** = *Strix*-species unknown, STNE = Great Gray Owl, **BUVI** = Great Horned Owl, **AEAC** = Northern Saw-whet Owl, **OTKE** = Western Screech Owl, **GLGN** = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. **Call Type(s): 4** = 4 Note Call (STOC Only), **A** = Agitated, **B** = Bark, **CO** = Contact Call, JB = Juvenile Begging, **W** = Whistle/Nest Call, **8** = 8 Note call (STVA only), **Stan** = (standard) other non-*Strix* owls

Comments:

Turnstone Environmental Consultants
NSO Survey Form

Survey Area: SDS **Owl Site(s):** ______ **Visit #** 3

Project Area: WHISTLING RIDGE **Crew:** D. SAHL **Month:** Ø7 **Day:** 24, **2009**

Tape **Voice** **Flute** **Other:** ______ **Block/Area ID:** ______

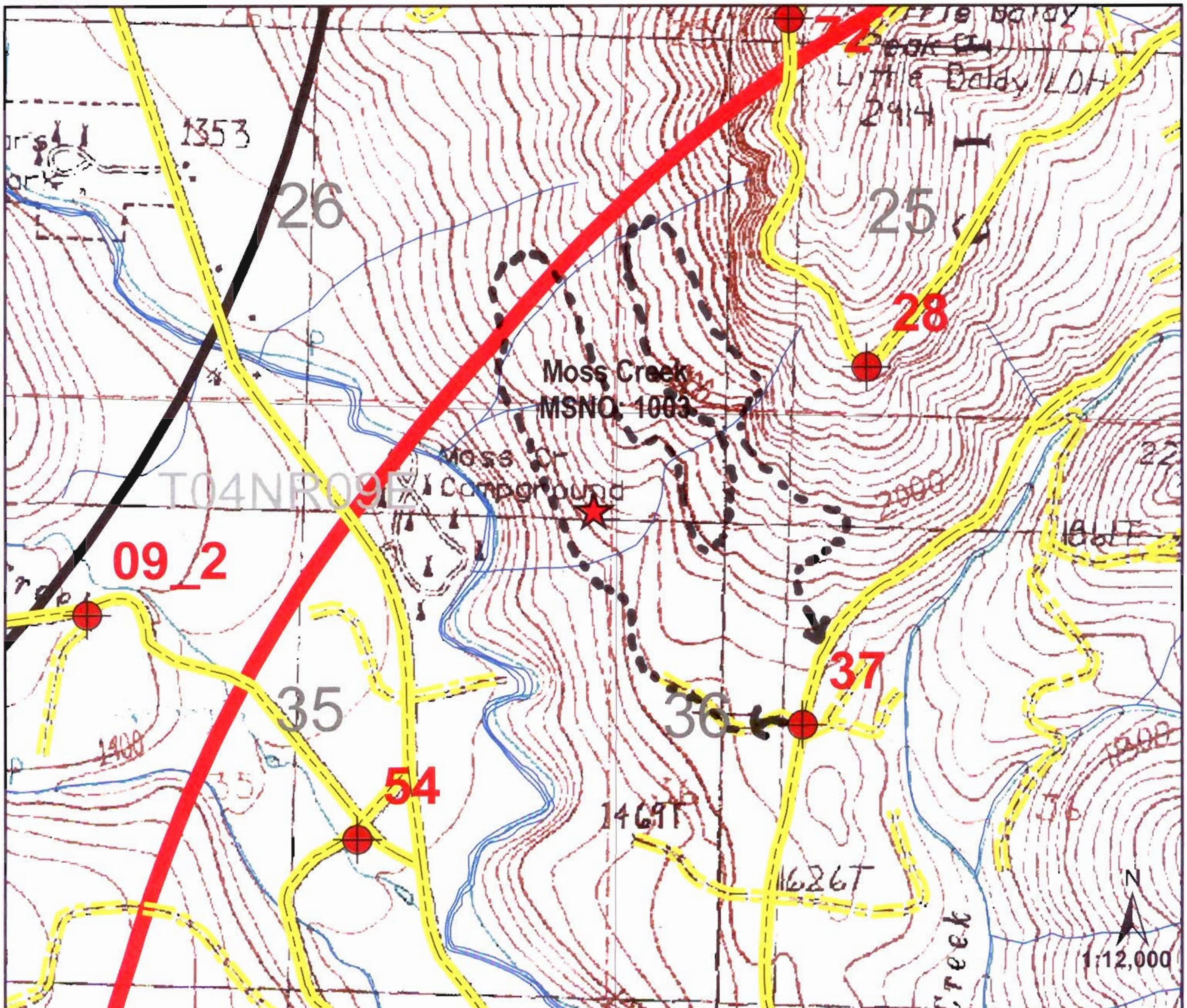
Wind Codes: **0** = Calm (<1 mph), **1** = Light air (1-3 mph) **2** = Light breeze (4-7 mph) **3** = Gentle breeze (8-12 mph) **4+** =Unsuitable (13+ mph)

Weather Codes: **CL** = Clear **FG** = Fog **PC** = Partly Cloudy **OC** = Overcast, **DR** = Drizzle **LR** = Light Rain **HR** = Heavy Rain (unsuitable) **SN** = Snow, **H** = Hail

ST#	Hike	Time Begin	Time End	Wind Code	Weather Code	Resp. code	Sex	Age	Species	Call Type(s)	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (feet)	Location Town	Location Range	Location Sect	¼	UTMX (NAD83-GPS data only)	UTMY (NAD83-GPS data only)
33		2021	2035	2	CL	N														
32		2100	2110	Ø	CL	N														
44		2122	2132	1	CL	N														
45		2136	2146	1	CL	N														
83		2203	2213	Ø	CL	N														
88		2216	2226	Ø	CL	N														
84		2230	2240	Ø	CL	N														
31		2255	2305	Ø	CL	N														
82		2317	2327	Ø	CL	N														
09-5		2336	2346	1	CL	N														
81		2355	0005	Ø	CL	N														
30		0014	0024	Ø	CL	N														
24		0028	0038	Ø	CL	N														
40		0051	0101	Ø	CL	N														
25		0113	1123	Ø	CL	N														
79		0129	0139	Ø	CL	N														
09-4		0148	0158	1	CL	N														
26		0209	0219	1	CL	N														
09-6		0255	0305	1	CL	N														
43	Y	0326	0336	2	CL	N														

Time: Military format (midnight is 0000). **Resp. Codes:** **N** = no owl response, **A** = audio response only, **V** = visual response only, **B** (or A, V) = both audio and visual response. **Sex: M** = male, **F** = female, **U** = unknown. **Age: A** = adult. **S** = subadult, **J** = juvenile **Species.** **Codes: STOC** = Northern Spotted Owl, **STVA** = Barred Owl, **STRIX** = *Strix*-species unknown, STNE = Great Gray Owl, **BUVI** = Great Horned Owl, **AEAC** = Northern Saw-whet Owl, **OTKE** = Western Screech Owl, **GLGN** = Northern Pygmy, TYAL = Barn Owl. OTFL = Flammulated Owl. **Call Type(s):** **4** = 4 Note Call (STOC Only), **A** = Agitated, **B** = Bark, **CO** = Contact Call, JB = Juvenile Begging, **W** = Whistle/Nest Call, **8** = 8 Note call (STVA only), **Stan** = (standard) other non-*Strix* owls

Comments: 43: Couple of Down Logs on RP.



TWN: 4 N RNG: 9 E Sec: 25, 26, 35, 36 1/4 Sec: — 1/16 Sec: — Date: 06/19/09 Obs: DARREN BOLEN

Resp T: — Start T: 1115 End T: 1420 Wind: 1 Weather: PC Time(D/N): D Visit Type: RO Resp Type: NR

Mice out: — # Mice taken: —

Adults/Sub: Males (spp.): — #Females (spp.): — Pair Status: — Sex Unk(spp): — # Juveniles: — #Fledglings: —

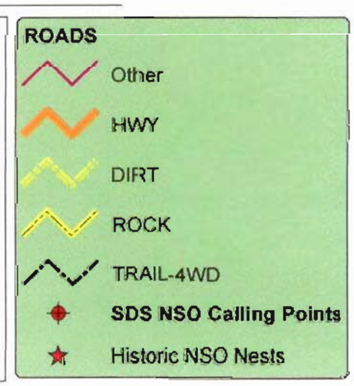
Nest: Status — NestLoc — Nest# — Nest Location UTM (nad83) Xcoord: — Ycoord: —

Please Provide Visit Notes & Description of Events:

HIKED ROUTE DRAWN IN ON MAP. NO RESPONSE. BROADCAST WITH PA, HOOT FLUTE. MAJORITY OF HABITAT located NEAR OLD NEST TREE.

- - - - = ROUTE HIKED

NR = NO RESPONSE



Observation Location UTM (nad83) Xcoord: — Ycoord: — Record All Bird and Band Details on Reverse:

Date: 06/19/09 Observer: DARREN BOLEN Page: 2 of 2

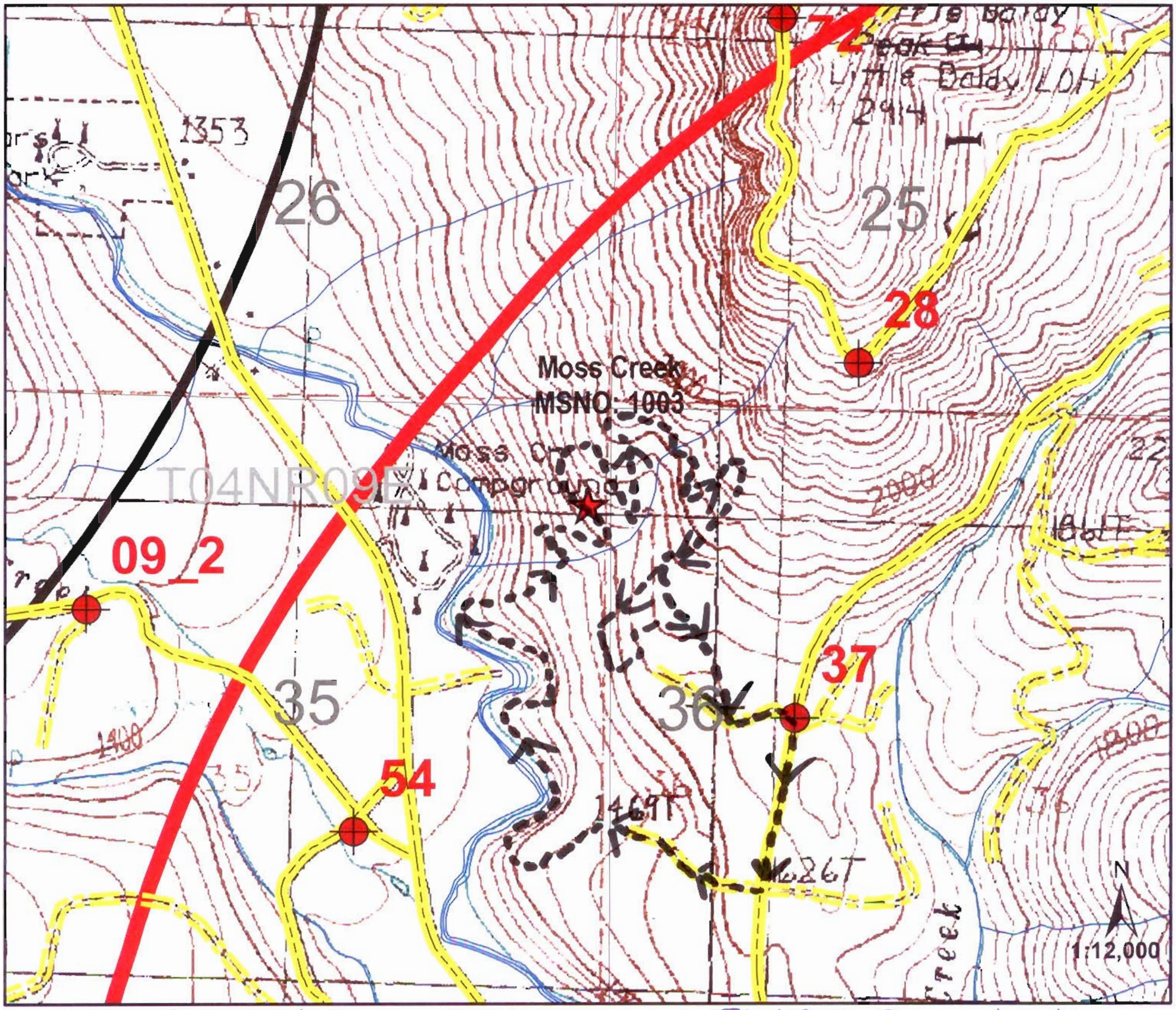
Male: Obs Type: NONE OBSERVED Age: _______ Tip Color: __________ Tip Shape: __________
USFWS #: ________________ Leg(R/L): _______ Weights: ______________
Color Band - Primary Color: ________ Leg (R/L): _____ Pat: ______ Sec. Color: ________ Tab: _______

Female: Obs Type: NONE OBSERVED Age: _______ Tip Color: __________ Tip Shape: __________
USFWS #: ____________________ Leg(R/L): _______ Weights: ______________
Color Band - Primary Color: ________ Leg (R/L): _____ Pat: _______ Sec. Color: ________ Tab: _______

Y1: Obs Type: NONE OBSERVED Age: _______ Tip Color: __________ Tip Shape: __________
USFWS #: _________________________ Leg(R/L): _______ Weights: ______________
Color Band - Primary Color: ________ Leg (R/L): _____ Pat: _______ Sec. Color: ________ Tab: _______

Y2: Obs Type: NONE OBSERVED Age: _______ Tip Color: __________ Tip Shape: __________
USFWS #: __________________ Leg(R/L): _______ Weights: ______________
Color Band - Primary Color: ________ Leg (R/L): _____ Pat: _______ Sec. Color: ________ Tab: _______

Additional notes:
NO SPOW OBSERVED



TWN: 4N RNG: 9E Sec: 35/36 1/4 Sec: — 1/16 Sec: — Date: 7/22/09 Obs: D. SAHL / J. VOTOS

Resp T: — Start T: 1541 End T: 1858 Wind: 2 Weather: CL Time(D/N): D Visit Type: RO Resp Type: NR

Mice out: — # Mice taken: —

Adults/Sub: Males (spp.): — #Females (spp.): — Pair Status: — Sex Unk(spp): — # Juveniles: — #Fledglings: —

Nest: Status — NestLoc — Nest# — Nest Location UTM (nad83) Xcoord: — Ycoord: —

Please Provide Visit Notes & Description of Events:

Hiked Route Drawn on Map. Two observers were used for this visit. Broadcast with Voice, Hoot Flute and PA system. Majority of Quality habitat is around old Nest Core. No SPOW observed or Detected.

----: Route Hiked

ROADS
- Other
- HWY
- DIRT
- ROCK
- TRAIL-4WD
- SDS NSO Calling Points
- Historic NSO Nests

Observation Location UTM (nad83) Xcoord: — Ycoord: — Record All Bird and Band Details on Reverse:

Date: 7/22/09 Observer: D. SAHL / J. Vitos Page: 2 of 2

Male: Obs Type: NON OBSERVED Age: _______ Tip Color: __________ Tip Shape: __________

USFWS #: ________________ Leg(R/L): _______ Weights: ______________
Color Band - Primary Color:________ Leg (R/L): _____ Pat: ______Sec. Color: ________ Tab: _______

Female: Obs Type: NON OBSERVED Age: _______ Tip Color: __________ Tip Shape: __________

USFWS #: ____________________ Leg(R/L): _______ Weights: ______________
Color Band - Primary Color:________ Leg (R/L): _____ Pat: _______ Sec. Color: ________ Tab: _______

Y1: Obs Type: NONE OBSERVED Age: _______ Tip Color: __________ Tip Shape: __________

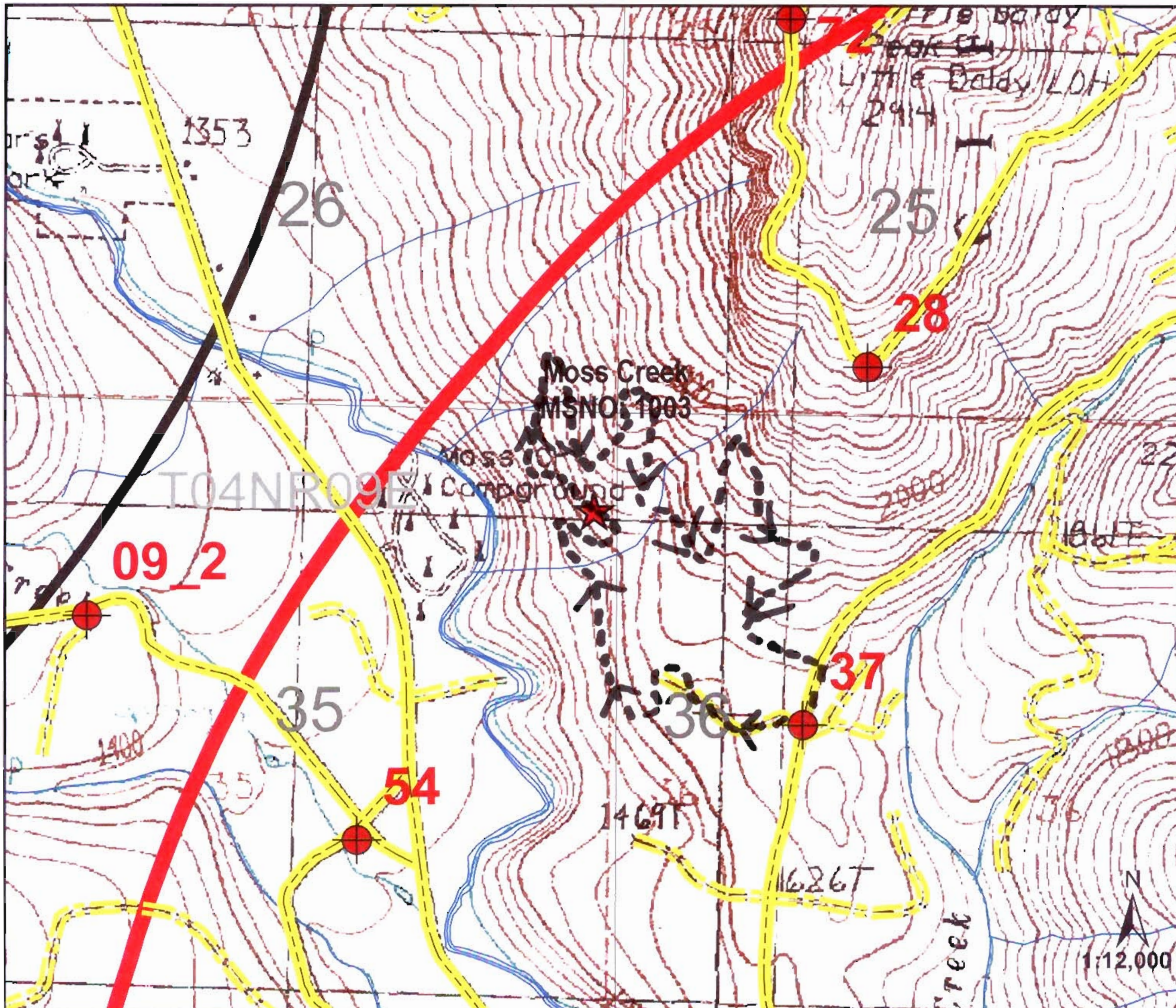
USFWS #: __________________________ Leg(R/L): _______ Weights: ______________

Color Band - Primary Color:________ Leg (R/L): _____ Pat: _______ Sec. Color: ________ Tab: _______

Y2: Obs Type: NON OBSERVED Age: _______ Tip Color: __________ Tip Shape: __________

USFWS #: ___________________ Leg(R/L): _______ Weights: ______________
Color Band - Primary Color:________ Leg (R/L): _____ Pat: _______ Sec. Color: ________ Tab: _______

Additional notes:
NO NSO Detected or OBSERVED During Visit



TWN: 4N RNG: 9E Sec: 25/26/35/36 1/4 Sec: — 1/16 Sec: — Date: 8/7/2009 Obs: D. SAHL

Resp T: — Start T: 1545 End T: 1900 Wind: 1 Weather: CL Time(D/N): D Visit Type: RO Resp Type: NR

Mice out: — # Mice taken: —

Adults/Sub: Males (spp.): — #Females (spp.): — Pair Status: — Sex Unk(spp): — # Juveniles: — #Fledglings: —

Nest: Status — NestLoc — Nest# — Nest Location UTM (nad83) Xcoord: — Ycoord: —

Please Provide Visit Notes & Description of Events:

HiKED Route on Map. Broadcast calls w/voice, PA and Hoot flute. Sharp shinned hawk Heard in the area, South of old nest core. No NSO observed or Detected.

- - - Route HiKED

ROADS
Other
HWY
DIRT
ROCK
TRAIL-4WD
SDS NSO Calling Points
Historic NSO Nests

Observation Location UTM (nad83) Xcoord: — Ycoord: — Record All Bird and Band Details on Reverse:

Date: 8/7/2009 Observer: D. SAHL Page: 2 of 2

Male: Obs Type: NON OBSERVED Age: _______ Tip Color: __________ Tip Shape: __________

USFWS #: ________________ Leg(R/L): _______ Weights: ______________
Color Band - Primary Color: ________ Leg (R/L): _____ Pat: ______ Sec. Color: ________ Tab: _______

Female: Obs Type: NON OBSERVED Age: _______ Tip Color: __________ Tip Shape: __________

USFWS #: _____________________ Leg(R/L): _______ Weights: ______________
Color Band - Primary Color: ________ Leg (R/L): _____ Pat: _______ Sec. Color: ________ Tab: _______

Y1: Obs Type: NON OBSERVED Age: _______ Tip Color: __________ Tip Shape: __________

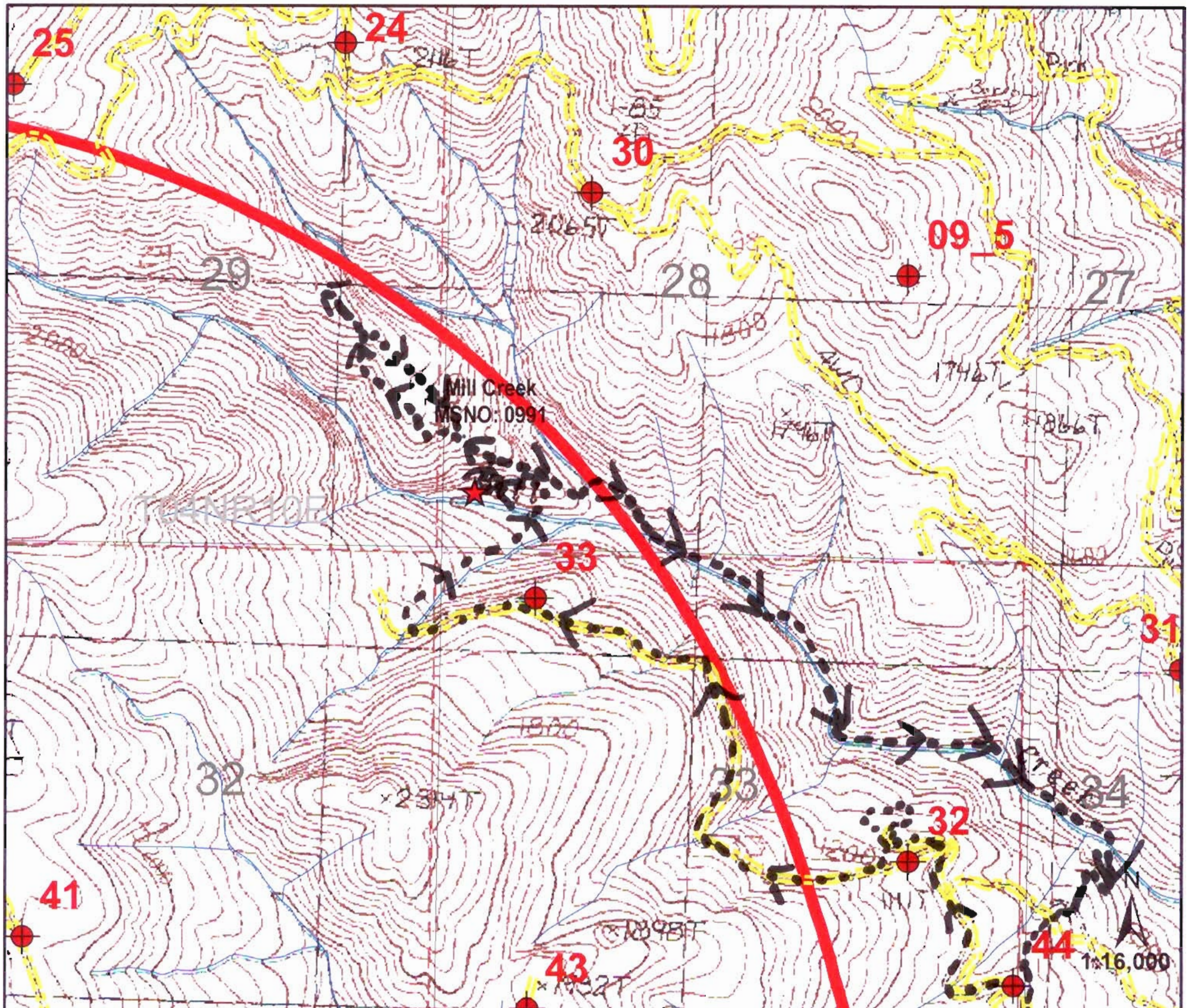
USFWS #: __________________________ Leg(R/L): _______ Weights: ______________

Color Band - Primary Color: ________ Leg (R/L): _____ Pat: _______ Sec. Color: ________ Tab: _______

Y2: Obs Type: NON OBSERVED Age: _______ Tip Color: __________ Tip Shape: __________

USFWS #: ___________________ Leg(R/L): _______ Weights: ______________
Color Band - Primary Color: ________ Leg (R/L): _____ Pat: _______ Sec. Color: ________ Tab: _______

Additional notes:
NO NSO OBSERVED or Detected During Visit.



TWN: 4N RNG: 10E Sec: 31/32/33/24 1/4 Sec: — 1/16 Sec: — Date: 06/19/09 Obs: D. SAHL

Resp T: — Start T: 1100 End T: 1733 Wind: 1 Weather: PC Time(D/N): D Visit Type: RO Resp Type: NR

Mice out: — # Mice taken: —

Adults/Sub: Males (spp.): — #Females (spp.): — Pair Status: — Sex Unk(spp): — # Juveniles: — #Fledglings: —

Nest: Status — NestLoc — Nest# — Nest Location UTM (nad83) Xcoord: — Ycoord: —

Please Provide Visit Notes & Description of Events: ----= Route HIKED

HIKED Route Drawn on Map, Broadcast with Voice, Hoot Flute and P.A. System. Older Forest type Near historic Nest Core and further upstream from that Area. Would advise others to access Old Nest Core from Top Down (follow Ridge to Decom RD.) Due to Creek Route Being slow.
No Response from NSO During Visit!

ROADS
- Other
- HWY
- DIRT
- ROCK
- TRAIL-4WD
- SDS NSO Calling Points
- Historic NSO Nests

Observation Location UTM (nad83) Xcoord: — Ycoord: — Record All Bird and Band Details on Reverse:

Date: 06/19/09 Observer: D. Sahl Page: 2 of 2

Male: Obs Type: NONE OBSERVED Age: ______ Tip Color: ________ Tip Shape: ________

USFWS #: ____________ Leg(R/L): ______ Weights: ____________
Color Band - Primary Color: ______ Leg (R/L): _____ Pat: ______ Sec. Color: ______ Tab: ______

Female: Obs Type: NON observed Age: ______ Tip Color: ________ Tip Shape: ________

USFWS #: ____________ Leg(R/L): ______ Weights: ____________
Color Band - Primary Color: ______ Leg (R/L): _____ Pat: ______ Sec. Color: ______ Tab: ______

Y1: Obs Type: None OBSERVED Age: ______ Tip Color: ________ Tip Shape: ________

USFWS #: ____________ Leg(R/L): ______ Weights: ____________

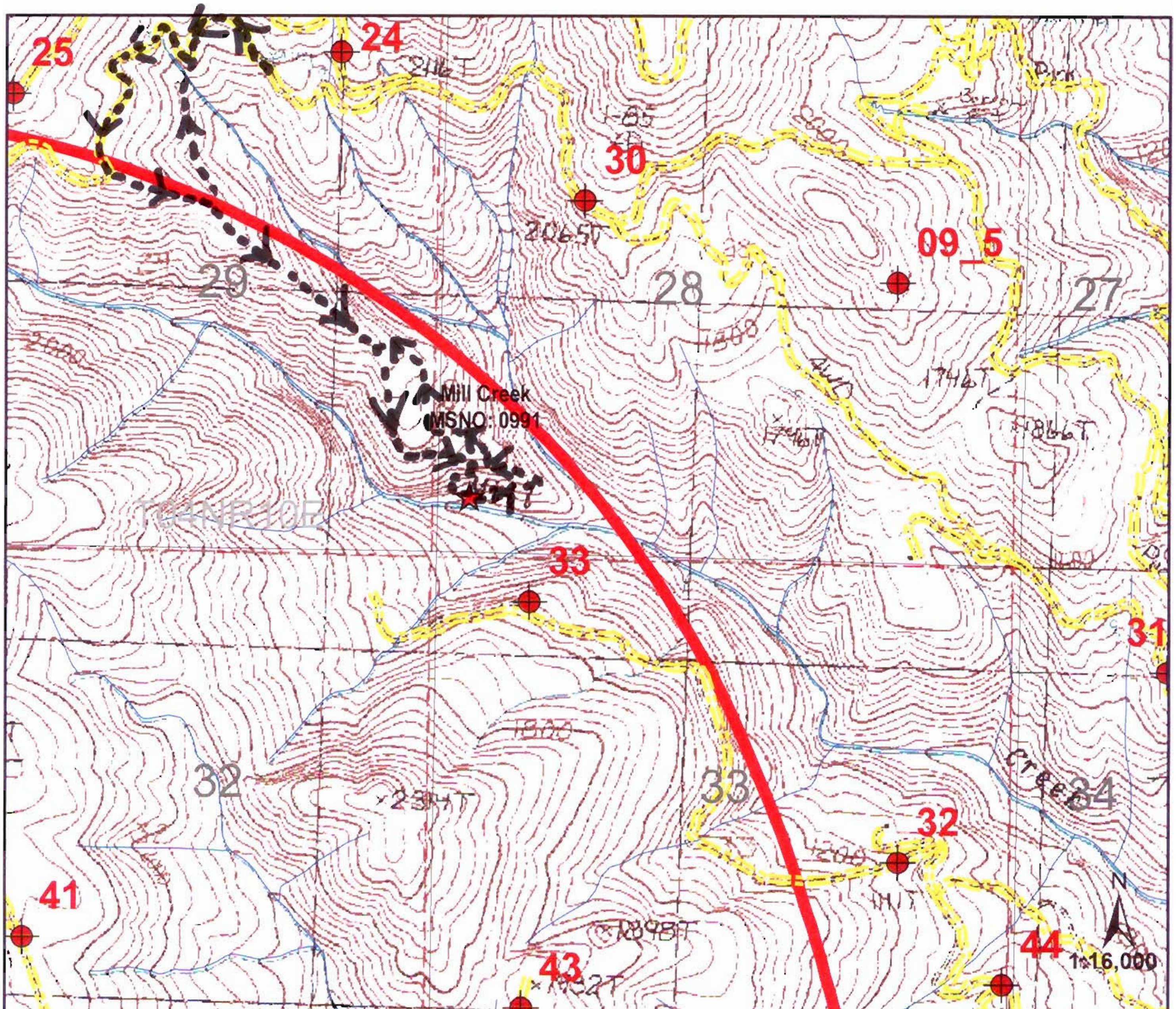
Color Band - Primary Color: ______ Leg (R/L): _____ Pat: ______ Sec. Color: ______ Tab: ______

Y2: Obs Type: NONE OBSERVED Age: ______ Tip Color: ________ Tip Shape: ________

USFWS #: ____________ Leg(R/L): ______ Weights: ____________
Color Band - Primary Color: ______ Leg (R/L): _____ Pat: ______ Sec. Color: ______ Tab: ______

Additional notes:

No NSO OBSERVED or Detected during visit.
NR = NO RESPONSE



TWN: 4N RNG: 10E Sec: 28/29 1/4 Sec: — 1/16 Sec: — Date: 7/25/09 Obs: D. Sahl

Resp T: — Start T: 1106 End T: 1517 Wind: Ø Weather: CL Time(D/N): D Visit Type: RO Resp Type: NR

Mice out: — # Mice taken: —

Adults/Sub: Males (spp.): — #Females (spp.): — Pair Status: — Sex Unk(spp): — # Juveniles: — #Fledglings: —

Nest: Status — NestLoc — Nest# — Nest Location UTM (nad83) Xcoord: — Ycoord: —

Please Provide Visit Notes & Description of Events:

Hiked route drawn on map. Broadcast NSO calls with voice, Hoot Flute and PA System. RIDGE Down hike is significanty Easier than going up Mill CREEK. Majority of high quality habitat is Near old Nest Cores and around the bottom of the drainage. No NSO Detected or observed.

---- = Route HIKED

ROADS
Other
HWY
DIRT
ROCK
TRAIL-4WD
SDS NSO Calling Points
Historic NSO Nests

Observation Location UTM (nad83) Xcoord: — Ycoord: — Record All Bird and Band Details on Reverse:

Date: 07/25/2009 Observer: D. Sahl Page: 2 of 2

Male: Obs Type: NON OBSERVED Age: _______ Tip Color: __________ Tip Shape: __________

USFWS #: ________________ Leg(R/L): _______ Weights: ______________

Color Band - Primary Color: ________ Leg (R/L): _____ Pat: ______ Sec. Color: ________ Tab: _______

Female: Obs Type: NON OBSERVED Age: _______ Tip Color: __________ Tip Shape: __________

USFWS #: ____________________ Leg(R/L): _______ Weights: ______________

Color Band - Primary Color: ________ Leg (R/L): _____ Pat: _______ Sec. Color: ________ Tab: _______

Y1: Obs Type: NON OBSERVED Age: _______ Tip Color: __________ Tip Shape: __________

USFWS #: _________________________ Leg(R/L): _______ Weights: ______________

Color Band - Primary Color: ________ Leg (R/L): _____ Pat: _______ Sec. Color: ________ Tab: _______

Y2: Obs Type: NON OBSERVED Age: _______ Tip Color: __________ Tip Shape: __________

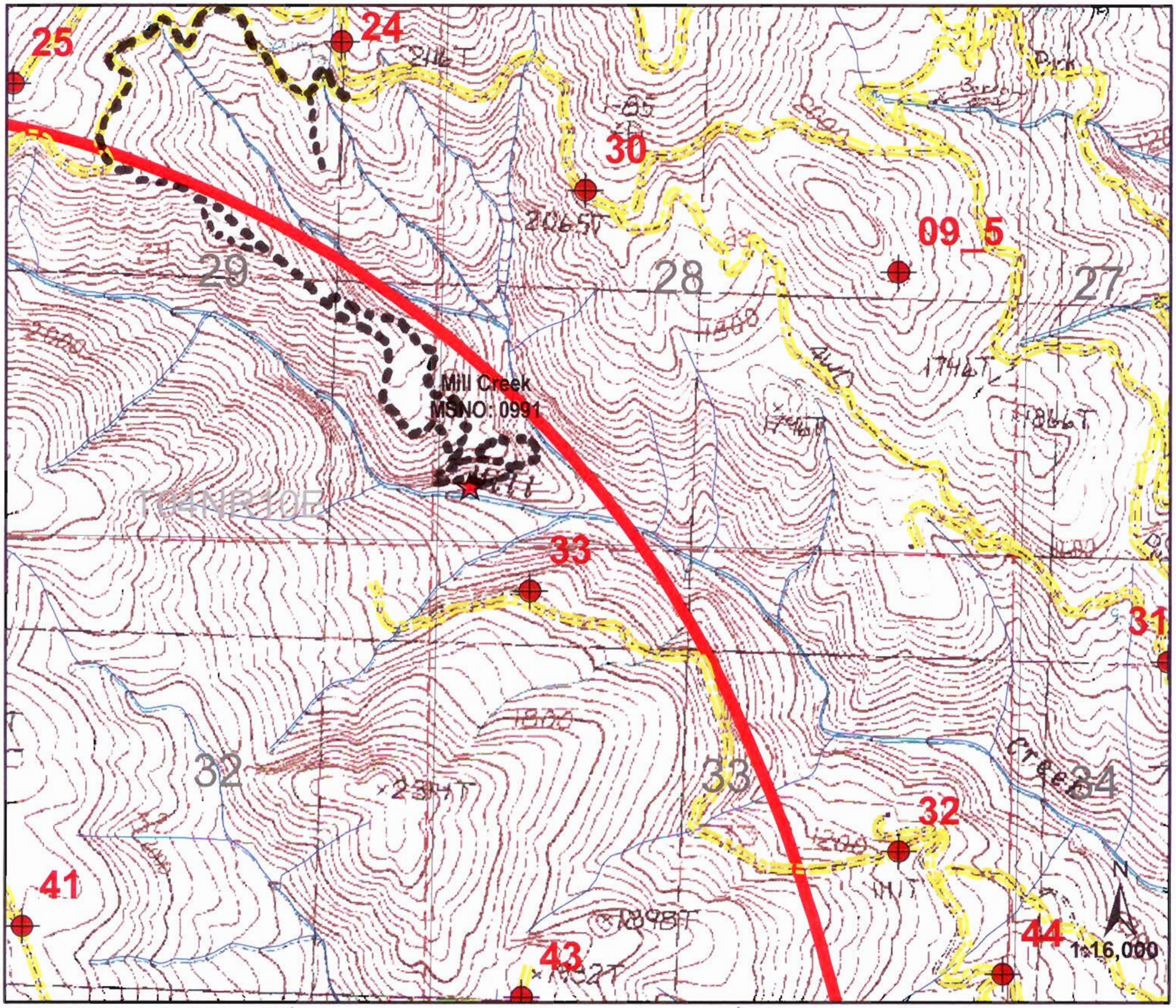
USFWS #: __________________ Leg(R/L): _______ Weights: ____________

Color Band - Primary Color: ________ Leg (R/L): _____ Pat: _______ Sec. Color: ________ Tab: _______

Additional notes:

No NSO Detected or OBSERVED During visit.

Beware a bald face hornet Nest on old SKid Rd. on Ridge Into the mill Creek site.



TWN: 4N RNG: 10E Sec: 28/29 1/4 Sec: — 1/16 Sec: — Date: 8/8/2009 Obs: D. SAHL

Resp T: — Start T: 1000 End T: 1430 Wind: 1 Weather: CL Time(D/N): D Visit Type: RO Resp Type: NR

Mice out: — # Mice taken: —

Adults/Sub: Males (spp.): — #Females (spp.): — Pair Status: — Sex Unk(spp): — # Juveniles: — #Fledglings: —

Nest: Status — NestLoc — Nest# — Nest Location UTM (nad83) Xcoord: — Ycoord: —

Please Provide Visit Notes & Description of Events:

HiKED Route on Map. Broadcast calls with PA/voice/ Hoot Flute. No Response from NSO, NO NSO OBserved.

---- : Route HIKED

ROADS
- Other
- HWY
- DIRT
- ROCK
- TRAIL-4WD
- SDS NSO Calling Points
- Historic NSO Nests

Observation Location UTM (nad83) Xcoord: — Ycoord: — Record All Bird and Band Details on Reverse:

Date: 8/18/2009 Observer: D. Saw Page: 2 of 2

Male: Obs Type: NON OBSERVED Age: _______ Tip Color: __________ Tip Shape: __________

USFWS #: ________________ Leg(R/L): _______ Weights: ______________
Color Band - Primary Color:________ Leg (R/L): _____ Pat: ______Sec. Color: ________ Tab: _______

Female: Obs Type: NON OBSERVED Age: _______ Tip Color: __________ Tip Shape: __________

USFWS #: ____________________ Leg(R/L): _______ Weights: ______________
Color Band - Primary Color:________ Leg (R/L): _____ Pat: _______ Sec. Color: ________ Tab: _______

Y1: Obs Type: NON OBSERVED Age: _______ Tip Color: __________ Tip Shape: __________

USFWS #: __________________________ Leg(R/L): _______ Weights: ______________

Color Band - Primary Color:________ Leg (R/L): _____ Pat: _______ Sec. Color: ________ Tab: _______

Y2: Obs Type: NON OBSERVED Age: _______ Tip Color: __________ Tip Shape: __________

USFWS #: ___________________ Leg(R/L): _______ Weights: ______________
Color Band - Primary Color:________ Leg (R/L): _____ Pat: _______ Sec. Color: ________ Tab: _______

Additional notes:
No NSO Detected or OBSERVED during the visit.

Appendix C - Northern Goshawk Survey Forms

Survey Time: Start 1430 End 1645

Intensive Nest Search Time: Start — End —

Temperature (°F): Begin 68 End 68

Turnstone Environmental Consultants

Goshawk Survey Form

Page 1 of 1 (including maps)

Survey Area/Project Area: SDS **Crew:** WLB **Month:** 6 **Day:** 24, 2009 **Visit #** 1

Period: Nestling / Fledgling **Call(s) Used:** Alarm / Wail / Begging **Survey Year:** 1st 2nd **Nest Search:** Y / N (if yes attach Search Form) **Nest Found:** Y / N (if yes attach Nest Loc. Form)

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: ______ **Cloud Cover :** 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 =Light Wind (8-12 mph), 5 =Wind (12-15 mph), 6 =Gusty (>15 mph)

Weather Codes (WC): CL = Clear, **FG** = Fog, **PC** = Partly Cloudy, **OC** = Overcast, **DR** = Drizzle, **RN** = Rain, **SN** = Snow **Weather Intensity (WI):** 1=light, 2=moderate, 3=heavy

		Sta. Time		Wind	Weather		Cloud	Detection	Detection	#	Sex	Age		Contact Time		Bearing	Dist	Location				UTMX	UTMY
Det._ID	ST#	Begin	End	Code	WC	WI	Cover	Code	Location				Species	Initial	Final	(Azimuth)	(meters)	Town	Range	Sect	¼	NAD83-GPS data only	
	657	1456	1502	3	PC	2	4	NC															
✓ 062409-1I				3	PC	2	4	V	BT	1	U	A	BAEA	1456	1458	overhead	0	3N	10E	17	NW	609741	5067651
	658	1515	1521	5	PC	3	4	NC															
	659	1534	1540	5	PC	3	4	NC															
	625	1557	1603	5	PC	3	4	NC															
	624	1621	1627	2	PC	1	4	NC															

Age: (A)dult, (F)ledgling, (N)estling, (U)nknown **Sex:** (M)ale, (F)emale, (U)nknown **Det. Code:** (A)udio, (V)isual, (B)oth **Det. Location:** (AT) station, (BT) between stations

#= number of goshawks or other raptor observed/detected **Det._ID:** unique detection identifier; date and sequential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format.

Comments:

✓ NC = NO Contact

Survey Time: Start 1500 End 1650

Intensive Nest Search Time: Start_____ End_____

Temperature (°F): Begin 78° End 76°

Survey Area/Project Area: SDS **Crew:** TDG **Month:** 06 **Day:** 24 **, 2009 Visit #** 1

Turnstone Environmental Consultants

Goshawk Survey Form

Period: Nestling / Fledgling **Call(s) Used:** Alarm / Wail / Begging **Survey Year:** 1st 2nd **Nest Search:** Y / N (if yes attach Search Form) **Nest Found:** Y / N (if yes attach Nest Loc. Form)

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: _____________ **Cloud Cover :** **1** = <5%; **2** = 5-20%; **3** = 21-40%; **4** = 41-60%; **5** = 61-80%; **6** = 81-100%

Wind Codes: **1** = Light air (>1mph), **2** = Light breeze (1-3 mph), **3** = Gentle breeze (4-7 mph), **4** =Light Wind (8-12 mph), **5** =Wind (12-15 mph), 6 =Gusty (>15 mph)

Weather Codes (WC): CL = Clear, **FG** = Fog, **PC** = Partly Cloudy, **OC** = Overcast, **DR** = Drizzle, **RN** = Rain, **SN** = Snow **Weather Intensity (WI):** 1=light, 2=moderate, 3=heavy

Det._ID	ST#	Sta. Time Begin	Sta. Time End	Wind Code	Weather WC	Weather WI	Cloud Cover	Detection Code	Detection Location	#	Sex	Age	Species	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (meters)	Location Town	Location Range	Location Sect	¼	UTMX NAD83-GPS data only	UTMY
	643	1505	1514	5	PC	2	4	NC															
	644	1521	1530	5	PC	2	4																
	646	1536	1545	5	PC	2	4																
	647	1553	1602	5	PC	2	4																
	648	1609	1617	5	PC	3	4																
	650	1627	1636	5	PC	3	4																

Age: (A)dult, **(F)**ledgling, **(N)**estling, **(U)**nknown **Sex: (M)**ale, **(F)**emale, **(U)**nknown **Det. Code: (A)**udio, **(V)**isual, **(B)**oth **Det. Location: (AT)** station, **(BT)** between stations

#= number of goshawks or other raptor observed/detected **Det._ID:** unique detection identifier; date and sequential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format.

Comments: Wind gusts became began to hinder my Ability to hear 200 m. Ended surveying @ 1650

NC = No contact

Survey Time: Start 0800 End 1615

Intensive Nest Search Time: Start — End —

Temperature (°F): Begin 55° End 59°

Turnstone Environmental Consultants

Goshawk Survey Form

Survey Area/Project Area: SDS **Crew:** WCB **Month:** 6 **Day:** 25, 2009 **Visit #** 1

Period: Nestling / Fledgling **Call(s) Used:** Alarm / Wail / Begging **Survey Year:** 1st 2nd **Nest Search:** Y / N (if yes attach Search Form) **Nest Found:** Y / N (if yes attach Nest Loc. Form)

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: ____________ **Cloud Cover :** 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 =Light Wind (8-12 mph), 5 =Wind (12-15 mph), 6 =Gusty (>15 mph)
Weather Codes (WC): CL = Clear, **FG** = Fog, **PC** = Partly Cloudy, **OC** = Overcast, **DR** = Drizzle, **RN** = Rain, **SN** = Snow **Weather Intensity (WI):** 1=light, 2=moderate, 3=heavy

		Sta. Time		Wind	Weather		Cloud	Detection	Detection	#	Sex	Age		Contact Time		Bearing	Dist	Location				UTMX	UTMY
Det._ID	ST#	Begin	End	Code	WC	WI	Cover	Code	Location				Species	Initial	Final	(Azimuth)	(meters)	Town	Range	Sect	¼	NAD83-GPS data only	
	G141	0952	0959	2	OC	1	6	NC															
	G140	1008	1015	2	OC	1	6																
	G122	1044	1050	3	OC	1	6																
	G127	1126	1132	3	OC	1	6	NC															
062509-1I								V		1	U	A	RTHA	1126	1126	314	60	3N	10E	6	NW	10T 0608094	5070505
	G126	1158	1204	2	OC	1	6	NC															
	G139	1220	1226	3	OC	1	6																
	G138	1237	1243	3	OC	1	6																
	G137	1250	1256	3	OC	1	6																
	G130	1308	1314	2	OC	1	6																
	G129	1333	1339	2	OC	1	6																
	G118	1350	1356	2	PC	1	6																
	G119	1410	1416	2	PC	1	6																
	G124	1422	1428	3	PC	1	5	NC															
062509-2I								V		1	U	U	RTHA	1424	1425	224	300	3N	10E	6	NW	10T 0608802	5070036
	G109	1545	1551	3	PC	1	5	NC															

Age: (A)dult, (F)ledgling, (N)estling, (U)nknown **Sex:** (M)ale, (F)emale, (U)nknown **Det. Code:** (A)udio, (V)isual, (B)oth **Det. Location:** (AT) station, (BT) between stations
#= number of goshawks or other raptor observed/detected **Det._ID:** unique detection identifier; date and sequential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format.
Comments:

Survey Time: Start 0745 End 1500

Turnstone Environmental Consultants

Goshawk Survey Form

Page 1 of 1 (including maps)

Intensive Nest Search Time: Start_____ End_____

Temperature (°F): Begin 52° End 60°

Survey Area/Project Area: SDS **Crew:** TDG **Month:** June **Day:** 25 **, 2009 Visit #** 1

Period: Nestling / Fledgling **Call(s) Used:** Alarm / Wail / Begging **Survey Year:** 1st 2nd **Nest Search:** Y / N (if yes attach Search Form) **Nest Found:** Y / N (if yes attach Nest Loc. Form)

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: _____________ **Cloud Cover :** 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 =Light Wind (8-12 mph), 5 =Wind (12-15 mph), 6 =Gusty (>15 mph)

Weather Codes (WC): CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow **Weather Intensity (WI):** 1=light, 2=moderate, 3=heavy

		Sta. Time		Wind	Weather		Cloud	Detection	Detection	#	Sex	Age		Contact Time		Bearing	Dist	Location				UTMX	UTMY
Det._ID	ST#	Begin	End	Code	WC	WI	Cover	Code	Location				Species	Initial	Final	(Azimuth)	(meters)	Town	Range	Sect	¼	NAD83-GPS data only	
	G105.5	0806	0814	3	OC	1	6	NC															
	G110	0820	0828	3	OC	1	6																
	G117	0834	0842	3	OC	1	6																
	G136	0848	0855	3	OC	1	6																
Dropped	G131	0909	0917	4	OC	1	6																
Dropped	G116	0927	0935	4	OC	1	6																
	G111	0942	0949	4	OC	1	6																
	G112	0954	1002	4	OC	1	6																
	G115	1011	1019	4	OC	1	6																
	G131.1	1029	1037	4	OC	1	6																
	G135	1052	1100	4	OC	1	6																
	G134	1114	1122	4	OC	1	6																
	G132	1133	1141	4	OC	1	6																
	G133	1157	1204	4	OC	1	6																
	G114	1217	1225	4	OC	1	6																
	G113	1236	1244	4	OC	1	6																
	G99	1300	1308	4	OC	1	6																
	G99.5	1320	1327	4	PC	1	5																
	G107	1338	1346	5	PC	1	5																
	G106	1355	1403	5	PC	1	5																
	G105	1416	1423	5	PC	1	5																
* Dropped	G102	1436	1444	5	PC	1	5																
	G103	1450	1457	5	PC	1	5																
	G107.5	1522	1529	4	PC	1	5	NC															

Age: (A)dult, (F)ledgling, (N)estling, (U)nknown **Sex:** (M)ale, (F)emale, (U)nknown **Det. Code:** (A)udio, (V)isual, (B)oth **Det. Location:** (AT) station, (BT) between stations
#= number of goshawks or other raptor observed/detected **Det._ID:** unique detection identifier; date and sequential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format.

Comments:

* Clearcut AREA

✓

Survey Time: Start 0740 End 1715

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Goshawk Survey Form

Page 1 of 1 (including maps)

Intensive Nest Search Time: Start____ End____

Temperature (°F): Begin 55 End 73

Survey Area/Project Area: SDS

Crew: JDG Month: 06 Day: 26, 2009 Visit # 1

Period: Nestling / Fledgling Call(s) Used: Alarm / Wail / Begging Survey Year: 1st 2nd Nest Search: Y / N (if yes attach Search Form) Nest Found: Y / N (if yes attach Nest Loc. Form)

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: ____________ Cloud Cover : 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 =Light Wind (8-12 mph), 5 =Wind (12-15 mph), 6 =Gusty (>15 mph)

Weather Codes (WC): CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow **Weather Intensity (WI):** 1=light, 2=moderate, 3=heavy

		Sta. Time		Wind	Weather		Cloud	Detection	Detection	#	Sex	Age		Contact Time		Bearing	Dist	Location				UTMX	UTMY
Det._ID	ST#	Begin	End	Code	WC	WI	Cover	Code	Location				Species	Initial	Final	(Azimuth)	(meters)	Town	Range	Sect	¼	NAD83-GPS data only	
	G1	0743	0751	2	CL	1	1	NC															
	G2	0754	0802	2	CL	1	1																
	G3	0809	0817	2	CL	1	1																
	G5	0828	0836	2	CL	1	1																
	G4	0846	0853	2	CL	1	1																
	G6	0909	0917	2	CL	1	1																
	G7	0934	0941	2	CL	1	1																
	G9	1001	1009	2	CL	1	1																
	G10	1026	1034	2	CL	1	1																
	G9.5	1047	1054	2	CL	1	1																
	G8	1107	1115	3	PC	1	2																
	G11	1125	1133	3	PC	1	2																
	G12	1148	1155	3	PC	1	2																
	G17	1235	1243	3	PC	1	2																
*	G13	1258	1306	3	PC	1	2	V	AT	1	U	U	URAP	1303	1303	90°	30	3N	10E	18	SW	604462	5066855
	G14	1326	1334	3	PC	1	2	NC															
	G14.5	1344	1352	3	PC	1	2																
	G15	1406	1414	3	PC	1	2																
	G22.5	1432	1441	3	PC	1	2																
	G22	1448	1455	3	PC	1	2																
	G44.1	1518	1526	3	PC	1	2	NC															

Age: (A)dult, (F)ledgling, (N)estling, (U)nknown **Sex:** (M)ale, (F)emale, (U)nknown **Det. Code:** (A)udio, (V)isual, (B)oth **Det. Location:** (AT) station, (BT) between stations

#= number of goshawks or other raptor observed/detected **Det._ID:** unique detection identifier; date and sequential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format.

Comments: * smaller owl-like body shape. URAPTOR FLEW out of large residual doug fir to the East, I hiked after it but was unable to locate or elicit any AUDIO responses. Did not Resemble Goshawk Individual. Possibly a saw-whet or PYGMY OWL.

NC = no contact

Survey Time: Start 0815 End 1530
Intensive Nest Search Time: Start — End —
Temperature (°F): Begin 55 End 70

Turnstone Environmental Consultants
Goshawk Survey Form

Page 1 of 1 (including maps)

Survey Area/Project Area: SDS **Crew:** WLB **Month:** 6 **Day:** 26, **2009** **Visit #** 1

Period: Nestling / Fledgling **Call(s) Used:** Alarm / Wail / Begging **Survey Year:** 1st 2nd **Nest Search:** Y / N (if yes attach Search Form) **Nest Found:** Y / N (if yes attach Nest Loc. Form)

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: ____________ **Cloud Cover :** 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 =Light Wind (8-12 mph), 5 =Wind (12-15 mph), 6 =Gusty (>15 mph)
Weather Codes (WC): CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow **Weather Intensity (WI):** 1=light, 2=moderate, 3=heavy

		Sta. Time		Wind	Weather		Cloud	Detection	Detection	#	Sex	Age		Contact Time		Bearing	Dist	Location				UTMX	UTMY
Det._ID	ST#	Begin	End	Code	WC	WI	Cover	Code	Location				Species	Initial	Final	(Azimuth)	(meters)	Town	Range	Sect	¼	NAD83-GPS data only	
	G23	0823	0829	2	CL	1	2	NC															
	G21	0844	0850	2	Cl	1	1																
	G15.5	0911	0917	2	Cl	1	1																
	G16	0928	0934	2	Cl	1	1																
	G18	0947	0953	2	Cl	1	1																
	G19	1009	1015	5	Cl	2	1																
	G28	1044	1050	3	Cl	1	1	NC															
062609-1I								V	BT	1	u	u	TUVU	1047	1047	48	400	3N	9E	18	NW	10T 0608247	5067337
	G26	1112	1118	2	Cl	1	1	NC															
	G27	1130	1136	2	Cl	1	1																
	G29	1147	1153	2	Cl	1	1																
	G36	1211	1218	2	Cl	1	1																
	G30	1233	1239	2	Cl	1	1																
	G31	1255	1301	3	Cl	1	1																
	G32	1316	1322	3	Cl	1	1																
	G33	1342	1348	3	Cl	1	1																
	G34	1354	1400	3	Cl	1	1																
	G35	1407	1513	4	Cl	1	1	NC															
062609-2I								V	BT	1	u	A	TUVU	1416	1416	160	150	3N	9E	7	SW	10T 0608841	5068402
	G36	1422	1428	4	Cl	1	1	NC															
	G53	1457	1503	4	Cl	1	1	NC															

Age: (A)dult, (F)ledgling, (N)estling, (U)nknown **Sex:** (M)ale, (F)emale, (U)nknown **Det. Code:** (A)udio, (V)isual, (B)oth **Det. Location:** (AT) station, (BT) between stations
#= number of goshawks or other raptor observed/detected **Det._ID:** unique detection identifier; date and sequential det. # for the day, (061208-1; 061208-2, ect) **Time:** Military format.
Comments:

Survey Time: Start 0910 End____

Intensive Nest Search Time: Start — End —

Temperature (°F): Begin 64 End 72

Turnstone Environmental Consultants

Goshawk Survey Form

Survey Area/Project Area: SNS **Crew:** WCB **Month:** 6 **Day:** 29, **2009** **Visit #** 1

Period: Nestling / Fledgling **Call(s) Used:** Alarm / Wail / Begging **Survey Year:** 1st 2nd **Nest Search:** Y / N (if yes attach Search Form) **Nest Found:** Y / N (if yes attach Nest Loc. Form)

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: ____________ **Cloud Cover :** 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 =Light Wind (8-12 mph), 5 =Wind (12-15 mph), 6 =Gusty (>15 mph)

Weather Codes (WC): CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow **Weather Intensity (WI):** 1=light, 2=moderate, 3=heavy

		Sta. Time		Wind	Weather		Cloud	Detection	Detection	#	Sex	Age		Contact Time		Bearing	Dist	Location				UTMX	UTMY
Det._ID	ST#	Begin	End	Code	WC	WI	Cover	Code	Location				Species	Initial	Final	(Azimuth)	(meters)	Town	Range	Sect	¼	NAD83-GPS data only	
	677	0922	0928	3	CL	1	1	NL															
	676	0943	0949	1	Cl	1	1																
	674	0958	1004	3	Cl	1	1																
	673	1014	1020	2	Cl	1	1																
	675	1041	1047	3	Cl	1	1																
	664	1109	1115	2	Cl	1	1																
	665	1131	1137	2	Cl	1	1																
	670	1145	1151	2	Cl	1	1																
	669	1158	1204	2	Cl	1	1																
	666	1214	1220	2	Cl	1	1																
	667	1229	1235	3	Cl	1	1																
	668	1245	1251	4	Cl	2	1	NC															
062909-1i								V	BT	4	u	u	TOVU	1254	1254	312	400	3N	10E	7	NE	10T 0609611	5069036
	690	1312	1318	4	Cl	2	1	NL															
026909-2i								V	BT	1	u	A	TOVU	1312	1312	52	20	3N	10E	7	NE	10T 0609148	5069217
	6921	1337	1343	3	Cl	1	1	NL															
	691	1408	1412	4	Cl	2	1	NL															
062909-3i								V	BT	1	u	u	TOVU	1411	1411	0	0	3N	10E	6	SE	10T 0609453	5069[illegible]
	688	1429	1435	4	Cl	2	1	NL															
	687	1447	1453	3	Cl	1	1																
	671	1458	1504	3	Cl	1	1																
	672	1514	1520	3	Cl	1	1																
	6120	1625	1631	3	Cl	2	1																
	6128	1640	1646	2	Cl	1	1																
	6125	1658	1704	2	Cl	1	1	NL															

Age: (A)dult, (F)ledgling, (N)estling, (U)nknown **Sex:** (M)ale, (F)emale, (U)nknown **Det. Code:** (A)udio, (V)isual, (B)oth **Det. Location:** (AT) station, (BT) between stations

#= number of goshawks or other raptor observed/detected **Det._ID:** unique detection identifier; date and sequential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format.

Comments:

NL = No Contact

Survey Time: Start 0910 End 1710

Intensive Nest Search Time: Start_____ End_____

Temperature (°F): Begin 64° End 72°

Turnstone Environmental Consultants

Goshawk Survey Form

Page 1 of 1 (including maps)

Survey Area/Project Area: SDS **Crew:** TDG **Month:** 06 **Day:** 29, **2009** **Visit #** 1

Period: Nestling / Fledgling **Call(s) Used:** Alarm / Wail / Begging **Survey Year:** 1st / 2nd **Nest Search:** Y / N (if yes attach Search Form) **Nest Found:** Y / N (if yes attach Nest Loc. Form)

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: ___________ **Cloud Cover :** 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 =Light Wind (8-12 mph), 5 =Wind (12-15 mph), 6 =Gusty (>15 mph)

Weather Codes (WC): CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow **Weather Intensity (WI):** 1=light, 2=moderate, 3=heavy

		Sta. Time		Wind	Weather		Cloud	Detection	Detection	#	Sex	Age		Contact Time		Bearing	Dist	Location				UTMX	UTMY
Det._ID	ST#	Begin	End	Code	WC	WI	Cover	Code	Location				Species	Initial	Final	(Azimuth)	(meters)	Town	Range	Sect	¼	NAD83-GPS data only	
	G83	0918	0926	3	CL	1	1	NC															
	G82	0938	0945	3	CL	1	1																
	G81	0957	1004	3	CL	1	1																
	G84	1018	1026	3	CL	1	1																
	G98	1045	1053	3	CL	1	1																
	G80	1112	1119	3	CL	1	1																
	G79	1130	1138	3	CL	1	1																
	G85	1147	1155	3	CL	1	1																
	G96	1209	1216	3	CL	1	1																
	G100	1241	1249	3	CL	1	1																
	G95	1306	1314	4	CL	1	1																
	G101	1330	1337	4	CL	1	1																
	G94	1355	1403	4	CL	1	1																
	G86	1418	1425	4	CL	1	1																
	G92	1445	1453	4	CL	1	1																
	G93	1504	1512	4	CL	1	1																
	G123	1635	1643	4	CL	2	1																
	G121	1647	1654	4	CL	2	1	NC															

Age: (A)dult, (F)ledgling, (N)estling, (U)nknown **Sex:** (M)ale, (F)emale, (U)nknown **Det. Code:** (A)udio, (V)isual, (B)oth **Det. Location:** (AT) station, (BT) between stations
#= number of goshawks or other raptor observed/detected **Det._ID:** unique detection identifier; date and sequential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format.
Comments:

NC = no contact

Survey Time: Start 0715 End 0900

Turnstone Environmental Consultants

Goshawk Survey Form

Intensive Nest Search Time: Start — End —

Temperature (*F): Begin 65 End 70

Survey Area/Project Area: SDS **Crew:** WLB **Month:** 6 **Day:** 30, **2009** **Visit #** 1

Period: Nestling / Fledgling **Call(s) Used:** Alarm / Wail / Begging **Survey Year:** 1st 2nd **Nest Search:** Y / N (if yes attach Search Form) **Nest Found:** Y / N (if yes attach Nest Loc. Form)

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: ____________ **Cloud Cover:** 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 = Light Wind (8-12 mph), 5 = Wind (12-15 mph), 6 = Gusty (>15 mph)

Weather Codes (WC): CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow **Weather Intensity (WI):** 1=light, 2=moderate, 3=heavy

	Sta. Time			Wind	Weather		Cloud	Detection	Detection	#	Sex	Age		Contact Time		Bearing	Dist	Location				UTMX	UTMY
Det._ID	ST#	Begin	End	Code	WC	WI	Cover	Code	Location				Species	Initial	Final	(Azimuth)	(meters)	Town	Range	Sect	¼	NAD83-GPS data only	
	661	0735	0741	3	CL	2	1	NC															
	662	0749	0755	3	CL	2	1	NC															
	663	0806	0812	2	CL	1	1	NC															
	664	0821	0827	2	CL	1	1	NC															
	678	0845	0851	3	CL	2	1	NC															

Age: (A)dult, (F)ledgling, (N)estling, (U)nknown **Sex:** (M)ale, (F)emale, (U)nknown **Det. Code:** (A)udio, (V)isual, (B)oth **Det. Location:** (AT) station, (BT) between stations

#= number of goshawks or other raptor observed/detected **Det._ID:** unique detection identifier; date and sequential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format.

Comments:

NC = NO Contact

Survey Time: Start 0710 End 0915

Turnstone Environmental Consultants

Goshawk Survey Form

Intensive Nest Search Time: Start_____ End_____

Temperature (°F): Begin 55° End_____

Survey Area/Project Area: SDS **Crew:** TDG **Month:** 06 **Day:** 30, **2009** **Visit #** 1

Period: Nestling / Fledgling **Call(s) Used:** Alarm / Wail / Begging **Survey Year:** 1st / 2nd **Nest Search:** Y / N (if yes attach Search Form) **Nest Found:** Y / N (if yes attach Nest Loc. Form)

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: ____________ **Cloud Cover :** 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 =Light Wind (8-12 mph), 5 =Wind (12-15 mph), 6 =Gusty (>15 mph)

Weather Codes (WC): CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow **Weather Intensity (WI):** 1=light, 2=moderate, 3=heavy

Det._ID	ST#	Sta. Time Begin	Sta. Time End	Wind Code	Weather WC	Weather WI	Cloud Cover	Detection Code	Detection Location	#	Sex	Age	Species	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (meters)	Location Town	Location Range	Location Sect	Location ¼	UTMX NAD83-GPS data only	UTMY NAD83-GPS data only
	G52	0724	0731	2	CL	1	1	NC															
	G56	0738	0745	2	CL	1	1																
	G55	0750	0758	2	CL	1	1																
	G54	0806	0813	2	CL	1	1																
✓ 063009-1	G60.5	0819	0827	3	CL	2	1	V	AT	1	U	A	RTHA	0830	0830	270°	100	3N	10E	8	SW	610224	50684[illegible]
	G60	0835	0843	3	CL	2	1	NC															
	G51	0857	0905	2	CL	1	1	NC															

Age: (A)dult, (F)ledgling, (N)estling, (U)nknown **Sex:** (M)ale, (F)emale, (U)nknown **Det. Code:** (A)udio, (V)isual, (B)oth **Det. Location:** (AT) station, (BT) between stations

#= number of goshawks or other raptor observed/detected **Det._ID:** unique detection identifier; date and sequential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format.

Comments:

Survey Time: Start 1145 End 1615

Intensive Nest Search Time: Start – End –

Temperature (°F): Begin 62 End 70

Turnstone Environmental Consultants
Goshawk Survey Form

Page 1 of 1 (including maps)

Survey Area/Project Area: SDS **Crew:** WLB **Month:** 7 **Day:** 9, **2009** **Visit #** 2

Period: Nestling / Fledgling **Call(s) Used:** Alarm / Wail / Begging **Survey Year:** 1st 2nd **Nest Search:** Y / N (if yes attach Search Form) **Nest Found:** Y / N (if yes attach Nest Loc. Form)

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: ______ **Cloud Cover :** 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 = Light Wind (8-12 mph), 5 = Wind (12-15 mph), 6 = Gusty (>15 mph)

Weather Codes (WC): CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow **Weather Intensity (WI):** 1=light, 2=moderate, 3=heavy

Det._ID	ST#	Sta. Time Begin	Sta. Time End	Wind Code	Weather WC	Weather WI	Cloud Cover	Detection Code	Detection Location	#	Sex	Age	Species	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (meters)	Location Town	Location Range	Location Sect	¼	UTMX NAD83-GPS data only	UTMY
	G75	1156	1202	3	PC	2	3	NC															
	G77	1209	1215	3	PC	2	3																
	G78	1223	1229	3	PC	2	3																
	G76	1245	1251	2	PC	1	3																
	G74	1258	1304	2	PC	1	3																
	G83	1315	1321	3	PC	1	3																
	G82	1335	1341	2	PC	1	3																
	G81	1349	1355	3	PC	2	3																
	G84	1413	1419	2	PC	1	3																
	G98	1440	1446	2	PC	1	3																
	G96	1506	1512	2	PC	1	3																
	G80	1525	1531	3	PC	1	3																
	G85	1544	1550	2	PC	1	3																
	G86	1600	1606	2	PC	1	3	NC															

Age: (A)dult, (F)ledgling, (N)estling, (U)nknown **Sex:** (M)ale, (F)emale, (U)nknown **Det. Code:** (A)udio, (V)isual, (B)oth **Det. Location:** (AT) station, (BT) between stations

#= number of goshawks or other raptor observed/detected **Det._ID:** unique detection identifier; date and sequential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format.

Comments:

NC = No Contact

✓

Survey Time: Start 1134 End 1704
Intensive Nest Search Time: Start — End —
Temperature (°F): Begin 61° End 78°
Survey Area/Project Area: SDS

Turnstone Environmental Consultants
Goshawk Survey Form

Crew: J. Votos **Month:** 7 **Day:** 9, **2009** **Visit #** 2

Period: Nestling / Fledgling **Call(s) Used:** Alarm / Wail / Begging **Survey Year:** 1st 2nd **Nest Search:** Y / N (if yes attach Search Form) **Nest Found:** Y / N (if yes attach Nest Loc. Form)

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: ____________ **Cloud Cover :** 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 = Light Wind (8-12 mph), 5 = Wind (12-15 mph), 6 = Gusty (>15 mph)
Weather Codes (WC): CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow **Weather Intensity (WI):** 1=light, 2=moderate, 3=heavy

		Sta. Time		Wind	Weather		Cloud	Detection	Detection	#	Sex	Age		Contact Time		Bearing	Dist	Location				UTMX	UTMY
Det._ID	ST#	Begin	End	Code	WC	WI	Cover	Code	Location				Species	Initial	Final	(Azimuth)	(meters)	Town.	Range	Sect	¼	NAD83-GPS data only	
	G122	1154	1200	4	PC	1	2	NC															
	G140	1220	1227	4	PC	1	2																
	G141	1230	1237	4	PC	1	2																
	G121	1315	1322	4	PC	1	2																
	G125	1330	1337	4	PC	1	2																
	G139	1348	1356	4	PC	2	2																
	G126	1400	1407	4	PC	2	2																
	G127	1414	1421	4	PC	2	2																
	G128	1447	1454	4	PC	2	2																
	G120	1501	1507	4	PC	2	2																
	G129	1514	1521	4	PC	2	2																
	G138	1529	1536	4	PC	2	2																
	G137	1545	1552	4	PC	2	2																
	G136	1555	1602	4	PC	2	2																
	G130	1607	1615	4	PC	2	2																
	G118	1624	1631	4	PC	2	2																
	G119	1639	1646	4	PC	2	2																
	G124	1648	1654	4	PC	2	2																
	G123	1657	1704	4	PC	2	2	NC															

Age: (A)dult, (F)ledgling, (N)estling, (U)nknown **Sex:** (M)ale, (F)emale, (U)nknown **Det. Code:** (A)udio, (V)isual, (B)oth **Det. Location:** (AT) station, (BT) between stations
= number of goshawks or other raptor observed/detected **Det._ID:** unique detection identifier; date and sequential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format.
Comments:

NC = No Contact

Survey Time: Start 0745 End 1415

Intensive Nest Search Time: Start — End —

Temperature (°F): Begin 57 End ____

Turnstone Environmental Consultants

Goshawk Survey Form

Page 1 of 1 (including maps)

Survey Area/Project Area: SDS **Crew:** WLB **Month:** 7 **Day:** 10, 2009 **Visit #** 2

Period: Nestling / Fledgling **Call(s) Used:** Alarm / Wail / Begging **Survey Year:** 1st 2nd **Nest Search:** Y / N (if yes attach Search Form) **Nest Found:** Y / N (if yes attach Nest Loc. Form)

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: ____________ **Cloud Cover :** 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 =Light Wind (8-12 mph), 5 =Wind (12-15 mph), 6 =Gusty (>15 mph)

Weather Codes (WC): CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow **Weather Intensity (WI):** 1=light, 2=moderate, 3=heavy

		Sta. Time		Wind	Weather		Cloud	Detection	Detection	#	Sex	Age		Contact Time		Bearing	Dist	Location				UTMX	UTMY
Det._ID	ST#	Begin	End	Code	WC	WI	Cover	Code	Location				Species	Initial	Final	(Azimuth)	(meters)	Town	Range	Sect	¼	NAD83-GPS data only	
	G95	0802	0808	1	PC	1	3	NC															
	G94	0821	0827	1	PC	1	3																
	G93	0841	0847	1	PC	1	3																
	G92.1	0901	0907	1	PC	1	3																
	G91	0917	0923	1	PC	1	4																
	G90	0942	0948	2	PC	1	4																
	G88	1003	1009	2	PC	1	4																
	G92	1022	1028	2	PC	1	4																
	G87	1041	1047	1	PC	1	4																
	G71	1052	1058	1	PC	1	4																
	G72	1106	1112	1	PC	1	4																
	G79	1118	1124	2	PC	1	2																
	G73	1131	1137	2	PC	1	2																
✓ 071009-1i				2	PC	1	2	V	BT	1	u	u	TUVU	1136	1136	340°	300	3N	10E	8	NE		
	G64.1	1155	1201	2	PC	1	2	NC															
	G64	1208	1214	2	PC	1	2																
	G63	1223	1229	2	PC	1	2																
	G62	1235	1241	2	PC	1	2																
	G61	1251	1257	2	PC	1	2																
	G67	1305	1311	1	PC	1	2																
	G68	1318	1324	2	PC	1	2																
	G69	1329	1335	2	PC	1	2																
	G66	1341	1347	2	PC	1	2																
	G65	1350	1356	2	PC	1	2																
	G70	1359	1405	3	PC	1	2	NC															

Age: (A)dult, (F)ledgling, (N)estling, (U)nknown **Sex:** (M)ale, (F)emale, (U)nknown **Det. Code:** (A)udio, (V)isual, (B)oth **Det. Location:** (AT) station, (BT) between stations

#= number of goshawks or other raptor observed/detected **Det._ID:** unique detection identifier; date and sequential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format.

Comments:

✓ NC = NO Contact

Survey Time: Start 0717 End 1322

Intensive Nest Search Time: Start - End -

Temperature (°F): Begin 57 End 78

Turnstone Environmental Consultants

Goshawk Survey Form

Survey Area/Project Area: SDS WHISTLING RIDGE **Crew:** J. Voros **Month:** 7 **Day:** 10 , **2009** **Visit #** 2

Period: Nestling / Fledgling **Call(s) Used:** Alarm / Wail / Begging **Survey Year:** 1st 2nd **Nest Search:** Y / N (if yes attach Search Form) **Nest Found:** Y / N (if yes attach Nest Loc. Form)

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: ____________ **Cloud Cover :** 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 =Light Wind (8-12 mph), 5 =Wind (12-15 mph), 6 =Gusty (>15 mph)
Weather Codes (WC): CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow **Weather Intensity (WI):** 1=light, 2=moderate, 3=heavy

		Sta. Time		Wind	Weather		Cloud	Detection	Detection					Contact Time		Bearing	Dist	Location				UTMX	UTMY
Det._ID	ST#	Begin	End	Code	WC	WI	Cover	Code	Location	#	Sex	Age	Species	Initial	Final	(Azimuth)	(meters)	Town.	Range	Sect	¼	NAD83-GPS data only	
	G103	0748	0754	1	PC	1	3	NC															
	G105	0803	0810	1	PC	1	3																
	G109	0823	0830	1	PC	1	3																
	G117	0835	0842	1	PC	1	4																
	G110	0845	0852	1	PC	1	4																
	G105.5	0857	0904	1	PC	1	4																
	G102	0913	0920	1	PC	1	4																
	G101	0924	0930	1	PC	1	5																
	G106	0933	0940	1	PC	1	5																
	G111	0945	0952	1	PC	1	6																
	G112	0958	1005	1	PC	1	6																
	G107	1028	1035	1	PC	1	6																
	G100	1041	1047	1	PC	1	6																
	G99.5	1049	1056	1	PC	1	4																
	G99	1102	1109	1	PC	1	4																
	G113	1118	1125	1	PC	1	4																
	G114	1114	1142	1	PC	1	4																
	G133	1154	1201	1	PC	1	4																
	G132	1211	1218	1	PC	1	4																
	G134	1224	1231	1	PC	1	5																
	G135	1240	1247	1	OC	1	6																
	G131	1252	1259	1	OC	1	6																
	G131.1	1303	1310	1	PC	1	5																
	G115	1315	1322	1	PC	1	5																
	G107.5	1336	1344	1	PC	1	5	NC															

Age: (A)dult, (F)ledgling, (N)estling, (U)nknown **Sex:** (M)ale, (F)emale, (U)nknown **Det. Code:** (A)udio, (V)isual, (B)oth **Det. Location:** (AT) station, (BT) between stations
#= number of goshawks or other raptor observed/detected **Det._ID:** unique detection identifier; date and sequential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format.
Comments:

NC = NO CONTACT

Survey Time: Start 1552 End 1962

Intensive Nest Search Time: Start — End ____

Temperature (°F): Begin 84° End 82°

Turnstone Environmental Consultants

Goshawk Survey Form

Survey Area/Project Area: SDS WHISTLING RIDGE **Crew:** J. YOTOS **Month:** 7 **Day:** 15, **2009** **Visit #** 2

Period: Nestling / Fledgling **Call(s) Used:** Alarm / Wail / Begging **Survey Year:** 1st 2nd **Nest Search:** Y / N (if yes attach Search Form) **Nest Found:** Y / N (if yes attach Nest Loc. Form)

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: ____________ **Cloud Cover:** 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 = Light Wind (8-12 mph), 5 = Wind (12-15 mph), 6 = Gusty (>15 mph)

Weather Codes (WC): CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow **Weather Intensity (WI):** 1=light, 2=moderate, 3=heavy

Det._ID	ST#	Sta. Time Begin	Sta. Time End	Wind Code	Weather WC	Weather WI	Cloud Cover	Detection Code	Detection Location	#	Sex	Age	Species	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (meters)	Location Town.	Location Range	Location Sect	Location ¼	UTMX (NAD83-GPS data only)	UTMY (NAD83-GPS data only)
	G22	1552	1559	1	CL	1	1	NC															
	G226	1603	1610	1	CL	1	1																
	G23	1628	1635	1	CL	1	1																
	G21	1644	1651	1	CL	1	1																
	G24	1658	1704	1	CL	1	1																
	G25	1714	1721	1	CL	1	1																
	G58	1733	1740	1	CL	1	1																
	G59	1745	1752	1	CL	1	1																
	G57	1802	1809	1	CL	3	1																
	G56	1818	1825	1	CL	2	1																
	G55	1830	1837	1	CL	3	1																
	G54	1853	1900	1	CL	3	1																
	G38	1902	1909	1	CL	3	1	NC															

Age: (A)dult, (F)ledgling, (N)estling, (U)nknown **Sex:** (M)ale, (F)emale, (U)nknown **Det. Code:** (A)udio, (V)isual, (B)oth **Det. Location:** (AT) station, (BT) between stations

#= number of goshawks or other raptor observed/detected **Det._ID:** unique detection identifier; date and sequential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format.

Comments:

✓ NC = No Contact

Survey Time: Start 1545 End 1930

Intensive Nest Search Time: Start — End —

Temperature (°F): Begin 84 End 78

Turnstone Environmental Consultants
Goshawk Survey Form

Page 1 of 1 (including maps)

Survey Area/Project Area: SDS **Crew:** WLB **Month:** 7 **Day:** 15, **2009** **Visit #** 2

Period: Nestling / Fledgling **Call(s) Used:** Alarm / Wail / Begging **Survey Year:** 1st 2nd **Nest Search:** Y / N (if yes attach Search Form) **Nest Found:** Y / N (if yes attach Nest Loc. Form)

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: ______ **Cloud Cover :** 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 = Light Wind (8-12 mph), 5 = Wind (12-15 mph), 6 = Gusty (>15 mph)

Weather Codes (WC): CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow **Weather Intensity (WI):** 1=light, 2=moderate, 3=heavy

Det._ID	ST#	Sta. Time Begin	Sta. Time End	Wind Code	Weather WC	Weather WI	Cloud Cover	Detection Code	Detection Location	#	Sex	Age	Species	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (meters)	Location Town	Location Range	Location Sect	¼	UTMX NAD83-GPS data only	UTMY
	G54	1557	1603	2	CL	1	1	NL															
	G60.5	1614	1620	3	CL	2	1																
	G60	1626	1632	2	CL	1	1																
	G53	1641	1647	2	CL	2	1																
	G52	1654	1700	2	CL	2	1																
	G51	1710	1706	1	CL	1	1																
	G50	1725	1731	2	CL	1	1																
	G48	1739	1745	3	CL	1	1	NL															
071509-1i				3	CL	1	1	V		2	u	u	TUVU	1740	1741	174	100	3N	10E	8	SW	10T 0609457	5067966
	G47	1752	1758	1	CL	1	1	NL															
	G46	1806	1812	3	CL	1	1	NL															
071509-2i				3	CL	1	1	V		1	A	u	TUVU	1807	1808	300	200	3N	10E	8	SW	10T 0609409	5068351
	G44	1820	1826	3	CL	1	1	NL															
	G43	1834	1840	2	CL	1	1																
	G36	1900	1906	2	CL	1	1																
	G35	1910	1916	2	CL	1	1	NC															

Age: (A)dult, (F)ledgling, (N)estling, (U)nknown **Sex:** (M)ale, (F)emale, (U)nknown **Det. Code:** (A)udio, (V)isual, (B)oth **Det. Location:** (AT) station, (BT) between stations
#= number of goshawks or other raptor observed/detected **Det._ID:** unique detection identifier; date and sequential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format.
Comments:

NL = No Contact

Survey Time: Start 0841 End 1252

Intensive Nest Search Time: Start – End –

Temperature (°F): Begin 68° End 91°

Turnstone Environmental Consultants

Goshawk Survey Form

Page 1 of 1 (including maps)

Survey Area/Project Area: SDS Whistling Ridge **Crew:** J. Votos **Month:** 7 **Day:** 16, 2009 **Visit #** 2

Period: Nestling / Fledgling **Call(s) Used:** Alarm / Wail / Begging **Survey Year:** 1st 2nd **Nest Search:** Y / N (if yes attach Search Form) **Nest Found:** Y / N (if yes attach Nest Loc. Form)

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: ____________ **Cloud Cover :** 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 =Light Wind (8-12 mph), 5 =Wind (12-15 mph), 6 =Gusty (>15 mph)
Weather Codes (WC): CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow **Weather Intensity (WI):** 1=light, 2=moderate, 3=heavy

		Sta. Time		Wind	Weather		Cloud	Detection	Detection	#	Sex	Age		Contact Time		Bearing	Dist	Location				UTMX	UTMY
Det._ID	ST#	Begin	End	Code	WC	WI	Cover	Code	Location				Species	Initial	Final	(Azimuth)	(meters)	Town.	Range	Sect	¼	NAD83-GPS data only	
	G20	0841	0848	1	CL	1	1	NC															
	G19	0854	0901	1	CL	1	1																
	G18	0912	0919	1	CL	1	1																
	G12	0940	0947	1	CL	1	1																
	G11	0954	1001	1	CL	1	1																
	G8	1010	1017	1	CL	1	1																
	G9	1024	1031	1	CL	1	1																
	G10	1040	1050	1	CL	1	1																
	G9.5	1058	1105	1	CL	1	1																
	G13	1121	1128	1	CL	1	1																
	G17	1137	1144	1	CL	1	1																
	G14	1158	1205	1	CL	1	1																
	G14.5	1212	1219	1	CL	1	1																
	G15	1221	1228	1	CL	1	1																
	G15.5	1231	1238	1	CL	1	1																
	G16	1245	1252	1	CL	1	1	NC															

Age: (A)dult, (F)ledgling, (N)estling, (U)nknown **Sex:** (M)ale, (F)emale, (U)nknown **Det. Code:** (A)udio, (V)isual, (B)oth **Det. Location:** (AT) station, (BT) between stations
#= number of goshawks or other raptor observed/detected **Det._ID:** unique detection identifier; date and sequential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format.
Comments:

NC = No Contact

Survey Time: Start 0845 End 1330

Intensive Nest Search Time: Start — End —

Temperature (°F): Begin 63° End 80°

Turnstone Environmental Consultants
Goshawk Survey Form

Survey Area/Project Area: SDS **Crew:** WLB **Month:** 7 **Day:** 16, **2009** **Visit #** 2

Period: Nestling / Fledgling **Call(s) Used:** Alarm / Wail / Begging **Survey Year:** 1st 2nd **Nest Search:** Y / N (if yes attach Search Form) **Nest Found:** Y / N (if yes attach Nest Loc. Form)

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: ____ **Cloud Cover :** 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 = Light Wind (8-12 mph), 5 = Wind (12-15 mph), 6 = Gusty (>15 mph)

Weather Codes (WC): CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow **Weather Intensity (WI):** 1=light, 2=moderate, 3=heavy

Det._ID	ST#	Sta. Time Begin	Sta. Time End	Wind Code	Weather WC	Weather WI	Cloud Cover	Detection Code	Detection Location	#	Sex	Age	Species	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (meters)	Location Town	Location Range	Location Sect	¼	UTMX	UTMY NAD83-GPS data only
	G32	0850	0856	2	CL	1	1	NC															
	G31	0911	0917	1	CL	1	1																
	G31.1	0929	0935	1	CL	1	1																
	G30	0948	0954	1	CL	1	1																
	G29	1008	1014	1	CL	1	1																
	G27	1022	1028	1	CL	1	1																
	G26	1036	1042	1	CL	1	1																
	G1	1103	1109	1	CL	1	1																
	G2	1112	1118	1	CL	1	1																
	G3	1122	1128	2	CL	1	1																
	G5	1133	1139	1	CL	1	1																
	G4	1150	1156	1	CL	1	1																
	G6	1209	1215	1	CL	1	1																
	G7	1223	1229	1	CL	1	1																
	G28	1309	1315	2	CL	1	1	NC															

Age: (A)dult, (F)ledgling, (N)estling, (U)nknown **Sex:** (M)ale, (F)emale, (U)nknown **Det. Code:** (A)udio, (V)isual, (B)oth **Det. Location:** (AT) station, (BT) between stations

#= number of goshawks or other raptor observed/detected **Det._ID:** unique detection identifier, date and sequential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format.

Comments:

NC = No Contact

Survey Time: Start 1000 End 2050

Turnstone Environmental Consultants

Goshawk Survey Form

Intensive Nest Search Time: Start — End —

Temperature (°F): Begin UNK. End UNK.

Survey Area/Project Area: Whistling RIDGE **Crew:** J. UHOS / W. BEARD D. SAHL / T. GILLEN **Month:** 06 **Day:** 30, **2009** **Visit #** 1

Period: Nestling / Fledgling **Call(s) Used:** Alarm / Wail / Begging **Survey Year:** 1st 2nd **Nest Search:** Y / N (if yes attach Search Form) **Nest Found:** Y / N (if yes attach Nest Loc. Form)

Survey Method: Broadcast Acoustical, Intensive Search or Dawn Acoustical, Other: ______ **Cloud Cover :** 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 = Light Wind (8-12 mph), 5 = Wind (12-15 mph), 6 = Gusty (>15 mph)

Weather Codes (WC): CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow **Weather Intensity (WI):** 1=light, 2=moderate, 3=heavy

Det_ID	ST#	Sta. Time Begin	Sta. Time End	Wind Code	Weather WC	Weather WI	Cloud Cover	Detection Code	Detection Location	#	Sex	Age	Species	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (meters)	Location Town	Location Range	Location Sect	¼	UTMX NAD83-GPS data only	UTMY
	A1	1000	1046	3	CL	/	1	NC															
	B1	1000	1046	3	CL	/	1																
	C1	1000	1046	3	CL	/	1																
	A2	1056	1138	2	CL	/	1																
	B2	1056	1138	2	CL	/	1																
NO	C3	T-SECT																					
*	A3	1146	1242	3	PC	/	2																
*	B3	1146	1242	3	PC	/	2																
*	C3	1146	1242	3	PC	/	2																
	A4	1250	1321	3	PC	/	2																
	B4	1250	1321	3	PC	/	2																
	C4	1250	1321	3	PC	/	2																
	A5	1350	1417	3	PC	/	2																
	B5	1350	1417	3	PC	/	2																
	C5	1350	1417	3	PC	/	2																
*	A6	1423	1458	2	PC	/	2																
*	B6	1423	1458	2	PC	/	2																
*	C6	1423	1458	2	PC	/	2																
	A7	1510	1520	2	PC	/	2																
	B7	1510	1520	2	PC	/	2																
	C7	1510	1520	2	PC	/	2																
	A8	1526	1537	3	PC	/	2																
	B8	1526	1537	3	PC	/	2																
	C8	1526	1537	3	PC	/	2																
*	A9	1545	1602	3	PC	/	2	NC															

Age: (A)dult, (F)ledgling, (N)estling, (U)nknown Sex: (M)ale, (F)emale, (U)nknown Det. Code: (A)udio, (V)isual, (B)oth Det. Location: (AT) station, (BT) between stations

#= number of goshawks or other raptor observed/detected Det._ID: unique detection identifier; date and sequential det # for the day, (061208-1, 061208-2, ect) Time: Military format.

Comments:

* = All 3 OBSERVERS Broadcast Calls on transect

NC = NO contact

Survey Time: Start 1000 End 2050

Turnstone Environmental Consultants

Goshawk Survey Form

Intensive Nest Search Time: Start — End —

Temperature (°F): Begin UNK. End UNK.

Survey Area/Project Area: Whistling RIDGE Crew: J.Woods / W. BEARD D. SAHL / T. GILLED Month: 06 Day: 30, 2009 Visit # 1

Period: Nestling / Fledgling Call(s) Used: Alarm / Wail / Begging Survey Year: 1st 2nd Nest Search: Y N (if yes attach Search Form) Nest Found: Y N (if yes attach Nest Loc. Form)

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: ______ Cloud Cover : 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 =Light Wind (8-12 mph), 5 =Wind (12-15 mph), 6 =Gusty (>15 mph)
Weather Codes (WC): CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow Weather Intensity (WI): 1=light, 2=moderate, 3=heavy

Det._ID	ST#	Sta. Time Begin	Sta. Time End	Wind Code	Weather WC	Weather WI	Cloud Cover	Detection Code	Detection Location	#	Sex	Age	Species	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (meters)	Location Town	Location Range	Location Sect	Location ¼	UTMX NAD83-GPS data only	UTMY
*	B9	1545	1602	3	PC	/	2	NC															
*	C9	1545	1602	3	PC	/	2																
	A10	1623	1715	3	PC	/	2																
	B10	1623	1715	3	PC	/	2																
	C10	1623	1715	3	PC	/	2																
	A11	1721	1806	3	PC	/	2																
	B11	1721	1806	3	PC	/	2																
	C11	1721	1806	3	PC	/	2																
*	A53	1849	2009	2	PC	/	2																
*	B53	1849	2009	2	PC	/	2																
*	C53	1849	2009	2	PC	/	2																
	A54	2012	2023	2	PC	/	2																
	B54	2012	2023	2	PC	/	2																
	C54	2012	2023	2	PC	/	2																
	A55	2030	2041	2	PC	/	2																
	B55	2030	2041	2	PC	/	2																
	C55	2030	2041	2	PC	/	2	NC															

Age: (A)dult, (F)ledgling, (N)estling, (U)nknown Sex: (M)ale, (F)emale, (U)nknown Det. Code: (A)udio, (V)isual, (B)oth Det. Location: (AT) station, (BT) between stations
#= number of goshawks or other raptor observed/detected Det._ID: unique detection identifier; date and sequential det. # for the day, (061208-1, 061208-2, ect) Time: Military format.

Comments: * = All 3 observers Broadcast Calls NC = NO contact
Wild TURKEY observed on B54 T-SECT

Survey Time: Start 0755 End 1635

Turnstone Environmental Consultants
Goshawk Survey Form

Intensive Nest Search Time: Start — End —

Temperature (°F): Begin 62 End 80

Survey Area/Project Area: WHISTLING RIDGE Crew: T. Gillen, J. Votos, W. Beard Month: 07 Day: 01, 2009 Visit # 1

Period: Nestling / Fledgling Call(s) Used: ~~Alarm / Wail~~ / Begging Survey Year: 1st 2nd Nest Search: Y / N (if yes attach Search Form) Nest Found: Y / N (if yes attach Nest Loc. Form)

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: ____________ Cloud Cover : 1 = <5%, 2 = 5-20%; 3 = 21-40%; 4 = 41-60%, 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 =Light Wind (8-12 mph), 5 =Wind (12-15 mph), 6 =Gusty (>15 mph)

Weather Codes (WC): CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow Weather Intensity (WI): 1=light, 2=moderate, 3=heavy

		Sta. Time		Wind	Weather		Cloud	Detection	Detection	#	Sex	Age		Contact Time		Bearing	Dist	Location				UTMX	UTMY
Det._ID	ST#	Begin	End	Code	WC	WI	Cover	Code	Location				Species	Initial	Final	(Azimuth)	(meters)	Town	Range	Sect	¼	NAD83-GPS data only	
*	A12	0755	0852	1	CL	/	1	NL															
*	B12	↓	↓	1	CL	/	1																
*	C12	↓	↓	1	CL	/	1																
	A13	0855	0941	1	CL	/	1																
	B13	↓	↓	1	CL	/	1																
	C13	↓	↓	1	CL	/	1																
	A14	0956	1102	1	CL	/	1																
	B14	↓	↓	1	CL	/	1																
	C14	↓	↓	1	CL	/	1																
*	A15	1118	1214	1	CL	/	1																
*	B15	↓	↓	1	CL	/	1																
*	C15	↓	↓	1	CL	/	1																
	A16	1241	1324	2	CL	/	1																
	B16	↓	↓	2	CL	/	1																
	C16	↓	↓	2	CL	/	1																
	A17	1345	1436	1	CL	/	1																
	B17	↓	↓	1	CL	/	1																
	C17	↓	↓	1	CL	/	1																
*	A18	1438	1459	1	CL	/	1																
*	B18	↓	↓	1	CL	/	1																
*	C18	↓	↓	1	CL	/	1																
	A19	1502	1512	1	CL	/	1																
	B19	↓	↓	1	CL	/	1																
	C19	↓	↓	1	CL	/	1	↓															
	A20	1516	1530	1	CL	/	1	NL															

Age: (A)dult, (F)ledgling, (N)estling, (U)nknown Sex: (M)ale, (F)emale, (U)nknown Det. Code: (A)udio, (V)isual, (B)oth Det. Location: (AT) station, (BT) between stations
#= number of goshawks or other raptor observed/detected Det._ID: unique detection identifier, date and sequential det. # for the day. (061208-1, 061208-2, ect) Time: Military format.

Comments: * = All 3 OBSERVERS Broad cast calls NL = NO contact

Survey Time: Start 0735 End 1635

Turnstone Environmental Consultants

Goshawk Survey Form

Intensive Nest Search Time: Start — End —

Temperature (°F): Begin 62 End 90

Survey Area/Project Area: Whistling RIDGE Crew: T. Gillen, J. Oates, W. Beard Month: 07 Day: 01, 2009 Visit # 1

Period: Nestling / Fledgling Call(s) Used: Alarm / Wail / Begging Survey Year: 1st 2nd Nest Search: Y / N (if yes attach Search Form) Nest Found: Y / N (if yes attach Nest Loc. Form)

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other ______ Cloud Cover : 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%, 5 = 61-80%, 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 = Light Wind (8-12 mph), 5 = Wind (12-15 mph), 6 = Gusty (>15 mph)

Weather Codes (WC): CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow Weather Intensity (WI): 1=light, 2=moderate, 3=heavy

Det_ID	ST#	Sta. Time Begin	Sta. Time End	Wind Code	Weather WC	Weather WI	Cloud Cover	Detection Code	Detection Location	#	Sex	Age	Species	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (meters)	Location Town	Location Range	Location Sect	¼	UTMX NAD83-GPS data only	UTMY
	B20	1516	1530	1	CL	/	1	NC															
	C20	↓	↓	1	CL	/	1	↓															
*	A21	1534	1544	1	CL	/	1	↓															
*	B21	↓	↓	1	CL	/	1	↓															
*	C21	↓	↓	1	CL	/	1	↓															
	A22	1549	1600	1	CL	/	1	↓															
	B22	↓	↓	1	CL	/	1	NC															

Age: (A)dult, (F)ledgling, (N)estling, (U)nknown Sex: (M)ale, (F)emale, (U)nknown Det. Code: (A)udio, (V)isual, (B)oth Det. Location: (AT) station, (BT) between stations

#= number of goshawks or other raptor observed/detected Det._ID: unique detection identifier; date and sequential det # for the day, (061208-1, 061208-2, ect) Time: Military format.

Comments: * = All 3 observers Broadcast calls at Intervals

NC = No Contact

Survey Time: Start 0915 End 1820

Intensive Nest Search Time: Start — End —

Temperature (°F): Begin 59 End 69

Survey Area/Project Area: Whistling Ridge

Turnstone Environmental Consultants

Goshawk Survey Form

Crew: D. Sahl, W. Beard, J. Votos Month: 07 Day: 13, 2009 Visit # 1

Period: Nestling / Fledgling Call(s) Used: Alarm / Wail / Begging Survey Year: 1st 2nd Nest Search: Y / N (if yes attach Search Form) Nest Found: Y / N (if yes attach Nest Loc. Form)

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: ______ Cloud Cover: 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%, 5 = 61-80%, 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 = Light Wind (8-12 mph), 5 = Wind (12-15 mph), 6 = Gusty (>15 mph)

Weather Codes (WC): CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow Weather Intensity (WI): 1=light, 2=moderate, 3=heavy

Det._ID	ST#	Sta. Time Begin	Sta. Time End	Wind Code	Weather WC	Weather WI	Cloud Cover	Detection Code	Detection Location	#	Sex	Age	Species	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (meters)	Location Town	Location Range	Location Sect	Location ¼	UTMX NAD83-GPS data only	UTMY NAD83-GPS data only
*	A23	0935	0949	3	DR	1	4	NC															
*	B23	↓	↓	3	DR	1	4	↓															
*	C23	↓	↓	3	DR	1	4	↓															
	A23-1	0949	1010	3	DR	1	4	↓															
	B23-1	↓	↓	3	DR	1	4	↓															
	C23-1	↓	↓	3	DR	1	4	↓															
	A23-2	1016	1039	3	DR	1	4	↓															
	B23-2	↓	↓	3	DR	1	4	↓															
	C23-2	↓	↓	3	DR	1	4	↓															
*	A23-3	1041	1056	3	DR	1	4	↓															
*	B23-3	↓	↓	3	DR	1	4	↓															
*	C23-3	↓	↓	3	DR	1	4	↓															
	A24-4	1101	1114	3	DR	1	4	↓															
	B24-4	↓	↓	3	DR	1	4	↓															
	C24-4	↓	↓	3	DR	1	4	↓															
	A24-3	1115	1130	3	DR	1	3	↓															
	B24-3	↓	↓	3	DR	1	3	↓															
	C24-3	↓	↓	3	DR	1	3	↓															
*	A24-2	1131	1145	3	DR	1	3	↓															
*	B24-2	↓	↓	3	DR	1	3	↓															
*	C24-2	↓	↓	3	DR	1	3	↓															
*	A24-1	1146	1300	3	DR	2	5	↓															
*	B24-1	↓	↓	3	DR	2	5	↓															
071309-1 *	C24-1	↓	↓	3	DR	2	5	V	BT	1	U	A	STVA	1154	1155	097	15	4N	10E	32	SW	609743	5071371
	A25	1310	1355	3	OC	/	6	NC															

Age: (A)dult, (F)ledgling, (N)estling, (U)nknown Sex: (M)ale, (F)emale, (U)nknown Det. Code: (A)udio, (V)isual, (B)oth Det. Location: (AT) station, (BT) between stations

#= number of goshawks or other raptor observed/detected Det._ID: unique detection identifier; date and sequential det. # for the day, (061208-1, 061208-2, ect) Time: Military format.

Comments:

* All 3 observers broadcast calls @ intervals

C24-1 = very skittish Barred owl observed flying through stand, would only perch briefly before flying off when observers approached. Broadcast STOC calls in case there was another Strix in the stand. There was no [illegible] to the STOC calls or additional observations of of the original STVA. NC = No Contact

Survey Time: Start 0915 End 1820

Turnstone Environmental Consultants

Goshawk Survey Form

Intensive Nest Search Time: Start_____ End_____

Temperature (°F): Begin 59 End 69

Survey Area/Project Area: Whistling Ridge **Crew:** P. SAHL, W. BEARD, J. VOKS **Month:** 07 **Day:** 13, **2009** **Visit #** 1

Period: Nestling / Fledgling **Call(s) Used:** Alarm / Wail / Begging **Survey Year:** 1st 2nd **Nest Search:** Y / N (if yes attach Search Form) **Nest Found:** Y / N (if yes attach Nest Loc. Form)

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: ___________ **Cloud Cover :** 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 =Light Wind (8-12 mph), 5 =Wind (12-15 mph), 6 =Gusty (>15 mph)
Weather Codes (WC): CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow **Weather Intensity (WI):** 1=light, 2=moderate, 3=heavy

Det._ID	ST#	Sta. Time Begin	Sta. Time End	Wind Code	Weather WC	Weather WI	Cloud Cover	Detection Code	Detection Location	#	Sex	Age	Species	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (meters)	Location Town	Location Range	Location Sect	¼	UTMX NAD83-GPS data only	UTMY
	B25	1310	1355	3	OC	/	6	NC															
	C25	↓	↓	3	OC	/	6																
*	A25-1	1400	1410	3	OC	/	6																
*	B25-1	↓	↓	3	OC	/	6																
*	C25-1	↓	↓	3	OC	/	6																
	A25-2	1411	1444	3	OC	/	6																
	B25-2	↓	↓	3	OC	/	6																
	C25-2	↓	↓	3	OC	/	6																
	A25-3	1446	1510	3	OC	/	6																
	B25-3	↓	↓	3	OC	/	6																
	C25-3	↓	↓	3	OC	/	6																
*	A26-2	1512	1524	3	OC	/	4																
*	B26-3	↓	↓	3	OC	/	4																
*	C26-2	↓	↓	3	OC	/	4																
	A26-1	1527	1600	3	OC	/	4																
	B26-2	↓	↓	3	OC	/	4																
	C26-2	↓	↓	3	OC	/	4																
	A27	1601	1643	3	OC	/	4																
	B27	↓	↓	3	OC	/	4																
	C27	↓	↓	3	OC	/	4																
*	A27-1	1649	1719	3	OC	/	4																
*	B27-1	↓	↓	3	OC	/	4																
*	C27-1	↓	↓	3	OC	/	4																
TO END *	A28-1	1729	1748	3	OC	/	4	↓															
TO END *	B28-1	1731	1741	3	OC	/	4	NC															

Age: **(A)**dult, **(F)**ledgling, **(N)**estling, **(U)**nknown **Sex:** **(M)**ale, **(F)**emale, **(U)**nknown **Det. Code:** **(A)**udio, **(V)**isual, **(B)**oth **Det. Location:** **(AT)** station, **(BT)** between stations
#= number of goshawks or other raptor observed/detected **Det._ID:** unique detection identifier, date and sequential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format.

Comments:

* ALL 3 OBSERVERS Broadcast Calls @ intervals NC= NO Contact

Survey Time: Start 0950 End 1400

Turnstone Environmental Consultants

Goshawk Survey Form

Intensive Nest Search Time: Start — End —

Temperature (°F): Begin 62 End 77

Survey Area/Project Area: Whistling Ridge **Crew:** P.Stahl / W.Beard / Fotos **Month:** 07 **Day:** 14, 2009 **Visit #** 1

Period: Nestling / Fledgling **Call(s) Used:** Alarm / Wail / Begging **Survey Year:** 1st 2nd **Nest Search:** Y N (If yes attach Search Form) **Nest Found:** Y N (If yes attach Nest Loc. Form)

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: ________ **Cloud Cover :** 1 = <5%, 2 = 5-20%; 3 = 21-40%; 4 = 41-60%, 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 = Light Wind (8-12 mph), 5 = Wind (12-15 mph), 6 = Gusty (>15 mph)
Weather Codes (WC): CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow **Weather Intensity (WI):** 1=light, 2=moderate, 3=heavy

Det_ID	ST#	Sta. Time Begin	Sta. Time End	Wind Code	Weather WC	Weather WI	Cloud Cover	Detection Code	Detection Location	#	Sex	Age	Species	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (meters)	Location Town	Location Range	Location Sect	¼	UTMX NAD83-GPS data only	UTMY NAD83-GPS data only
	A29	0925	0948	1	CL	-	1	NC															
	B29	↓	↓	1	CL	-	1																
	C29	↓	↓	1	CL	-	1																
	A30	0952	1015	1	CL	-	1																
	B30	↓	↓	1	CL	-	1																
	C30	↓	↓	1	CL	-	1																
*	A31-1	1018	1100	1	CL	-	1																
*	B31-1	↓	↓	1	CL	-	1																
*	C31-1	↓	↓	1	CL	-	1																
	A32	1110	1138	1	CL	-	1																
	B32	↓	↓	1	CL	-	1																
	C32	↓	↓	1	CL	-	1																
	A32-1	1140	1245	1	CL	-	1																
	B32-1	↓	↓	1	CL	-	1																
	C32-1	↓	↓	1	CL	-	1																
*	A38-1	1330	1400	1	CL	-	1																
*	B38-1			1	CL	-	1																
*	C38-1			1	CL	-	1		NO Habitat														
	A39-1			1	CL	-	1																
	B39-1			1	CL	-	1																
	C39-1	↓	↓	1	CL	-	1																
	A41-1	1410	1427	1	CL	-	1																
	B41-1	↓	↓	1	CL	-	1																
	C41-1	↓	↓	1	CL	-	1	↓															
*	A36-1	1439		2	CL	-	1	NC															

Age: (A)dult, (F)ledgling, (N)estling, (U)nknown **Sex:** (M)ale, (F)emale, (U)nknown **Det. Code:** (A)udio, (V)isual, (B)oth **Det. Location:** (AT) station, (BT) between stations
#= number of goshawks or other raptor observed/detected **Det._ID:** unique detection identifier; date and sequential det # for the day, (061208-1, 061208-2, ect) **Time:** Military format.

Comments: 29-34 = Good NOGO Habitat * = All 3 observers Broadcast Calls. Tsects
38-1 → 39-1 : AREA has little to NO Potential NOGO Habitat, Drop Area (~5 Acres) for round 2 and adjust the #41 tsect,
NC = NO Contact

Survey Time: Start 0950 End 1900

Turnstone Environmental Consultants

Goshawk Survey Form

Intensive Nest Search Time: Start — End —

Temperature (*F): Begin 62 End 77

Survey Area/Project Area: Whistling Ridge **Crew:** R.Sohl/W.Beard/J.Watts **Month:** 07 **Day:** 14, **2009** **Visit #** 1

Period: Nestling / Fledgling **Call(s) Used:** Alarm / Wail / Begging **Survey Year:** 1st 2nd **Nest Search:** Y/N (if yes attach Search Form) **Nest Found:** Y/N (if yes attach Nest Loc. Form)

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: ______ **Cloud Cover :** 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 =Light Wind (8-12 mph), 5 =Wind (12-15 mph), 6 =Gusty (>15 mph)

Weather Codes (WC): CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow **Weather Intensity (WI):** 1=light, 2=moderate, 3=heavy

		Sta. Time		Wind	Weather		Cloud	Detection	Detection	#	Sex	Age		Contact Time		Bearing	Dist	Location				UTMX	UTMY
Det_ID	ST#	Begin	End	Code	WC	WI	Cover	Code	Location				Species	Initial	Final	(Azimuth)	(meters)	Town	Range	Sect	¼	NAD83-GPS data only	
*	B36-1	1439	1540	2	CL	/	1	NC															
*	C36-1	↓	↓	2	CL	/	1																
	A33	1550	1614	3	CL	/	1																
	B33	↓	↓	3	CL	/	1																
	C33	↓	↓	3	CL	/	1																
*	A34	1615	1625	3	CL	/	1																
*	B34	↓	↓	3	CL	/	1																
*	C34	↓	↓	3	CL	/	1																
	A35	1645	1716	3	CL	–	1																
	B35	↓	↓	3	CL	/	1	↓															
	C35	↓	↓	3	CL	/	1	NC															

Age: (A)dult, (F)ledgling, (N)estling, (U)nknown **Sex:** (M)ale, (F)emale, (U)nknown **Det. Code:** (A)udio, (V)isual, (B)oth **Det. Location:** (AT) station, (BT) between stations

#= number of goshawks or other raptor observed/detected **Det._ID:** unique detection identifier; date and sequential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format

Comments: * = All 3 observers Broadcast Calls @ Intervals

Beware of Cliffs South of C36-1 AREA.

NC = No Contact

Survey Time: Start 0845 End ____

Intensive Nest Search Time: Start — End —

Temperature (°F): Begin 72 End 90

Turnstone Environmental Consultants

Goshawk Survey Form

Page 1 of 1 (including maps)

Survey Area/Project Area: Whistling Ridge Crew: D.Sch/W.Beard/J.Votos Month: 07 Day: 15, 2009 Visit # 1

Period: Nestling / Fledgling Call(s) Used: Alarm / Wail / Begging Survey Year: 1st 2nd Nest Search: Y / N (if yes attach Search Form) Nest Found: Y / N (if yes attach Nest Loc. Form)

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: ____ Cloud Cover : 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 = Light Wind (8-12 mph), 5 = Wind (12-15 mph), 6 = Gusty (>15 mph)

Weather Codes (WC): CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow Weather Intensity (WI): 1=light, 2=moderate, 3=heavy

Det._ID	ST#	Sta. Time Begin	Sta. Time End	Wind Code	Weather WC	Weather WI	Cloud Cover	Detection Code	Detection Location	#	Sex	Age	Species	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (meters)	Location Town	Location Range	Location Sect	Location ¼	UTMX NAD83-GPS data only	UTMY NAD83-GPS data only
	A43	0915	0938	1	CL	/	1	NC															
	B43	↓	↓	1	CL	/	1																
	C43	↓	↓	1	CL	/	1																
*	A45-1	0941	1021	1	CL	/	1																
*	B45-1	↓	↓	1	CL	/	1																
*	C45-1	↓	↓	1	CL	/	1																
	A46	1025	1110	1	CL	/	1																
	B46	↓	↓	1	CL	/	1																
	C46	↓	↓	1	CL	/	1																
	A47-1	1115	1200	1	CL	/	1																
	B47-1	↓	↓	1	CL	/	1																
	C47-1	↓	↓	1	CL	/	1	↓															
*	A48	1210	1250	1	CL	/	1	NC															
071509-1 *	B48	↓	↓	1	CL	/	1	A	BT	U	U	A	SSHA	1238	1239	87°	100	3N	9E	1	NE	0608030	5070108
*	C48	↓	↓	1	CL	/	1	NC															
	A49-1	1300	1336	1	CL	/	1																
	B49-1	↓	↓	1	CL	/	1																
	C49-1	↓	↓	1	CL	/	1																
*	A52	1342	1407	1	CL	/	1																
*	B52	↓	↓	1	CL	/	1																
	B42	1435	1453	1	CL	/	1	↓															
	B42	↓	↓	1	CL	/	1	NC															

Age: (A)dult, (F)ledgling, (N)estling, (U)nknown Sex: (M)ale, (F)emale, (U)nknown Det. Code: (A)udio, (V)isual, (B)oth Det. Location: (AT) station, (BT) between stations

#= number of goshawks or other raptor observed/detected Det._ID: unique detection identifier; date and sequential det. # for the day, (061208-1, 061208-2, ect) Time: Military format.

Comments: * = All 3 observers Broadcast Calls @ intervals

Note: Area East (upslope) of the A/B 52 Tsects is not NOGO Habitat. Area is predominantly shrubby non-conifer until it intersects with area covered by the Broadcast Acoustic Survey effort. NC = No Contact

Survey Time: Start 0920 End 1452

Intensive Nest Search Time: Start — End —

Temperature (°F): Begin 62 End 74

Turnstone Environmental Consultants

Goshawk Survey Form

Page 1 of 2 (including maps)

Survey Area/Project Area: Whistling RIDGE **Crew:** D.Sohl / W. BEARD / J.Otos **Month:** 07 **Day:** 23, 2009 **Visit #** 2

Period: Nestling / Fledgling **Call(s) Used:** Alarm / Wail / Begging **Survey Year:** 1st 2nd **Nest Search:** Y / N (if yes attach Search Form) **Nest Found:** Y / N (if yes attach Nest Loc. Form)

Survey Method: Broadcast Acoustical Intensive Search or Dawn Acoustical, Other: ____________ **Cloud Cover :** 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 =Light Wind (8-12 mph), 5 =Wind (12-15 mph), 6 =Gusty (>15 mph)

Weather Codes (WC): CL = Clear, **FG** = Fog, **PC** = Partly Cloudy, **OC** = Overcast, **DR** = Drizzle, **RN** = Rain, **SN** = Snow **Weather Intensity (WI): 1**=light, **2**=moderate, **3**=heavy

Det._ID	ST#	Sta. Time Begin	Sta. Time End	Wind Code	Weather WC	Weather WI	Cloud Cover	Detection Code	Detection Location	#	Sex	Age	Species	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (meters)	Location Town	Location Range	Location Sect	¼	UTMX NAD83-GPS data only	UTMY
	A1	1000	1028	3	PC	/	2	NC															
	B1	↓	↓	3	PC	/	2																
	C1	↓	↓	3	PC	/	2																
	A1-2	1035	1054	3	PC	/	2																
	B1-2	↓	↓	3	PC	/	2																
*	A3	1057	1133	3	PC	/	2																
*	B3	↓	↓	3	PC	/	2																
*	C3	↓	↓	3	PC	/	2																
	A4-1	1201	1236	3	PC	/	2																
	B4-1	↓	↓	3	PC	/	2																
	C4-1	↓	↓	3	PC	/	2																
	A5	1241	1305	3	PC	/	2																
	B5	↓	↓	3	PC	/	2																
	C5	↓	↓	3	PC	/	2																
*	A6-1	1310	1334	3	PC	/	2																
*	B6-1	↓	↓	3	PC	/	2																
*	C6-1	↓	↓	3	PC	/	2																
	A7	1334	1352	3-4	PC	/	2																
	B7	↓	↓	3-4	PC	/	2																
	C7	↓	↓	3-4	PC	/	2																
	A8-1	1355	1412	3-4	PC	/	2																
	B8-1	↓	↓	3-4	PC	/	2																
	C8-1	↓	↓	3-4	PC	/	2																
*	A9	1417	1452	2	PC	/	2	↓															
*	B9	↓	↓	2	PC	/	2	NC															

Age: (A)dult, **(F)**ledgling, **(N)**estling, **(U)**nknown **Sex: (M)**ale, **(F)**emale, **(U)**nknown **Det. Code: (A)**udio, **(V)**isual, **(B)**oth **Det. Location: (AT)** station, **(BT)** between stations

#= number of goshawks or other raptor observed/detected **Det._ID:** unique detection identifier; date and sequential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format.

Comments: * = All 3 observers Broadcast Calls NC = No Contact

Survey Time: Start 0920 End 1852

Intensive Nest Search Time: Start — End —

Temperature (°F): Begin 62 End 74

Turnstone Environmental Consultants
Goshawk Survey Form

Page 2 of 2 (including maps)

Survey Area/Project Area: Whistling RIDGE **Crew:** P.Sahl/W.Beard/J.Votos **Month:** 07 **Day:** 23, 2009 **Visit #** 2

Period: Nestling / Fledgling **Call(s) Used:** Alarm / Wail / Begging **Survey Year:** 1st 2nd **Nest Search:** Y / N (if yes attach Search Form) **Nest Found:** Y / N (if yes attach Nest Loc. Form)

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: ______ **Cloud Cover :** 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 =Light Wind (8-12 mph), 5 =Wind (12-15 mph), 6 =Gusty (>15 mph)
Weather Codes (WC): CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow **Weather Intensity (WI):** 1=light, 2=moderate, 3=heavy

Det._ID	ST#	Sta. Time Begin	Sta. Time End	Wind Code	Weather WC	Weather WI	Cloud Cover	Detection Code	Detection Location	#	Sex	Age	Species	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (meters)	Location Town	Location Range	Location Sect	¼	UTMX NAD83-GPS data only	UTMY
*	C9	1417	1452	2	PC	/	2	NL															
*	A10	1500	1556	1	PC	/	2	↓															
	B10	↓	↓	1	PC	/	2																
	C10	↓	↓	1	PC	/	2																
	A11-1	1600	1641	1	PC	/	2																
	B11-1	↓	↓	1	PC	/	2																
	C11-1	↓	↓	1	PC	/	2																
*	A53	1738	1801	1	PC	/	2																
	B53	↓	↓	1	PC	/	2																
	C53	↓	↓	1	PC	/	2																
	A54	1806	1815	1	PC	/	2																
	B54	↓	↓	1	PC	/	2																
	C54	↓	↓	1	PC	/	2																
	A55	1822	1830	1	PC	/	2																
	B55	↓	↓	1	PC	/	2	↓															
	C55	↓	↓	1	PC	/	2	NL															

Age: (A)dult, (F)ledgling, (N)estling, (U)nknown **Sex:** (M)ale, (F)emale, (U)nknown **Det. Code:** (A)udio, (V)isual, (B)oth **Det. Location:** (AT) station, (BT) between stations
#= number of goshawks or other raptor observed/detected **Det._ID:** unique detection identifier; date and sequential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format.
Comments: * = All 3 observes Broadcast calls @ intervals
NL = No Contact

Survey Time: Start 0810 End 1800

Intensive Nest Search Time: Start — End —

Temperature (°F): Begin 72 End 90

Survey Area/Project Area: ____________

Turnstone Environmental Consultants
Goshawk Survey Form

Page 1 of 2 (including maps)

Crew: D. Sahl / J. Volos / W. Beard Month: 07 Day: 24, 2009 Visit # 2

Period: Nestling/Fledgling Call(s) Used: Alarm/Wail/Begging Survey Year 1st 2nd Nest Search: Y N (if yes attach Search Form) Nest Found: Y N (if yes attach Nest Loc. Form)

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: ____________ Cloud Cover: 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 = Light Wind (8-12 mph), 5 = Wind (12-15 mph), 6 = Gusty (>15 mph)

Weather Codes (WC): CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow Weather Intensity (WI): 1=light, 2=moderate, 3=heavy

Det._ID	ST#	Sta. Time Begin	Sta. Time End	Wind Code	Weather WC	Weather WI	Cloud Cover	Detection Code	Detection Location	#	Sex	Age	Species	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (meters)	Location Town	Location Range	Location Sect	Location ¼	UTMX NAD83-GPS data only	UTMY NAD83-GPS data only
	A12	0850	0930	1	PC	/	2	NC															
	B12	↓	↓	1	PC	/	2																
	C12	↓	↓	1	PC	/	2																
*	A13	0940	1050	1	PC	/	2																
*	B13	↓	↓	1	PC	/	2																
*	C13	↓	↓	1	PC	/	2																
	A14-1	1100	1147	1	PC	/	2																
	B14-1	↓	↓	1	PC	/	2																
	C14-1	↓	↓	1	PC	/	2																
	A15	1155	1240	1	PC	/	1																
	B15			1	PC	/	1																
	C15	↓	↓	1	PC	/	1																
*	A16-1	1259	1400	1	PC	—	1																
*	B16-1	↓	↓	1	PC	/	1																
*	C16-1	↓	↓	1	PC	/	1																
	A17	1405	1450	1	PC	/	1																
	B17			1	PC	/	1																
	C17	↓	↓	1	PC	/	1																
	A18-1	1456	1530	1	PC	/	1																
	B18-1	↓	↓	1	PC	/	1																
	C18-1	↓	↓	1	PC	/	1																
*	A19	1554	1624	1	PC	/	1																
*	B19	↓	↓	1	PC	/	1																
*	C19	↓	↓	1	PC	/	1	↓															
	A20-1	1632	1652	1	PC	—	1	NC															

Age: (A)dult, (F)ledgling, (N)estling, (U)nknown Sex: (M)ale, (F)emale, (U)nknown Det. Code: (A)udio, (V)isual, (B)oth Det. Location: (AT) station, (BT) between stations

#= number of goshawks or other raptor observed/detected Det._ID: unique detection identifier; date and sequential det. # for the day, (061208-1, 061208-2, ect) Time: Military format.

Comments: * = All 3 observers Broadcast Calls @ Intervals

NC = No Contact

Survey Time: Start 0810 End 1400

Intensive Nest Search Time: Start — End —

Temperature (°F): Begin 72 End 90

Turnstone Environmental Consultants
Goshawk Survey Form

Survey Area/Project Area: Whistling RIDGE **Crew:** D.SAHL/J.Utos/W.BEARD **Month:** 07 **Day:** 24, **2009** **Visit #** 2

Period: Nestling / Fledgling **Call(s) Used:** Alarm / Wail / Begging **Survey Year:** 1st 2nd **Nest Search:** Y / N (if yes attach Search Form) **Nest Found:** Y / N (if yes attach Nest Loc. Form)

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: ______ **Cloud Cover :** 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 =Light Wind (8-12 mph), 5 =Wind (12-15 mph), 6 =Gusty (>15 mph)
Weather Codes (WC): CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow **Weather Intensity (WI):** 1=light, 2=moderate, 3=heavy

		Sta. Time		Wind	Weather		Cloud	Detection	Detection	#	Sex	Age		Contact Time		Bearing	Dist	Location				UTMX	UTMY
Det._ID	ST#	Begin	End	Code	WC	WI	Cover	Code	Location				Species	Initial	Final	(Azimuth)	(meters)	Town	Range	Sect	¼	NAD83-GPS data only	
	B20-1	1632	1652	1	PC	/	1	NC															
	C20-1	↓	↓	1	PC	/	1																
*	A21	1700	1713	1	PC	/	1																
*	B21	↓	↓	1	PC	/	1																
*	C21	↓	↓	1	PC	/	1																
	A22-1	1710	1727	1	PC	/	1	↓															
	B22-1	↓	↓	1	PC	/	1	NC															

Age: (A)dult, (F)ledgling, (N)estling, (U)nknown **Sex:** (M)ale, (F)emale, (U)nknown **Det. Code:** (A)udio, (V)isual, (B)oth **Det. Location:** (AT) station, (BT) between stations
#= number of goshawks or other raptor observed/detected **Det._ID:** unique detection identifier; date and sequential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format.
Comments:
* = All 3 observers Broadcast Calls @ intervals
NC = No Contact

Survey Time: Start 1027 End 1640

Intensive Nest Search Time: Start — End —

Temperature (°F): Begin 78 End 95

Turnstone Environmental Consultants

Goshawk Survey Form

Page 1 of 2 (including maps)

Survey Area/Project Area: WHISTLING RIDGE **Crew:** W. BEARD, K. Rostad, J. Ustas **Month:** 7 **Day:** 27, 2009 **Visit #** 2

Period: Nestling, Fledgling **Call(s) Used:** Alarm / Wail / Begging **Survey Year:** 1st 2nd **Nest Search:** Y / N (if yes attach Search Form) **Nest Found:** Y / N (if yes attach Nest Loc. Form)

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: ____________ **Cloud Cover :** 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 =Light Wind (8-12 mph), 5 =Wind (12-15 mph), 6 =Gusty (>15 mph)

Weather Codes (WC): CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow **Weather Intensity (WI):** 1=light, 2=moderate, 3=heavy

Det._ID	ST#	Sta. Time Begin	Sta. Time End	Wind Code	Weather WC	Weather WI	Cloud Cover	Detection Code	Detection Location	#	Sex	Age	Species	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (meters)	Location Town	Location Range	Location Sect	¼	UTMX NAD83-GPS data only	UTMY
K	A23	1033	1054	1	CL	-	1	NC															
W	B23	↓	↓	1	CL	-	1																
J	C23			1	CL	-	1																
K	A23-1	1058	1119	1	CL	-	1																
W	B23-1	↓	↓	1	CL	-	1																
J	C23-1			1	CL	-	1																
* K	A23-2	1122	1151	1	CL	-	1																
* W	B23-2	↓	↓	1	CL	-	1																
* J	C23-2			1	CL	-	1																
K	A23-3	1154	1207	1	CL	-	1																
W	B23-3	↓	↓	1	CL	-	1																
J	C23-3			2	CL	-	1																
K	A24-4	1229	1242	2	CL	-	1																
J	B24-4	↓	↓	2	CL	-	1																
W	C24-4			2	CL	-	1																
* K	A24-3	1243	1303	2	CL	-	1																
* J	B24-3	↓	↓	2	CL	-	1																
* W	C24-3			2	CL	-	1																
K	A24-2	1304	1316	2	CL	-	1																
J	B24-2	↓	↓	2	CL	-	1																
W	C24-2			2	CL	-	1																
K	A24-1	1317	1352	2	CL	-	1																
J	B24-1	↓	↓	2	CL	-	1	↓															
W	C24-1			2	CL	-	1	NC															

Age: (A)dult, **(F)**ledgling, **(N)**estling, **(U)**nknown **Sex: (M)**ale, **(F)**emale, **(U)**nknown **Det. Code: (A)**udio, **(V)**isual, **(B)**oth **Det. Location: (AT)** station, **(BT)** between stations
#= number of goshawks or other raptor observed/detected **Det._ID:** unique detection identifier; date and sequential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format.
Comments:

* = All 3 surveyors Broadcast calls @ intervals
NC = No contact

Survey Time: Start 1610 End 1640

Intensive Nest Search Time: Start – End –

Temperature (°F): Begin 78 End 95

Survey Area/Project Area: WHISTLING RIDGE

Turnstone Environmental Consultants
Goshawk Survey Form

Crew: J. Votos, W. Beard, K. Rostad Month: 7 Day: 27, 2009 Visit # 2

Period: Nestling, **Fledgling**, Call(s) Used: Alarm, **Wail**, **Begging** Survey Year **1st** 2nd Nest Search: Y **N** (if yes attach Search Form) Nest Found: Y **N** (if yes attach Nest Loc. Form)

Survey Method: Broadcast Acoustical, **Intensive Search**, or Dawn Acoustical, Other: ____ Cloud Cover: 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 =Light Wind (8-12 mph), 5 =Wind (12-15 mph), 6 =Gusty (>15 mph)

Weather Codes (WC): CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow Weather Intensity (WI): 1=light, 2=moderate, 3=heavy

Det._ID	ST#	Sta. Time Begin	Sta. Time End	Wind Code	Weather WC	Weather WI	Cloud Cover	Detection Code	Detection Location	#	Sex	Age	Species	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (meters)	Location Town	Location Range	Location Sect	¼	UTMX NAD83-GPS data only	UTMY
*J	A25*	1411	1452	2	CL	/	1	NC															
*K	B25	↓	↓	2	CL	/	1	↓															
*W	C25	↓	↓	2	CL	/	1																
J	A25-1	1454	1502	2	CL	/	1																
K	B25-1	↓	↓	2	CL	/	1																
W	C25-1	↓	↓	2	CL	/	1																
J	A25-2	1504	1521	2	CL	/	1																
K	B25-2		↓	2	CL	/	1																
W	C25-2	↓	↓	2	CL	/	1																
*J	A25-3	522	1610	2	CL	/	1																
*K	B25-3	↓	↓	2	CL	/	1	↓															
*W	C25-3	↓	↓	2	CL	/	1	NC															
	END																						

Age: (A)dult, (F)ledgling, (N)estling, (U)nknown Sex: (M)ale, (F)emale, (U)nknown Det. Code: (A)udio, (V)isual, (B)oth Det. Location: (AT) station, (BT) between stations

#= number of goshawks or other raptor observed/detected Det._ID: unique detection identifier; date and sequential det. # for the day, (061208-1, 061208-2, ect) Time: Military format.

Comments:

* = All 3 OBSERVERS Broadcast calls

NC: NO Contact

Survey Time: Start 0651 End 1345

Intensive Nest Search Time: Start — End —

Temperature (°F): Begin 70 End 100

Survey Area/Project Area: WHISTLING RIDGE

Turnstone Environmental Consultants
Goshawk Survey Form

Crew: J. Kotos / W. BEARD / K. ROSTAD Month: 7 Day: 28, 2009 Visit # 2

Period: Nestling **Fledgling** Call(s) Used: Alarm / **Wail** / **Begging** Survey Year: **1st** 2nd Nest Search: Y / **N** (if yes attach Search Form) Nest Found: Y / **N** (if yes attach Nest Loc. Form)

Survey Method: Broadcast Acoustical, **Intensive Search**, or Dawn Acoustical, Other: ____________ Cloud Cover : 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 = Light Wind (8-12 mph), 5 = Wind (12-15 mph), 6 = Gusty (>15 mph)

Weather Codes (WC): CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow **Weather Intensity (WI):** 1=light, 2=moderate, 3=heavy

		Sta. Time		Wind	Weather		Cloud	Detection	Detection	#	Sex	Age		Contact Time		Bearing	Dist	Location				UTMX	UTMY
Det._ID	ST#	Begin	End	Code	WC	WI	Cover	Code	Location				Species	Initial	Final	(Azimuth)	(meters)	Town	Range	Sect	¼	NAD83-GPS data only	
*	A29	0725	0750	1	CL	/	1	NL															
*	B29	0725	0750	1	CL	/	1																
*	A30-1	0800	0810	1	CL	/	1																
	B30-1	0800	0810	1	CL	/	1																
	C30-1	0800	0810	1	CL	/	1																
	A31	0838	0906	1	CL	/	1																
	B31	0838	0906	1	CL	/	1																
	C31	0838	0906	1	CL	/	1																
*	A32	0943	1000	1	CL	/	1																
*	B32	0943	1000	1	CL	/	1																
*	C32	0943	1000	1	CL	/	1																
	A32-1	1001	1028	1	CL	/	1																
	B32-1	1001	1028	1	CL	/	1																
	C32-1	1001	1028	1	CL	/	1																
	A35-1	1034	1059	1	CL	/	1																
	B35-1	1034	1059	1	CL	/	1																
	C35-1	1034	1059	1	CL	/	1																
*	A41-1	1110	1120	2	CL	/	1																
*	B41-1	1110	1120	2	CL	/	1																
*	C41-1	1110	1120	2	CL	/	1																
	A36-1	1132	1145	1	CL	/	1																
	B36-1	1132	1145	1	CL	/	1																
	C36-1	1132	1145	1	CL	/	1																
	A36	1203	1250	1	CL	/	1	↓															
	B36	1203	1250	1	CL	/	1	NL															

Age: (A)dult, (F)ledgling, (N)estling, (U)nknown **Sex:** (M)ale, (F)emale, (U)nknown **Det. Code:** (A)udio, (V)isual, (B)oth **Det. Location:** (AT) station, (BT) between stations
#= number of goshawks or other raptor observed/detected **Det._ID:** unique detection identifier; date and sequential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format.

Comments:
* = All 3 observers Broadcast Calls @ Intervals
NL = No Contact

Survey Time: Start 0651 End 1345

Intensive Nest Search Time: Start – End –

Temperature (°F): Begin 70 End 100

Survey Area/Project Area: Whistling Ridge

Turnstone Environmental Consultants

Goshawk Survey Form

Crew: J. Yates, W. Beard, K. Rosstad Month: 7 Day: 28, 2009 Visit # 2

Period: Nestling / Fledgling Call(s) Used: Alarm / Wail / Begging Survey Year: 1st 2nd Nest Search: Y / N (if yes attach Search Form) Nest Found: Y / N (if yes attach Nest Loc. Form)

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: ______ Cloud Cover : 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 =Light Wind (8-12 mph), 5 =Wind (12-15 mph), 6 =Gusty (>15 mph)

Weather Codes (WC): CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow **Weather Intensity (WI):** 1=light, 2=moderate, 3=heavy

Det._ID	ST#	Sta. Time Begin	Sta. Time End	Wind Code	Weather WC	Weather WI	Cloud Cover	Detection Code	Detection Location	#	Sex	Age	Species	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (meters)	Location Town	Location Range	Location Sect	Location ¼	UTMX NAD83-GPS data only	UTMY NAD83-GPS data only
	C32	1257	1320	1	CL	/	1	NC															
*	A33	1257	1320	1	CL	/	1	NC															
072809-1 *	B33	1257	1320	1	CL	/	1	V	BT	2	U	A	RTHA	1315	1317	190	30M	4N	9E	36	SE	0607656	5070958
*	A34	1327	1337	1	CL	/	1	NC															
*	B34	1327	1337	1	CL	/	1	↓															
*	C34	1327	1337	1	CL	/	1	NC															

Age: (A)dult, (F)ledgling, (N)estling, (U)nknown **Sex:** (M)ale, (F)emale, (U)nknown **Det. Code:** (A)udio, (V)isual, (B)oth **Det. Location:** (AT) station, (BT) between stations

#= number of goshawks or other raptor observed/detected **Det._ID:** unique detection identifier; date and sequential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format.

Comments:

* = ALL 3 observers Broadcast Calls @ Intervals

NC = NO Contact

Survey Time: Start 0530 End 1430

Intensive Nest Search Time: Start — End —

Temperature (°F): Begin 78 End 100

Survey Area/Project Area: Whistling Ridge

Turnstone Environmental Consultants
Goshawk Survey Form

Crew: J.Votos, K.Rosund, W.Berd Month: 7 Day: 29, 2009 Visit # 2

Period: Nestling, Fledgling Call(s) Used: Alarm, Wail / Begging Survey Year: 1st 2nd Nest Search: Y N (if yes attach Search Form) Nest Found: Y N (if yes attach Nest Loc. Form)

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: ______ Cloud Cover: 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 = Light Wind (8-12 mph), 5 = Wind (12-15 mph), 6 = Gusty (>15 mph)

Weather Codes (WC): CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow **Weather Intensity (WI):** 1=light, 2=moderate, 3=heavy

Det._ID	Sta. Time ST#	Sta. Time Begin	Sta. Time End	Wind Code	Weather WC	Weather WI	Cloud Cover	Detection Code	Detection Location	#	Sex	Age	Species	Contact Time Initial	Contact Time Final	Bearing (Azimuth)	Dist (meters)	Location Town	Location Range	Location Sect	Location ¼	UTMX NAD83-GPS data only	UTMY NAD83-GPS data only
	A26-3	0537	0550	1	CL	/	/	NC															
	B26-3	0537	0550	1	CL	/	/																
	C26-3	0537	0550	1	CL	/	/																
*	A26-2	0552	0606	1	CL	/	/																
*	B26-2	0552	0606	1	CL	/	/																
*	C26-2	0552	0606	1	CL	/	/																
	A26-1	0608	0647	1	CL	/	/																
	B26-1	0608	0647	1	CL	/	/																
	C26-1	0608	0647	1	CL	/	/																
	A27	0658	0725	2	CL	/	/																
	B27	0658	0725	2	CL	/	/																
	C27	0658	0725	2	CL	/	/																
*	A27-1	0726	0736	1	CL	/	/																
*	B27-1	0726	0736	1	CL	/	/																
*	C27-1	0726	0736	1	CL	/	/																
	A+B28	0738	0738	1	CL	/	/																
	A49	0935	1000	1	CL	/	/																
	B49	0935	1000	1	CL	/	/																
	C49	0935	1000	1	CL	/	/																
072909-1i	—	—	—	1	CL	/	/	V	OUTSIDE	3	U	J/2UNK	SSHA	1000	1015	90	0	3N	9E	1	NE	0608126	5069997
*	A48-1	1028	1045	1	CL	/	/	NC															
*	B48-1	1028	1045	1	CL	/	/																
*	C48-1	1028	1045	1	CL	/	/	NC															

Age: (A)dult, (F)ledgling, (N)estling, (U)nknown **Sex:** (M)ale, (F)emale, (U)nknown **Det. Code:** (A)udio, (V)isual, (B)oth **Det. Location:** (AT) station, (BT) between stations

#= number of goshawks or other raptor observed/detected **Det._ID:** unique detection identifier; date and sequential det. # for the day, (061208-1, 061208-2, ect) **Time:** Military format.

Plucking post 10M from this point

Comments: * = All 3 observers Broadcast Calls @ Intervals

NC = No Contact

C49: 3 SSHA Individuals observed, one was a Juvenile the other 2 were likely adults but observer was unable to Determine for sure. Birds were observed ~ 50m outside of the survey polygon.

Survey Time: Start 0530 End 1430

Turnstone Environmental Consultants

Goshawk Survey Form

Intensive Nest Search Time: Start — End —

Temperature (°F): Begin 78 End 100

Survey Area/Project Area: Whistling Ridge Crew: J.VOSS, K.ROSTAD, W.BEARD Month: 7 Day: 29, 2009 Visit # 2

Period: Nestling / Fledgling Call(s) Used: Alarm / Wail / Begging Survey Year: 1st 2nd Nest Search: Y / N (if yes attach Search Form) Nest Found: Y / N (if yes attach Nest Loc. Form)

Survey Method: Broadcast Acoustical, Intensive Search, or Dawn Acoustical, Other: ____________ Cloud Cover : 1 = <5%; 2 = 5-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Wind Codes: 1 = Light air (>1mph), 2 = Light breeze (1-3 mph), 3 = Gentle breeze (4-7 mph), 4 = Light Wind (8-12 mph), 5 = Wind (12-15 mph), 6 = Gusty (>15 mph)

Weather Codes (WC): CL = Clear, FG = Fog, PC = Partly Cloudy, OC = Overcast, DR = Drizzle, RN = Rain, SN = Snow Weather Intensity (WI): 1=light, 2=moderate, 3=heavy

		Sta. Time		Wind	Weather		Cloud	Detection	Detection	#	Sex	Age		Contact Time		Bearing	Dist	Location				UTMX	UTMY
Det._ID	ST#	Begin	End	Code	WC	WI	Cover	Code	Location				Species	Initial	Final	(Azimuth)	(meters)	Town.	Range	Sect	¼	NAD83-GPS data only	
	A47	1100	1125	1	CL	/	1	NC															
	B47	1100	1125	1	CL	/	1																
	C47	1100	1125	1	CL	/	1																
	A46-1	1128	1155	2	CL	/	1																
	B46-1	1128	1155	2	CL	/	1																
	C46-1	1128	1155	2	CL	/	1																
*	A45	1157	1215	1	CL	/	1																
*	B45	1157	1215	1	CL	/	1																
*	C45	1157	1215	1	CL	/	1																
	A44	1219	1238	2	CL	/	1																
	B44	1219	1238	2	CL	/	1																
	A43	1244	1300	3	CL	/	1																
	B43	1244	1300	3	CL	/	1																
	C43	1244	1300	3	CL	/	1																
*	A42-1	1310	1315	3	CL	/	1																
*	B42-1	1310	1315	3	CL	/	1																
*	A52-1	1340	1408	3	CL	/	1	NC															

Age: (A)dult, (F)ledgling, (N)estling, (U)nknown Sex: (M)ale, (F)emale, (U)nknown Det. Code: (A)udio, (V)isual, (B)oth Det. Location: (AT) station, (BT) between stations

#= number of goshawks or other raptor observed/detected Det._ID: unique detection identifier; date and sequential det. # for the day, (061208-1, 061208-2, ect) Time: Military format.

Comments: * = All 3 OBSERVERS Broadcast Calls @ Intervals

NC = No contact

Appendix D - Western Gray Squirrel Survey Forms

WESTERN GRAY SQUIRREL SURVEY - COVER SHEET

Use one cover sheet per stand surveyed. Attach the map(s) on which you mark squirrel nests and show the transect(s) or area(s) surveyed. For each map, attach one Map Label and one or more Western Gray Squirrel Survey Data Sheets. If you see or hear a western gray squirrel please fill out a wildlife observation form and attach.

Mark Water Sources and Survey Transect or Survey Polygon on Attached Map.

Name of Area Surveyed: Polygons: A1,A2, B1,B2

(Use a generic geographic name like "Yahne Canyon". Add the timber sale name/number if available.)

Location (TRS): **T** 4N **R** 10E **S** 31 **County:** Skamania

T 3N **R** 10E **S** 6 **County:** Skamania

Date(s) Surveyed: 3/11/09

Start/Stop time(s): 0930-1215

Surveyor Names and Affiliations: D. Sahl, Turnstone Environmental Consultants

Contact Name, Address, & Phone:

TECI
Turnstone Environmental Consultants Inc.
18000 NW lucy Reeder Rd Portland, OR 97231
503-621-9613

Directions to Site: Be specific enough to allow someone unfamiliar with the site to find it.

From the Jct. of Cook Underwood Rd. and Knapp Rd. Go NW on Knapp Rd. for ~0.1miles to Scoggins Rd., Turn right onto Scoggins Rd. and ~100 yards to Jct. with private drive on left (Signed as CG 2930). Proceed up CG 2930 to access SDS and WDNR lands. See the polygon map for access routed to the specific survey polygons.

Description of Habitat at Site: Include approximate age/size (dbh) of stand, dominant overstory species, percent oak in stand, slope position and aspect, and distance to nearest water.

All polygons surveyed were composed of mixed conifer/hardwoods, primarily PSME with some scattered THPL/TSHE. The majority of the overstory PSME appears to be >25 years of age, with some scattered remnant PSME >70 years. Slopes within the polygon boundaries vary between ~0% to 30%. The aspect of each polygon also varies. The A1, A2, B1 and B2 polygons have a predominantly southern aspect. No areas of standing water were observed in any of the polygons during the survey. Most areas within the survey polygon had some snow cover varying from a trace to several feet in depth at the time of the survey.

No Western Gray squirrels, or their nest structures were observed during the survey. Several bird nests were observed and numerous douglas squirrels were heard and a few were observed. Several Rabbits were observed in the A2 polygon.

WESTERN GRAY SQUIRREL SURVEY - COVER SHEET

Use one cover sheet per stand surveyed. Attach the map(s) on which you mark squirrel nests and show the transect(s) or area(s) surveyed. For each map, attach one Map Label and one or more Western Gray Squirrel Survey Data Sheets. If you see or hear a western gray squirrel please fill out a wildlife observation form and attach.

Mark Water Sources and Survey Transect or Survey Polygon on Attached Map.

Name of Area Surveyed: Polygon: A3

(Use a generic geographic name like "Yahne Canyon". Add the timber sale name/number if available.)

Location (TRS): **T** 3N **R** 10E **S** 6 **County:** Skamania

T 3N **R** 9E **S** 1 **County:** Skamania

Date(s) Surveyed: 3/11/09

Start/Stop time(s): 0915-1220

Surveyor Names and Affiliations: D. Bolen, Turnstone Environmental Consultants

Contact Name, Address, & Phone:

TECI
Turnstone Environmental Consultants Inc.
18000 NW lucy Reeder Rd Portland, OR 97231
503-621-9613

Directions to Site: Be specific enough to allow someone unfamiliar with the site to find it.

From the Jct. of Cook Underwood Rd. and Knapp Rd. Go NW on Knapp Rd. for ~0.1miles to Scoggins Rd., Turn right onto Scoggins Rd. and go ~100 yards to Jct. with private drive on left (Signed as CG 2930). Proceed up CG 2930 to access SDS and WDNR lands. See the polygon map for access routes to the specific survey polygons.

Description of Habitat at Site: Include approximate age/size (dbh) of stand, dominant overstory species, percent oak in stand, slope position and aspect, and distance to nearest water.

All polygons surveyed were composed of mixed conifer/hardwoods, primarily PSME with some scattered THPL/TSHE. The majority of the overstory PSME appears to be >15 years of age, with some scattered remnant PSME >70 years. A few small patches of Quercus SPP (likely Quercus Garryana), were observed within the boundaries of the A3 polygon. The trees were not > than 15ft. in height and growing in a few steep, rocky, open areas with a westerly aspect. In Polygons A3 there were numerous ACMA and ACCI present, especially towards the toe of the slope and along drainages. Slopes within the polygon boundary vary but are generally steep, with a few rocky cliff areas, between ~0% to 85%. The A3 polygon has a predominantly western aspect and several active incised drainages. Water was present in seasonally intermittent streams in polygon A3 on the north end of the polygon at the time of survey. No areas of non-flowing, standing water were observed in the polygon during the survey. Most areas within the survey polygon had some snow cover varying from a trace to several feet in depth at the time of the survey.

No Western Gray squirrels, or their nest structures were observed during the survey. numerous douglas squirrels were heard and a few were observed. Recent Bract piles were observed in several locations all were presumed to be created by douglas squirrels.

WESTERN GRAY SQUIRREL SURVEY - COVER SHEET

Use one cover sheet per stand surveyed. Attach the map(s) on which you mark squirrel nests and show the transect(s) or area(s) surveyed. For each map, attach one Map Label and one or more Western Gray Squirrel Survey Data Sheets. If you see or hear a western gray squirrel please fill out a wildlife observation form and attach.

Mark Water Sources and Survey Transect or Survey Polygon on Attached Map.

Name of Area Surveyed: Polygons: A5,B5
(Use a generic geographic name like "Yahne Canyon". Add the timber sale name/number if available.)

Location (TRS): **T** 3N **R** 10E **S** 5,6,8 **County:** Skamania
T **R** **S** **County:**
Date(s) Surveyed: 3/12/09
Start/Stop time(s): 0935-1210

Surveyor Names and Affiliations: D. Bolen, Turnstone Environmental Consultants

Contact Name, Address, & Phone:
TECI
Turnstone Environmental Consultants Inc.
18000 NW lucy Reeder Rd Portland, OR 97231
503-621-9613

Directions to Site: Be specific enough to allow someone unfamiliar with the site to find it.

From the Jct. of Cook Underwood Rd. and Knapp Rd. Go NW on Knapp Rd. for ~0.1miles to Scoggins Rd., Turn right onto Scoggins Rd. and ~100 yards to Jct. with private drive on left (Signed as CG 2930). Proceed up CG 2930 to access SDS and WDNR lands. See the polygon map for access routed to the specific survey polygons.

Description of Habitat at Site: Include approximate age/size (dbh) of stand, dominant overstory species, percent oak in stand, slope position and aspect, and distance to nearest water.

Both polygons surveyed were composed of mixed conifer/hardwoods, primarily PSME with some scattered THPL/TSHE. The majority of the overstory PSME appears to be >25 years of age, with some scattered remnant PSME >70 years. No patches of Quercus SPP. were observed within the boundaries of the A5 or B5 polygons. In both Polygons there were ACMA present. Slopes within the polygon boundaries vary between ~0% to 30%. Both polygons have predominantly north to NNE aspects. Their was a small section of active drainage in B5.Most areas within the survey polygon had some snow cover varying from a trace to several feet in depth at the time of the survey.

No Western Gray squirrels, or their nest structures were observed during the survey. Numerous douglas squirrels were heard and observed.

WESTERN GRAY SQUIRREL SURVEY - COVER SHEET

Use one cover sheet per stand surveyed. Attach the map(s) on which you mark squirrel nests and show the transect(s) or area(s) surveyed. For each map, attach one Map Label and one or more Western Gray Squirrel Survey Data Sheets. If you see or hear a western gray squirrel please fill out a wildlife observation form and attach.

Mark Water Sources and Survey Transect or Survey Polygon on Attached Map.

Name of Area Surveyed: Polygons: A6,B4

(Use a generic geographic name like "Yahne Canyon". Add the timber sale name/number if available.)

Location (TRS): **T** 3N **R** 10E **S** 6 **County:** Skamania

T 4N **R** 10E **S** 31 **County:** Skamania

Date(s) Surveyed: 3/12/09

Start/Stop time(s): 0930-1215

Surveyor Names and Affiliations: W. Perkins, Turnstone Environmental Consultants

Contact Name, Address, & Phone:

TECI
Turnstone Environmental Consultants Inc.
18000 NW lucy Reeder Rd Portland, OR 97231
503-621-9613

Directions to Site: Be specific enough to allow someone unfamiliar with the site to find it.

From the Jct. of Cook Underwood Rd. and Knapp Rd. Go NW on Knapp Rd. for ~0.1miles to Scoggins Rd., Turn right onto Scoggins Rd. and ~100 yards to Jct. with private drive on left (Signed as CG 2930). Proceed up CG 2930 to access SDS and WDNR lands. See the polygon map for access routed to the specific survey polygons.

Description of Habitat at Site: Include approximate age/size (dbh) of stand, dominant overstory species, percent oak in stand, slope position and aspect, and distance to nearest water.

Both polygons surveyed were composed of mixed conifer/hardwoods, primarily PSME with some scattered THPL/TSHE. The majority of the overstory PSME appears to be >25 years of age, with some scattered remnant PSME >70 years. No patches of Quercus SPP. were observed within the boundaries of the A6 or B4 polygons. In both Polygons there were ACMA present. Slopes within the polygon boundaries vary between ~0% to 45%. The A6 polygon has a predominantly southwestern aspect, the B4 polygon has several aspects that include;, NW, NE and S. Both polygons had had active drainages. Their were 2 small active drainages in B4 and a larger active drainage and a pond in the A6 polygon. Most areas within the survey polygon had some snow cover varying from a trace to several feet in depth at the time of the survey. The pond that was present in A6 was roundish in shape and appeared to be shallow (>10' deep and ~50 feet across at time of survey), it was difficult to determine the exact extent of the pond area due to the snowpack. Water in the pond is present year round as observed in mid August of this year. No Western Gray squirrels, or their nest structures were observed during the survey. Numerous douglas squirrels were heard and observed. Several large bract piles were encountered in the A6 polygon which were attributed to the douglas squirrels observed. A coyote was also observed on the edge of the A6 polygon.

WESTERN GRAY SQUIRREL SURVEY - COVER SHEET

Use one cover sheet per stand surveyed. Attach the map(s) on which you mark squirrel nests and show the transect(s) or area(s) surveyed. For each map, attach one Map Label and one or more Western Gray Squirrel Survey Data Sheets. If you see or hear a western gray squirrel please fill out a wildlife observation form and attach.

Mark Water Sources and Survey Transect or Survey Polygon on Attached Map.

Name of Area Surveyed: Polygon: A10, A9

(Use a generic geographic name like "Yahne Canyon". Add the timber sale name/number if available.)

Location (TRS): **T** 3N **R** 10E **S** 7,8 **County:** Skamania

T **R** **S** **County:**

Date(s) Surveyed: 3/10/09

Start/Stop time(s): 1300-1520

Surveyor Names and Affiliations: D Sahl, W. Perkins, D. Bolen, Turnstone Environmental Consultants

Contact Name, Address, & Phone:

TECI
Turnstone Environmental Consultants Inc.
18000 NW lucy Reeder Rd Portland, OR 97231
503-621-9613

Directions to Site: Be specific enough to allow someone unfamiliar with the site to find it.

From the Jct. of Cook Underwood Rd. and Knapp Rd. Go NW on Knapp Rd. for ~0.1miles to Scoggins Rd., Turn right onto Scoggins Rd. and go ~100 yards to Jct. with private drive on left (Signed as CG 2930). Proceed up CG 2930 to access SDS and WDNR lands. See the polygon map for access routes to the specific survey polygons.

Description of Habitat at Site: Include approximate age/size (dbh) of stand, dominant overstory species, percent oak in stand, slope position and aspect, and distance to nearest water.

The A10 and A9 polygons were surveyed in a leapfrog fashion by 3 surveyors walking adjacent meandering transects. The A10 and A9 polygons are composed of mixed conifer/hardwoods, primarily PSME with some scattered TSHE. The majority of the overstory in the stands in these polygons was PSME and appears to be mixed age, most was >20 years of age with a few older remnant trees present. No patches of Quercus SPP. were observed within the boundaries of the polygons. Both polygons are fairly flat with slopes within the polygon boundaries that vary between ~0% to 5%. There were no drainages or areas of standing water present within the polygons. Most areas within the survey polygon had some snow cover varying from a trace to several feet in depth at the time of the survey.

No Western Gray squirrels, or their nest structures were observed during the survey. numerous douglas squirrels were heard and a few were observed. Bract piles were observed in several areas within the survey polygons, they were attributed to the numerous douglas squirrels observed during the survey.

WESTERN GRAY SQUIRREL SURVEY - COVER SHEET

Use one cover sheet per stand surveyed. Attach the map(s) on which you mark squirrel nests and show the transect(s) or area(s) surveyed. For each map, attach one Map Label and one or more Western Gray Squirrel Survey Data Sheets. If you see or hear a western gray squirrel please fill out a wildlife observation form and attach.

Mark Water Sources and Survey Transect or Survey Polygon on Attached Map.

Name of Area Surveyed: Polygon: A12, A13, A14

(Use a generic geographic name like "Yahne Canyon". Add the timber sale name/number if available.)

Location (TRS): **T** 3N **R** 10E **S** 7 **County:** Skamania

T **R** **S** **County:**

Date(s) Surveyed: 3/10/09

Start/Stop time(s): 0940-1200

Surveyor Names and Affiliations: D Sahl, W. Perkins, Turnstone Environmental Consultants

Contact Name, Address, & Phone:

TECI
Turnstone Environmental Consultants Inc.
18000 NW lucy Reeder Rd Portland, OR 97231
503-621-9613

Directions to Site: Be specific enough to allow someone unfamiliar with the site to find it.

From the Jct. of Cook Underwood Rd. and Knapp Rd. Go NW on Knapp Rd. for ~0.1miles to Scoggins Rd., Turn right onto Scoggins Rd. and go ~100 yards to Jct. with private drive on left (Signed as CG 2930). Proceed up CG 2930 to access SDS and WDNR lands. See the polygon map for access routes to the specific survey polygons.

Description of Habitat at Site: Include approximate age/size (dbh) of stand, dominant overstory species, percent oak in stand, slope position and aspect, and distance to nearest water.

The A12 and A13 polygons were composed of mixed conifer/hardwoods, primarily PSME with some scattered THPL/TSHE. The majority of the overstory in the stands in these polygons was PSME and appears to be mixed age, most was >20 years of age with a few older remnant trees present. No patches of Quercus SPP. were observed within the boundaries of the polygons. Both polygons are very flat with slopes within the polygon boundaries vary between ~0% to 5%. Both polygons had very marginal potential WGS habitat. There were no drainages or areas of standing water present within the polygons. The A14 polygon was composed of mixed conifer/hardwoods, primarily PSME with some scattered THPL/TSHE. The majority of the overstory PSME appears to be >25 years of age, stand appeared to be even aged. No patches of Quercus SPP. were observed within the boundaries of the polygon. There was some ACMA and ACCI present within the polygon. Slopes within the polygon boundaries vary between ~0% to 60%. The A14 polygon has a westerly aspect and one seasonal drainage. The drainage was dry at the time of the survey. No areas of non-flowing, standing water were observed in the polygon during the survey. Most areas within the survey polygon had some snow cover varying from a trace to several feet in depth at the time of the survey. No Western Gray squirrels, or their nest structures were observed during the survey. numerous douglas squirrels were heard and a few were observed.

WESTERN GRAY SQUIRREL SURVEY - COVER SHEET

Use one cover sheet per stand surveyed. Attach the map(s) on which you mark squirrel nests and show the transect(s) or area(s) surveyed. For each map, attach one Map Label and one or more Western Gray Squirrel Survey Data Sheets. If you see or hear a western gray squirrel please fill out a wildlife observation form and attach.

Mark Water Sources and Survey Transect or Survey Polygon on Attached Map.

Name of Area Surveyed: Polygons:A17,A18,B6,B7, B8, C1

(Use a generic geographic name like "Yahne Canyon". Add the timber sale name/number if available.)

Location (TRS): **T** 3N **R** 10E **S** 7,18 **County:** Skamania

T 3N **R** 9E **S** 13 **County:** Skamania

Date(s) Surveyed: 3/10/09

Start/Stop time(s): 1330-1740

Surveyor Names and Affiliations: D. Bolen, D. Sahl and W. Perkins with Turnstone Environmental Consultants

Contact Name, Address, & Phone:

TECI
Turnstone Environmental Consultants Inc.
18000 NW lucy Reeder Rd Portland, OR 97231
503-621-9613

Directions to Site: Be specific enough to allow someone unfamiliar with the site to find it.

From the Jct. of Cook Underwood Rd. and Knapp Rd. Go NW on Knapp Rd. for ~0.1miles to Scoggins Rd., Turn right onto Scoggins Rd. and go ~100 yards to Jct. with private drive on left (Signed as CG 2930). Proceed up CG 2930 to access SDS and WDNR lands. See the polygon map for access routes to the specific survey polygons.

Description of Habitat at Site: Include approximate age/size (dbh) of stand, dominant overstory species, percent oak in stand, slope position and aspect, and distance to nearest water.

The A18, A17, B6, B7, B8 and C1 polygons were surveyed by 3 surveyors walking concurrent, adjacent meandering transects. All of the survey polygons are along the top or flanks of a ridge running almost north/south. The B6, B7 and B8 polygons are small extension of the A17 and A18 polygons that were added to the survey area after the the boundaries of the original polygons were determined. The habitat type in the B polygons is similar to their adjacent A polygon. The survey polygons are composed of mixed conifer/hardwoods, primarily PSME with some scattered TSHE and THPL in the drainages. The majority of the overstory in the stands in these polygons was PSME and appears to be mixed age, most was >20 years of age. A few scattered remnant trees older than 70 years were present. No patches of Quercus SPP. were observed within the boundaries of the polygons. There were some areas ACMA and ACCI present within the polygons. All of these polygons were on the extreme southern end of the project area. A18 has a northwestern aspect on a fairly steep slope and a seasonal drainage that was wet and flowing at the time of the survey.
The A17 polygon had a south and southeast exposure and no significant drainages. It had trees older than the other polygons in the overstory and a few remnant PSME present that were greater than 70yrs of age. The A17 polygon is adjacent to the C1 polygon that had a seasonal stream present in it that was flowing at the time of survey but was obscured due to snowpack in most places. The C1 polygon had a SW aspect. Slopes within the polygon boundaries vary between ~10%to 80%. Most areas within the survey polygon had some snow cover varying from a trace to several feet in depth at the time of the survey.

No Western Gray squirrels, or their nest structures were observed during the survey. numerous douglas squirrels were heard and a few were observed.

WESTERN GRAY SQUIRREL SURVEY - COVER SHEET

Use one cover sheet per stand surveyed. Attach the map(s) on which you mark squirrel nests and show the transect(s) or area(s) surveyed. For each map, attach one Map Label and one or more Western Gray Squirrel Survey Data Sheets. If you see or hear a western gray squirrel please fill out a wildlife observation form and attach.

Mark Water Sources and Survey Transect or Survey Polygon on Attached Map.

Name of Area Surveyed: Polygon: A15

(Use a generic geographic name like "Yahne Canyon". Add the timber sale name/number if available.)

Location (TRS): **T** 3N **R** 10E **S** 7,18 **County:** Skamania

T 3N **R** 9E **S** 19 **County:** Skamania

Date(s) Surveyed: 3/10/09

Start/Stop time(s): 0910-1125

Surveyor Names and Affiliations: D. Bolen, Turnstone Environmental Consultants

Contact Name, Address, & Phone:

TECI
Turnstone Environmental Consultants Inc.
18000 NW lucy Reeder Rd Portland, OR 97231
503-621-9613

Directions to Site: Be specific enough to allow someone unfamiliar with the site to find it.

From the Jct. of Cook Underwood Rd. and Knapp Rd. Go NW on Knapp Rd. for ~0.1miles to Scoggins Rd., Turn right onto Scoggins Rd. and go ~100 yards to Jct. with private drive on left (Signed as CG 2930). Proceed up CG 2930 to access SDS and WDNR lands. See the polygon map for access routes to the specific survey polygons.

Description of Habitat at Site: Include approximate age/size (dbh) of stand, dominant overstory species, percent oak in stand, slope position and aspect, and distance to nearest water.

The A15 polygon is composed of mixed conifer/hardwoods, primarily PSME with some scattered TSHE. The majority of the overstory in the stands in these polygons was PSME and appears to be mixed age, most was >25 years of age with a few older remnant trees present. No patches of Quercus SPP. were observed within the boundaries of the polygons. There was some ACMA and ACCI present within the polygon. Slopes within the polygon boundary vary between ~10% to 80%. The A15 polygon has a westerly aspect and two seasonal drainages. The drainages were wet at the time of the survey and partially obscured by snowpack. No areas of non-flowing standing water were observed at the time of survey. Most areas within the survey polygon had some snow cover varying from a trace to several feet in depth at the time of the survey.

No Western Gray squirrels, or their nest structures were observed during the survey. numerous douglas squirrels were heard and a few were observed.

WESTERN GRAY SQUIRREL SURVEY - COVER SHEET

Use one cover sheet per stand surveyed. Attach the map(s) on which you mark squirrel nests and show the transect(s) or area(s) surveyed. For each map, attach one Map Label and one or more Western Gray Squirrel Survey Data Sheets. If you see or hear a western gray squirrel please fill out a wildlife observation form and attach.

Mark Water Sources and Survey Transect or Survey Polygon on Attached Map.

Name of Area Surveyed: Polygon: A4, A11

(Use a generic geographic name like "Yahne Canyon". Add the timber sale name/number if available.)

Location (TRS): **T** 3N **R** 10E **S** 6, 7 **County:** Skamania

T **R** **S** **County:**

Date(s) Surveyed: 3/11/09

Start/Stop time(s): 0900-1200

Surveyor Names and Affiliations: W. Perkins, Turnstone Environmental Consultants

Contact Name, Address, & Phone:

TECI
Turnstone Environmental Consultants Inc.
18000 NW lucy Reeder Rd Portland, OR 97231
503-621-9613

Directions to Site: Be specific enough to allow someone unfamiliar with the site to find it.

From the Jct. of Cook Underwood Rd. and Knapp Rd. Go NW on Knapp Rd. for ~0.1miles to Scoggins Rd., Turn right onto Scoggins Rd. and go ~100 yards to Jct. with private drive on left (Signed as CG 2930). Proceed up CG 2930 to access SDS and WDNR lands. See the polygon map for access routes to the specific survey polygons.

Description of Habitat at Site: Include approximate age/size (dbh) of stand, dominant overstory species, percent oak in stand, slope position and aspect, and distance to nearest water.

The majority of the overstory in the stands in these polygons was PSME and appears to be mixed age, most was >20 years of age. No patches of Quercus SPP. were observed within the boundaries of the polygons. There was some ACMA and ACCI present within the polygons. Slopes within the polygon boundaries vary between ~0% to 60%. The A4 polygon had a western aspect and the A11 polygons had varying aspects that included NW, NE and easterly. The A11 polygon has multiple pieces all of which contained very marginal (primarily young tightly spaced trees) potential WGS habitat. There are two seasonal drainages within the area of the polygons and both appeared to be dry at the time of the survey, but were obscured by snowpak. No areas of non-flowing, standing water were observed in the polygon during the survey. Most areas within the survey polygon had some snow cover varying from a trace to several feet in depth at the time of the survey.

No Western Gray squirrels, or their nest structures were observed during the survey. numerous douglas squirrels were heard and a few were observed.

WESTERN GRAY SQUIRREL SURVEY - COVER SHEET

Use one cover sheet per stand surveyed. Attach the map(s) on which you mark squirrel nests and show the transect(s) or area(s) surveyed. For each map, attach one Map Label and one or more Western Gray Squirrel Survey Data Sheets. If you see or hear a western gray squirrel please fill out a wildlife observation form and attach.

Mark Water Sources and Survey Transect or Survey Polygon on Attached Map.

Name of Area Surveyed: Polygon: A7

(Use a generic geographic name like "Yahne Canyon". Add the timber sale name/number if available.)

Location (TRS): **T** 3N **R** 10E **S** 5,6,7,8 **County:** Skamania

T ___ **R** ___ **S** ___ **County:** ___

Date(s) Surveyed: 3/12/09

Start/Stop time(s): 0915-1135

Surveyor Names and Affiliations: D. Sahl, Turnstone Environmental Consultants

Contact Name, Address, & Phone:

TECI
Turnstone Environmental Consultants Inc.
18000 NW lucy Reeder Rd Portland, OR 97231
503-621-9613

Directions to Site: Be specific enough to allow someone unfamiliar with the site to find it.

From the Jct. of Cook Underwood Rd. and Knapp Rd. Go NW on Knapp Rd. for ~0.1miles to Scoggins Rd., Turn right onto Scoggins Rd. and go ~100 yards to Jct. with private drive on left (Signed as CG 2930). Proceed up CG 2930 to access SDS and WDNR lands. See the polygon map for access routes to the specific survey polygons.

Description of Habitat at Site: Include approximate age/size (dbh) of stand, dominant overstory species, percent oak in stand, slope position and aspect, and distance to nearest water.

The A7 polygon surveyed was composed of mixed conifer/hardwoods, primarily PSME with some scattered THPL/TSHE. The majority of the overstory PSME appears to be >20 years of age, with some scattered remnant PSME >70 years. Some areas of this polygon had large amounts of vine maple. Slopes within the polygon boundary vary between ~0% to 40%. The A7 polygon has a variety of aspects, primarily eastern and northern. Water was present in 2 streams in the polygon. one stream appears to be seasonally intermittent and the other appears to have some water present all season (as observed while conducting other surveys in july/august). Both contained water at time of survey, stream banks indicate that the water level increases significantly during the wet season. No areas of non-flowing standing water were observed in the A7 polygon. Most areas within the survey polygon had some snow cover varying from a trace to several feet in depth at the time of the survey.

No Western Gray squirrels, or their nest structures were observed during the survey. numerous douglas squirrels were heard and a few were observed. Recent Bract piles were observed in several locations all were presumed to be created by douglas squirrels.

WESTERN GRAY SQUIRREL SURVEY - COVER SHEET

Use one cover sheet per stand surveyed. Attach the map(s) on which you mark squirrel nests and show the transect(s) or area(s) surveyed. For each map, attach one Map Label and one or more Western Gray Squirrel Survey Data Sheets. If you see or hear a western gray squirrel please fill out a wildlife observation form and attach.

Mark Water Sources and Survey Transect or Survey Polygon on Attached Map.

Name of Area Surveyed: Polygons: B3

(Use a generic geographic name like "Yahne Canyon". Add the timber sale name/number if available.)

Location (TRS): **T** 3N **R** 10E **S** 5 **County:** Skamania

T 4N **R** 10E **S** 31,32 **County:** Skamania

Date(s) Surveyed: 3/12/09

Start/Stop time(s): 1310-1535

Surveyor Names and Affiliations: D. Bolen, D. Sahl, W. Perkins, Turnstone Environmental Consultants

Contact Name, Address, & Phone:

TECI
Turnstone Environmental Consultants Inc.
18000 NW lucy Reeder Rd Portland, OR 97231
503-621-9613

Directions to Site: Be specific enough to allow someone unfamiliar with the site to find it.

From the Jct. of Cook Underwood Rd. and Knapp Rd. Go NW on Knapp Rd. for ~0.1miles to Scoggins Rd., Turn right onto Scoggins Rd. and ~100 yards to Jct. with private drive on left (Signed as CG 2930). Proceed up CG 2930 to access SDS and WDNR lands. See the polygon map for access routed to the specific survey polygons.

Description of Habitat at Site: Include approximate age/size (dbh) of stand, dominant overstory species, percent oak in stand, slope position and aspect, and distance to nearest water.

This polygon was surveyed by 3 surveyors simultaneously. The polygon is composed of mixed conifer/ hardwoods, primarily PSME with some scattered THPL/TSHE. The majority of the overstory PSME appears to be >30 years of age, with some scattered remnant PSME >80 years. No patches of Quercus SPP. were observed within the boundaries of the polygon. In Scattered ACMA was present throughout the polygon. Slopes within the polygon boundaries vary between ~0% to 70%. The polygon has a predominant north to NE aspect. Their were a few seep areas that appeared to be active seasonally in the bottom of a few of the small drainages present in the polygon. Most areas within the survey polygon had some snow cover varying from a trace to several feet in depth at the time of the survey.

No Western Gray squirrels, or their nest structures were observed during the survey. Several douglas squirrels were heard and observed while surveying the polygon.

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Bat Acoustic Studies for the Saddleback Wind Resource Area, Skamania County, Washington, August 20 – October 21, 2007. Prepared for SDS Lumber Company.

WEST, Inc. 2007

Final Report

Bat Acoustic Studies for the Saddleback Wind Energy Project Skamania County, Washington

August 20th – October 21st, 2007

Prepared for:

SDS Lumber Company

Prepared by:

Donald Solick, Greg Johnson and Jerry Baker
Western **E**co**S**ystems **T**echnology, Inc.
2003 Central Avenue
Cheyenne, Wyoming

WEST, Inc.

February 14, 2008

EXECUTIVE SUMMARY

In August 2007 Western EcoSystems Technology, Inc. initiated surveys designed to assess bat use within the proposed Saddleback Wind Energy Project, Skamania County, Washington. Passive AnaBat® II echolocation detectors were used to perform acoustic surveys for bats from August 20 through October 21, 2007. Three survey stations were established in the study area and each Anabat surveyed continuously during the night time hours over the study period.

The objective of the acoustic bat surveys was to estimate the seasonal and spatial use of the study area by bats. Two Anabat echolocation detectors were used to periodically monitor bat use at the study during the period August 20 - October 21, 2007. A total of 348 bat passes were recorded during 45 detector nights. Just over half (55%) of the calls were < 35 kHz in frequency (e.g., big brown bat, hoary bat), and the remaining calls were > 35 kHz (e.g., *Myotis* bat species). Species identification was only possible for the hoary bat, which made up 5% of all passes. Activity levels for bat passes peaked in late August/early September. Activity levels for hoary bats were highest in mid-September, suggesting this species migrates through the study area at this time of year. However, equipment failures prevented data collection between September 17 and October 14, so bat activity during this period is unknown.

The mean number of bat passes per detector per night was compared to existing data at five wind-energy facilities where both bat activity and mortality levels have been measured. The level of bat activity documented at the Saddleback Wind Resource Area was higher than that at wind-energy facilities in Minnesota and Wyoming, where reported bat mortalities are low, but was much lower than at facilities in the eastern US, where reported bat mortality is highest. Based on the available data it is likely that some bat mortality will occur in the study area, but the mortality is not expected to be as high as other facilities, and most casualties may occur late-August to mid-September, during likely migration periods. Assuming that a relationship between bat activity and bat mortality exists, and that it extends to the western US, the rate of bat mortality at the Saddleback Wind Resource Area would likely be greater than the 2.2 bat fatalities/turbine/year reported at the wind-energy facility at Buffalo Ridge, Minnesota, and would likely be much lower than the 20.8 fatalities/turbine/year reported at the facility at Buffalo Mountain, Tennessee.

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INTRODUCTION

SDS Lumber Company is proposing to develop a wind-energy facility, the Saddleback Wind Energy Project (SWRA), in Skamania County, Washington (Figure 1). SDS Lumber requested Western EcoSystems Technology, Inc. (WEST) to develop and implement a standardized protocol for baseline studies of bat use in the project area for the purpose of estimating the impacts of the wind-energy facility on bats, and to assist with siting turbines to minimize impacts to bats. The protocol for the baseline study is similar to protocols used at other wind-energy facilities in the US. The protocol has been developed based on WEST's experience studying wildlife and wind turbines at projects throughout the US and included passive AnaBat® II (Anabat) ultrasonic detectors sampling from fixed stations to quantify bat use in the study area.

The purpose of this report is to summarize and describe the results of Anabat surveys during the fall of 2007, and to bring any items of biological interest, such as changes in seasonal bat use, to the attention of SDS Lumber. The scope of the surveys for bats included only acoustic bat surveys at fixed stations.

STUDY AREA

The proposed project area is in southeast Skamania County, approximately four miles northwest of White Salmon, Washington (Figure 1). The specific project area is just north of Underwood Mountain and includes Sections 5, 6, 7, and 8, Township 3N, Range 10E. The project area consists of hilltops, dominated by coniferous forests with some clearcuts, and linear clearings associated with powerline rights-of-way. Elevation of the project area ranges from approximately 1,700 – 2,400 feet (ft; 518 – 732 meters (m)) above sea level..

METHODS

The objective of the acoustic bat surveys was to estimate the seasonal and spatial use of the SWRA by bats. Bats were surveyed using AnaBat® II ultrasonic detectors coupled with Zero Crossing Analysis Interface Modules (ZCAIM; Titley Electronics Pty Ltd., NSW, Australia). Bat detectors are widely used to index and compare habitat use by bats. The use of bat detectors for calculating an index to bat impacts has been used at several wind-energy facilities (Kunz et al. 2007a), and is a primary and economically feasible bat risk assessment tool (Arnett 2007). Bat activity was surveyed using two detectors from August 20 to October 21, 2007, a period corresponding to likely fall bat migration at this site.

Detectors were placed at two locations (Figure 1). The detector at the north location was placed on the ground at the base of a meteorological tower on August 20, but on September 7 was elevated on the tower at a height of approximately 130 ft (40 m). The detector at the south location was placed on the ground on September 7, and remained there for the duration of the study. It was placed just outside the project area, but in an area representative of the project area in terms of habitat and topography.

Anabat detectors record bat echolocation calls with a broadband microphone. The echolocation sounds are then translated into frequencies audible to humans by dividing the frequencies by a predetermined ratio. A division ratio of eight was used for the study. Bat echolocation detectors also detect other ultrasonic sounds made by insects, raindrops hitting vegetation, and other sources. A sensitivity level of six was used to reduce interference from these other sources of ultrasonic noise. The calls were recorded via the ZCAIM, which uses a CompactFlash memory card with large storage capacity. The Anabat detectors were placed inside weather-tight containers (plastic tubs for ground units, a polypropylene dry bag for the elevated unit) with a hole cut in the side of the container for the microphone to extend through. Microphones were encased in PVC tubing with drain holes that curved vertically outside the container to minimize the potential for water damage due to weather. Anabat units situated on the ground were raised approximately 3 ft (1 m) to minimize echo interference and to elevate the unit above vegetation. The elevated Anabat unit was raised approximately 130 ft (40 m) up the meteorological tower using a pulley system. All units were programmed to turn on approximately ½ hour before sunset and turn off approximately ½ hour after sunrise each night.

Incoming echolocation calls were digitally processed by the detector and passed to the ZCAIM for further processing and data storage. Each series of echolocation calls was saved to a file on a high-capacity CompacFlash card, and these files were then transferred to a computer for analysis. Computer software was used to view digital “sonograms” of the echolocation calls showing change in frequency over time. During analysis, these frequency versus time displays were used to separate bat calls from other types of ultrasonic noise (e.g. wind, rain, insects, etc.) and to assign calls to a high- or low-frequency group.

The units of activity were number of bat passes (Hayes 1997). The absolute abundance of bats within a study area cannot be determined through acoustic sampling, and bat pass data represent levels of bat activity rather than numbers of individuals. A pass was defined as a continuous series of two or more call notes produced by an individual bat, with no pauses between call notes of more than one second (White and Gehrt 2001; Gannon et al. 2003). In this report, the terms bat pass and bat call are used interchangeably. The number of bat passes was determined by downloading the data files to a computer and tallying the number of echolocation passes recorded. Total number of passes was corrected for effort by dividing by the number of detector nights. Bat passes were classified as either high-frequency calls (≥ 35 kHz), which are generally given by small bats (e.g. *Myotis* spp. and western red bat (*Lasiurus blossevillii*)), or low-frequency (< 35 kHz), which are generally given by larger bats (e.g. Townsend’s big-eared bat (*Corynorhinus townsendii*), and hoary bat (*Lasiurus cinereus*)). Data determined to be noise (produced by a source other than a bat) or call notes that did not meet the pre-specified criteria to be termed a pass were removed from the analysis. To establish which species may have produced the high- and low-frequency calls recorded, a list of species expected to occur in the study area was compiled from range maps (Harvey et al. 1999; BCI website).

The total number of bat passes per detector night was used as an index for bat use at the SWRA. Bat pass data represent levels of bat activity, rather than the numbers of individuals present, because individuals cannot be differentiated by their calls. Bat activity was summarized by location and by weekly and nightly intervals from August 20 to October 21, 2007. To predict potential for bat mortality (i.e. low, moderate, high), the mean number of bat passes per detector night across locations (i.e., the mean of ratios) was compared to existing data from wind-energy facilities where both bat activity and mortality levels have been measured.

RESULTS

Bat activity was monitored at three sampling locations on a total of 63 nights during the period August 20 – October 21, 2007. Equipment failures compromised data collection for the northern unit between September 17 and October 14, and for the southern unit between September 17 and October 21. Anabat units were operable for 24% of the sampling period, recording 348 bat passes on 45 detector-nights (Table 1). Averaging bat passes per detector-night across locations gave a mean of 7.91 bat passes per detector-night.

Spatial Variation

Bat activity was similar between the ground Anabat units in the north (mean = 11.67 ± 2.0 bat passes per detector-night) and south (mean = 9.60 ± 4.1; Figure 2a) locations. At both locations, the number of high-frequency (HF) bat passes per detector-night was approximately one and a half times greater than the number of low-frequency (LF) passes. Bat activity was much lower at the north elevated location (mean = 2.47 ± 1.1), and LF bat passes greatly outnumbered HF bat passes. Patterns of nightly activity were similar among detector locations (Figure 2b), although data from the north ground detector were not collected concurrently with data from the other two detectors, making direct comparisons difficult.

Seasonal Variation

From the start of the acoustic bat surveys on August 20, bat activity increased to a peak on September 1, and then decreased through September 13, 2007 (Figure 3). Bat detectors were largely inoperable past September 17, preventing detection of bats for the entire duration of the study, except for a one-week period at the end of the study for the north elevated station, during which no bats were detected. Patterns of activity for HF and LF bats were congruent with the overall trend (Figure 4a), with the number of HF bat passes per detector-night peaking between August 30 and September 1 (26% of all HF passes), and LF bat activity at its highest on September 6 and 9 (29% of all LF passes; Figure 4b).

Species Composition

Species identification for specific bat passes was possible for the hoary bat; therefore, passes by this species could be separated from passes by all other low-frequency bats. Hoary bats comprised 5.7% of the total passes detected within the SWRA (20 of 348 bat passes; Table 1). Most passes by hoary bats occurred at the south location (mean = 1.2 ± 0.7 passes per detector-night), with several being detected at the north elevated location (mean = 0.2 ± 0.1) as well. No hoary bat passes were detected at the north ground location. Activity for hoary bats was highest on September 9 (44% of total hoary passes; Figure 5).

DISCUSSION

Potential Impacts

Assessing the potential impacts of wind energy development to bats at the SWRA is complicated by our current lack of understanding of why bats collide with wind turbines (Kunz et al. 2007b), combined with the inherent difficulties of monitoring elusive, night-flying animals (O'Shea et al. 2003). To date, monitoring studies of wind-energy facilities suggest that a) migratory tree-roosting species (eastern red bat (*Lasiurus borealis*), hoary bat, and silver-haired bat (*Lasionycteris noctivagans*)) comprise almost 75% of reported bats killed (Kunz et al. 2007b); b) the majority of collisions occur during the post-breeding or fall migration season (roughly August and September; Gruver 2002; Johnson et al. 2003); and c) the highest reported fatalities occur at wind facilities located along forested ridge tops in the eastern US (Kunz et al. 2007b), although recent studies report relatively high fatalities as well in agricultural regions of Iowa (Jain 2005) and Alberta, Canada (Baerwald 2006).

Some studies at wind-energy facilities have recorded both pre-construction Anabat detections per night and bat mortality once the facility is operational (Table 2). The number of bat calls per night as determined from bat detectors shows a rough correlation with bat mortality, but may be misleading because effort, timing of sampling, species recorded, and detector settings (equipment and locations) varies among studies (Kunz et al. 2007b). The best available estimate of mortality levels at a proposed wind-energy facility involves the evaluation of on-site acoustic bat data, in terms of activity levels, seasonal variation, and species composition, and the topographic features of the project area.

Activity

Bat activity at the SWRA (mean = 7.91 bat passes per detector-night; Table 1) was relatively high compared to that observed at wind-energy facilities in Minnesota and Wyoming, where bat collision mortality was low, but it was much lower than activity recorded at facilities in West Virginia and Tennessee, where bat mortality rates were high (Table 2). Based on the presumed relationship between pre-construction bat activity and post-construction fatalities, we expect bat mortality rates at the SWRA to be greater than the 2.2 bat fatalities/turbine/year reported at Buffalo Ridge, Minnesota, but much lower than the 20.8 fatalities/turbine/year reported at Buffalo Mountain, Tennessee.

Seasonal Variation

The number of bat calls detected per night at the SWRA peaked in late-August/early-September. Activity by hoary bats appeared to peak in mid-September, suggesting that migration of this species through the area occurs at this time of year. However, given the lack of Anabat coverage between September 17 and October 14, it is unknown whether bat activity would continue to abate, or whether subsequent pulses of activity were missed. The absence of bat calls from the detector at the north elevated station between October 15 and 21 suggests that bat activity is low at this time of year. Fatality studies of bats at wind-energy facilities in the US have shown a peak in mortality in August and September, and generally lower mortality earlier in the summer

(Johnson 2005). While survey efforts vary among different studies, the studies that combine Anabat surveys and fatality surveys show a general association between the timing of increased bat call rates and timing of mortality, with both call rates and mortality peaking during the fall (Kunz et al. 2007b). Based on the available data, it is expected that bat mortality at the SWRA will be highest in late August/early September, with an undetermined potential for mortality in late September/early October.

Species Composition

Of the fourteen species of bat likely to occur in the study area, five are known fatalities at wind-energy facilities (Table 3). Acoustic bat surveys were unable to determine bat species present in the study area (except for hoary bat), but they were able to distinguish high-frequency from low-frequency species. Bat passes at the SWRA were fairly evenly distributed between high- and low-frequency species. Fifty-five percent of passes were by high-frequency bats, suggesting higher relative abundance of species such as western red bat and *Myotis* species. High-frequency species were detected more often than low-frequency species at the ground stations, whereas the reverse was true at the north elevated station. This pattern may reflect different foraging strategies among species. Many of the low-frequency species likely to be present at the SWRA (e.g., hoary bat, silver-haired bat, and big brown bat (*Eptesicus fuscus*)) tend to forage at higher altitudes than most high-frequency species, due to their wing morphology and echolocation call structure (Norberg and Rayner 1987). Hoary bats made up 10% of all low-frequency passes at the SWRA, and were most active in mid-September, suggesting fall migration through the area.

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Table 1. Results of bat acoustic surveys conducted at SWRA, August 20 – October 21, 2007.

Anabat Location	# of HF Bat Passes	# of LF Bat Passes*	# of Hoary Bat Passes	Total Bat Passes	Detector-Nights	Bat Passes/ Night
North ground	126	84	0	210	18	11.67
North elevated	4	38	4	42	17	2.47
South ground	60	36	16	96	10	9.60
Total	**126**	**239**	**66**	**348**	**45**	**7.91**

*Passes by hoary bats are included in low-frequency numbers

Table 2. Wind-energy facilities in the US with both pre-construction Anabat sampling data and post-construction mortality data for bat species (adapted from Kunz et al. 2007b).

Wind-Energy Facility	Activity (#/Detector Night)	Mortality (Bats/Turbine/Year)	Reference
Saddleback, WA	7.91		This study
Foote Creek Rim, WY	2.2	1.3	Gruver 2002
Buffalo Ridge, MN	2.1	2.2	Johnson et al 2004
Buffalo Mountain, TN	23.7	20.8	Fiedler 2004
Top of Iowa, IA	34.9	10.2	Koford et al. 2005
Mountaineer, WV	38.3	38.0	Arnett et al. 2005

Table 3. Bat species determined from range-maps (Harvey et al. 1999; BCI website) as likely to occur within the SWRA, sorted by call frequency.

High-Frequency (≥ 35 kHz)		Low Frequency (< 35 kHz)	
western red bat†	*Lasiurus blossevillii*	pallid bat	*Antrozous pallidus*
California bat	*Myotis californicus*	Townsend's big-eared bat	*Corynorhinus townsendii*
western small-footed bat	*Myotis ciliolabrum*	big brown bat†	*Eptesicus fuscus*
western long-eared bat	*Myotis evotis*	hoary bat*†	*Lasiurus cinereus*
Keen's bat	*Myotis keenii*	silver-haired bat*†	*Lasionycteris noctivagans*
little brown bat†	*Myotis lucifugus*		
fringed bat	*Myotis thysanodes*		
long-legged bat	*Myotis volans*		
Yuma bat	*Myotis yumanensis*		

*long-distance migrant; †species known to have been killed at wind-energy facilities

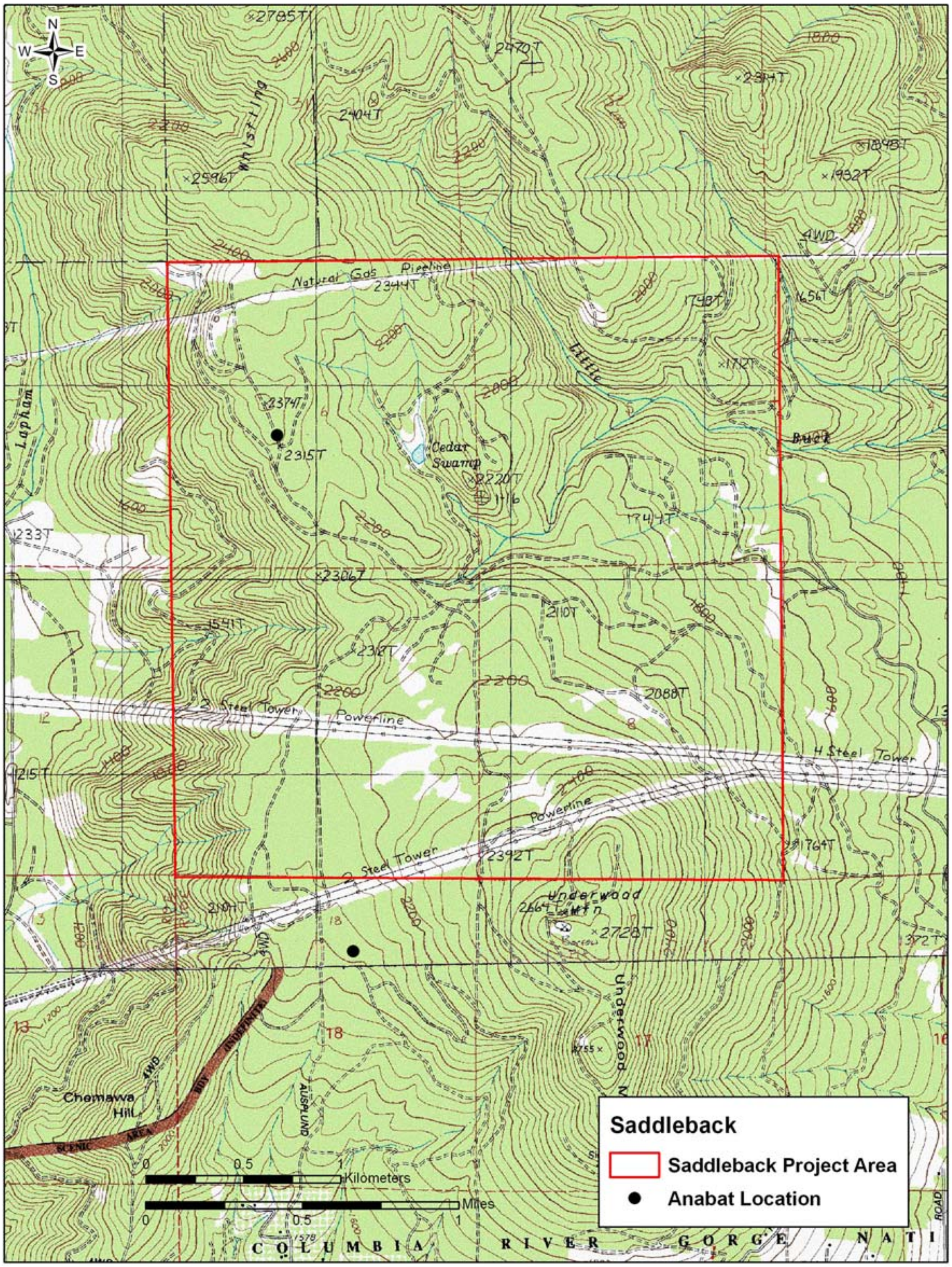

Figure 1. Study area map showing project area and Anabat sampling stations at the SWRA.

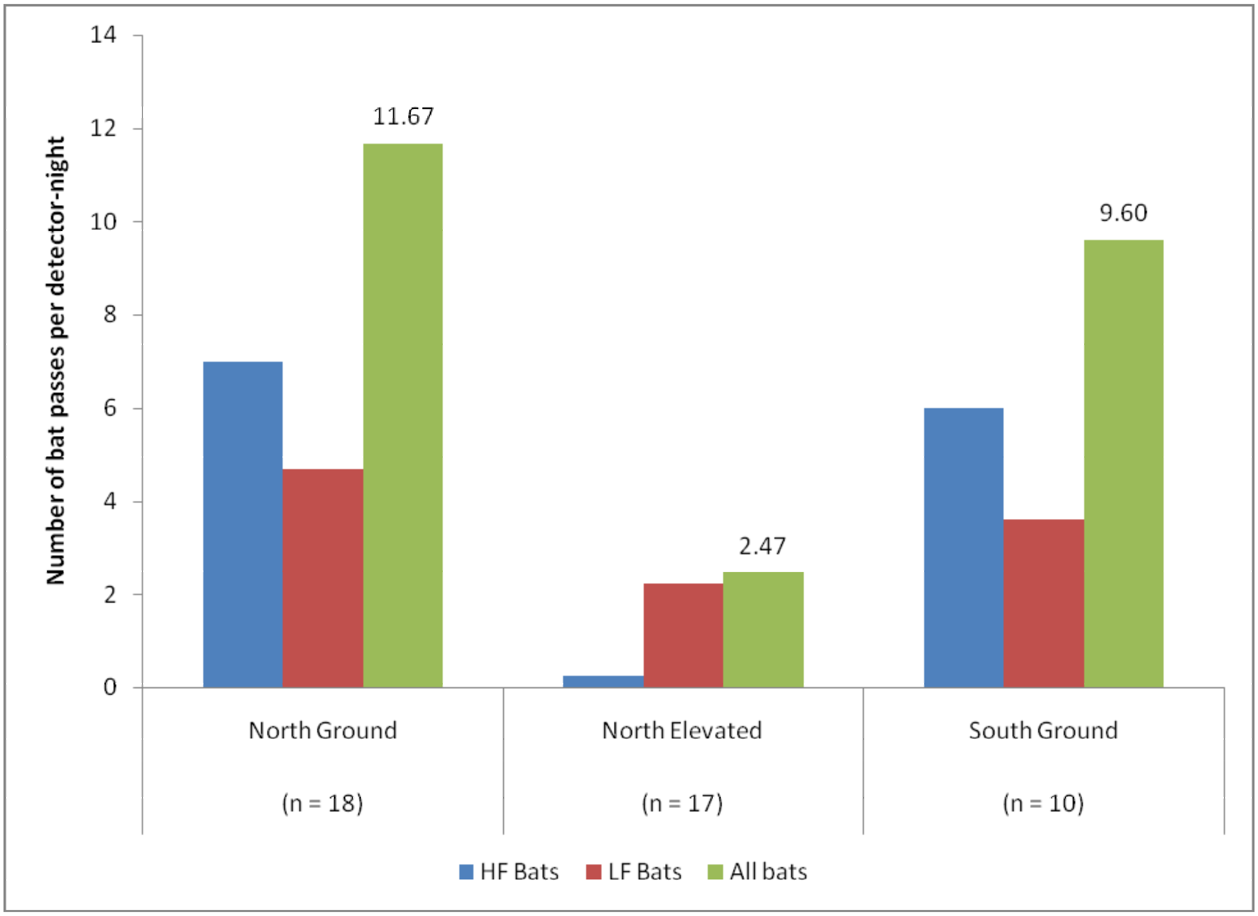

Figure 2a. Number of bat passes per detector-night by location at the SWRA.

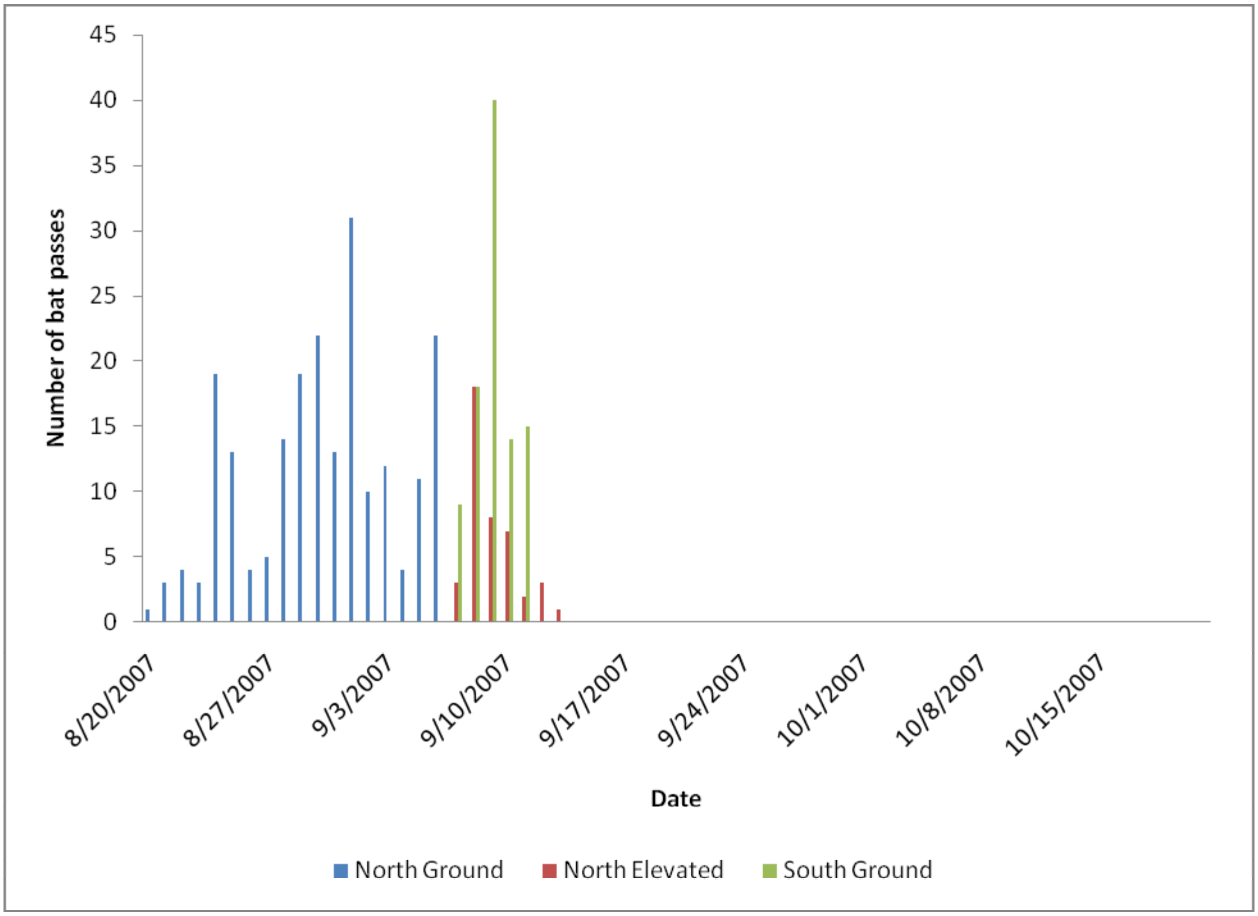

Figure 2b. Number of nightly bat passes, grouped by Anabat location, at the SWRA.

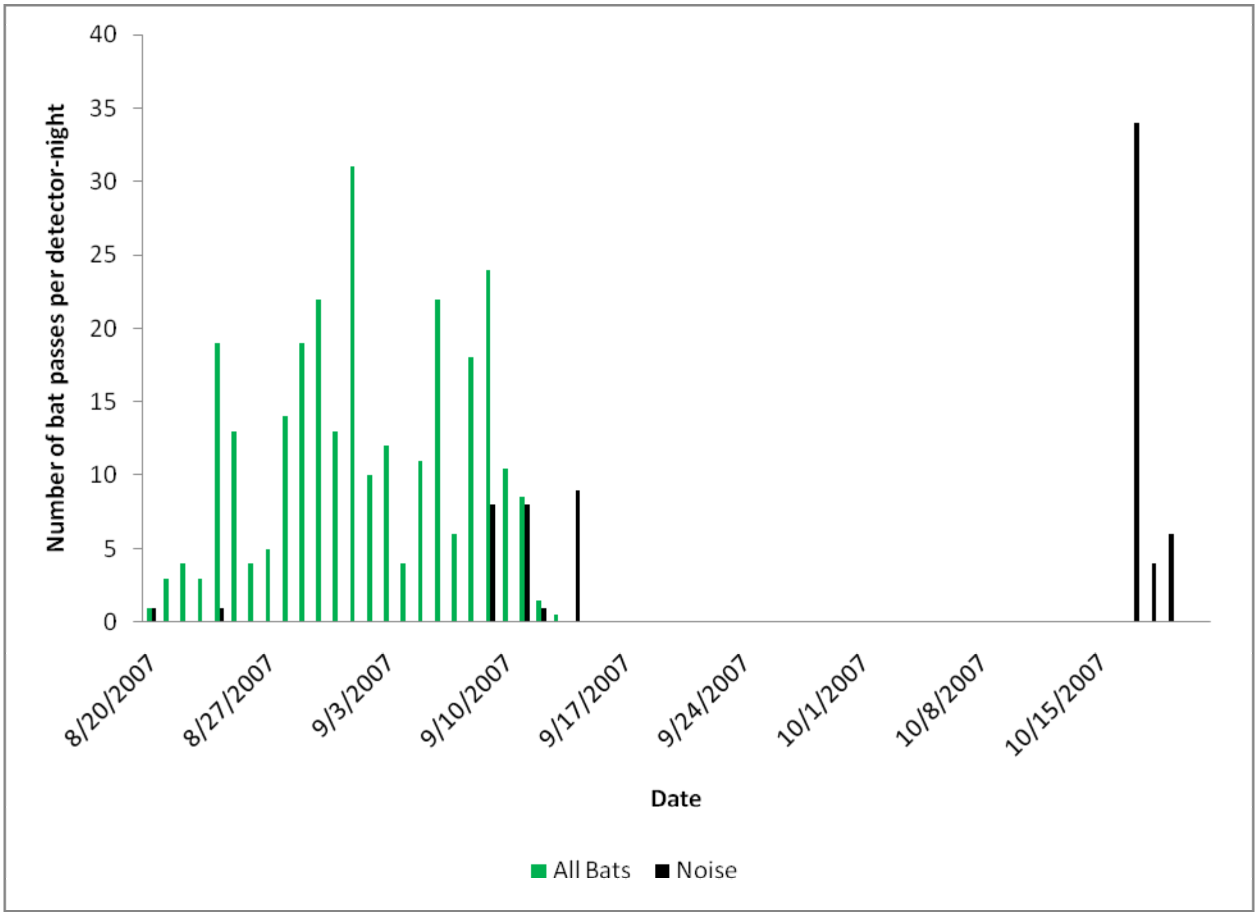

Figure 3. Number of bat passes and noise files detected per detector–night, presented nightly, at the SWRA.

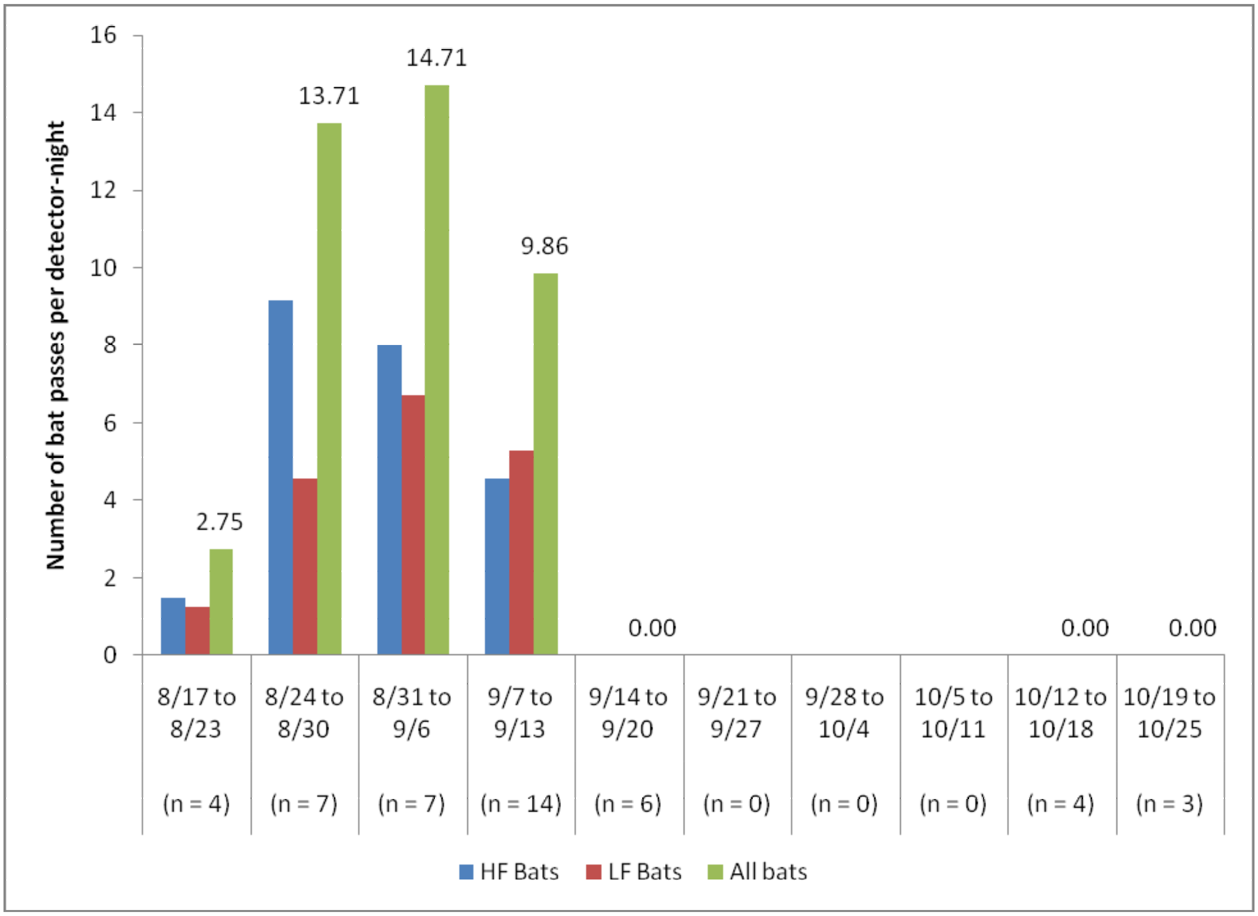

Figure 4a. Weekly activity by high- and low-frequency bats at the SWRA. (Equipment failures prevented data collection between September 17 and October 14, 2007.)

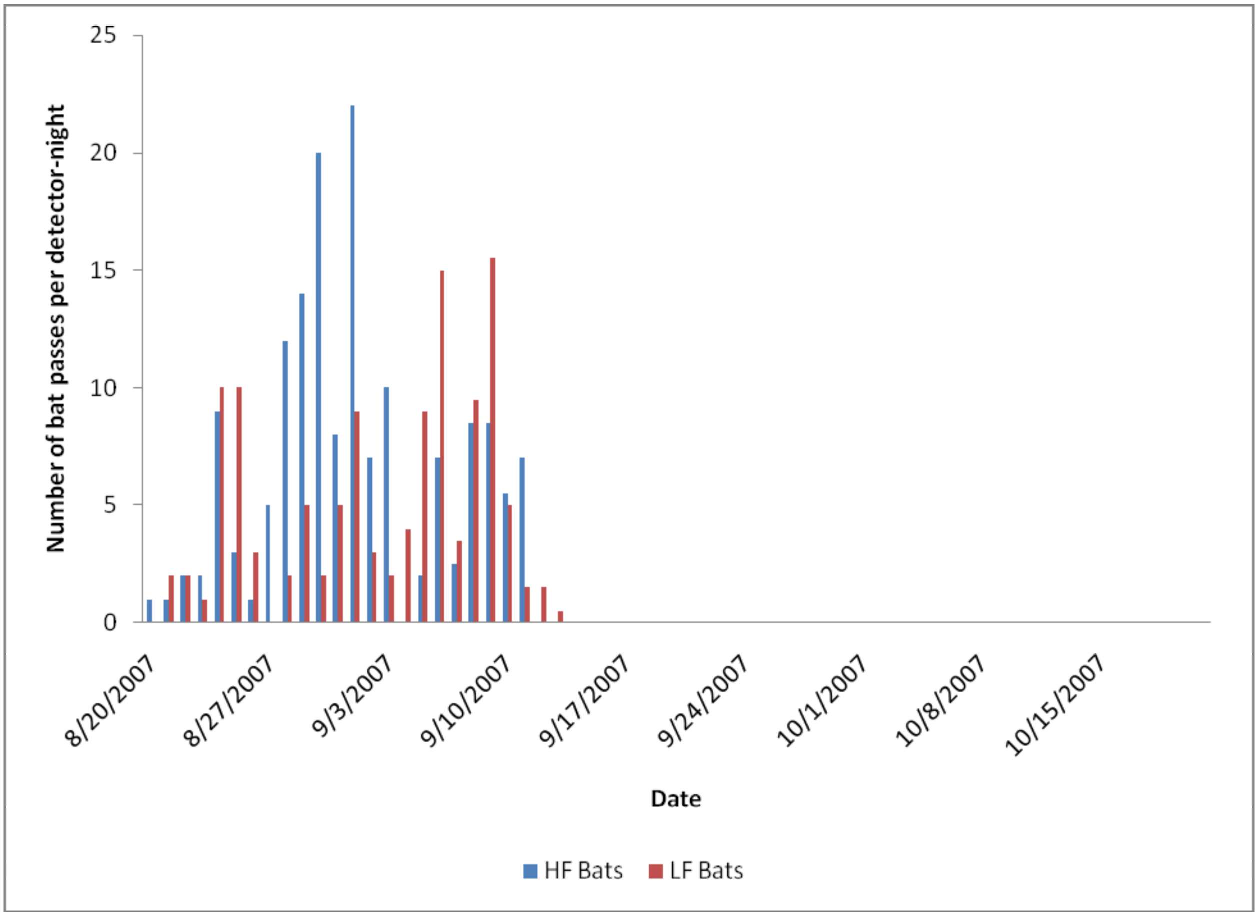

Figure 4b. Nightly activity by high- and low-frequency bats at the SWRA. (Equipment failures prevented data collection between September 17 and October 14, 2007.)

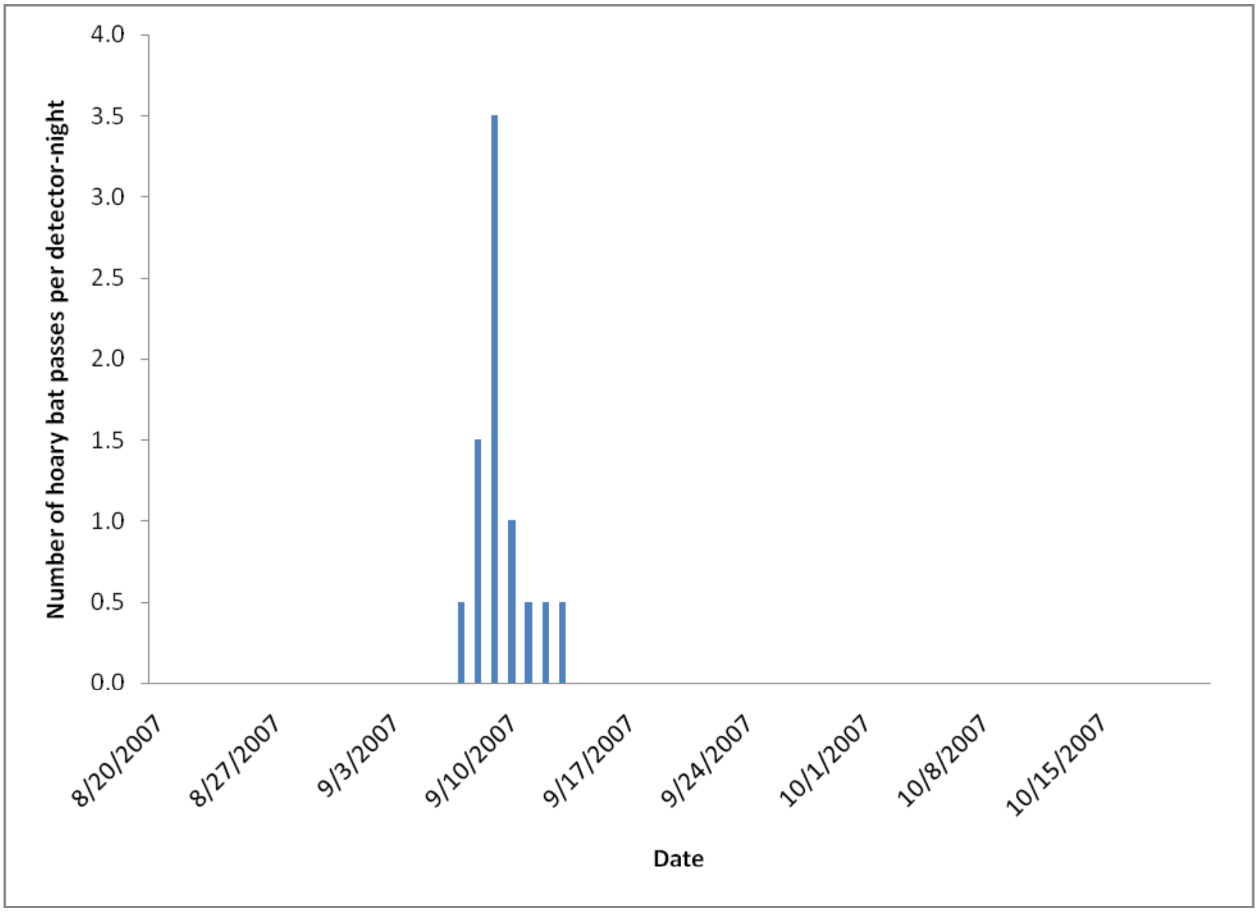

Figure 5. Number of passes per detector–night by hoary bats, presented nightly, at the SWRA. (Equipment failures prevented data collection between September 17 and October 14, 2007.)

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Bat Acoustic Studies for the Saddleback Wind Resource Area, Skamania County, Washington, July 3 – October 7, 2008. Prepared for SDS Lumber Company

WEST, Inc. 2009.

Final Report

Bat Acoustic Studies for the Saddleback Wind Resource Area Skamania County, Washington

July 3 – October 7th, 2008

Prepared for:

SDS Lumber Company
P.O. Box 266
Bingen, WA 98605

Prepared by:

Greg Johnson, Jeff Gruver, Tamara Enz and Jerry Baker

Western **E**co**S**ystems **T**echnology, Inc.
2003 Central Avenue
Cheyenne, Wyoming

WEST, Inc.

January 28, 2009

EXECUTIVE SUMMARY

Western EcoSystems Technology, Inc. initiated surveys in July 2008 designed to assess bat use within the proposed Saddleback Wind Resource Area, Skamania County, Washington. Acoustic surveys for bats using Anabat® SD-1 ultrasonic detectors at four fixed stations were conducted from July 3 to October 7, 2008. The objective of the acoustic bat surveys was to estimate the seasonal and spatial use of the study area by bats. A total of 56,595 bat passes were recorded during 97 detector nights. Averaging bat passes per detector-night across locations, we detected a mean of 148.34 bat passes per detector-night across all stations.

Three stations were placed in upland areas typical of those likely to contain wind turbines. Data from these three detectors were used to assess risk of bat collision mortality. A fourth detector was placed adjacent to a pond in the local area to assess levels bat activity and composition of primarily breeding bats in the project area.

At the three upland stations, over 65% of the calls were <35 kHz in frequency (e.g., big brown bat, silver-haired bat, hoary bat), and the remaining calls were >35 kHz (e.g., *Myotis* bat species). Species identification was only possible for the hoary bat, which made up 6.0% of all passes at the upland stations. At the wetland station (SB2), 69.7% of all passes were >35 kHz and hoary bats composed 2.0% of all recorded bat passes. Activity levels for bat passes both the upland stations and wetland station peaked in July and early August. Activity levels for hoary bats were highest in July, suggesting the project area is used more for breeding by this species than as a migration corridor.

The mean number of bat passes per detector per night was compared to existing data at five wind-energy facilities where both bat activity and mortality levels have been measured. The level of bat activity documented at the Saddleback Wind Resource Area was considerably higher than that at wind facilities in Minnesota and Wyoming, where reported bat mortalities are low, and was also higher than at facilities in the eastern US, where reported bat mortality is highest.

Although high bat activity levels were recorded at the Saddleback Wind Resource Area, the available evidence indicates that these data do not necessarily imply that bat fatality levels will be high. Numerous factors, including the timing of the activity, differences in call rates among the various habitats, and composition of the bat calls suggest that bat mortality may be lower than indicated by the high bat activity recorded. No data on bat mortality levels associated with wind energy developments in western coniferous forests are available to help predict risk to bats at the Saddleback Wind Resource Area. Bat fatality patterns may differ from those in open habitats as well as in eastern deciduous forests.

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INTRODUCTION

SDS Lumber Company is proposing to develop a wind-energy facility in Skamania County, Washington. SDS Lumber requested Western EcoSystems Technology, Inc. (WEST) to develop and implement a standardized protocol for baseline studies of bat use in the project area for the purpose of estimating the impacts of the wind-energy facility on bats, and to assist with siting turbines to minimize impacts to bats. The protocol for the baseline study is similar to protocols used at other wind-energy facilities in the United States. The protocol has been developed based on WEST's experience studying wildlife and wind turbines at projects throughout the US and included passive acoustic sampling using Anabat bat detectors at fixed stations to quantify bat use in the study area.

STUDY AREA

The proposed project area is in southeast Skamania County approximately four miles northwest of White Salmon, Washington (Figure 1). The specific project area is just north of Underwood Mountain and includes Sections 5, 6, 7, & 8, Township 3N, Range 10E. The project area consists of hilltops dominated by coniferous forests with some clearcuts and linear clearings associated with powerline rights-of-way. Elevation of the project area ranges from approximately 1700′ – 2400′.

METHODS

Bat Acoustic Surveys

The objective of the bat use surveys was to estimate the seasonal and spatial use of the SWRA by bats. Bats were surveyed using Anabat® SD-1 bat detectors (Titley Electronics Pty Ltd., NSW, Australia). Bat detectors are a recommended method to index and compare habitat use by bats. The use of bat detectors for calculating an index to bat impacts has been used at several wind-energy facilities (Kunz et al. 2007*a*), and is a primary and economically feasible bat risk assessment tool (Arnett 2007). Bat activity was surveyed using four detectors from July 3 to October 7, 2008, a period corresponding to summer breeding and fall bat migration at this site. Detectors were placed at four locations (Figure 1).

One detector (SB2) was placed at a wetland in the project area to assess activity levels and composition of local, breeding bats in the project area. This is a standard practice for evaluating local bat use of a project area when bat concentration areas such as wetlands or ponds are present. These data were not, however, used to assess risk to bats of collision mortality. The other three detectors were placed in upland areas typical of proposed turbine locations in the project area. One of these detectors (SB3) was placed at a linear clearing created for a road through coniferous forest, and the other two (SB1 and SB4) were placed within clear cuts in the project area.

Anabat detectors record bat echolocation calls with a broadband microphone. The echolocation sounds are then translated into frequencies audible to humans by dividing the frequencies by a predetermined ratio. A division ratio of 16 was used for the study. Bat echolocation detectors also detect other ultrasonic sounds made by insects, raindrops hitting vegetation, and other sources. A sensitivity level of six was used to reduce interference from these other sources of ultrasonic noise. Calls were recorded to a compact flash memory card with large storage capacity. The Anabat detectors were placed inside plastic weather-tight containers with a hole cut in the side of the container for the microphone to extend through. Microphones were encased in PVC tubing with drain holes that curved skyward at 45 degrees outside the container to minimize the potential for water damage due to rain. Containers were raised approximately 1 m off the ground to minimize echo interference and lift the unit above vegetation. All units were programmed to turn on each night approximately one half-hour before sunset and to turn off approximately one half-hour after sunrise.

Statistical Analysis

Bat Acoustic Surveys

The units of activity were number of bat passes (Hayes, 1997). A pass was defined as a continuous series of less than or equal to two call notes produced by an individual bat with no pauses between call notes of less than one second (White and Gehrt 2001, Gannon et al. 2003). In this report, the terms bat pass and bat call are used interchangeably. The number of bat passes was determined by downloading the data files to a computer and tallying the number of echolocation passes recorded. Total number of passes was corrected for effort by dividing by the number of detector nights. Bat calls were classified as either high-frequency calls (≥ 35 kHz) that are generally given by small bats (e.g. *Myotis* spp.) or low-frequency calls (< 35 kHz) that are generally given by larger bats (e.g. silver-haired bat [*Lasionycteris noctivagans*], big brown bat [*Eptesicus fuscus*], hoary bat [*Lasiurus cinereus*]). Data determined to be noise (produced by a source other than a bat) or call notes that did not meet the pre-specified criteria to be termed a pass were removed from the analysis. To establish which species may have produced the high- and low-frequency calls recorded, a list of species expected to occur in the study area was compiled from range maps (Table 1; Harvey et al. 1999, BCI website).

The total number of bat passes per detector night was used as an index of bat use in the SWRA. Bat pass data represented levels of bat activity rather than the numbers of individuals present because individuals could not be differentiated by their calls. To predict potential for bat mortality (i.e. low, moderate, high), the mean number of bat passes per detector night (averaged across those monitoring stations placed in upland habitats) was compared to existing data from wind-energy facilities where both bat activity and mortality levels have been measured.

RESULTS

Bat Acoustic Surveys

For the combined upland locations, bat activity was monitored at three sampling locations over a total of 97 nights during the period July 3 to October 7, 2008. Anabat units were operable for 95.5% of the sampling period (Figure 2), recording 39,326 bat passes on 278 detector-nights (Table 2). Bat activity at the wetland location (SB2) was also monitored for a total of 97 nights during the period of July 3 to October7, 2008. This unit was operable for 100% of the sample period (Figure 3), recording 17,269 bat passes on 97 detector nights (Table 3). Averaging bat passes per detector-night across the upland locations (SB1, SB3, and SB4), we detected a mean of 138.44 bat passes per detector-night. The wetland station (SB2) recorded an average of 178.03 bat passes per detector-night.

Spatial Variation

Bat activity varied among upland Anabat units SB1, SB3 and SB4 in the SWRA (mean = 138.44 bat passes per detector-night; Figures 1, 4). A total of 80.7% of all bat passes (mean = 327.25 bat passes per detector-night) was recorded at station SB3, located along a linear clearing in a forested situation, while activity recorded at stations SB1 and SB4, located in clear cuts, comprised only 19.1% of all bat passes (mean = 14.30 and 73.76, respectively). AnaBat wetland station SB2 recorded a mean of 178.03 bat passes per detector-night (Figures 1, 5).

Temporal Variation

Bat activity was highest at the three upland stations throughout the months of July and August, with peak activity occurring between July 10 and July 16 (Figure 6). The greatest activity on a single night occurred on August 4 (1,445 passes). After the third week of August, activity dropped off to much lower levels and remained low for the duration of the study period. Temporal patterns were largely consistent among stations SB3 (road clearing) and SB4 (clear-cut), although SB3 recorded much greater levels of bat activity (Figure 6). The level of bat activity at station SB1 (clear-cut) was relatively consistent across the entire study period. Bat activity at wetland station SB2 was highest during the month of July (Figure 7), with an activity peak on July 5. Bat activity from July 3 through mid-August (mean = 218.6/detector night) was over four times higher than activity from mid-August through October 7 (mean = 52.3; Figures 10 and 11).

Species Composition

At the combined upland stations, passes by low-frequency bats (LF; 67.0%) outnumbered passes by high-frequency bats (HF; 33.0%). The proportion of HF and LF bat passes was similar among Anabat stations (Figure 8). At wetland station SB2, passes by HF bats (69.7%) outnumbered passes by LF bats (30.3%; Figure 9).

Species identification for specific passes was possible only for the hoary bat; therefore, passes by this species could be separated from passes by other low-frequency bats. Hoary bats comprised 6.0% of total passes detected at the combined upland points, and use among the three stations was similar (Figure 12). Hoary bats comprised 2.0% of total bat passes at the wetland station SB2 (Figure 13). Patterns of hoary bat activity were similar to other bats, with most bat passes occurring in July and early August (Figures 14 and 15).

DISCUSSION

Potential Impacts

Assessing the potential impacts of wind energy development to bats at the SWRA is complicated by our current lack of understanding of why bats die at wind turbines (Kunz et al. 2007b; Baerwald et al. 2008), combined with the inherent difficulties of monitoring elusive, night-flying animals (O'Shea et al. 2003). To date, monitoring studies of wind projects suggest that a) migratory tree-roosting species (eastern red, hoary, and silver-haired bats) comprise almost 75% of reported bats killed, b) the majority of fatalities occur during the post-breeding or fall migration season (roughly August and September), and c) the highest reported fatalities occur at wind facilities located along forested ridge tops in the eastern US (Arnett et al. 2008, Gruver 2002, Johnson et al. 2003, Kunz et al. 2007b), although recent studies in agricultural regions of Iowa and Alberta, Canada, report relatively high fatalities as well (Jain 2005, Baerwald 2006).

Some studies of wind projects have recorded both Anabat detections per night and bat mortality (Tables 4 and 5). The number of bat calls per night as determined from bat detectors shows a rough correlation with bat mortality, but may be misleading because effort, timing of sampling, species recorded, and detector settings (equipment and locations) varies among studies (Kunz et al. 2007*b*). Thus, our best available estimate of mortality levels at a proposed wind project involves evaluation of our on-site bat acoustic data in terms of activity levels, seasonal variation, species composition, and topographic features of the project area.

Activity

Bat activity within the SWRA (mean = 138.4 bat passes per detector-night at combined upland points, 178.0 at the wetland site) was very high compared to that observed at facilities in Minnesota and Wyoming, where bat mortality was low, and it was higher than activity recorded at sites in West Virginia and Tennessee, where bat mortality rates were high (Tables 4 and 5). Thus, based solely on the presumed relationship between pre-construction bat activity and post-construction fatalities, bat mortality rates at SWRA may be higher than many other wind resource areas in the U.S.

Spatial Variation

The proposed wind-energy facility is not located near any large, known bat colonies or other features that are likely to attract large numbers of bats. The nearest known bat hibernaculum is near Trout Lake, located nearly 20 miles north of the SWRA (B. Weiler, WDFW, pers. commun.). The SWRA also does not contain unique topographic features that may funnel migrating bats. The highest bat mortality rates documented at wind energy facilities have been on forested ridgetops in the eastern US. However, the relatively large numbers of bat fatalities recently reported in northern Iowa (Jain 2005) and southwestern Alberta (Baerwald 2006) indicate that an open landscape is also no guarantee of low mortality.

Activity was relatively high at stations SD2 and SD3 compared to other stations, accounting for the majority of the calls recorded during this study. Station SD2 was located adjacent to a wetland, which likely attracts bats for drinking and foraging opportunities. Station SD3 was located in a road clearing through coniferous forest. The linear clearing is likely used as a travel corridor by local bats in the project area. Bat activity was much lower at the two stations placed within clear cuts.

Temporal Variation
The number of bat calls detected per night at the SWRA was highest during July and early August, with activity peaks between July 10 and July 16. Activity in July and early August likely reflects use of the SWRA by local bats during the reproductive season, when pups are being weaned and foraging rates are high. Activity beyond mid-August likely represents movement of migrating bats through the area. Activity by hoary bats was also substantially higher in July, and dropped off significantly beginning in early August. After August 31, activity for all bats was very low relative to earlier dates, indicating that most bats had left the area for winter hibernacula or warmer climates. This suggests higher use of the project area by resident populations of hoary bats as well as other bats, rather than bats migrating through the area. Based on these data, it does not appear that migratory bats are concentrating in the project area.

Fatality studies of bats at wind projects in the US have shown a peak in mortality in August and September and generally lower mortality earlier in the summer (Johnson 2005; Arnett et al. 2008). While the survey effort varies among the different studies, the studies that combine Anabat surveys and fatality surveys show a general association between the timing of increased bat call rates and timing of mortality, with both call rates and mortality peaking during the fall (Kunz et al. 2007*b*). The highest use of the SWRA occurred in July and early August, prior to the time that most bat mortality occurs at wind resource areas in the Pacific Northwest as well as throughout the US.

Species Composition
Of the fourteen species of bat likely to occur in the study area, three are known fatalities at wind-energy facilities (Table 1). Acoustic bat surveys were unable to determine bat species present in the study area (except for hoary bats), but they were able to distinguish high frequency from low-frequency species. Roughly 65% percent of passes at the combined upland stations were by low-frequency bats, suggesting higher relative abundance of species such as hoary bat, silver-haired bat, or big brown bat, while nearly 70% of bat passes at the wetland station were by high-frequency bats, suggesting a higher relative abundance of species such as *Myotis* spp.

CONCLUSIONS

Although the data collected during this study indicate relatively high use of the project area by bats, bat activity at the SWRA is not uniquely high among wind resource areas. During a recent Anabat echolocation study conducted at the proposed Grayland Wind Resource Area in Pacific County, Washington during the period August 26 – September 12, 2008, a mean of 219.8 bat passes were recorded per detector night (McGraw et al. 2008). At a proposed wind energy facility at Maple Ridge, New York, Reynolds (2004) recorded an average of approximately 165 bat passes per detector night from late June through early July. The Grayland wind energy project has not been constructed, so post-construction fatality estimates are not available. Bat mortality at the Maple Ridge, New York project was estimated at 11.23/MW/year (Jain et al. 2008), much lower than the pre-construction bat activity levels would suggest. The highest bat mortality recorded at a wind energy facility in North America was at Mountaineer, West Virginia, where it averaged 38 bats/turbine/year. Pre-construction bat activity levels at Mountaineer as determined by Anabat sampling averaged 38.3 bat passes per detector night. These data suggest that high bat activity levels as determined by Anabat sampling may not necessarily equate to high bat mortality levels.

There are several other factors to suggest that even though bat activity is relatively high at the SWRA, this does not necessarily equate to high risk of bat mortality at the site. No turbines will be constructed near wetlands or ponds, and the cleared corridors along turbine strings will not resemble the narrow road path through the timber that also had high bat activity levels. Bat activity levels recorded at clear cuts in the project area were the lowest, averaging 14.3 and 73.8 bat passes/detector-night at these two locations. These areas most closely resemble what the habitat adjacent to turbines will resemble, because vegetation removal would occur in forested areas where the proposed roadway and turbine alignment is planned. The cleared area would extend 50 feet in all directions from each turbine. From a distance of 50 feet to 150 feet from the base of the turbines, tree heights will be limited to 15 feet above the elevation of the base of the turbine. Areas where trees are permanently removed would be replanted with native grasses and low-growing shrubs, and would therefore resemble habitat at existing clear cuts in the project area.

A substantial proportion of the bat calls recorded at the SWRA were made by high frequency species, including 33% of passes at the upland stations and 69.7% of passes at the wetland station. Although some of these calls may have been made by western red bat (*Lasiurus blossevillii*), most of these calls were likely made by *Myotis* species. *Myotis* species are rarely killed at wind energy facilities. At numerous wind resource areas throughout the US, these species have comprised from 0-13.5% of the fatalities, except at one site each in Iowa and Canada, where little brown bats (*Myotis lucifugus*) made up nearly 25% of the fatalities (Arnett et al. 2008). *Myotis* species are rarely found at other projects in the Pacific Northwest. Of 337 bat fatalities collected at existing wind-energy facilities in eastern Oregon and Washington, 320 (95.8%) were low frequency species, including 152 hoary bats, 163 silver-haired bats, and five big brown bats. Only one species that emits high frequency calls, the little brown bat, has been found as a turbine fatality in the Pacific Northwest, and the eight little brown bats found comprised only 2.4% of the fatalities (Johnson and Erickson 2008). These data indicate that *Myotis* bats are much less susceptible to turbine collisions than species that emit low frequency calls, which are primarily the foliage roosting long-distance migrants (i.e., hoary bat and silver-haired bat).

Another important factor to take into consideration is the timing of bat activity recorded at the SWRA. Bat activity from early July through mid-August 2008 was over four times higher than activity from mid-August through early October. Bat activity was also monitored at three sampling locations in the SWRA during the period August 20 – October 21, 2007 (Solick et al. 2008). Anabat units recorded 348 bat passes on 45 detector-nights, resulting in a mean of 7.91 bat passes per detector-night. Both of these stations were located in upland habitats characteristic of proposed turbine locations. These data support the conclusion that bat activity in the SWRA is low from mid August through October. Therefore, much lower activity levels were documented during the time frame that most bat mortality occurs at wind energy facilities in the Pacific Northwest, where the peak mortality levels occur from mid-August through September. This time period corresponds with fall migration of the tree bats and dispersal from summer breeding areas to hibernacula for the other species. Bat mortality at wind energy projects throughout the US during the breeding season has been low, as only 4.1% of the fatalities have occurred between May 15 and July 15 (Johnson 2005). At several wind farms studied, low mortality has been documented during the breeding season even though relatively large bat populations were present in the area (Fiedler 2004, Gruver 2002, Howe et al. 2002, Johnson et al. 2004, Schmidt et al. 2003). These data suggest that high bat activity levels during the breeding season do not equate to high bat fatality rates.

Although high bat activity levels were recorded at the SWRA, the available evidence indicates that these data do not necessarily imply that bat fatality levels will be high. Numerous factors, including the timing of the activity, differences in call rates among the various habitats, and species composition of the bat calls suggest that bat mortality may be lower than indicated by the high bat activity recorded. No data on bat mortality levels associated with wind energy developments in western coniferous forests are available to help predict risk to bats at the SWRA. Bat fatality patterns may differ from those in open habitats as well as in eastern deciduous forests.

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Table 1. Bat species determined from range-maps (Harvey et al. 1999; BCI website) as likely to occur within the SWRA, sorted by call frequency.

High-frequency (≥ 35 kHz)		Low-frequency (< 35 kHz)	
western red bat	*Lasiurus blossevillii*	big brown bat[†]	*Eptesicus fuscus*
western long-eared bat	*Myotis evotis*	silver-haired bat*[†]	*Lasionycteris noctivagans*
long-legged bat	*Myotis volans*	hoary bat*[†]	*Lasiurus cinereus*
little brown bat[†]	*Myotis lucifugus*	pallid bat	*Antrozous pallidus*
western pipistrelle	*Parastrellus hesperus*	Townsend's big-eared bat	*Corynorhinus townsendii*
Yuma myotis	*Myotis yumanensis*	fringed myotis**	*Myotis thysanodes*
western small-footed bat**	*Myotis ciliolabrum*		
California bat	*Myotis californicus*		

*long-distance migrant
[†]species known to have been killed at wind-energy facilities
**species distribution on the edge or just outside project area

Table 2. Results of bat acoustic surveys conducted at SWRA, July 3, 2008 - October 7, 2008.

AnaBat Location	# of HF Bat Passes	# of LF Bat Passes	# of Hoary Bat Passes*	Total Bat Passes	Detector-Nights	Bat Passes/ Night
SB1	677	710	31	1,387	97	14.30
SB3	12,273	19,470	1,856	31,743	97	327.25
SB4	23	6,173	489	6,196	84	73.76
Total	**12,973**	**26,353**	**2,376**	**39,326**	**278**	**138.44**

***Data for hoary bat passes is included in LF bat passes**

Table 3. Results of bat acoustic surveys conducted at SWRA, July 3, 2008 - October 7, 2008.

AnaBat Location	# of HF Bat Passes	# of LF Bat Passes	# of Hoary Bat Passes*	Total Bat Passes	Detector-Nights	Bat Passes/ Night
SB2	12,030	5,239	338	17,269	97	178.03
Total	**12,030**	**5,239**	**338**	**17,269**	**97**	**178.03**

*Data for hoary bat passes is included in LF bat passes

Table 4. Wind-energy facilities in the U.S. with both pre-construction AnaBat sampling data and post-construction mortality data for bat species (adapted from Kunz et al. 2007*b*).

Wind-Energy Facility	Activity (#/detector night)	Mortality (bats/turbine/year)	Reference
Saddleback, WA (upland stations)	138.4		This study
Foote Creek Rim, WY	2.2	1.3	Gruver 2002
Buffalo Ridge, MN	2.1	2.2	Johnson et al 2004
Buffalo Mountain, TN	23.7	20.8	Fiedler 2004
Top of Iowa, IA	34.9	10.2	Jain 2005
Mountaineer, WV	38.3	38	Arnett et al. 2005

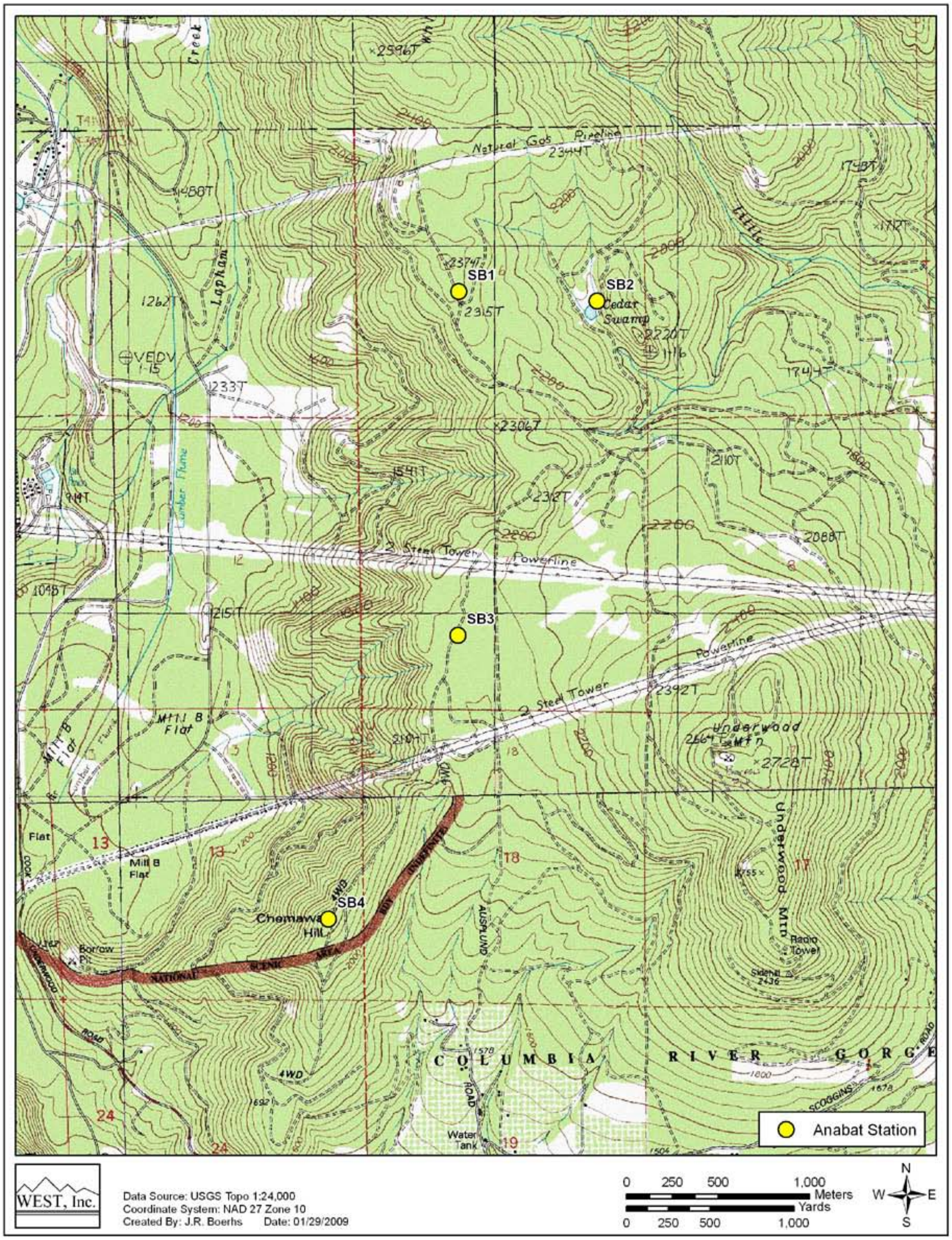

Figure 1. Anabat sampling locations at the Saddleback Wind Resource Area.

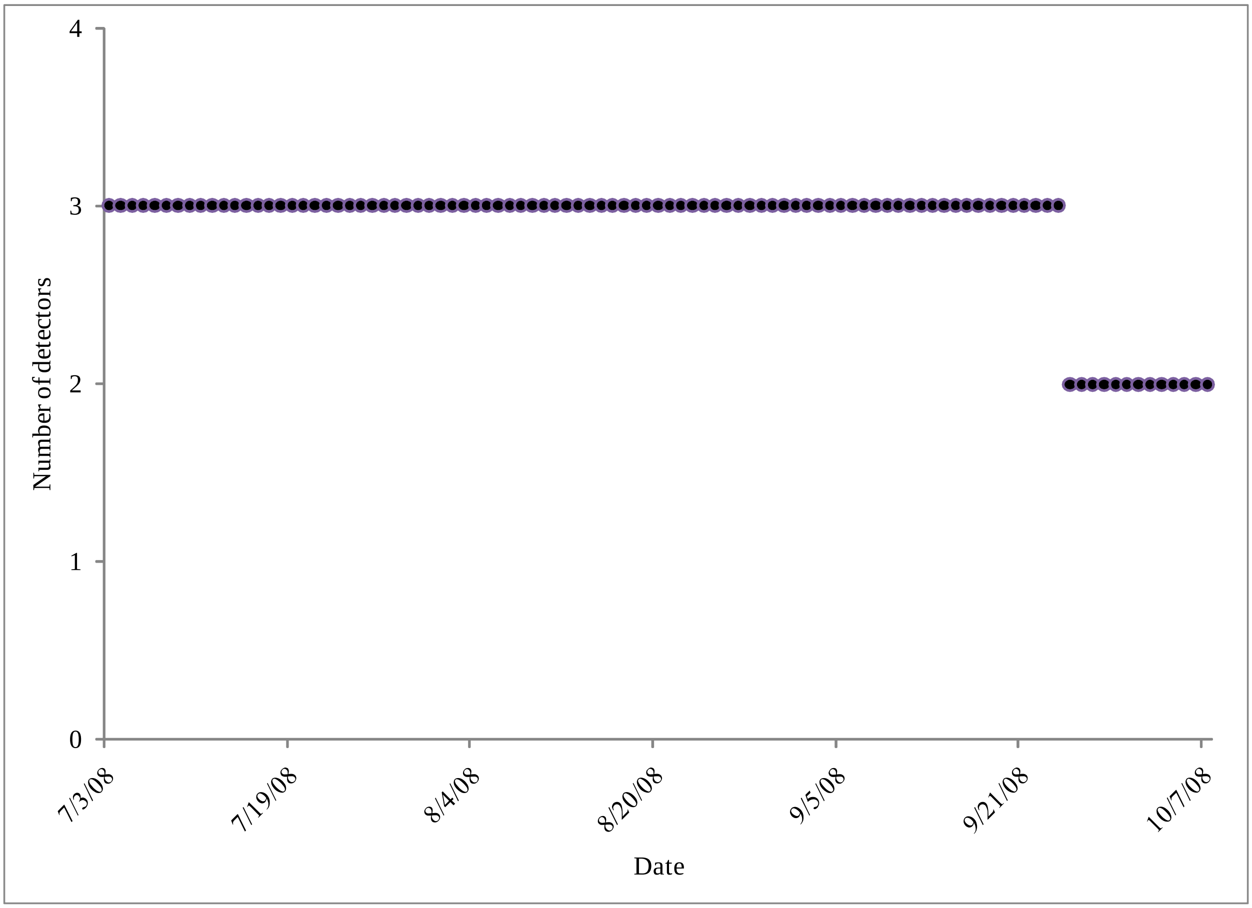

Figure 2. Number of Anabat detectors (n = 3) at the Saddleback Wind Resource Area operating during each night of the study period July 3 – October 7, 2008.

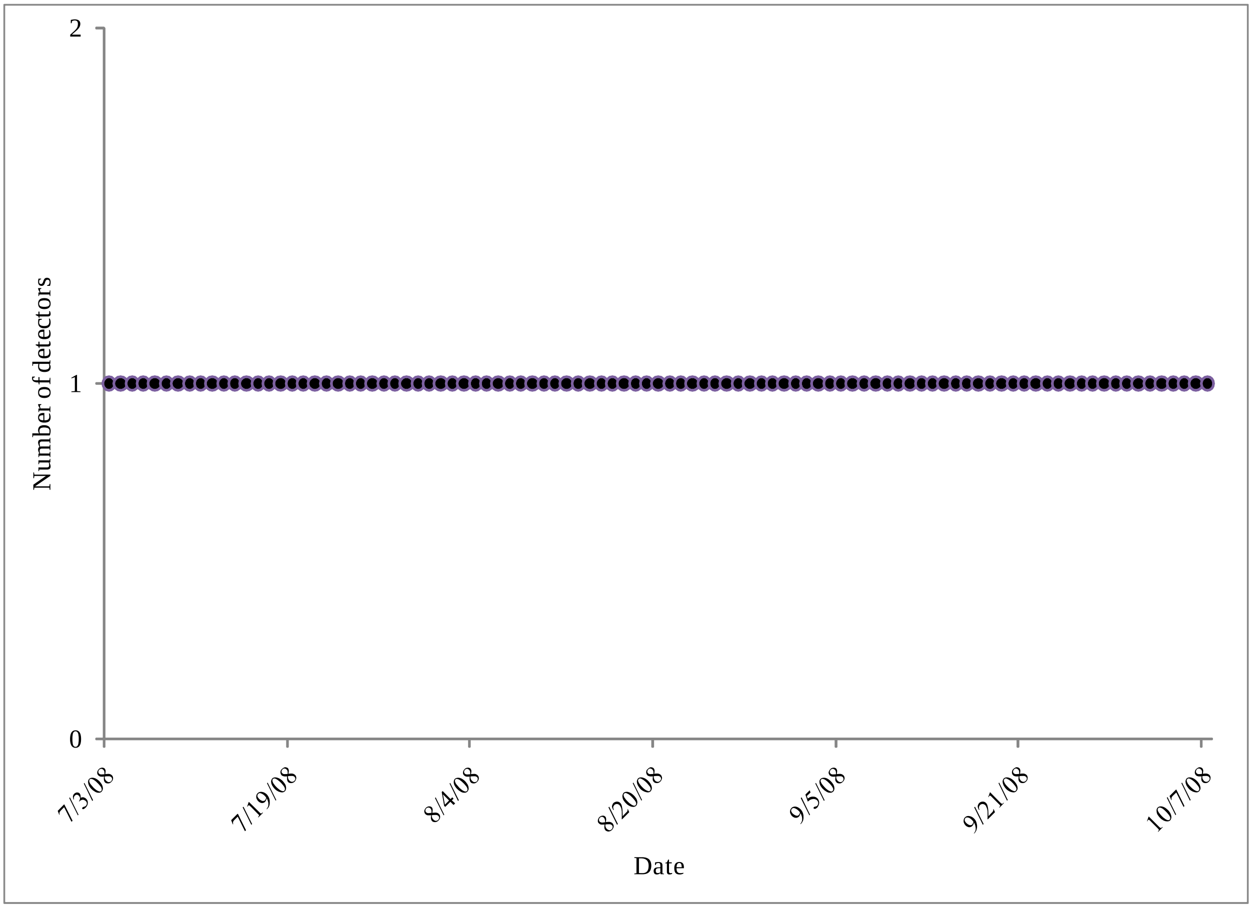

Figure 3. Number of Anabat detectors at wetland station SB2, operating during each night of the study period July 3 – October 7, 2008.

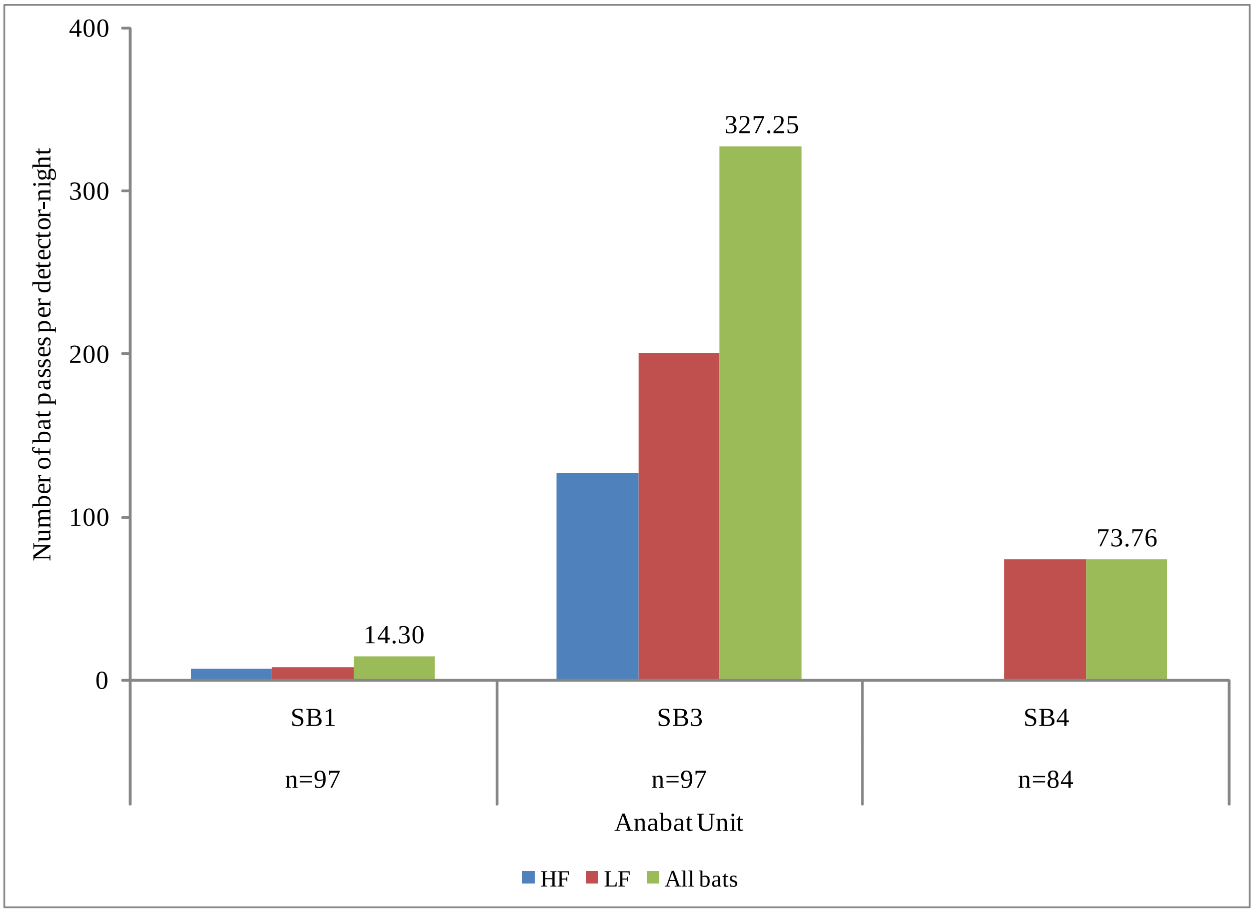

Figure 4. Number of bat passes per detector-night at upland Anabat locations at the Saddleback Wind Resource Area for the study period July 3 – October 7, 2008.

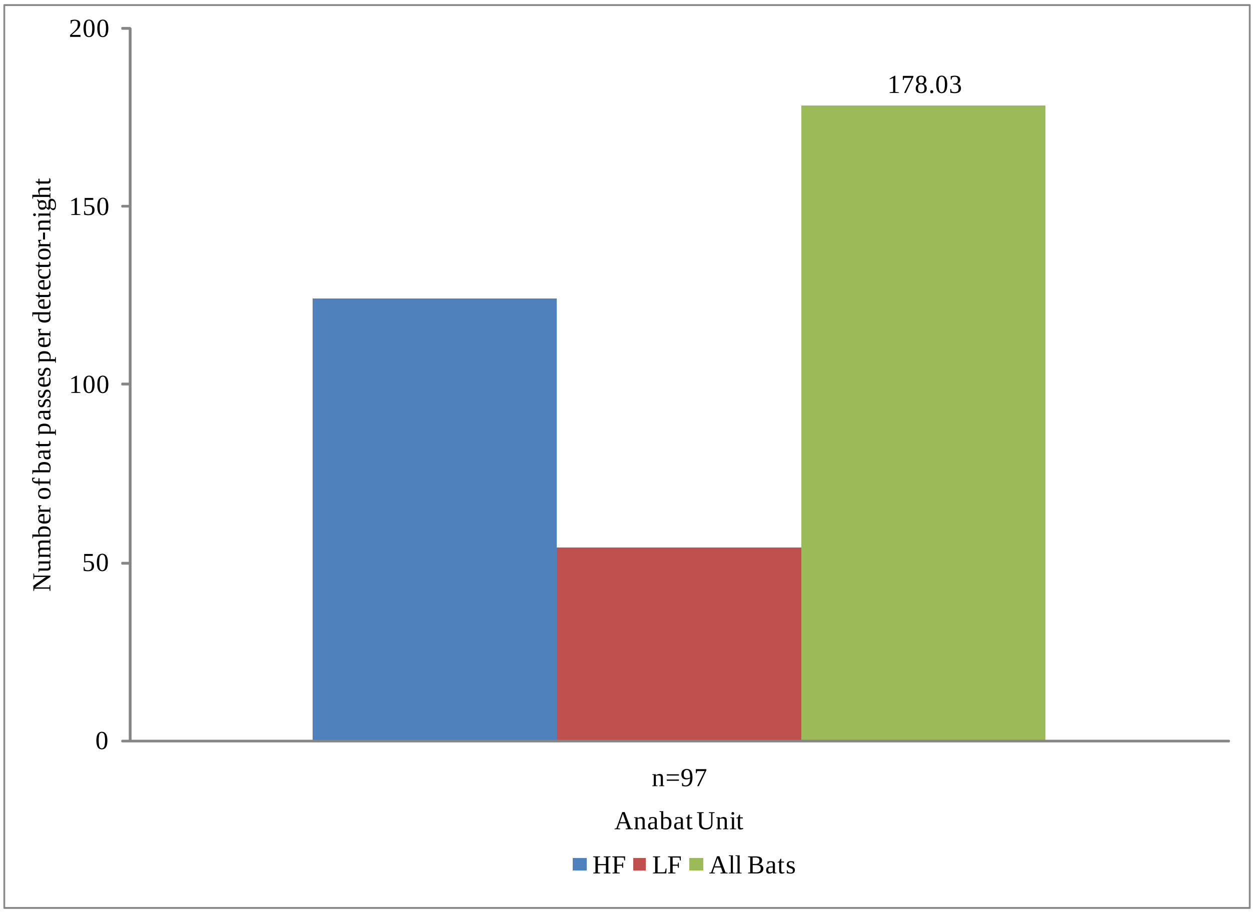

Figure 5. Number of bat passes per detector-night at Anabat wetland location SB2 for the study period July 3 – October 7, 2008.

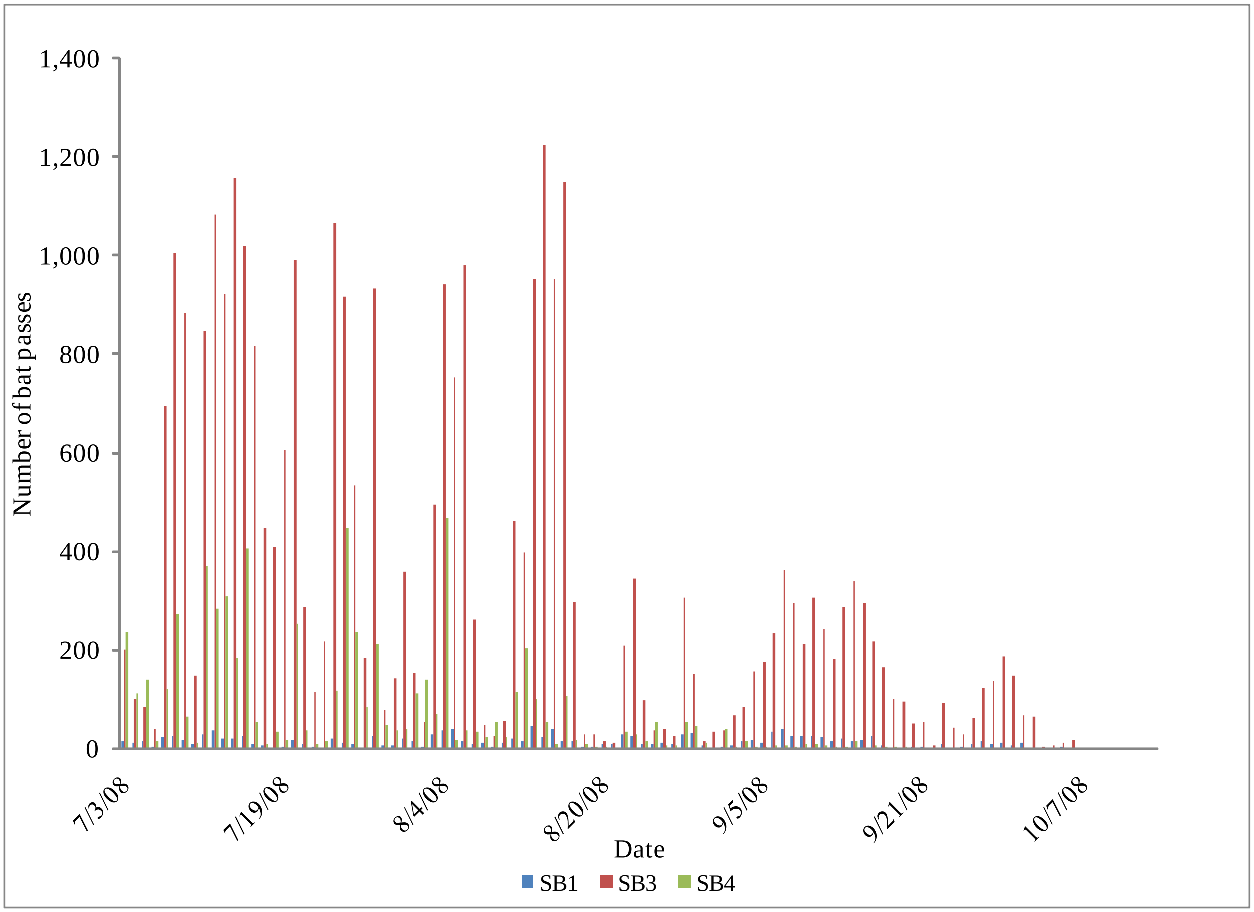

Figure 6. Number of nightly bat passes by station for the study period July 3 – October 7, 2008.

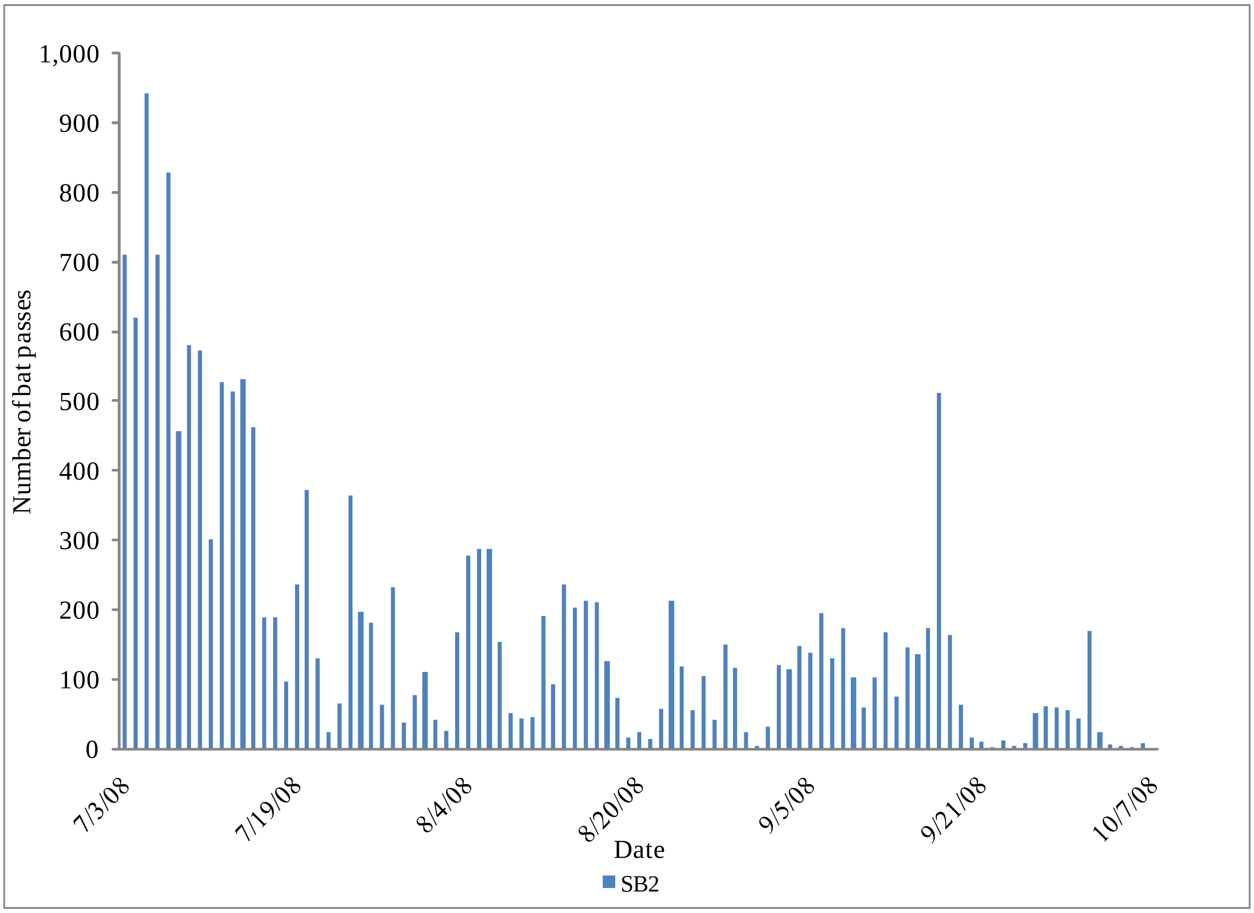

Figure 7. Number of nightly bat passes at wetland station SB2 for the study period July 3 – October 7, 2008.

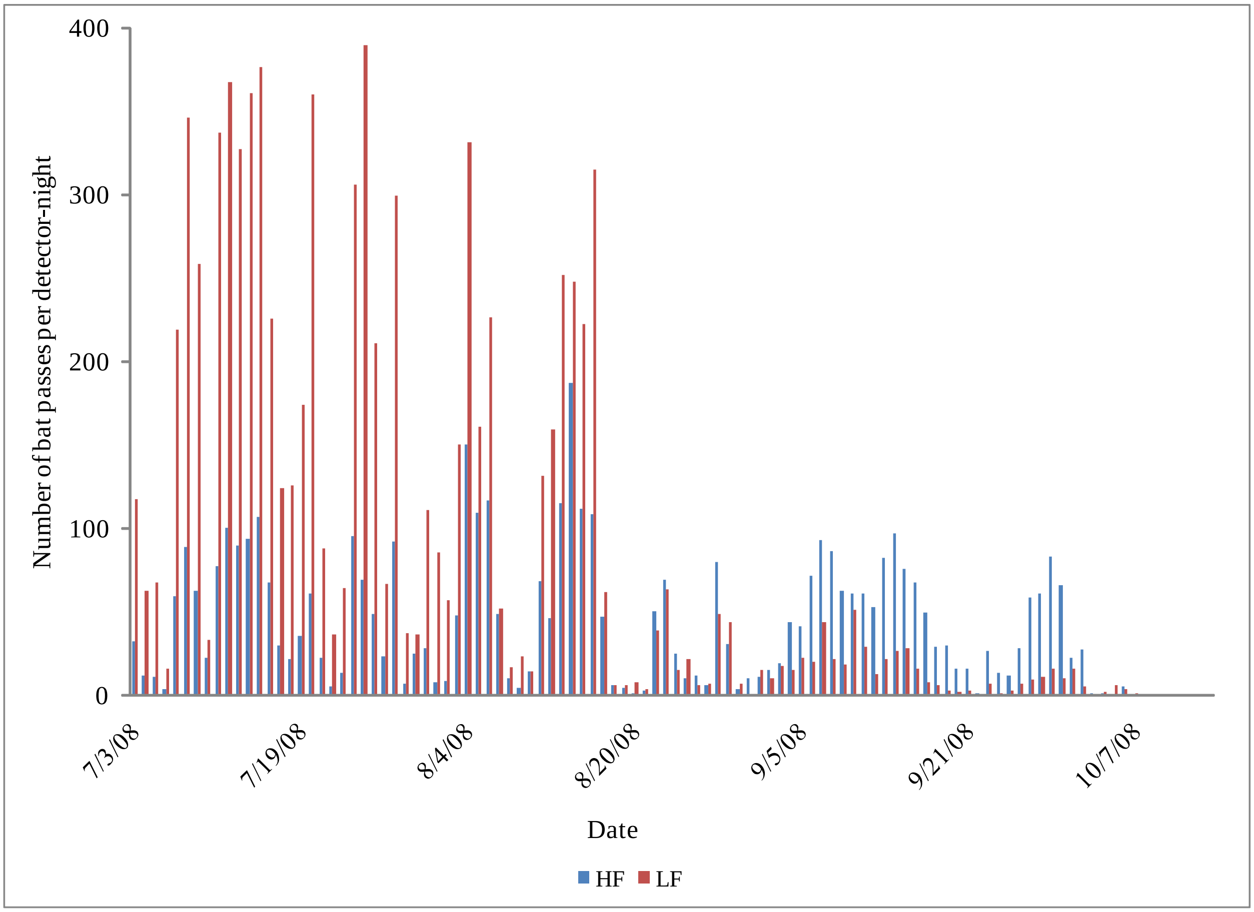

Figure 8. Nightly activity by high-frequency (HF) and low-frequency (LF) bats at upland stations at the Saddleback Wind Resource Area for the study period July 3 – October 7, 2008.

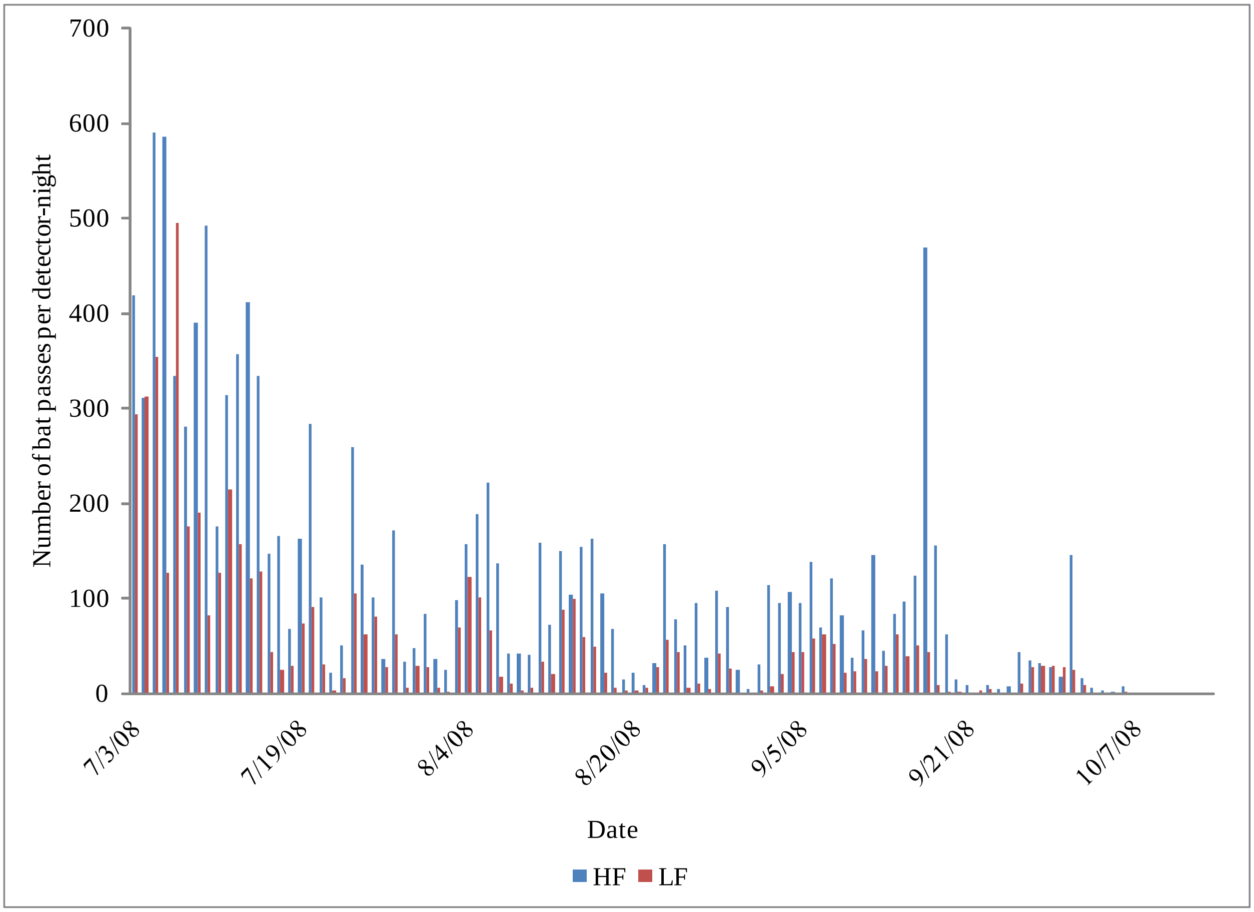

Figure 9. Nightly activity by high-frequency (HF) and low-frequency (LF) bats at wetland station SB2 for the study period July 3 – October 7, 2008.

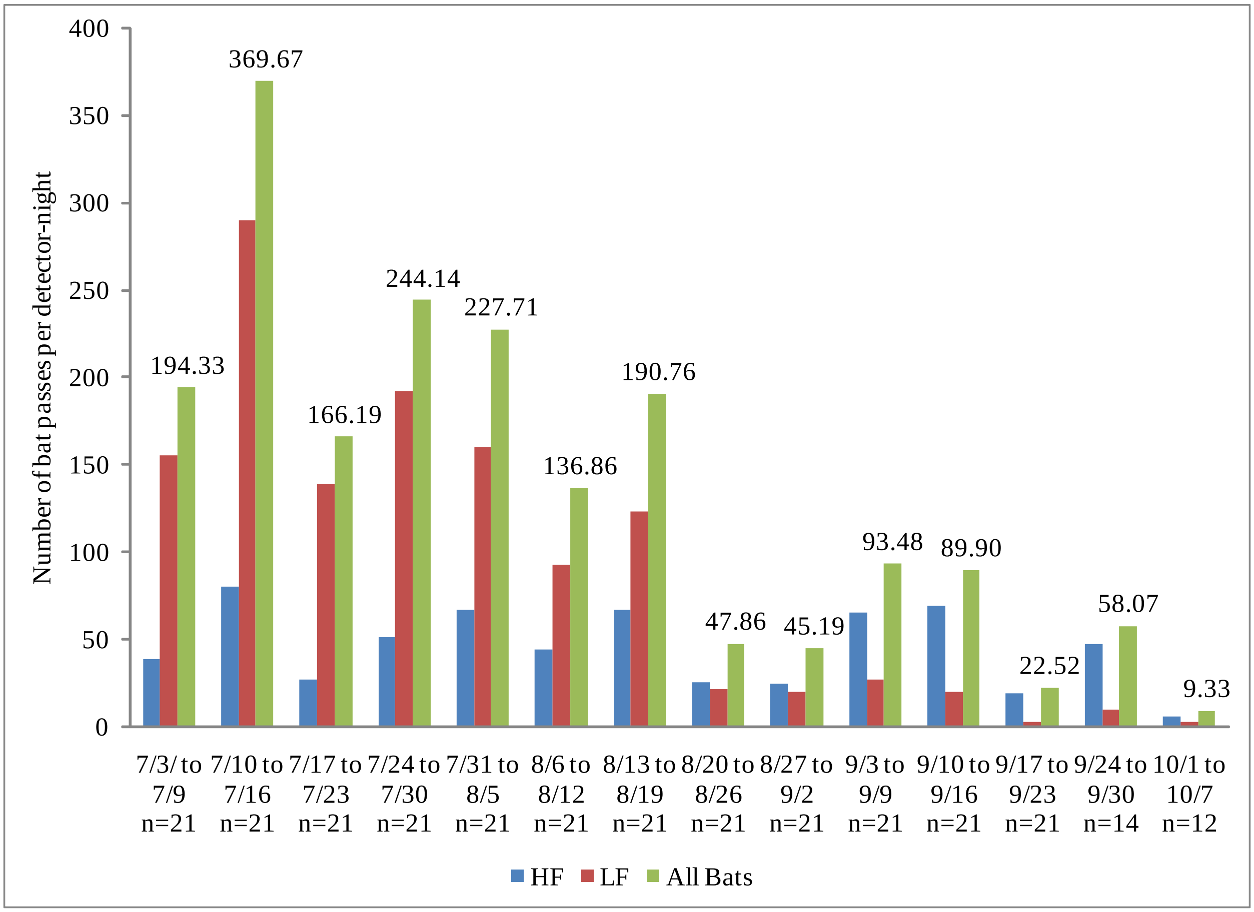

Figure 10. Weekly activity by high-frequency (HF) and low-frequency (LF) bats at upland stations for the study period July 3 – October 7, 2008.

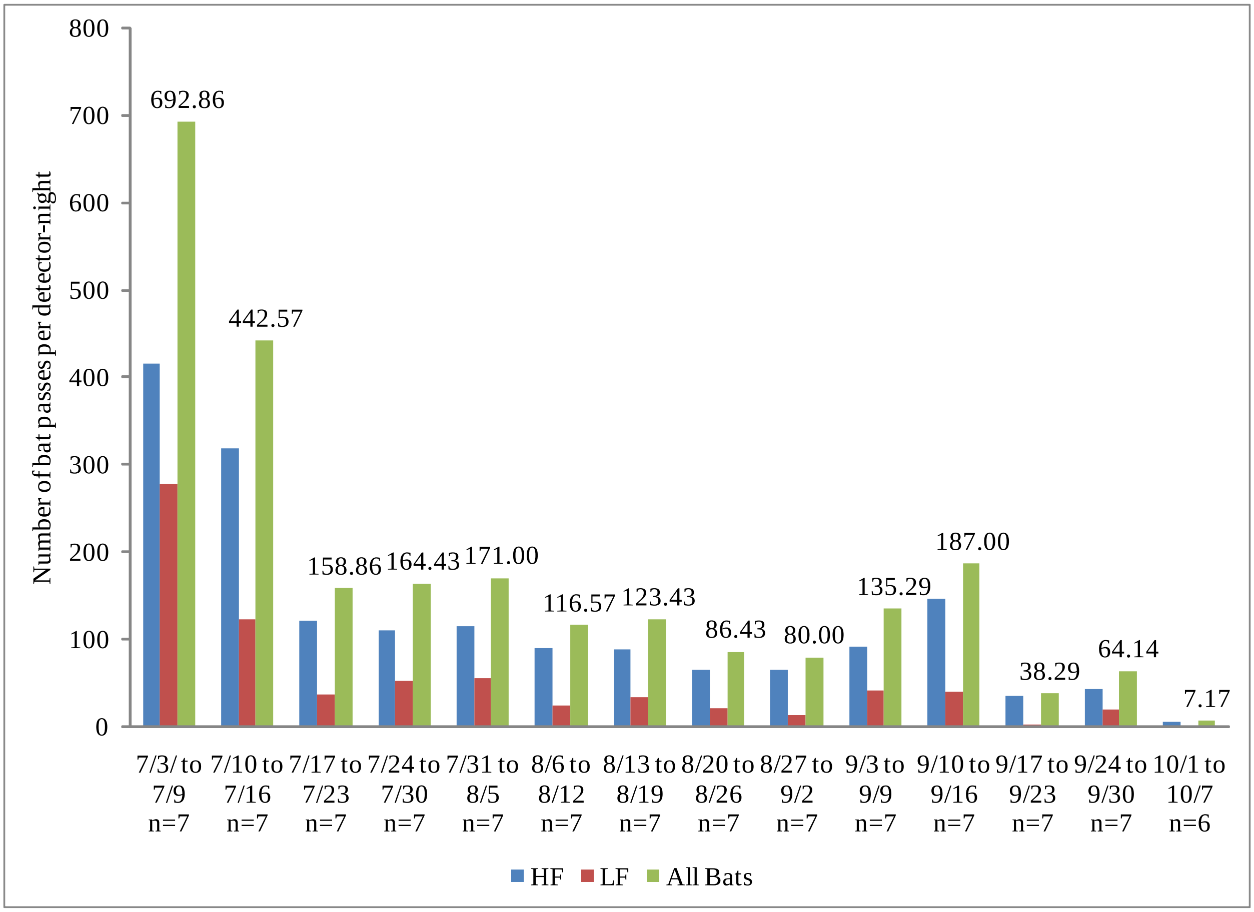

Figure 11. Weekly activity by high-frequency (HF) and low-frequency (LF) bats at wetland station SB2 for the study period July 3 – October 7, 2008.

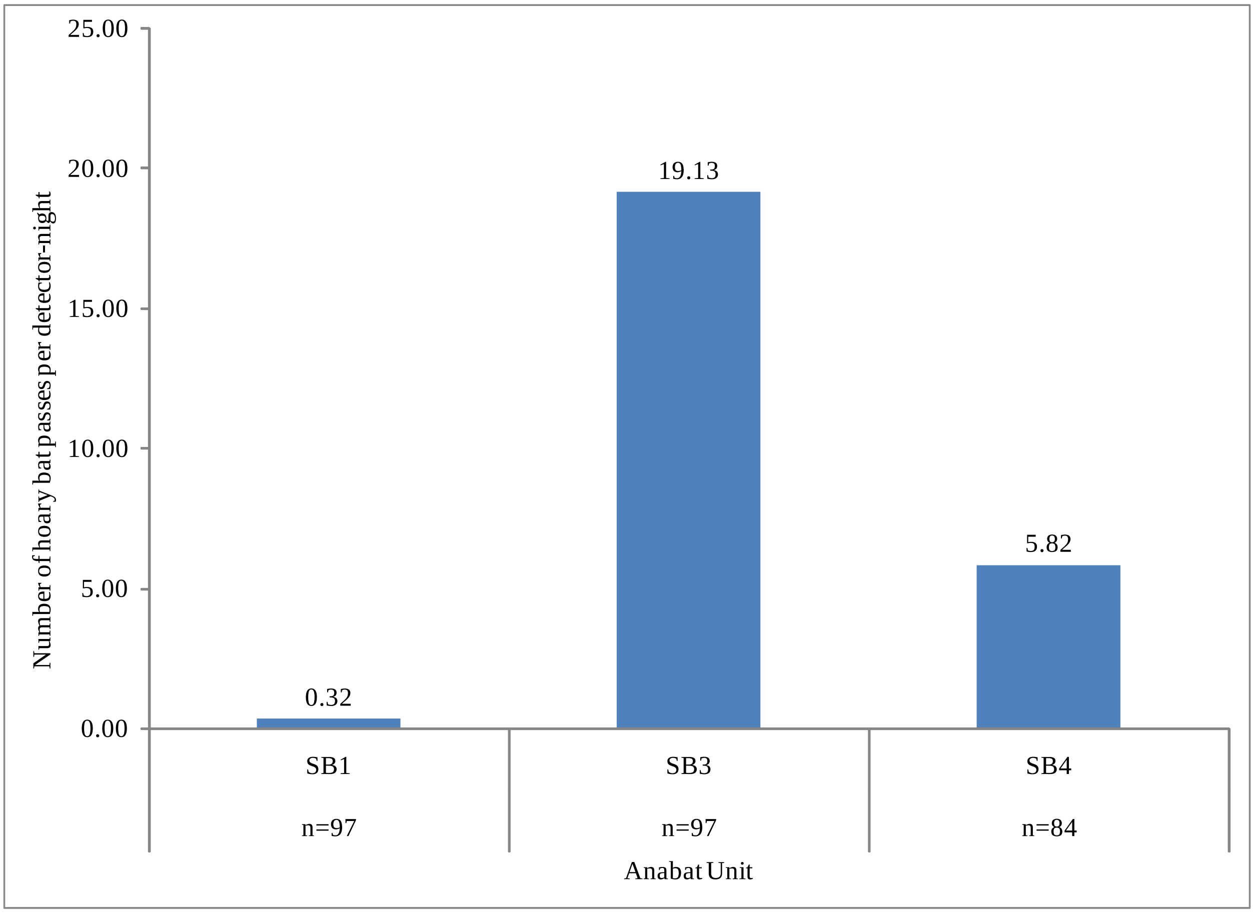

Figure 12. Number of passes per detector–night by hoary bats at upland Anabat stations at the Saddleback Wind Resource Area, for the study period July 3 – October 7, 2008.

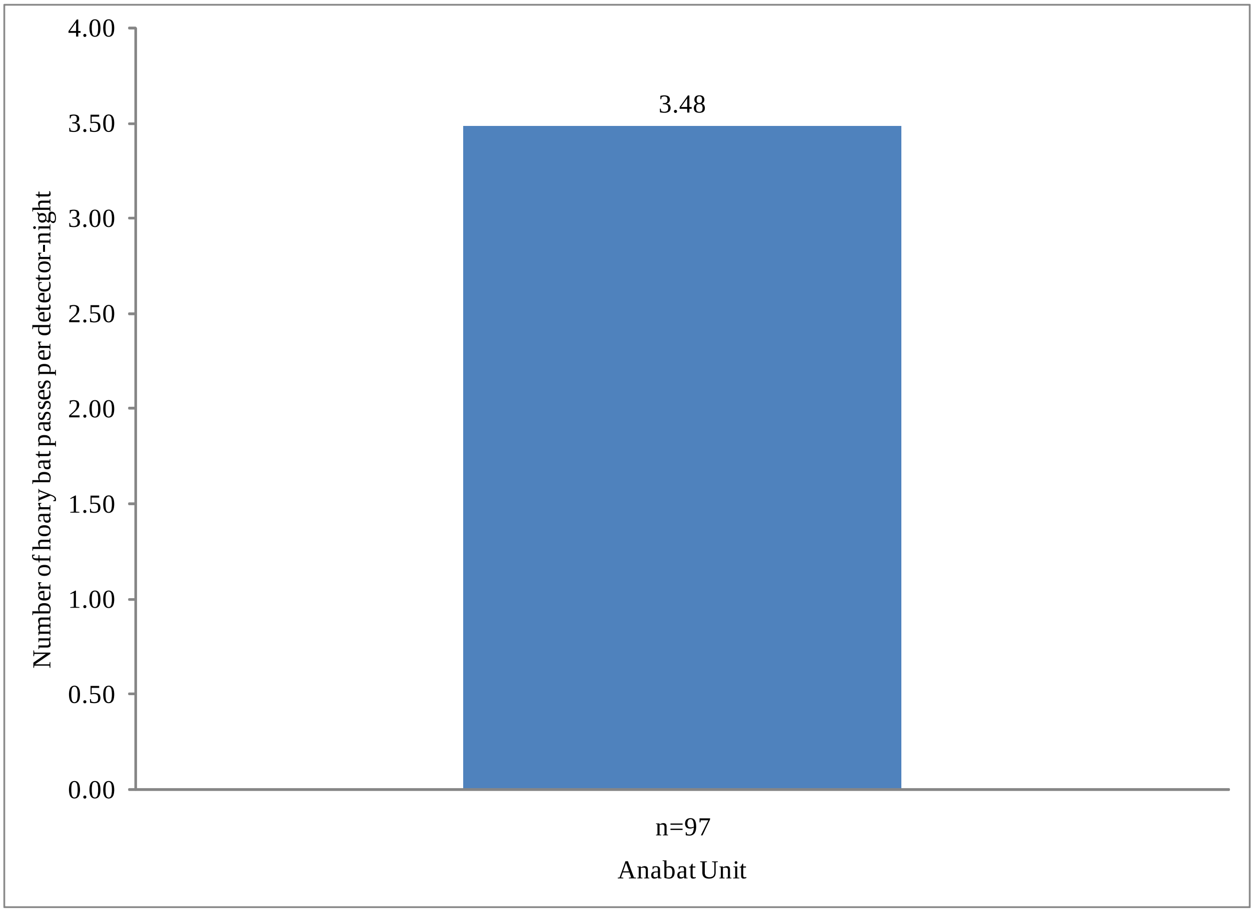

Figure 13. Number of passes per detector–night by hoary bats at Anabat wetland station SB2 for the study period July 3 – October 7, 2008.

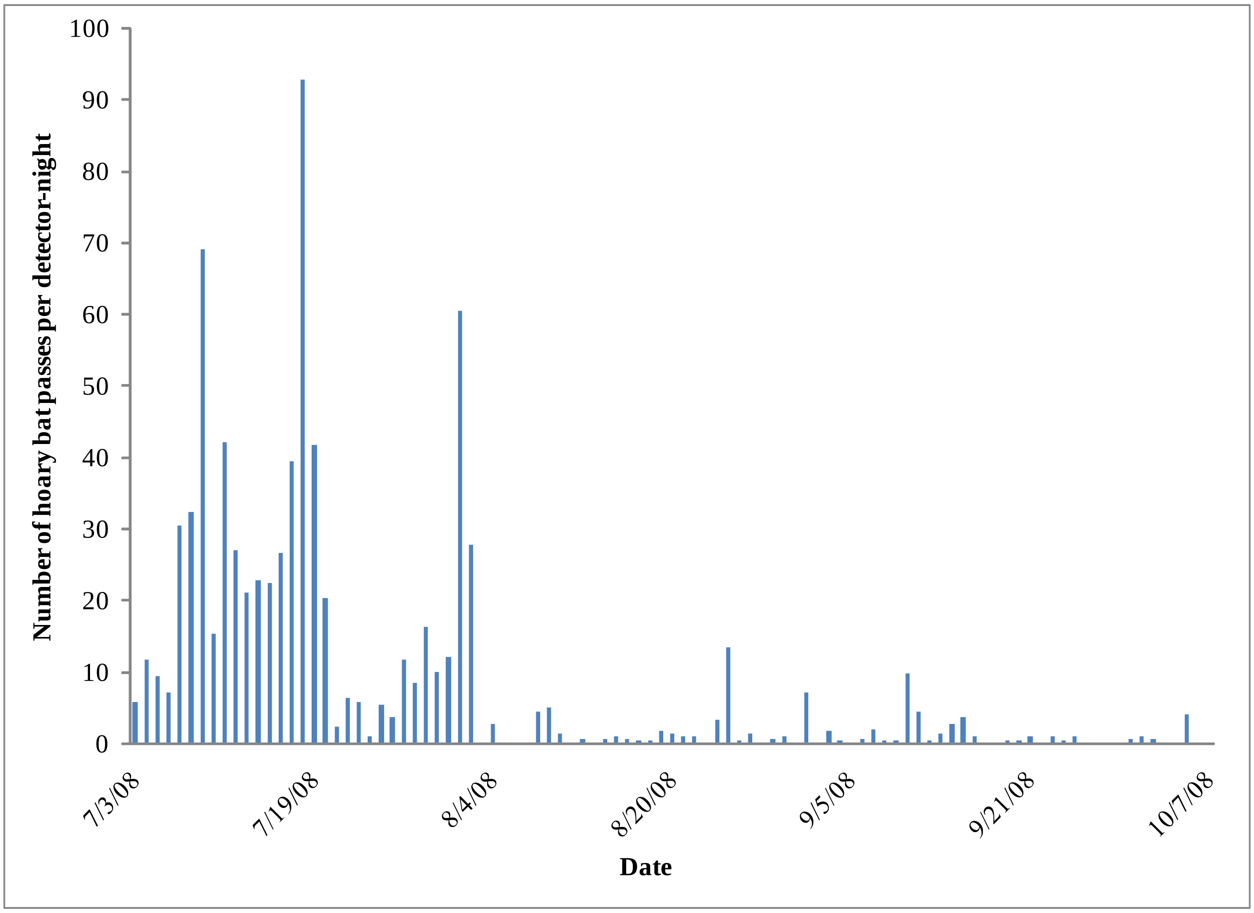

Figure 14. Number of passes per detector–night by hoary bats at upland stations at the Saddleback Wind Resource Area, presented nightly for the study period July 3 – October 7, 2008.

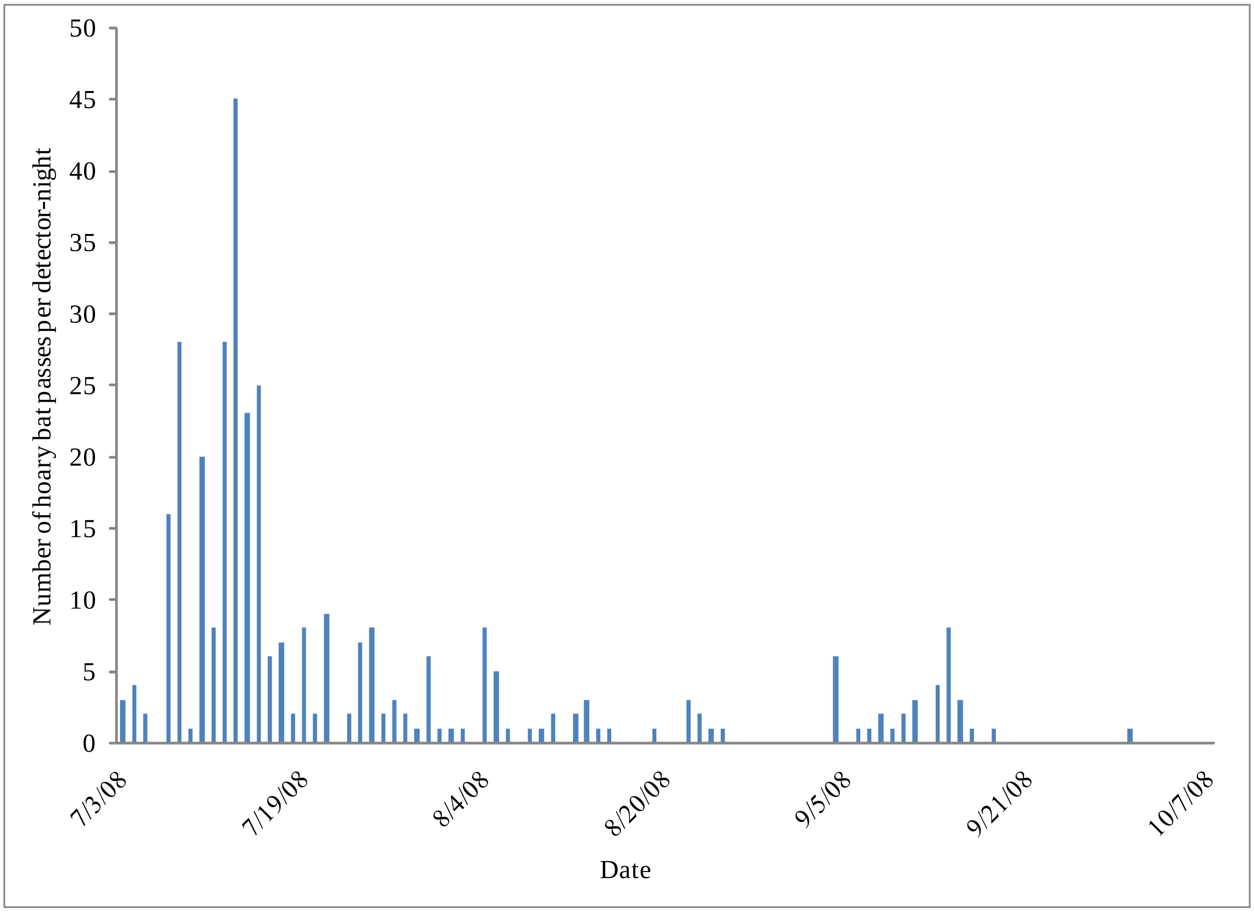

Figure 15. Number of passes per detector–night by hoary bats at wetland station SB2, presented nightly for the study period July 3 – October 7, 2008.

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Bat Acoustic Studies for the Saddleback Wind Resource Area, Skamania County, Washington, June 4 – October 25, 2009. Prepared for SDS Lumber Company

WEST, Inc. 2009.

Bat Acoustic Studies for the Whistling Ridge Wind Resource Area Skamania County, Washington

June 4th – October 25th, 2009

Prepared for:

SDS Lumber Company

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Prepared by:

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2003 Central Avenue
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WEST, Inc.

December 1, 2009

EXECUTIVE SUMMARY

Western EcoSystems Technology, Inc. initiated surveys in June 2009 designed to assess bat use within the proposed Whistling Ridge Wind Resource Area, Skamania County, Washington. Acoustic surveys for bats using Anabat™ SD1 ultrasonic detectors at three fixed paired (ground and elevated) stations were conducted from June 4 to October 25, 2009. The objective of the acoustic bat surveys was to estimate the seasonal and spatial use of the Whistling Ridge Wind Resource Area by bats. Anabat units recorded 6,805 bat passes during 770 detector nights. Averaging bat passes per detector-night across locations, a mean of 8.09 bat passes per detector-night was recorded.

The majority (71.6%) of the calls were less than 35 kilohertz in frequency (e.g., big brown bat, silver-haired bat, hoary bat), and the remaining calls were greater than 35 kilohertz (e.g., *Myotis* bat species). Species identification was only possible for the hoary bat, which made up 5.9% of all passes. Activity levels for bat passes peaked in early July, and again in mid-August. Activity levels for hoary bats were highest in mid-August, suggesting this species migrates through the Whistling Ridge Wind Resource Area at this time of year.

The mean number of bat passes per detector per night was compared to existing data from six wind-energy facilities where both bat activity and mortality levels have been measured. The level of bat activity documented at the Whistling Ridge Wind Resource Area was higher than that at wind-energy facilities in Minnesota and Wyoming, where reported bat mortalities are low, but was much lower than at facilities in the eastern US, where reported bat mortality is highest. Assuming that a relationship between bat activity and bat mortality exists, and that it extends to the northwestern US, relatively low levels of bat mortality would be expected to occur in the Whistling Ridge Wind Resource Area; most likely during early July to mid-August.

Based on fatality rates at wind-energy facilities in the western US, the bat call rates observed at this project and habitat of the project area, we expect that the potential risk to bats from turbine operations to be somewhat higher than the rates observed at other western facilities placed in non-forested environments, but not nearly as high as the rates observed at eastern ridgeline facilities. The post-construction monitoring program should be designed to accurately estimate the level of bat mortality.

STUDY PARTICIPANTS

Western EcoSystems Technology

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Kimberly Bay	Data Analyst and Report Manager
Saif Nomani	Statistician
JR Boehrs	GIS Technician
Melissa Nicholas	Report Compiler
Andrea Palochak	Technical Editor
Jerry Baker	Field Technician

REPORT REFERENCE

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INTRODUCTION

SDS Lumber Company is proposing to develop a wind-energy facility in Skamania County, Washington. SDS Lumber requested that Western EcoSystems Technology, Inc. (WEST) develop and implement a standardized protocol for baseline studies of bat use in the Whistling Ridge Wind Resource Area (WRWRA) for the purpose of estimating the impacts of the wind-energy facility on bats, and to assist with siting turbines to minimize impacts to bats. The protocol for the baseline study is similar to protocols used at other wind-energy facilities in the United States. The protocol has been developed based on WEST's experience studying wildlife and wind turbines at projects throughout the US and included passive acoustic sampling using Anabat™ bat detectors to quantify bat use in the WRWRA.

The following is a final report describing the results of Anabat surveys during the 2009 study season within the proposed WRWRA. This represents the third consecutive year that bat acoustical studies have been conducted at the WRWRA. We are not aware of any other proposed wind energy facilities with this extensive level of pre-construction bat activity monitoring. In addition to site-specific data, this report presents existing information and results of bat monitoring studies conducted at other wind-energy facilities. Where possible, comparisons with regional and local studies were made.

STUDY AREA

The proposed WRWRA is in southeast Skamania County approximately four miles (6.44 kilometers [km]) northwest of White Salmon, Washington (Figure 1). The specific project area is just north of Underwood Mountain and includes Sections 5, 6, 7, & 8, Township 3N, Range 10E. The project is located in a forested environment managed for commercial timber production. Topography of the WRWRA consists of hilltops dominated by coniferous forests with some clear cuts and linear clearings associated with power line rights-of-way. Elevation ranges from approximately 1700 – 2400 feet (ft; 518 – 732 meters [m]).

METHODS

Bat Acoustic Surveys

The objective of the bat use surveys was to estimate the seasonal and spatial use of the WRWRA by bats. Bats were surveyed using Anabat™ SD1 bat detectors (Titley Scientific™, Australia). Bat detectors are a recommended method to index and compare use by bats. The use of bat detectors for calculating an index to bat impacts is a primary bat risk assessment tool for baseline wind development surveys (Arnett 2007, Kunz et al. 2007a). Bat activity was surveyed using six detectors from June 4 to October 25, 2009, a period corresponding to summer breeding and fall bat migration at this site. Detectors were placed near the ground at three fixed stations (Figure 1). At each of these stations, ground detectors (WR1, WR3, and WR5) were paired with detectors raised (WR2, WR4, and WR6) on meteorological (met) towers to compare bat activity at different heights (ground versus raised) and monitor bat activity in the rotor-swept zone. Pair

WR1 and WR2 were placed next to an area where timber was being harvested, WR3 and WR4 were placed in an area of regeneration, and WR5 and WR6 were in a clear cut on a ridge with open water at the base of the ridge.

Anabat detectors record bat echolocation calls with a broadband microphone. The echolocation sounds are then translated into frequencies audible to humans by dividing the frequencies by a predetermined ratio. A division ratio of 16 was used for the study (Messina 2004). Bat echolocation detectors also detect other ultrasonic sounds made by insects, raindrops hitting vegetation, and other sources. A sensitivity level of six was used to reduce interference from these other sources of ultrasonic noise. Calls were recorded to a compact flash memory card with large storage capacity. The detection range of Anabat detectors depends on a number of factors (e.g., echolocation call characteristics, microphone sensitivity, habitat, the orientation of the bat, atmospheric conditions; Limpens and McCracken 2004), but is generally less than 30 m (98 ft) due to atmospheric absorption on echolocation pulses (Fenton 1991). To ensure similar detection ranges among detectors, microphone sensitivities were calibrated using a BatChirp (Tony Messina, Las Vegas, Nevada) ultrasonic emitter as described in Larson and Hayes (2000). All units were programmed to turn on each night approximately one half-hour before sunset and to turn off approximately one half-hour after sunrise.

Anabat detectors were placed inside plastic weather-tight containers with a hole cut in the side of the container through which the microphone extended. Microphones were encased in PVC tubing with drain holes that curved skyward at 45 degrees outside the container to minimize the potential for water damage due to rain. Ground units were raised approximately 3.3 ft (one m) off the ground to minimize echo interference and lift the unit above vegetation. Raised Anabat microphones were elevated 147.6 ft (45 m) on meteorological towers using a pulley system. Microphones were encased in a Bat-Hat weatherproof housing (EME Systems, Berkeley, California), and attached to a coaxial cable that transmitted ultrasonic sounds to an Anabat unit at the base of the tower. The Bat-Hat weatherproof housing was modified by replacing the Plexiglas reflector plate with a 45-degree angle PVC elbow, for better comparability with data collected by detectors on the ground.

Statistical Analysis

The units of activity were number of bat passes (Hayes 1997). A pass was defined as a continuous series of two or more call notes produced by an individual bat with no pauses between call notes of more than one second (White and Gehrt 2001, Gannon et al. 2003). In this report, the terms bat pass and bat call are used interchangeably. The number of bat passes was determined by downloading the data files to a computer and tallying the number of echolocation passes recorded. Total number of passes was corrected for effort by dividing by the number of detector nights.

For each station, bat calls were sorted into two groups, based on their minimum frequency, that correspond roughly to species groups of interest. For example, species such as western red bat (*Lasiurus blossevillii*) and those in the genus *Myotis* generally echolocate at frequencies above 40 kilohertz (kHz), whereas species such as big brown bat (*Eptesicus fuscus*), silver-haired bat (*Lasionycteris noctivagans*) and hoary bat (*Lasiurus cinereus*) have echolocation frequencies that fall below 35 kHz. Therefore, we classified calls as high-frequency (HF; > 35 kHz) and low-frequency (LF; <35 kHz) calls. To establish which species may have produced calls in each category, a list of species expected to occur in the study area was compiled from range maps (Table 1; Harvey et al. 1999, BCI website). Data determined to be noise (produced by a source other than a bat) or call notes that did not meet the pre-specified criteria to be termed a pass were removed from the analysis.

Within these categories, an attempt was made to identify calls made by hoary bats. Calls that had a distinct U-shape and that exhibited variability in the minimum frequency across the call sequence were identified as belonging to the *Lasiurus* genus (C. Corben, pers comm.). Hoary bats were distinguished based on minimum frequency; hoary bats typically produce calls with minimum frequencies between 18 and 24 kHz (J. Szewczak, pers comm.). Only sequences containing three or more calls were used for species identification. Given the high intraspecific variability of *Lasiurus* calls, and the number of call files that were too fragmented for proper identification, it is likely that more hoary bat calls were recorded than were positively identified.

The total number of bat passes per detector night was used as an index of bat use in the WRWRA. Bat pass data represented levels of bat activity rather than the numbers of individuals present because individuals could not be differentiated by their calls. To assess potential for bat mortality, the mean number of bat passes per detector night (averaged across ground-based monitoring stations) was compared to existing data from wind-energy facilities where both bat activity and mortality levels have been measured.

RESULTS

Bat Acoustic Surveys

Bat activity was monitored at three fixed, paired sampling locations over a total of 144 nights during the period June 4 to October 25, 2009. Anabat units operated correctly for the entire night for 89.1% of the sampling period (Figure 2). Levels of wind and insect noise were relatively low throughout the study period (Figure 3). Anabat units recorded 6,805 bat passes on 770 detector-nights (Table 2). Averaging bat passes per detector-night across the locations, a mean of 8.09 ± 0.55 bat passes per detector-night was recorded. The average pass rate was 11.58 ± 0.70 bat passes per detector-night for ground stations and 4.59 ± 0.43 bat passes per detector-night for stations raised on met towers to a height of 45 m.

Spatial Variation

Bat activity varied among the Anabat unit pairs in the WRWRA (mean of 8.09 bat passes per detector-night; Figures 1 and 4; Table 2). Most (59.0%) bat calls were recorded at stations WR1 and WR2 (mean of 17.28 and 10.59 bat passes per detector-night, respectively), which were located at the southern-most met tower. Detections were lowest at paired stations WR5 and WR6 (mean of 6.43 and 1.64, respectively), located at the eastern-most met tower. Detections at stations WR3 and WR4, located at the northern-most met tower, were moderate (mean 11.40 and 1.59, respectively; Figure 1 and 4; Table 2).

Comparing paired stations on just the nights that both ground and raised detectors were operating, bat activity was consistently higher at ground stations (Figure 5). The difference in bat activity levels between ground and raised units was much less between WR5 and WR6 than at other detector pairs.

Temporal Variation
Bat activity increased from early June through early July, and then peaked during early- to mid-July and again in mid-August (Table 3, Figure 6). Activity decreased through September and October, with small spikes in activity occurred in some weeks. Bat passes were recorded during every week of the survey period, but over half (54.1%) of all bat passes were recorded between July 2 and August 19 (Table 3).

Bat activity levels over time were similar at ground and raised stations (Figure 7). Raised and ground stations recorded similar levels of activity through late June, but ground stations recorded much more activity through the remainder of the study period.

Species Composition
Overall, passes by low-frequency bats (LF; 71.6% of all bat passes) outnumbered passes by high-frequency bats (HF; 28.4%; Table 2). Ground units had a similar pattern, with 62.0% of all passes being LF (Table 2; Figures 4 and 5). Among raised stations, LF bats comprised about 98% of all bat passes (Table 2; Figures 4 and 5). Patterns of activity varied slightly between species groups, with the majority (70.0%) of passes by LF species occurring between June 25 and August 26, whereas most (70.7%) passes by HF species occurred between July 23 and September 23 (Table 3; Figures 6 and 7).

Hoary bats comprised 5.9% of total passes detected within the WRWRA, and 8.2% of all low frequency passes (Table 2). Eighty-seven percent of hoary bat passes were detected at raised stations (Table 2; Figure 8). Station WR2 recorded most of the hoary bat activity (77.9% of 399 hoary bat passes). Most of the hoary bat activity was recorded between August 6 and August 26 (Figure 9).

DISCUSSION

Potential Impacts

Assessing the potential impacts of wind-energy development to bats at the WRWRA is complicated by the current lack of understanding of why bats die at wind turbines (Kunz et al. 2007b, Baerwald et al. 2008), combined with the inherent difficulties of monitoring elusive, night-flying animals (O'Shea et al. 2003). In addition, while installed capacity for wind energy has increased rapidly in recent years, the availability of well-designed studies from existing projects lags development of proposed projects (Kunz et al. 2007b). To date, monitoring studies of wind projects suggest that:

a) bat mortality shows a rough correlation with bat activity as measured by Anabat units (Table 4);

b) the majority of fatalities occur during the post-breeding or fall migration season (roughly August and September);

c) migratory tree-roosting species (eastern red, hoary, and silver-haired bats) comprise almost 75% of reported bat fatalities, and;

d) the highest reported numbers of fatalities occur at wind-energy facilities located along forested ridge tops in the eastern and northeastern US; however, recent studies in agricultural regions of Iowa and Alberta, Canada, report relatively high fatalities as well (Table 4).

Based on these patterns, current guidance to estimate potential mortality levels at a proposed wind project involves evaluation of the on-site bat acoustic data in terms of activity levels, seasonal variation, and species composition (Kunz et al. 2007b), as well as comparison to regional patterns.

Overall Activity

To date, six studies of wind energy projects have concurrently recorded both Anabat detections per night and bat mortality (Table 4). Because these concurrent studies show correlation between bat activity and fatality rates, it is assumed that a similar relationship holds for pre-construction activity and post-construction fatalities. The addition of data sets like this one will contribute to our understanding of the relationship between bat activity near wind turbines and bat fatalities. To our knowledge, data for those studies in Table 4 were collected using Anabat detectors placed near the ground (i.e., none raised on metrological towers) and none of the detectors were located near features attractive to bats. Thus, this report relies on the mean activity rate for ground-based detectors placed near metrological towers and/or potential turbine locations to assess potential risk of bat fatality at the WRWRA relative to the six studies with similar data.

Bat activity recorded by ground detectors within the WRWRA (11.58 bat passes per detector-night) was somewhat higher than that observed at facilities in Minnesota and Wyoming, where bat mortality was relatively low, but was much lower than activity levels recorded at sites in West Virginia, Iowa, and Tennessee, where bat mortality rates were higher (Table 3). Thus, based solely on the expected relationship between pre-construction bat activity and post-construction fatalities, bat mortality rates at the WRWRA would be expected to be greater than the 2.4 bat fatalities/MW/year reported at Buffalo Ridge Minnesota, but much lower than the 31.5 fatalities/MW/year reported at Buffalo Mountain, Tennessee.

Spatial Variation

The proposed WRWRA is not located near any large, known bat colonies. However, the proposed project is located on forested ridges. In the eastern US, the highest bat fatality rates have been recorded at wind-energy facilities located on forested ridges (Table 4). However, the relatively large numbers of bat fatalities recently reported in northern Iowa (Jain 2005) and southwestern Alberta (Baerwald 2006) indicate that an open landscape does not guarantee low mortality.

Activity at the southern-most met tower (stations WR1 and WR2) was relatively higher compared to other stations, accounting for the majority (59.0%) of the calls recorded during this study. These stations were located next to an area currently being cut, which may have offered bats more foraging opportunities, relative to Anabats stationed in an area undergoing regeneration or in a previously clear cut area. Bat activity was lowest at the paired stations (WR5 and WR6) placed in a clear cut.

Temporal Variation

The number of bat calls detected per night at the WRWRA was highest from early June through mid-August. Activity in July likely corresponds with the reproductive season, when pups are being weaned and foraging rates are high. August activity may represent movement of migrating bats through the area. By October, activity dropped to lower rates though a small spike in late October suggests a late migratory wave during that time period.

Fatality studies of bats at wind-energy facilities in the US have shown a peak in mortality in August and September, with generally lower mortality levels earlier in the summer (Johnson 2005, Arnett et al. 2008). Bat mortality at wind energy projects throughout the US during the breeding season has been low, as only 4.1% of the fatalities have occurred between May 15 and July 15 (Johnson 2005). At several wind farms studied, low mortality has been documented during the breeding season even though relatively large bat populations were present in the area (Fiedler 2004, Gruver 2002, Howe et al. 2002, Johnson et al. 2004, Schmidt et al. 2003). These data suggest that high bat activity levels during the breeding season do not equate to high bat fatality rates.

While the survey effort varies among the different studies, the studies that combine Anabat surveys and fatality surveys show a general association between the timing of increased bat call rates and timing of mortality, with both call rates and mortality peaking during the late summer and early fall.

Species Composition

Of the 14 species of bat likely to occur in the study area, four are known fatalities at wind-energy facilities (Table 1). Acoustic bat surveys were able to classify bat calls to frequency groups that roughly correspond to groups of relative risk. Approximately 72% of passes were by low-frequency bats, suggesting higher relative abundance of species such as big brown and silver-haired bats, and hoary bats made up 8.2% of all low-frequency passes. These species are known to occur as fatalities at wind turbine operations in the Pacific Northwest and elsewhere (Table 1). Based on data from 10 wind energy facilities in the Pacific Northwest, hoary bats and silver-haired bats have comprised the majority (93.5%) of fatalities, while big brown bats are relatively uncommon wind turbine fatalities, comprising only 1.5% of the fatalities (Johnson and Erickson 2008).

Passes by LF species were more common than those by HF species every week of the study except for a two-week period in mid-September. The relative increase in HF passes at this time may reflect movement of HF species through the area. The high-frequency group at WRWRA would be comprised of the *Myotis* bats, western red bats (*Lasiurus blossevillii*), and the canyon bat (*Parastrellus hesperus*). Bats in the HF group are not typically found during fatality studies, although little brown bat (*Myotis lucifugus*) fatalities were as common as red bat fatalities in Iowa, 1.7 times as common as silver-haired bats in Alberta, and comprised 10% of fatalities discovered at the Vansycle facility in Oregon (Arnett et al. 2008).

At raised stations, low-frequency passes greatly outnumbered high-frequency passes, which most likely reflects different migration flight heights or foraging patterns among species. Generally, low-frequency species tend to forage in less cluttered conditions (e.g., at greater heights) than high-frequency species due to their wing morphology and echolocation call structure (Norberg and Rayner 1987). To date, hoary and silver-haired bats have been found as fatalities in higher relative proportions than have big brown bats, and are therefore considered to be at greater risk for collision with wind turbines (e.g., Arnett et al. 2008).

Regional Fatality Studies

Bat mortality studies at wind-energy facilities across North America show a wide range of bat mortality rates, ranging from none to 39.70 bat fatalities/MW/year (Table 4). In general, fatality rates have been highest in the Northeast and lowest in the Northwest, although a high degree of variation in fatality rates is present for most regions. To date, bat fatality estimates in the Northwest region have ranged from 0.39 to 2.46 bat fatalities/MW/year, and averaged 1.18 (Johnson and Erickson 2008). However, all of these projects are located in the more arid eastern portions of the region, and it is not clear if similar results can be expected in the more forested western parts of the region.

CONCLUSIONS

The data collected in 2009 represent the third year of bat acoustical studies conducted at the WRWRA. In 2007, bat activity was monitored at two ground stations and one elevated station on a met tower during the period August 20 – October 21 (Solick et al. 2008). Both of these stations were located in upland habitats characteristic of proposed turbine locations. Bat activity levels were similar to those measured in 2009, as the mean number of bat passes per detector night was 7.91. In 2008, Anabat surveys were conducted at four ground stations from July 3 to October 7 (Johnson et al. 2009). Two stations were placed in clear cuts, one was placed along a logging road through a forest, and the fourth was placed adjacent to a pond in the study area to assess levels of bat activity and composition of primarily breeding bats in the project area. For all four units combined, a mean of 148.34 bat passes per detector-night was recorded. However, 80.7% of all calls were recorded at the detector set on the logging road, which was likely used as a travel corridor by bats and was not representative of cleared areas where turbines would be placed. The detector placed near the pond also recorded relatively high activity levels (178.03 bat passes/detector night). Bat activity at the two stations placed in clear cuts comprised only 19.1% of all bat passes recorded during the study (14.30 and 73.76 bat passes/detector night, respectively).

The data collected in 2009 were collected entirely at met tower locations, which were most representative of proposed turbine locations. In addition, the three units elevated on the met towers to a height of 45 m, within the rotor swept zone, likely provide the best data for assessing risk to bats in the project area (Baerwald 2008). Based on results of the 2009 study, it does not appear that construction of a wind energy facility at the WRWRA would result in high bat mortality levels. However, no data on bat mortality levels associated with wind energy developments in western coniferous forests are available to help predict risk to bats at the WRWRA. Bat fatality patterns may differ from those in open habitats as well as in eastern deciduous forests. Post-construction monitoring of the Whistling Ridge wind energy facility would provide valuable data on bat collision mortality in this environment that would be useful for assessing risk to bats of future proposed wind energy developments in western coniferous forests.

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Table 1. Bat species determined from range-maps (Harvey et al. 1999, BCI website) as likely to occur within the Whistling Ridge Wind Resource Area, sorted by call frequency.

Common Name	Scientific Name
High Frequency (HF; ≥ 35 kHz)	
western red bat	*Lasiurus blossevillii*
California bat	*Myotis californicus*
western small-footed bat[3]	*Myotis ciliolabrum*
western long-eared bat	*Myotis evotis*
little brown bat[2]	*Myotis lucifugus*
long-legged bat	*Myotis volans*
Yuma myotis	*Myotis yumanensis*
canyon bat	*Parastrellus hesperus*
Low Frequency (LF; < 35 kHz)	
pallid bat	*Antrozous pallidus*
Townsend's big-eared bat	*Corynorhinus townsendii*
big brown bat[2]	*Eptesicus fuscus*
silver-haired bat[1,2]	*Lasionycteris noctivagans*
hoary bat[1,2]	*Lasiurus cinereus*
fringed myotis[3]	*Myotis thysanodes*

[1]long-distance migrant
[2]species known to have been killed at wind-energy facilities
[3]species occurrence based upon a single source

Table 2. Results of bat acoustic surveys conducted at the Whistling Ridge Wind Resource Area, June 4, 2009 - October 25, 2009.

AnaBat Station	Location	# of HF Bat Passes	# of LF Bat Passes	# of Hoary Bat Passes*	Total Bat Passes	Detector-Nights	Bat Passes/ Night
WR1	ground	762	1,726	38	2,488	144	17.28±1.65
WR2	raised	20	1,505	311	1,525	144	10.59±1.15
WR3	ground	763	827	7	1,590	144	11.04±0.75
WR4	raised	13	186	23	199	130	1.53±0.17
WR5	ground	364	524	9	888	138	6.43±0.61
WR6	raised	10	105	11	115	70	1.64±0.22
Total Ground		**1,889**	**3,077**	**54**	**4,966**	**426**	**11.58±0.7**
Total Raised		**43**	**1,796**	**345**	**1,839**	**344**	**4.59±0.43**
Grand Total		**1,932**	**4,873**	**399**	**6,805**	**770**	**8.09±0.55**

*Passes by hoary bat passes is included in low frequency (LF) numbers

Table 3. Weekly bat activity and the contribution of each week (%) to total recorded activity for high-frequency (HF), low-frequency (LF), and all bats within the Whistling Ridge Wind Resource Area.

Week	HF Pass Rate	HF % Composition	LF Pass Rate	LF % Composition	All Bats Pass Rate	All Bats % Composition	Cumulative % Composition
06/04/09 to 06/10/09	0.52	1.0	2.95	2.2	3.48	1.9	1.9
06/11/09 to 06/17/09	1.07	2.0	5.90	4.4	6.98	3.8	5.6
06/18/09 to 06/24/09	1.81	3.4	4.47	3.4	6.28	3.4	9.0
06/25/09 to 07/01/09	2.89	5.5	7.31	5.5	10.20	5.5	14.5
07/02/09 to 07/08/09	2.46	4.6	15.97	12.0	18.43	9.9	24.4
07/09/09 to 07/15/09	2.20	4.2	12.00	9.0	14.20	7.6	32.0
07/16/09 to 07/22/09	2.66	5.0	15.83	11.9	18.49	9.9	41.9
07/23/09 to 07/29/09	3.86	7.3	7.51	5.6	11.37	6.1	48.0
07/30/09 to 08/05/09	3.36	6.3	7.17	5.4	10.52	5.7	53.7
08/06/09 to 08/12/09	2.38	4.5	9.79	7.4	12.17	6.5	60.2
08/13/09 to 08/19/09	5.69	10.8	9.74	7.3	15.43	8.3	68.5
08/20/09 to 08/26/09	5.10	9.6	7.87	5.9	12.97	7.0	75.5
08/27/09 to 09/02/09	3.53	6.7	4.90	3.7	8.43	4.5	80.0
09/03/09 to 09/09/09	3.86	7.3	4.17	3.1	8.02	4.3	84.3
09/10/09 to 09/16/09	5.83	11.0	4.17	3.1	10.00	5.4	89.7
09/17/09 to 09/23/09	3.83	7.2	2.69	2.0	6.51	3.5	93.2
09/24/09 to 09/30/09	0.76	1.4	2.00	1.5	2.76	1.5	94.7
10/01/09 to 10/07/09	0.45	0.9	2.50	1.9	2.95	1.6	96.3
10/08/09 to 10/14/09	0.14	0.3	0.77	0.6	0.91	0.5	96.8
10/15/09 to 10/21/09	0.49	0.9	4.20	3.2	4.69	2.5	99.3
10/22/09 to 10/25/09	0.05	0.1	1.25	0.9	1.30	0.7	100.0

Table 4. Wind-energy facilities in North America, with both Anabat sampling and bat mortality data, grouped by geographic region. To date, no results from southwestern or southeastern wind-energy facilities have been made public.

Geographic Region	Wind-Energy Facility	Activity (#/detector night)	Mortality (bats/MW/year)	Number of Turbines	Total Site MW	Reference
Northwestern	**Whistling Ridge, WA**	**8.09**				**This study**
	Nine Canyon, WA		2.47	37	48	Erickson et al. 2003
	High Winds, CA		2.02	90	162	Kerlinger et al. 2006
	Big Horn, WA		1.90	133	199.5	Kronner et al. 2008
	Combine Hills, OR		1.88	41	41	Young et al. 2006
	Stateline, WA/OR		1.70	454	300	Erickson et al. 2004
	Vansycle, OR		1.12	38	24.9	Erickson et al. 2000
	Klondike, OR		0.77	16	24	Johnson et al. 2003
	Hopkins Ridge, WA		0.63	83	150	Young et al. 2007
	Klondike II, WA		0.41	50	75	NWC and WEST 2007
	Wild Horse, WA		0.39	127	229	Erickson et al. 2008
	SMUD, CA		0.07		15	URS et al. 2005
Midwest & Rocky Mountains	Summerview, Alberta (2007/2008)		11.42	39	70.2	Baerwald 2008
	Summerview, Alberta (2005/2006)		10.27	39	70.2	Brown and Hamilton 2006
	Judith Gap, MT		8.93	90	135	TRC 2008
	Blue Canyon II, OK (2006/2007)		3.71	84	151.2	Burba et al. 2008
	Crescent Ridge, OK		3.27	33	49.5	Kerlinger et al. 2007
	Foote Creek Rim, WY (Phase I)	2.2	2.23	69	41.4	Young et al. 2003
	NPPD Ainsworth, NE		1.16	36	59.4	Derby et al. 2007
	Oklahoma Wind Energy Center, OK		0.53	68	102	Piorkowski 2006
	Buffalo Gap, TX		0.10	67	134	Tierney 2007
Upper Midwest	Top of Iowa, IA (2004)	34.9	10.27	89	80	Jain 2005
	Top of Iowa, IA (2003)		7.16	89	80	Jain 2005
	Buffalo Ridge, MN (Phase III)		2.72	138	103.5	Johnson et al. 2000
	Buffalo Ridge, MN (Phase II)	2.1	2.37	143	107.25	Johnson et al. 2000
	Buffalo Ridge, MN (Phase I)		0.76	73	25	Johnson et al. 2000

	Buffalo Mountain, TN (Phase II)		39.70	18	29	Fiedler et al. 2007
	Mountaineer, WV	38.3	31.69	44	66	Kerns and Kerlinger 2004
	Buffalo Mountain TN (Phase I)	23.7	31.54	3	2	Nicholson et al. 2005
	Casselman, PA		15.66	23	34.5	Arnett et al. 2009
	Maple Ridge, NY 2006		15.00	195	321.75	Jain et al. 2007
	Mount Storm, WV	35.2	12.21	82	164	Young et al. 2009
	Meyersdale, PA		10.93	20	30	Arnett et al. 2005
Eastern	Maple Ridge, NY 2007		9.42	195	321.75	Jain et al. 2008
	Noble Ellensburg, NY		5.45	54	80	Jain et al. 2009a
	Noble Bliss, NY		5.05	67	100	Jain et al. 2009c
	Noble Clinton, NY		3.63	67	100.5	Jain et al. 2009b
	Mars Hill, ME 2007		2.91	28	42	Stantec 2008
	Erie Shores, Ont.		1.51	66	99	James 2008
	Mars Hill, NY 2008		0.45	28	42	Stantec 2009
	Searsburg, NY		0.00	11	7	Kerlinger 2002

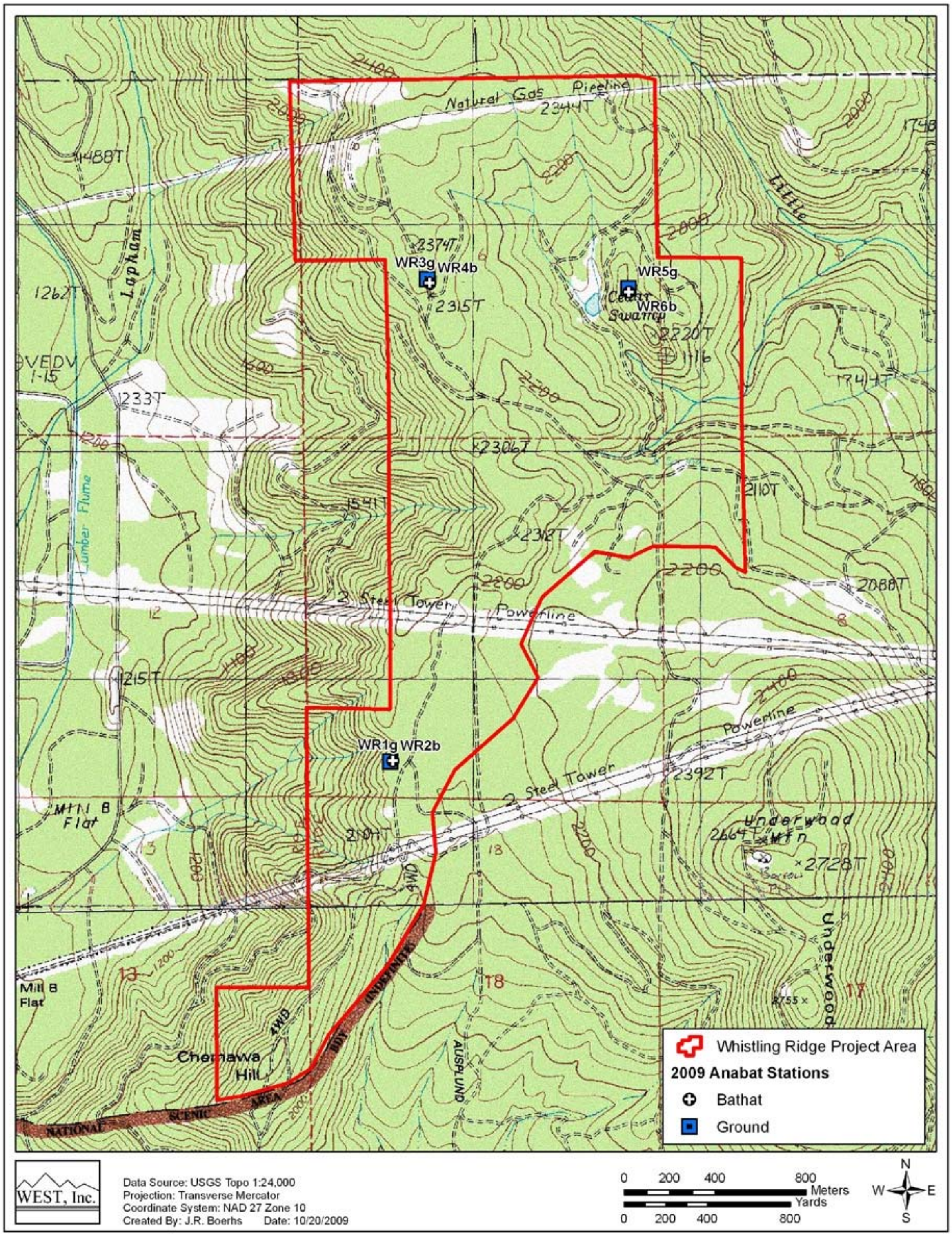

Figure 1. Study area map and Anabat sampling stations at the Whistling Ridge Wind Resource Area.

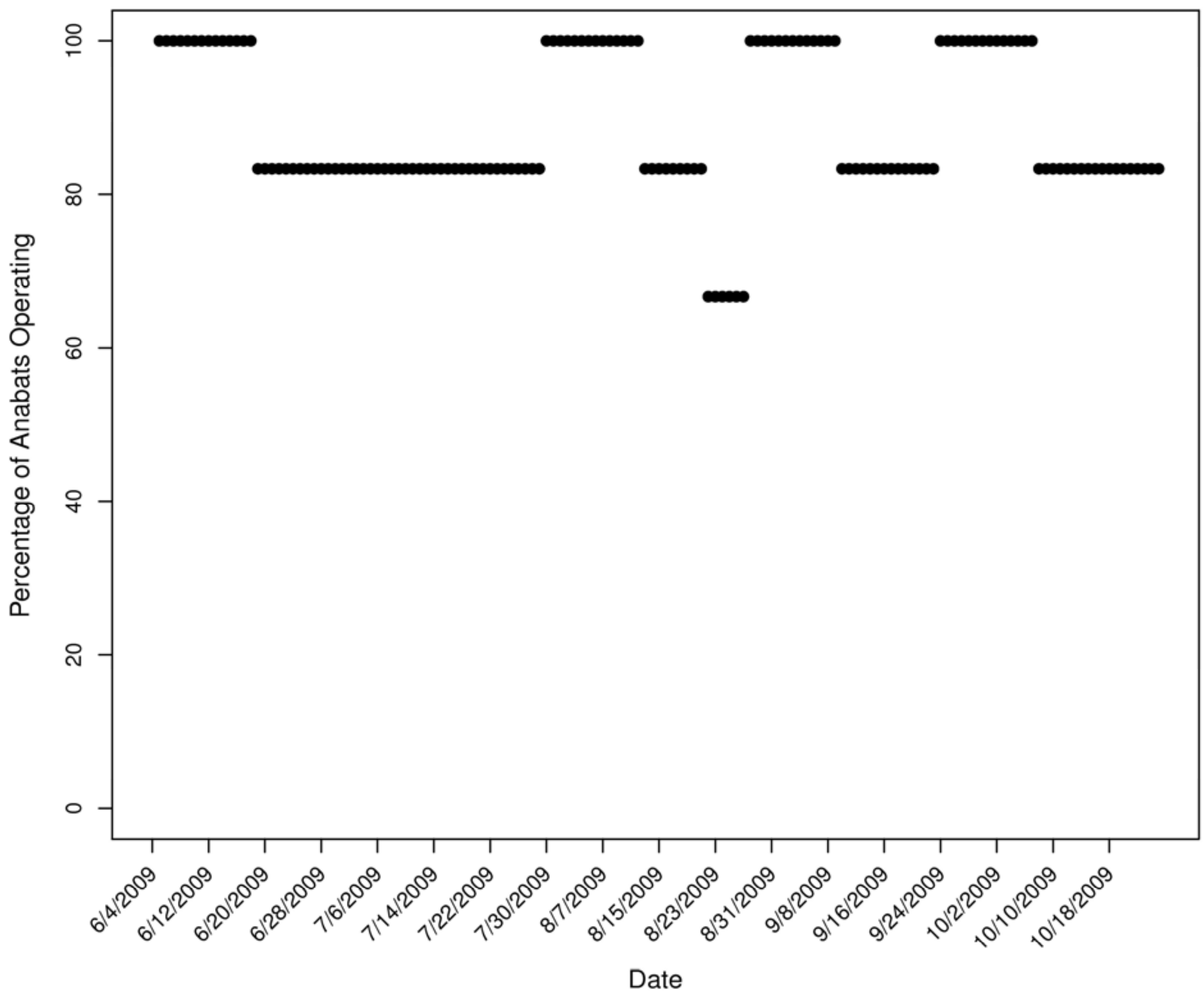

Figure 2. Number of Anabat detectors (n = 6) at the Whistling Ridge Wind Resource Area operating during each night of the study period, June 4 – October 25, 2009.

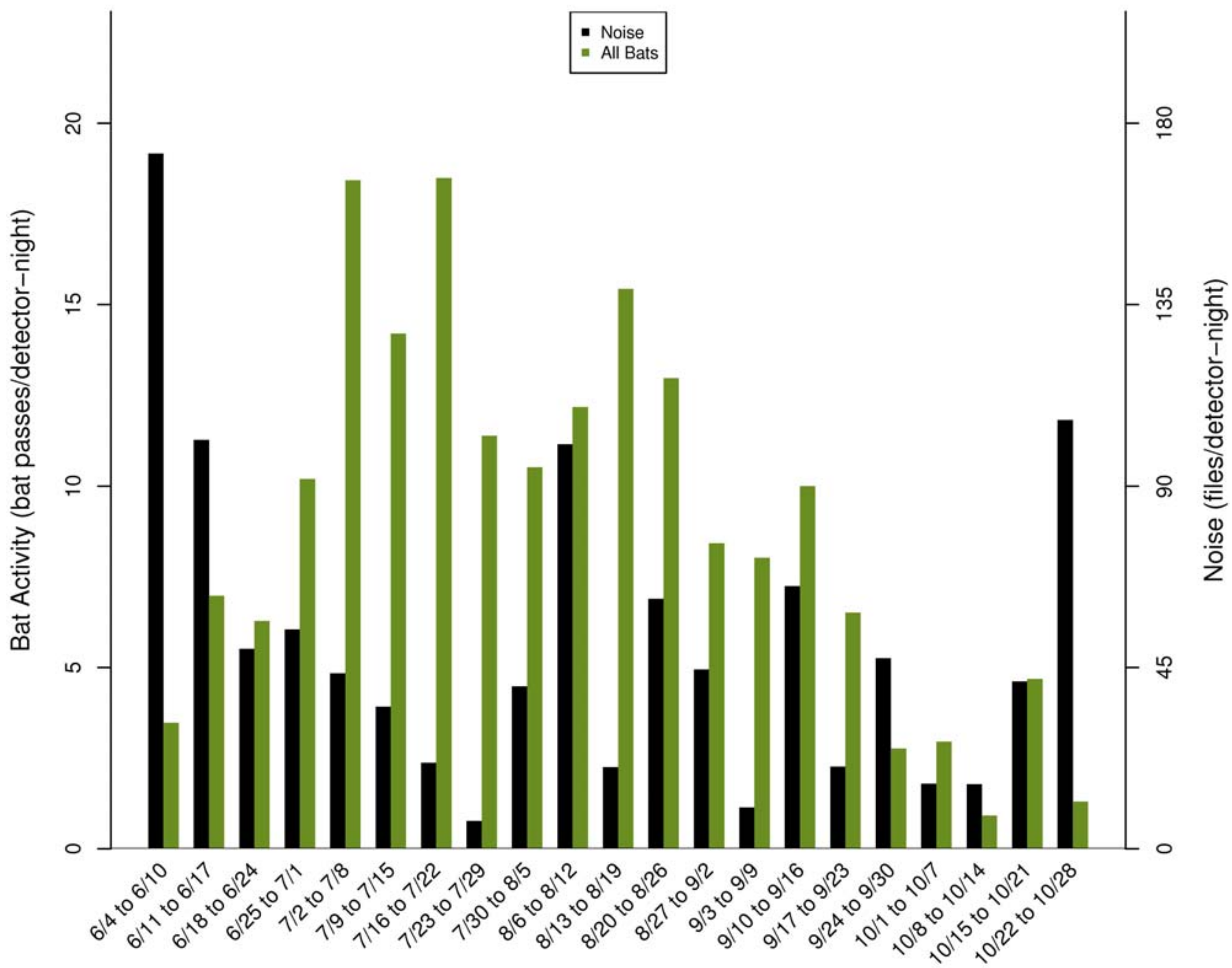

Figure 3. Number of bat passes and noise files detected per detector-night at the Whistling Ridge Wind Resource Area for the study period June 4 – October 25, 2009, presented nightly. Noise files are indicated on the second axis.

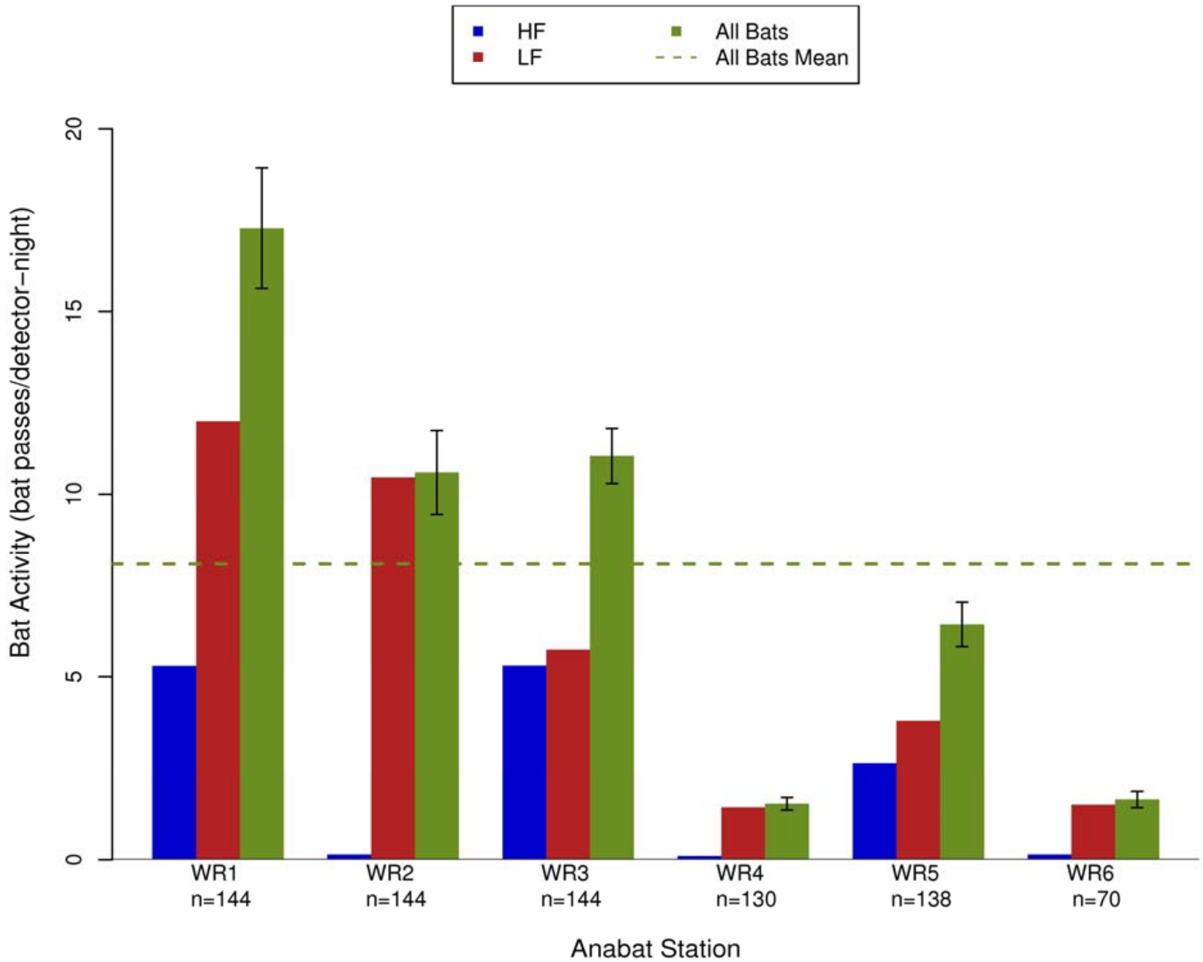

Figure 4. Number of bat passes per detector-night by Anabat location at the Whistling Ridge Wind Resource Area for the study period June 4 – October 25, 2009.

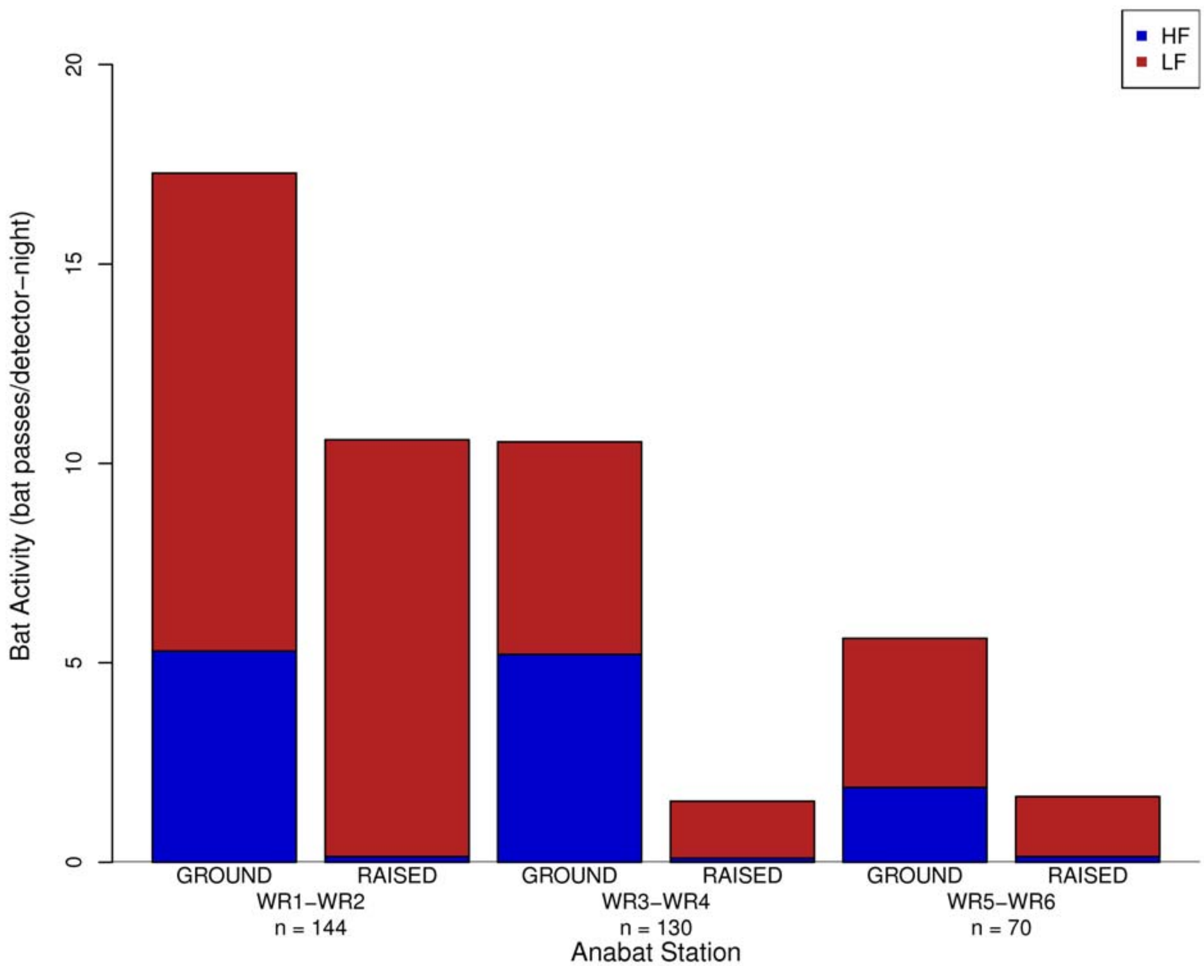

Figure 5. Number of high-frequency (HF) and low-frequency (LF) bat passes per detector-night recorded at paired ground and high Anabat unit stations at the Whistling Ridge Wind Resource Area for the study period June 4 – October 25, 2009.

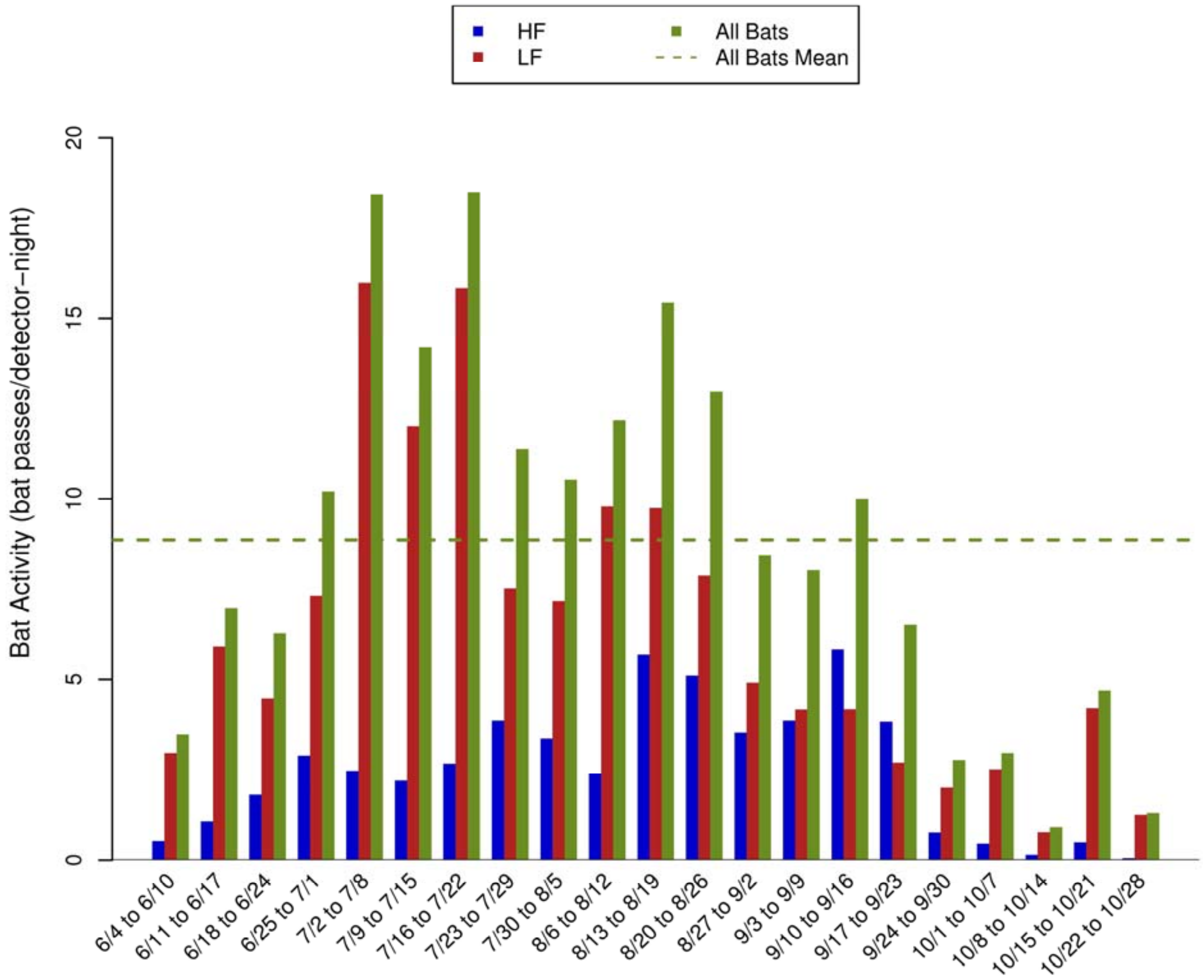

Figure 6. Weekly activity by high-frequency (HF) and low-frequency (LF) bats at the Whistling Ridge Wind Resource Area for the study period June 4 – October 25, 2009.

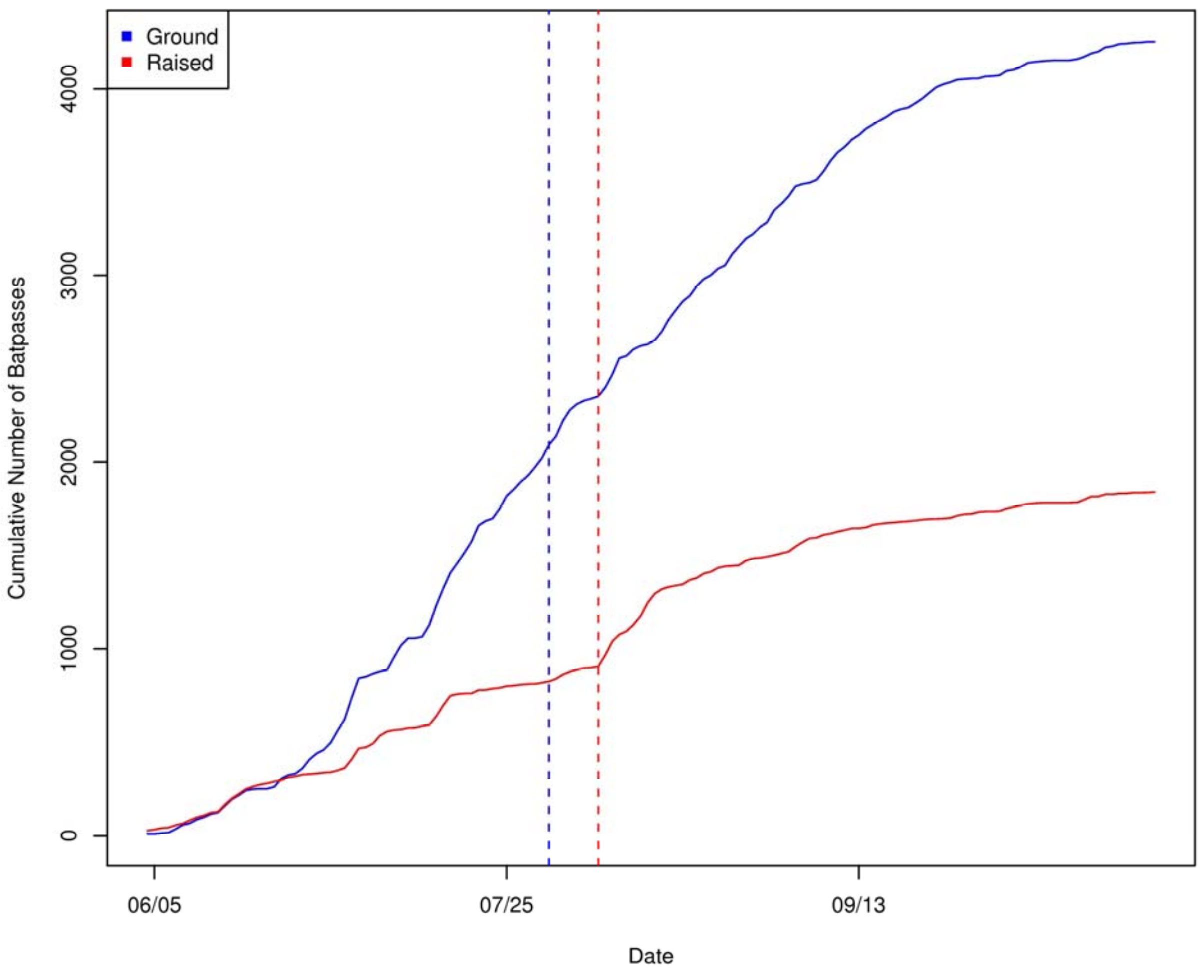

Figure 7. Empirical cumulative distribution of bat passes at ground and raised stations within the Whistling Ridge Wind Resource Area, June 4 – October 25, 2009. Dashed vertical lines indicate the point at which 50% of the calls occurred, an indication of the median date of bat activity.

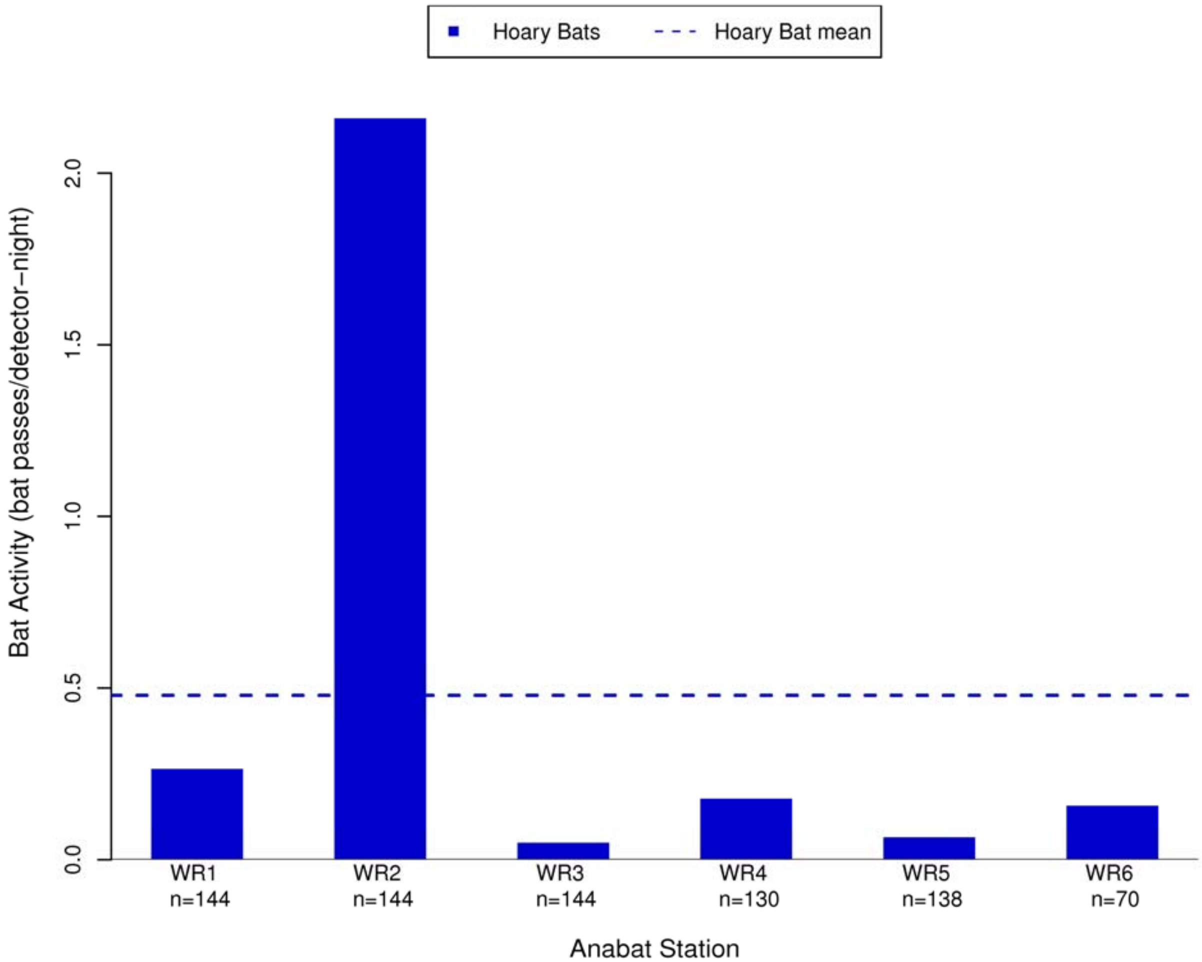

Figure 8. Number of passes per detector–night by hoary bats at the Whistling Ridge Wind Resource Area for the study period June 4 – October 25, 2009.

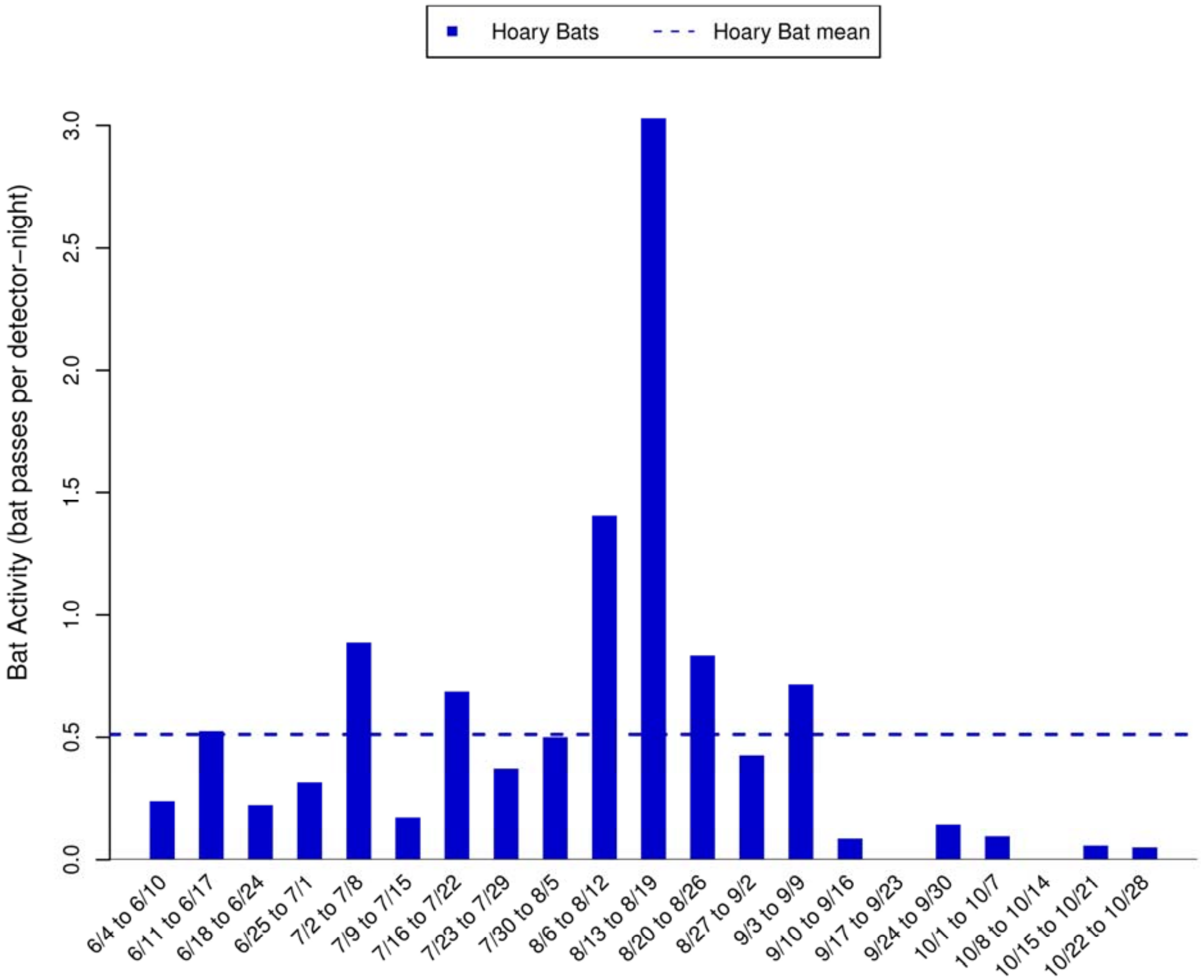

Figure 9. Weekly number of passes per detector–night by hoary bats at the Whistling Ridge Wind Resource Area for the study period June 4 – October 25, 2009.

C-11

Final Report. Avian and Bat Cumulative Impacts Associated with Wind Energy Development in the Columbia Plateau Ecoregion of Eastern Washington and Oregon. Prepared for Klickitat County Planning Department.

WEST, Inc. 2008.

FINAL REPORT

AVIAN AND BAT CUMULATIVE IMPACTS ASSOCIATED WITH WIND ENERGY DEVELOPMENT IN THE COLUMBIA PLATEAU ECOREGION OF EASTERN WASHINGTON AND OREGON

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INTRODUCTION AND BACKGROUND

Over the last decade, there has been a surge of interest in wind energy development in Oregon and Washington within the Columbia Plateau physiographic region (ecoregion). A central issue for wind power development is the potential for direct impacts to birds and bats through collision mortality and for indirect effects through habitat fragmentation or displacement of birds and other wildlife. Proposals for wind energy developments are commonly reviewed by natural resource agencies, private conservation groups, permitting authorities and other stakeholders. Frequently, baseline studies are conducted to estimate bird and bat abundance at proposed development sites for use in impact assessments and siting project features, followed by post-construction monitoring studies to measure actual impacts from the wind-energy facility. As more wind energy developments are constructed within the Columbia Plateau Ecoregion, cumulative impacts from multiple wind-energy facilities have become a concern.

With the possible exception of golden eagles (*Aquila chrysaetos*) at the Altamont Pass wind-energy facility, California, where an estimated 40–70 golden eagles are killed each year (Hunt 2002, Smallwood and Thelander 2004), no wind-energy facilities have been documented to cause population declines of any species. The purpose of this report is to estimate cumulative impacts associated with all existing, permitted, and currently proposed wind-energy facilities within the Columbia Plateau Ecoregion (CPE) of eastern Washington and Oregon. For the purpose of this analysis, we assumed that for cumulative impacts to occur, there must be a potential for a long-term reduction in the size of a population of birds or bats. When assessing the potential for cumulative impacts, it is necessary to first define the population potentially affected by wind energy development. Because birds and other animals do not recognize geopolitical boundaries, we have defined the affected population as those birds and bats of each species that breed, winter, or migrate through the CPE.

ANALYSIS AREA AND WIND ENERGY PROJECTS

As of mid–2008, 17 wind-energy facilities totaling 2464 MW were in operation in the CPE (Table 1), and an additional 30 wind-energy facilities are currently planned or being constructed within the CPE (Table 1). There are currently approximately 6665 MW of existing or proposed wind-energy facilities in the CPE. For the purpose of this analysis, we assumed that 6700 MW of wind power would be present in the CPE. However, past experience indicates that not all permitted projects are built, so these figures likely overestimate what will actually be constructed.

Most wind energy development in northern Oregon and southern Washington has been within the Columbia Plateau Level III Ecoregion (Thorson et al. 2003; Figure 1). The Columbia Plateau was historically characterized by open, arid shrub-steppe and grassland-steppe habitats. The current predominant land use of the Ecoregion is dryland agriculture, land enrolled in the Conservation Reserve Program (CRP), and rangeland (Figure 2). Precipitation through the region is 6 to 12 inches (about 15-30 centimeters) per year (Thorson et al. 2003). Surrounding ecoregions are more mountainous, receive more precipitation, and are more forested than the Columbia Plateau.

METHODS

This report provides a broad, qualitative analysis using existing public information about existing and proposed wind-energy facilities in the region, estimated population sizes of birds in the CPE, results of fatality monitoring studies, and published literature to compile a cumulative impact analysis for bird and bat resources. The analysis relies heavily on existing information from studies in the CPE. Information about wind project proposals was gathered from a variety of sources such as federal and state agencies (e.g., Bonneville Power Administration (BPA), Oregon Energy Facility Siting Council (EFSC)), permitting agencies (e.g., Klickitat County, WA), non-profit renewable energy advocates (e.g. Renewable Northwest Project), wind energy developers, and other public sources such as internet resources. Basic information such as the proposed capacity and location of each wind-energy facility identified was gathered and summarized to the extent possible.

The general approach to the cumulative effects analysis was to summarize results of fatality monitoring studies at operational wind-energy facilities within the CPE, and then use those results to estimate impacts for all constructed and proposed wind-energy facilities within the same ecoregion. Habitat and land use throughout the entire CPE are similar.

This cumulative effects analysis relies heavily on data from 11 wind-energy facilities in the CPE where monitoring for fatalities has occurred. Most of the operating facilities have had or will have some sort of bird or casualty monitoring associated with them, and post-construction fatality monitoring data are available from 11 operational wind energy facilities in the CPE (Table 2). For each of the individual study areas from which fatality results are available, the predominant land use was a mosaic of agriculture, mainly dryland wheat farming, and grassland or shrub- steppe rangeland used for livestock grazing. In general, the region where future wind-energy facilities are being planned is similar in vegetation types (Quigley and Arbelbeide 1997), although, for any given facility, the amount of each type varies. It is assumed for the analysis that results from the existing studies would be applicable to new proposed facilities.

With the exception of the Condon, Oregon, wind-energy facility, where no scavenging or searcher efficiency trials were conducted to estimate total mortality, the data sets used in this report were collected using similar methods, where observed fatality rates, calculated from standardized carcass searches, were adjusted for searcher efficiency and carcass removal biases. The analysis operates under the assumption that the bird and bat communities are similar across all wind-energy facilities because of habitat and land use similarities throughout the ecoregion, and thus are applicable to proposed facilities in this same ecoregion. Details about results, methods, and estimates of potential bird and bat impacts from each individual wind-energy facility are available in the referenced facility reports.

To define population sizes of those species most likely to be affected by wind energy development in the CPE, we used data from a recent publication that estimates breeding size of bird species by Bird Conservation Region, and then by that portion of each state within the Bird Conservation Region (see Blancher et al. 2007). Those portions of Washington and Oregon within the Great Basin Bird Conservation Region (see US NABCI Committee (2000) for a description) essentially comprise the same area that we have defined as the CPE.

Raptors

Pre–construction raptor use estimates and post-construction raptor fatality estimates are available for 11 facilities in eastern Washington and Oregon. Based on available data, it is likely that raptor mortality throughout the CPE would be on the same order of magnitude as other wind-energy facilities in the western US outside California. Raptor use (raptors/survey) at wind resource areas (WRAs) in the CPE ranges from 0.26 to 1.64, and averages 0.68 observations per 20-min survey (Table 3). This use is substantially lower than that at Altamont Pass and High Winds, two facilities in California that have had relatively high levels of raptor mortality. Similar levels of raptor mortality in the CPE would not be expected. To predict raptor mortality for all existing and proposed wind-energy facilities in the CPE, we assumed it would be similar to the other existing wind-energy facilities in the CPE. Mean annual raptor mortality (fatalities/MW/year) at the 11 existing wind-energy facilities in eastern Washington and Oregon ranges from 0 to 0.15/MW/year, with a mean of 0.07/MW/year. Because the 1.5–3.0 MW turbines constructed or proposed for most new-generation wind-energy facilities are larger than turbines used at most of the existing wind-energy facilities, it is likely not appropriate to predict raptor mortality in the CPE using per turbine estimates from the other wind-energy facilities, as several of the existing facilities used smaller turbines, ranging from 0.66 – 1.5 MW in size. Therefore, we used per megawatt estimates of raptor mortality for extrapolating the estimated numbers of raptor fatalities in the CPE. We used a range of 0.07 (mean) to 0.15 (maximum) raptor fatalities/MW/year for estimating raptor mortality at each of the CPE wind energy facilities. To estimate cumulative mortality of individual species, we assumed that species composition of bird and bat fatalities associated with 6700 MW of wind energy would be similar to species composition of fatalities found at the 11 existing facilities in the CPE. For example, American kestrels (*Falco sparverius*) composed 38.6% of the raptor fatalities found at existing wind-energy facilities. To estimate the total number of American kestrel fatalities associated with 6700 MW of wind energy development, we assumed that they would also compose 38.6% of the total cumulative number of raptor fatalities per year.

All Birds

Compared with raptors, there is little correlation between total numbers of birds (all species) observed during pre-construction surveys (most of which are song birds) and post-construction mortality, presumably because many of the collision fatalities are nocturnal migrants, which are not accounted for during diurnal surveys. In addition, the survey methods for quantifying use are more relevant for large birds than for small birds. Total bird use at 24 wind-energy facilities in the CPE has ranged from 5–23.6 birds/survey and averaged 13.4 birds/survey (Table 3). Total bird use at the 11 wind-energy facilities in eastern Washington and Oregon with post-construction fatality data ranged from 5.0 birds/survey at Wild Horse to 23.6 birds/survey at Leaning Juniper, and averaged 12.4 birds/survey (Table 2). Because total bird use at proposed wind-energy facilities with pre-construction bird use data is within the range of similar bird use values for existing wind-energy facilities in the CPE, it is reasonable to assume that mortality of all birds combined at CPE wind-energy facilities would be similar to that observed at the 11 existing wind-energy facilities in the CPE. Therefore, we multiplied the total number of MW by 2.1 fatalities/MW/year (the mean among the 11 CPE wind-energy facilities) to estimate total bird mortality. Based on the range of fatality rates at existing wind energy projects in Washington and Oregon (0.9–3.2 fatalities/MW/year), we multiplied the total number of MW by 0.9 fatalities/MW/year to get a more conservative estimate, and by 3.2 fatalities/MW/year to get a more liberal estimate of total bird mortality. To estimate total cumulative mortality by bird type and/or species, we assumed the fatalities associated with 6700 MW of wind energy would have the same group and species composition as fatalities found at existing wind-energy facilities in the CPE.

Bats

To estimate cumulative bat mortality for all projects in the CPE, we assumed that bat mortality would be similar to the existing wind-energy facilities located in the CPE. Therefore, we multiplied the total number of MW by the mean number of bat fatalities/MW/year at the other CPE Projects (1.18/MW/year). Based on the range of fatality rates at existing wind energy projects in Washington and Oregon (0.39–2.46 fatalities/MW/year), we multiplied the number of MW by 0.39 fatalities/MW/year to get a more conservative estimate, and by 2.46 fatalities/MW/year to get a more liberal estimate of cumulative bat mortality. We estimated the total number of fatalities by species assuming species composition would be similar to the species composition of bat fatalities found at existing wind-energy facilities in the CPE.

RESULTS

Existing Data for CPE Projects

Raptors

Pre–construction raptor use estimates and post-construction raptor fatality estimates are available for 11 wind-energy facilities in eastern Washington and Oregon. Pre-construction raptor use estimates at these wind-energy facilities have ranged from 0.26 raptors/survey at Nine Canyon, to 0.90 raptors/survey at Bighorn I, and averaged 0.50/survey (Table 2). Raptor mortality was not documented at three of these wind-energy facilities (Klondike I, Vansycle and Combine Hills) during one-year post-construction mortality surveys, and was relatively low at the other eight, ranging from 0.05/MW/year at Nine Canyon, Washington to 0.15/MW/year at Bighorn I, Washington. Quantitative mortality estimates were not made for Condon, but only one raptor fatality was documented at that facility.

The 57 raptor fatalities found at CPE wind-energy facilities have composed 8.6% of the total bird mortality. Most of the raptor fatalities have been American kestrels (22 fatalities; 38.6%), red-tailed hawks (*Buteo jamaicensis*; 14 fatalities; 24.6%) and short-eared owls (*Asio flammeus*; 7 fatalities; 12.3%). Other raptors found as fatalities at CPE wind-energy facilities include four ferruginous hawks (*Buteo regalis*), three Swainson's hawks (*Buteo swainsonii*) and one each of the following: rough-legged hawk (*Buteo lagopus*), Cooper's hawk (*Accipiter cooperii*), northern harrier (*Circus cyaneus*), great horned owl (*Bubo virginianus*), long-eared owl (*Asio otus*), barn owl (*Tyto alba*) and unidentified accipiter (Table 4).

All Birds

Seventy-seven species have occurred as fatalities at existing wind energy facilities in the CPE. Passerines (songbirds) have been the most abundant bird fatality at wind-energy facilities outside California, often comprising more than 80% of total bird fatalities (Erickson et al. 2001a). Passerines are also the most commonly observed birds during pre-construction fixed-point bird use surveys at all of these sites. Both migrant and resident passerine fatalities have been observed. Songbird mortality at wind-energy facilities in eastern Oregon and Washington has been reasonably consistent among sites. Songbirds have composed 69.5% of the bird mortality at CPE wind-energy facilities. Horned larks (*Eremophila alpestris*) have been the most commonly observed songbird fatality in the CPE, composing 31.1% of all bird fatalities (Table 4), and have been the most abundant songbird observed during pre-construction fixed point bird use surveys at these sites. Based on long term Breeding Bird Survey (BBS) data, horned larks are likely one of the most common birds in the Columbia Plateau. No other resident songbird species comprised a large proportion of the fatalities observed at the wind-energy facilities in the CPE (Table 4). The one apparent migrant with the highest number of fatalities is the golden-crowned kinglet (*Regulus satrapa*; 43 fatalities; 6.5% of all fatalities).

Mourning doves (*Zenaida macroura*) and rock pigeons (*Columba livia*) have composed 3.2% of the mortality at CPE wind-energy facilities. Waterfowl, waterbirds and shorebirds have composed only 1.7% of the fatalities, and include four Canada geese (*Branta canadensis*), two mallards (*Anas platyrhynchos*), and one each of the following species: great blue heron (*Ardea herodias*), American coot (*Fulica americana*), bufflehead (*Bucephala albeola*), killdeer (*Charadrius vociferous*), and western grebe (*Aechmophorus occidentalis*). Mortality compared to use by these groups is very low. For example, only two Canada goose fatalities were documented at the Klondike, Oregon wind-energy facility (Johnson et al. 2003a), even though 43 flocks totaling 4845 individual Canada geese were observed during pre-construction fixed-point bird use surveys (Johnson et al. 2002a). Shorebird use of wind-energy facilities in the CPE has been low, with the most common species being killdeer. Shorebirds as a group are rarely killed at wind-energy facilities; of 1036 avian fatalities collected at US wind-energy facilities and summarized in Erickson et al. (2001), only one was a shorebird (a killdeer found at Buffalo Ridge wind-energy facility, Minnesota). Low shorebird mortality has occurred even though shorebirds have been recorded at virtually every wind-energy facility evaluated. Some waterfowl, shorebird and other waterbird mortality will occur at CPE wind-energy facilities, but based on all available data from other facilities, the numbers are expected to be low relative to the use of each area. Upland gamebirds documented during surveys of CPE wind-energy facilities include ring-necked pheasant (*Phasianus colchicus*), gray partridge (*Perdix perdix*), chukar (*Alectoris chukar*), and California quail (*Callipepla californica*). Some upland gamebird mortality has been documented at many wind-energy facilities (Erickson et al. 2001a; Erickson et al. 2002). In the CPE, upland gamebirds are one of the most common fatalities, composing 14.5% of all identified fatalities (Table 5). Based on habitat present, results from other regional wind-energy facilities, and the presence of upland gamebirds during baseline surveys, some mortality of upland gamebirds is expected to occur at nearly all wind-energy facilities in the CPE.

Bats

Bat mortality estimates have been made for 10 existing wind-energy facilities in the CPE, where they ranged from 0.39–2.46 fatalities/MW/year, and averaged 1.18 fatalities/MW/year (Table 6). Bat mortality patterns at wind-energy facilities in Washington and Oregon have followed patterns similar to the rest of the country. Of 337 bat fatalities collected at existing wind-energy facilities in eastern Oregon and Washington, 315 (93.5%) have been the two migratory species that occur in the CPE, including 152 hoary bats (*Lasiurus cinereus*) and 163 silver-haired bats (*Lasionycteris noctivagans*). The other mortalities have consisted of small numbers of big brown bats (*Eptesicus fuscus*), little brown bats (*Myotis lucifugus*), and unidentified bats (Table 7). Virtually all of the mortality has occurred in late summer and early fall, during the fall migration period for hoary and silver-haired bats.

Mortality Estimates and Population Consequences

Birds (Excluding Raptors)

For all birds combined, we estimate that total annual mortality in the CPE would be 14,070 birds/year, with a reasonable range of 6,030 to 21,440 birds/year. Despite several thousand bird fatalities from 6700 MW of wind power, these impacts are spread across numerous species and bird groups, as well as across seasons. Therefore, the overall impact to any given species or population of a species is substantially less. Based on species composition of fatalities at existing CPE wind-energy facilities (Table 4), passerines would compose approximately 69.5% of the fatalities, upland gamebirds would compose 14.5%, doves/pigeons would compose 3.2%, waterfowl/waterbirds/shorebirds would compose 1.7% and other bird types, such as woodpeckers, nighthawks and swifts, would compose 2.6%. Approximately 3.3% of the mortality would be composed of non-protected European starlings (*Sturnus vulgaris*) and rock pigeons.

Raptors

Using raptor mortality estimates from existing wind energy facilities in the CPE, we estimate total raptor mortality in the CPE would be 469 fatalities per year, with an upper bound of 1005 per year. The upper bound assumes that all projects would have raptor fatality rates similar to those experienced at the wind farm with the highest raptor mortality rate (0.15/MW/year), which is unlikely. Therefore, we feel the projected number of fatalities using the mean raptor fatality rate at existing CPE wind projects is the most appropriate metric for cumulative impacts analysis. American kestrels account for 38.6%, red-tailed hawks account for 24.6% and short-eared owls account for 12.3% of the raptor fatalities recorded at the regional wind projects studied (see Table 4). Assuming this trend holds true for all proposed wind-energy facilities in the CPE, and assuming there would be 469 raptor fatalities per year, it would be expected that on average 181 American kestrels, 115 red-tailed hawks and 58 short-eared owls would be killed each year.

The other species of raptors occurring in the CPE have had no or few fatalities at existing wind-energy facilities, and would likely represent a much smaller number of fatalities. For example, no golden eagle, peregrine falcon (*Falcon peregrinus*) or prairie falcon (*Falcon mexicanus*) fatalities have been found to date; therefore, our mortality estimate for these species is necessarily zero. Two species of concern in the region, ferruginous hawk and Swainson's hawk, have both been found as turbine collision victims in the CPE. Ferruginous hawks have composed 7.0% of the raptor fatalities (four of 57), while Swainson's hawks have composed 5.3% (three of 57). Assuming a total of 469 raptor fatalities could occur each year in the CPE, this would result in 33 ferruginous hawk and 25 Swainson's hawk fatalities per year.

The three species of raptors with the largest expected numbers of fatalities due to wind energy development in the CPE are American kestrel, red-tailed hawk and short-eared owl. Raptor fatalities in the CPE have occurred throughout the year, with 22.8% in the spring, 45.6% in the summer, 17.5% in the fall, and 12.3% in the winter (Table 8). Approximately 52.6% of the raptor fatalities have occurred during the spring and fall migration, and during winter periods, when the affected population could contain birds from numerous local breeding populations in the Pacific Northwest as well as further north in Canada. Assuming approximately 45.6% of the mortality would occur during the breeding season, it would be expected that approximately 83 American kestrel, 52 red-tailed hawk and 26 short-eared owl fatalities would occur during the breeding season. An estimate of the breeding population in the Columbia Plateau, based on the BBS long-term average data, is approximately 170,000 breeding American kestrels, 77,000 breeding red-tailed hawks and 21,000 breeding short-eared owls (Blancher et al. 2007). Annual collision mortality in the CPE would represent approximately 0.05% of the breeding population of American kestrels, 0.07% of the breeding population of red-tailed hawks and 0.12% of the breeding population of short-eared owls. Even if we assumed all mortality (instead of 45.6%) would occur to adult breeding birds, this would still represent only 0.11%, 0.15% and 0.28% of the breeding American kestrels, red-tailed hawks and short-eared owls, respectively, in the CPE. Background mortality for these species is much higher than this estimate and the additional wind energy related mortality is likely insignificant from a population standpoint. Typical annual mortality rates for red-tailed hawks are 54% of juveniles, 20% of subadults, and 20% of adults. American kestrels suffer even higher mortality, as the annual mortality rate is 69% of juveniles and 45% of adults (Millsap and Allen 2006). Annual survival data are not available for short-eared owls (Wiggins et al. 2006). Given these numbers, plus the fact that most raptor populations can withstand additional harvest of nestlings and migrating birds by falconers of 10-20% or even higher (Millsap and Allen 2006), it is unlikely that the additional mortality of <0.30% associated with projected wind power development in the CPE would lead to measurable population effects for American kestrels, red-tailed hawks and short-eared owls. Based on an analysis of population sizes and survival rates, the US Fish & Wildlife Service conservatively estimates that falconers could harvest 13,216 juvenile red-tailed hawks and 19,575 juvenile American kestrels each year in the US without any consequences to populations (Millsap and Allen 2006). Actual harvest by falconers in 2004 was only 1,062 raptors comprising 15 species (Milsap and Allen 2006). Given these estimates of a sustainable harvest and the actual number of birds harvested, the number of birds killed in 2004 by wind turbines in North America should have fallen into a range of sustainable mortality.

Even though only four ferruginous and three Swainson's hawk fatalities have been found at existing wind energy facilities in the CPE, these raptors are species of concern and warrant additional analysis. The ferruginous hawk is listed as threatened by the Washington Department of Fish and Wildlife (WDFW) and as "critical" by the Oregon Department of Fish and Wildlife (ODFW), while the Swainson's hawk is listed as "vulnerable" by the ODFW. The estimated breeding population in the CPE is 1,000 ferruginous hawks (Blancher et al. 2007). Ferruginous hawks may occur in the CPE throughout the year and their populations include breeders, migrants and winter residents, as well as juveniles and adults. Given our estimate of 33 ferruginous hawk fatalities on an annual basis, even if all turbine mortality occurred to resident breeding adult birds, this would represent 3.3% of the breeding ferruginous hawks in the CPE. Because mortality would likely be spread out among migrants, winter residents, resident breeders, and juveniles as well as adults, mortality of adult ferruginous hawks actually breeding in the CPE would be less than 3.3%, likely on the order of 1–2%. According to Millsap and Allen (2006), ferruginous hawk populations can sustain 1% harvest rates (limited to juveniles) without affecting populations. This harvest rate was considered conservative because it was modeled using data obtained from red-tailed hawk banding or marking studies, which typically greatly underestimate survival in raptors compared to telemetry studies. Therefore, the sustainable harvest rate is likely greater than 1%. To put a 1-2% mortality rate into perspective, we examined existing mortality rates of ferruginous hawks. A study of ferruginous hawks in Washington State found that annual adult mortality was 24%, and mortality of juvenile ferruginous hawks was 57% between the first and second year (Watson 2003). A ferruginous hawk banding study in Alberta, Canada found that first year mortality was 60% (Schmutz and Fyfe 1987), and a study of ferruginous hawks in Utah found that annual mortality was 25% for adults and 66% for juveniles the first year (Woffinden and Murphy 1989). Another study in Canada (Alberta and Saskatchewan) found that annual adult mortality was 29.2%, and first year mortality of nestlings was 45.5%. Despite annual adult mortality of 29.2%, the authors concluded that adult survival was not limiting the population; abundance of ground squirrels, which affected nesting success, appeared to be the primary factor regulating population size (Schmutz et al. 2008). Given published annual mortality rates for adult ferruginous hawks of 24–30%, additional losses of 1–2% of resident breeders associated with 6700 MW of wind energy development in the CPE would not likely have measurable population consequences.

The above analysis is for the entire population of 1000 ferruginous hawks in the CPE. It assumes that wind energy development and ferruginous hawk populations are spread uniformly across the entire CPE, which is not the case. Given the actual locations of existing and proposed wind energy facilities and ferruginous hawk population centers, actual impacts are likely lower. For example, the existing and proposed wind energy development in Klickitat County, Washington is approximately 1751 MW, or 26% of all wind energy development in the CPE. However, only three breeding pairs of ferruginous hawk are known to occur in the county (Jim Watson, Wildlife Research Scientist, Washington Department of Fish and Wildlife, pers. commun). Therefore, the county with the largest amount of wind energy development has a low breeding population of ferruginous hawks, which reduces the potential for significant impacts to this species across its entire range in the CPE. According to Watson (2003), the core breeding area for ferruginous hawks in Washington is in Benton and Franklin Counties. To date, no wind energy facilities have been proposed in Franklin County and only three of the existing/proposed facilities are in Benton County (Figure 1). Therefore, there is little overlap between areas of intensive wind energy development and core breeding areas for ferruginous hawk, which further reduces the potential for cumulative impacts to this species. Although local populations of ferruginous hawk may be reduced in areas of intensive wind energy development, the evidence suggests that this impact is not likely to affect the ferruginous hawk population in the entire CPE.

Breeding Bird Survey data collected over the last 27 years (1980–2007) show a negative trend in population growth for ferruginous hawks in the CPE (Sauer et al. 2008), but the negative trend is not statistically significantly due to low sample sizes and uncertainty (Sauer et al. 2008). If ferruginous hawk populations are declining in the region, and wind energy development continues at its current rate of growth in the CPE, ferruginous hawk collision mortality could eventually reach a point that populations may begin to decline without some form of mitigation. Mitigation could include establishing appropriate buffers around ferruginous hawk breeding territories at future wind energy facilities, erecting artificial nest structures, or otherwise improving habitat for ferruginous hawks in the CPE (Johnson et al. 2007).

The estimated Swainson's hawk breeding population in the CPE is 10,000 (Blancher et al. 2007). Unlike ferruginous hawks, Swainson's hawks occur in the CPE only during summer and most are resident breeders. Given our mortality estimate of 25 Swainson's hawks per year, this would represent only 0.25% of the Swainson's hawks in the CPE. Compared to many other raptor species, there is little data on annual survival of Swainson's hawks (England et al. 1997). The annual mortality rate of Swainson's hawks was reported in one study from western Canada, where it was estimated to be 15.7%, and nestling mortality rates ranged from 56–81% over the multi-year study (Schmutz et al. 2006). Given these mortality rates, additional losses of <0.3% would be considered sustainable and would not have measurable population consequences.

Upland Gamebirds

Upland gamebirds represent a higher percentage (14.5%) of the bird fatalities in the Columbia Plateau than in other regions in the US. No native upland gamebirds have been found as fatalities at wind-energy facilities in the CPE. All of the fatalities have been ring-necked pheasant, gray partridge, and chukar, which are all introduced species. Given our total bird mortality estimate of 14,070, approximately 2,040 upland gamebird fatalities would be expected to occur on an annual basis.

The species most impacted, ring-necked pheasant, gray partridge, and chukar, are all common in mixed agricultural native grass/steppe habitats. Habitats throughout the Columbia Plateau are highly suitable for these species and the large populations likely influence the higher mortality rate for the regional wind-energy facilities. The total estimated population size of these three species combined in the CPE of Oregon and Washington is 370,900 (Blancher et al. 2007); therefore, wind energy fatalities would compose approximately 0.55% of the population. As with non-native (non-protected) passerine species, there is generally lower concern over impacts to exotic upland gamebirds. Given the vast amount of suitable habitat and the ability of these species to withstand harvest rates substantially higher than 0.55%, it is unlikely that additional fatalities from wind energy development would be significant from a population standpoint.

Waterfowl, Waterbirds and Shorebirds

Waterfowl, waterbirds and shorebirds represent a very small percentage (1.7%) of all fatalities at existing wind energy projects in the CPE. Based on our total bird mortality estimate of 14,070, approximately 239 fatalities could result on an annual basis, including 152 waterfowl, 65 waterbirds, and 22 shorebirds.

Populations of waterfowl, waterbirds and shorebirds in the CPE are considerable. In addition, members of these groups are present year-round in the form of resident breeders, migrants, and winter residents. Given that we estimate only a few hundred individuals will be killed by turbine collisions on an annual basis, no cumulative impacts on these species are likely. In addition to killdeer, another shorebird commonly associated with upland habitats where wind-energy facilities are placed, is long-billed curlew. To date, however, no fatalities of this sensitive species have been documented at any wind-energy facility in the CPE, and no cumulative impacts are likely from collision mortality.

<u>Passerines</u>

For projects in the CPE, approximately 69.5% of the bird fatalities have been passerines (Table 5). Assuming that 69.5% of all bird mortality would be composed of passerines, approximately 9,779 passerine fatalities would occur annually in the CPE. Of all passerine fatalities recorded during the regional monitoring studies, horned lark made up nearly half (44.7%) of the fatalities. Assuming this pattern holds for all CPE wind-energy facilities, it could be expected that on average there would be 4,371 horned lark fatalities per year. Another common grassland breeder in the CPE, western meadowlark (*Sturnella neglecta*), composed approximately 4.6% of the passerine fatalities at wind-energy facilities, and therefore total annual mortality of this species related to wind turbine collisions would be approximately 450 individuals. At wind-energy facilities in the CPE, migrant passerines of several species generally composed approximately 32.9% of the bird fatalities. Assuming these estimates are representative of all CPE wind-energy facilities, approximately 3,217 nocturnal migrant fatalities would be expected per year if 6700 MW of wind power were constructed. The most common migrant fatality at existing wind-energy facilities in the CPE was golden-crowned kinglet (Table 4). Approximately 9.3% of the passerine fatalities were of this species; therefore, estimated annual mortality for this species would be approximately 909 individuals.

According to Blancher et al. (2007), the estimated size of the breeding population of horned larks in that portion of the CPE in Washington and Oregon is 2.2 million. Given our estimate of 4,371 horned lark fatalities, and if it is assumed that the horned lark fatalities are spread equally over the year, then roughly 25% (~1,093) of these fatalities would be during the breeding season. This represents approximately 0.05% of the breeding horned lark population. Given that most of the mortality will be composed of common species with widespread distribution and large populations, that annual mortality rates of song birds typically range from 30–70% (Lack 1966; Welty 1982), losses amounting to less than one percent are impacts to individuals, and therefore not significant from a population standpoint.

While this example represents a plausible means of addressing potential population impacts under a number of assumptions, it illustrates the low level of effect on the common grassland/agricultural species that comprise the largest portion of the fatalities. Similar examples could be used for the other species that illustrate lower effects. For example, the BBS data indicate the breeding population of western meadowlarks in the CPE of Oregon and Washington is one million (Blancher et al. 2007). Given our estimate of 450 western meadowlark fatalities, the impact on the western meadowlark breeding population in the Columbia Plateau would be minor and insignificant. The number of fatalities from other species are even fewer (see Table 4) and unlikely to have any population effects.

In general, while modern turbines are getting taller, new wind-energy facilities do not appear to have a large impact on migrant birds. Results of marine radar surveys for proposed wind-energy facilities have indicated that the vast majority of nocturnal migrants fly at altitudes that do not put them at risk of collision with turbines (Young and Erickson 2006). Also, there have been only two multiple individual mortality events during a migration season reported at newer wind-energy facilities in the US. At Buffalo Ridge, Minnesota, fourteen migrating passerine fatalities (vireos, warblers, flycatchers) were observed at two turbines during a single night in May 2002 (Johnson et al. 2002b), and 33 migrating passerine fatalities (mostly warblers) were observed near one turbine and a well-lit substation at the Mountaineer, West Virginia, wind-energy facility in May 2004 (Kerns and Kerlinger 2004). At wind-energy facilities in the CPE, migrant passerines of several species generally composed approximately 30% of the bird fatalities. Some impacts are expected for nocturnal migrating species; however, impacts are not expected to be great for the CPE. The apparent migrant with the greatest number of collision fatalities is golden-crowned kinglet. Our annual mortality estimate for golden-crowned kinglet was 909, which would represent 0.13% of the estimated breeding population size of this species in the CPE of Oregon and Washington, which is 720,000 (Blancher et al. 2007). Golden-crowned kinglets are typically associated with forested habitats during the breeding season, so it is assumed that many of the impacted individuals were from surrounding mountainous ecoregions or populations further north (e.g., Canada), rather than from the CPE. As with horned lark, estimating the potential population size from which these birds came requires a number of assumptions. However, while the potential population size is unknown, it is possible that the individual fatalities came from several populations in surrounding or more northern ecoregions, thus further diluting the impacts on any one population. Other potential migrant species were found in lower numbers. Cumulatively the impacts to migrants would be spread over a much larger population base and are not considered significant.

Sensitive Bird Species

In addition to ferruginous and Swainson's hawks discussed above, other species classified as sensitive species by the WDFW and/or ODFW have been found as fatalities at CPE wind energy projects. These include Lewis's woodpecker (*Melanerpes lewis*), grasshopper sparrow (*Ammodramus savannarum*), sage thrasher (*Oreoscoptes montanus*), sage sparrow (*Amphispiza belli*) and Vaux's swift (*Chaetura vauxi*). Only one fatality of each of the above species has been found at CPE wind energy projects. Given that 663 bird fatalities have been found at these projects and estimated total bird mortality is 14,070, the estimated mortality for each of these species would be approximately 21 fatalities per year. The estimated population sizes of each of these species in the CPE based on Blancher et al. (2007) is 25,000 Lewis's woodpeckers, 149,000 grasshopper sparrows, 1,060,000 sage thrashers, 314,000 sage sparrows, and 110,000 Vaux's swifts. Given these estimated populations sizes, the loss of 21 individuals per year would not have measurable populations consequences.

Bats

Based on bat mortality estimates at the other regional wind-energy facilities, total bat mortality in the CPE was estimated at 7,906 per year, with an expected range of 2,613–16,482 fatalities per year. Based on species composition of bat fatalities found at CPE wind-energy facilities, approximately 3,827 silver-haired and 3,566 hoary bat fatalities would occur in the CPE on an annual basis.

Unlike birds, there is little information available about population sizes of most bat species, especially the non-hibernating, solitary tree-roosting species that compose most of the wind-energy facility related mortality in North America. Results of monitoring studies across the US and Canada have found similar trends in impacts. Risk to bats from wind turbines is unequal across species and across seasons. The majority of bat fatalities at wind projects in the US and Canada have been tree roosting bats that are long-distance migrants. Silver-haired bats throughout the US and species in the *Lasiurus* genus, the hoary bat in the west and the eastern red bat (*L. borealis*) in the east, are the most abundant fatalities found at wind-energy facilities. Less common fatalities include big brown bats and *Myotis* species (Johnson 2005). The highest mortality occurs during the fall migration period for bats, from roughly late-July through September (Arnett et al. 2007, Johnson 2005). Much lower mortality rates occur in the spring and summer, particularly in the CPE.

More recently, studies at different locations in the US and Canada appear to indicate that bat mortality is not related to site features or habitat, and dissimilar results for ecologically similar facilities have been found. While it is hypothesized that eastern deciduous forests in mountainous areas may be the highest risk areas, relatively high bat mortality has also occurred at wind-energy facilities in prairie/agricultural settings (Alberta, Canada) and mixed deciduous woods and agricultural settings (Maple Ridge, New York). For example, a wind project in dryland agricultural prairie type habitats in southern Alberta has reported fairly high observed bat mortality (not corrected for searcher and carcass removal biases) of 12-15 bats per turbine per year or seven to eight bats per MW per year (Baerwald 2007). In contrast, other nearby (within 15.5 miles or 25 km) wind-energy facilities to that site have reported similar bat mortality (one to two bats per MW per year) to the wind-energy facilities studied in the CPE (Baerwald, pers. comm.). Bat mortality in the CPE would involve primarily silver-haired and hoary bats. Most mortality is observed during the fall migration period. The regional monitoring studies suggest resident bats do not appear to be significantly affected because very low numbers of resident bat species have been observed as fatalities. One species of potential concern is the Townsend's big-eared bat (*Corynorhinus townsendii*), a state candidate species in Washington. Very little is known about the current distribution of Townsend's big-eared bat in Washington. According to Marshall et al. (1996) the subspecies *Corynorhinus townsendii pallescens* occurs east of the Cascade Range, within the CPE. A Biological Assessment prepared to address the potential for a wind-energy facility in West Virginia to impact the federally endangered Virginia big-eared bat (*Corynorhinus townsendii virginianus*), a subspecies of Townsend's big-eared bat, concluded that the collision risk to this species is very low because it is non-migratory and forages well below the space occupied by turbine blades (Johnson and Strickland 2003). These conclusions are also likely applicable to Townsend's big-eared bat, and to date no fatalities of this species have been found at any wind energy facility in the CPE.

Hoary bats and silver-haired bats occupy forested habitats during the breeding season – habitat distinctly lacking and localized throughout the CPE. The significance of wind energy impacts on hoary and silver-haired bat populations is difficult to predict, as there is very little information available regarding the overall population sizes of these bats. However, hoary and silver-haired bats are widely distributed throughout North America. Most concern over impacts to bats is with wind-energy facilities built on ridgetops in the Appalachian Mountains, where mortality levels have been as high as 47.5 bat fatalities/turbine/ year (Kerns et al. 2005), substantially higher than the average of 1.18 bat fatalities/MW/year observed in the Pacific Northwest.

In general, mortality levels on the order of one to two bats per turbine or per MW are likely not significant to populations, although cumulative effects may have greater consequences for long-lived, low-fecundity species such as bats. Unlike many bird species that may have multiple clutches of multiple young per year, hoary bats and silver-haired bats typically raise only one or two young per year and only breed once per year (Shump and Shump 1982; Kunz 1982). Bats tend to live longer than birds, however, and may have a longer breeding lifespan. The impact of the loss of breeding individuals to populations such as these may have greater consequences.

Since it is most likely breeding populations from surrounding mountainous/forested ecoregions or from more northern areas (e.g., Canada) are affected at the Columbia Plateau wind-energy facilities during the fall migration, the dynamics of these populations would need to be known to predict population effects. For large and stable populations the level of impact is not expected to be significant, although impacts could be more pronounced for less stable populations. Bat Conservation International (BCI), the American Wind Energy Association (AWEA), the US Fish & Wildlife Service (USFWS), and the US Department of Energy National Renewable Energy Laboratory (NREL) have initiated a research effort termed the Bat Wind Energy Cooperative to conduct research and further understand bat and wind turbine interactions and how to prevent or minimize bat fatalities at wind energy facilities.

Indirect Effects

Grassland and shrub-steppe communities are the most abundant native communities in the CPE, but they are also highly subjected to development and conversion to agriculture (Johnson and O'Neil 2001). In addition to potentially thousands of new vertical structures, added wind energy generation in the region will result in more roads (mostly dirt and gravel) and increased human activity due to turbine construction and maintenance. A substantial portion of these impacts will be to already heavily disturbed agricultural fields and moderately disturbed rangeland used for livestock grazing. The percent of direct impacts actually occurring in native grassland or shrub-steppe habitat are difficult to predict and would be based on individual facility design and layout. However, based on the community types that existing wind-energy facilities are located in, we assume that approximately 25% of the existing and proposed facilities would be in cultivated cropland. Based on terrestrial vegetative communities in the CPE (Figure 2), only seven of the 47 existing or proposed wind energy facilities are in communities classified as shrub steppe, with two additional facilities in areas classified as grasslands. The remainder is all within vegetative communities classified by Quigley and Arbelbeide (1997) as agricultural lands. These lands include croplands as well as rangelands used for cattle grazing, but are apparently degraded such that they are no longer classified as shrublands or grasslands. Therefore, most of the wind energy facilities in the CPE are in areas already degraded to some extent from conversion to pastures and cultivated cropland.

Assuming that on average the permanent impacts associated with a turbine and the associated access roads are 1.5 acres per turbine, and that 1.5-3.0 MW turbines are used for all new projects in the foreseeable future, then approximately 5,000 acres (7.8 mi^2) of non-agricultural vegetation types, primarily grassland shrub-steppe vegetation, would be lost in the CPE with 6,700 MW of wind energy. These impacts would be spread over a large area geographically (see Figure 1). Given that the CPE is 32,096 mi^2 in size, permanent impacts associated with 6700 MW of wind energy development would represent only 0.02% of the area.

While the CPE covers a large area, and characteristic grassland shrub-steppe habitat is widespread, it is also heavily fragmented by agricultural activities. Species that depend on native habitat face physical and ecological barriers within the region and at the region's edges. The Columbia River, and other smaller rivers in the area, cut deep canyons and present linear alteration to the general physiography and potential barriers to some animal species movement. Large swaths of agricultural land are less obvious, but may pose significant obstacles to small or less mobile animals. While many birds are not impeded by such physical barriers, some smaller, habitat-specific birds that depend on brushy habitats for cover could be affected by such habitat fragmentation. Habitat specialists and obligates such as greater sage-grouse (*Centrocercus urophasianus*) and sage sparrow (*Amphispiza belli*) require large tracts of continuous sage habitat (Johnson and O'Neil 2001), which is largely missing from the Columbia Plateau, and the range for these species in the Columbia Plateau is already severely restricted. Assuming that agricultural vegetation types are not important wildlife habitat, habitat loss impacts are not expected to be a significant loss to any given species within the entire CPE. However, because existing and proposed wind-energy facilities tend to be concentrated within certain regions within the CPE (see Figure 1), habitat loss may lead to localized population declines of some species.

The presence of wind turbines may alter the landscape so that wildlife habitat use patterns are altered, thereby displacing wildlife away from the wind-energy facilities. Development of wind turbines near raptor nests may result in indirect impacts to the nesting birds; however, the only published report of avoidance of wind turbines by raptors occurred at Buffalo Ridge, Minnesota, where raptor nest density on 101 mi^2 (261.59 km^2) of land surrounding a wind project was 5.94/39 mi^2 (5.94/ 101.01 km^2), yet no nests were present in the 12 mi^2 (31.08 km^2) wind-energy facility itself, even though habitat was similar (Usgaard et al. 1997). However, this analysis assumes that raptor nests are uniformly distributed across the landscape, an unlikely event, and even though no nests were found, only two would be expected for an area 12 mi^2 in size if the nests were distributed uniformly. No red-tailed hawks or golden eagles are known to nest within the Altamont Pass WRA (APWRA), suggesting that the large numbers of turbines present within that area may discourage nesting by raptors, or that collision mortality prevents nesting in the APWRA. At the Foote Creek Rim wind-energy facility in southern Wyoming, one pair of red-tailed hawks nested within 0.3 miles (0.48 km) of the turbine strings, and seven red-tailed hawk, one great horned owl, and one golden eagle nests located within one mile (1.61 km) of the wind-energy facility successfully fledged young (Johnson et al. 2000a). The golden eagle pair successfully nested a half-mile (0.80

km) from the wind-energy facility for three different years after it became operational. Additionally, a Swainson's hawk nested within a half-mile mile of the Klondike, Oregon Wind Project (Johnson et al. 2003a). Studies at the Stateline Wind Project in Oregon and Washington have shown no measurable short-term effects to nesting raptors (Erickson et al. 2004). Maintaining permanent nest buffers would reduce the potential for indirect impacts.

At the Foote Creek Rim wind-energy facility in Carbon County, Wyoming, results of a long-term mountain plover monitoring study found that mountain plover use of the of the area declined during and immediately after construction of the facility. Mountain plover use slowly increased following operation of the facility, although not to the same level as it was prior to construction. It is possible that construction of the wind-energy facility resulted in some displacement of plovers, although a regional decline in mountain plover populations may also have contributed to the decline. Mountain plover use also declined during this same period at a nearby reference area and a more regional decline was documented by Fritz Knopf (Personal communication) and the USFWS (1999). Some mountain plovers have apparently become habituated to the turbines, as several mountain plover nests have been located within 246 ft (75 m) of turbines, many of which were successful (Young et al. 2005).

At a large wind-energy facility at Buffalo Ridge in Minnesota, the abundance of shorebirds, waterfowl, upland game birds, woodpeckers, and several groups of passerines was found to be statistically significantly lower at survey plots with turbines than at plots without turbines. There were fewer differences in avian use as a function of distance from turbines; however, suggesting that the area of reduced use was limited primarily to those areas within 328 ft (100 m) of the turbines (Johnson et al. 2000b). These results are similar to those of Osborn et al. (1998), who reported that birds at Buffalo Ridge avoided flying in areas with turbines. Also at Buffalo Ridge, Leddy et al. (1999) found that densities of male songbirds were significantly lower in Conservation Reserve Program grasslands containing turbines than in CRP grasslands without turbines. Grasslands without turbines and portions of grasslands located at least 590 ft (180 m) from turbines had bird densities four times greater than grasslands located near turbines. Reduced bird use near turbines was attributed to avoidance of turbine noise and maintenance activities and reduced habitat effectiveness because of the presence of access roads and large gravel pads surrounding turbines (Leddy 1996; Johnson et al. 2000b). Some birds apparently do become accustomed to turbines, as Osborn et al. (1998) reported a mallard nest within 102 ft (31 m) of a turbine in Minnesota.

Preliminary results from the Stateline Wind Project in Oregon and Washington (Erickson et al. 2004) suggest a relatively small-scale impact of the wind-energy facility on grassland nesting passerines. Transect surveys conducted prior to and after construction of the wind-energy facility indicated that grassland songbird use was significantly reduced only within 164 ft (50 m) of turbine strings; areas further away from turbine strings did not have reduced avian use. The reduced use was attributed to temporary and permanent habitat disturbance near the turbines. Horned larks appeared least impacted, likely because this species prefers areas of bare ground such as those created by turbine pads and access roads (Beason 1995). A long-term grassland bird displacement study at a wind energy facility in South Dakota found that chestnut-collared longspur (*Calcarius ornatus*) and western meadowlarks did not appear to avoid turbines, whereas grasshopper sparrows appeared to avoid turbines out to a distance of 200 m (D. H. Johnson and J.A. Shaffer, US Geological Survey, personal communication).

The CPE wind energy facilities will be sited in vegetation communities common to the region, and other similar vegetation types are abundant. Furthermore, the actual area occupied by turbines and other infrastructure in a typical modern wind energy facility is only 5-10% of the total project area. However, it is not known if displaced individuals simply move somewhere else and breed successfully, have reduced breeding success, do not breed at all, or some combination of the above. In addition, habitat fragmentation and disturbance from turbines and maintenance activities may make the entire wind-energy facility unsuitable for some species. If this occurs, a reduction in the number of breeding birds within the wind-energy facility and adjacent areas may occur, and the effect may be more pronounced in areas with concentrated facilities in circumstances where habitat is a limiting factor. However, the total area occupied by wind-energy facilities is only a small fraction of the CPE (see Figure 1), and measurable population impacts are not likely for the entire region.

DISCUSSION

Mortality estimates for this analysis were based on species composition of fatalities found at 11 existing wind energy facilities in the CPE. Sample sizes for this analysis were relatively small for some groups. For example, we estimated ferruginous hawk mortality assuming that they would compose 7.0% of all raptor fatalities based on four ferruginous hawk fatalities out of 57 raptor fatalities found at the existing wind energy facilities. This ratio could easily change as additional fatality data are collected at new wind energy facilities in the CPE.

Our cumulative mortality estimates should be considered tentative, as no comparable fatality data exist for the large 2.0-3.0 MW turbines proposed for many of the future wind-energy facilities in the CPE. These estimates assume bird and bat fatality rates for a 2.0-MW turbine would be twice as high than for a 1.0-MW turbine, which may not be accurate. Although the 2.0-3.0 MW turbines have a larger rotor diameter, which may increase collision risk to raptors, the rotor-swept area is higher off the ground and the turbine rotates at slower speeds, which may actually reduce risk to some raptors. Based on an analysis of avian fatality data at wind farms with turbines ranging in size from 0.04–1.8 MW, tower heights ranging from 24–94 m and rotor diameters ranging from 15–80 m, Barclay et al. (2007) concluded that avian fatality rates were not affected by any of these parameters. Therefore, inflating our estimates to account for larger turbines may lead to over-estimates of avian mortality.

This cumulative effects analysis was based largely on results of existing studies of wind-energy facilities in the region, and in particular monitoring studies that estimated the direct impacts of a particular wind-energy project. The overall design for these studies incorporates several assumptions or factors that affect the results of the fatality estimates. First, all bird casualties found within the standardized search plots during the study periods were included in the analyses. It is assumed that carcass found incidentally within a search plot during other activities would have been found during a standardized carcass search. Second, it was assumed that all carcasses found during the studies were due to collision with wind turbines. True cause of death is unknown for most of the fatalities. It is highly likely that some of the casualties included in the data pool for the various projects were due to natural causes or background mortality such as predation, disease, other natural causes, or manmade causes such as farming activity or vehicles on county/project roads. The overall effect of these assumptions is that the analyses provide a conservative estimate (an overestimate) of mortality.

A few studies of wind-energy facilities in other regions of the country have provided information on background mortality. During a four-year study at Buffalo Ridge, Minnesota, 2,482 fatality searches were conducted on study plots without turbines to estimate reference mortality in the study area. Thirty-one bird fatalities comprising 15 species were found (Johnson et al. 2000a). Reference mortality adjusted for searcher efficiency and carcass removal for the study was estimated to average 1.1 fatalities per plot per year. At a second study, pre-project carcass searches were conducted at a proposed wind-energy facility in Montana (Harmata et al. 1998). Three bird fatalities were found during eight searches of five transects, totaling 10.94 miles (17.61 km) per search. On average, approximately 1.12 miles (1.8 km) of transect are searched within each turbine plot in the referenced studies for the CPE (Table 2). The amount of transect searched at the Montana site per search was equivalent to searching approximately seven to nine turbines for the regional studies. The background estimate for observed mortality would be approximately 0.33 per turbine plot per year, unadjusted for scavenging and searcher efficiency. The background mortality information from the Minnesota and Montana studies suggests that the estimates of bird mortality include some fatalities not related to turbine collision, and this factor alone would lead to an over-estimate of actual bird collision mortality for wind-energy facilities.

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Table 1. Wind power projects constructed or planned in the Columbia Plateau Ecoregion of Washington and Oregon.

Project	Max. Capacity (MW)	Project Information Source
Existing		
Combine Hills I (Umatilla Co., OR)	41	http://www.rnp.org/News/pr_EurusCombineJun03.html
Vansycle Ridge (Umatilla Co., OR)	25	http://www.rnp.org/Projects/vansycle.html
Stateline (Umatilla Co., OR)	300	http://www.ppmenergy.com/cs_stateline.html
Klondike I (Sherman Co., OR)	24	http://www.rnp.org/Resources/Klondike%201%20pager.pdf
Klondike II (Sherman Co., OR)	75	http://www.portlandgeneral.com/about_pge/ current_issues/klondikeII/Default.asp?bhcp=1
Condon (Gilliam Co., OR)	50	http://www.efw.bpa.gov/environmental_services/ Document_Library/Condon_Wind/RODwMAP.pdf
Leaning Juniper I (Gilliam Co., OR)	104	http://www.efw.bpa.gov/environmental_services/ Document_Library/Arlington_PPM/ROD031105.pdf
Nine Canyon I (Benton Co., WA)	64	http://www.energy-northwest.com/downloads/ninecan.pdf
Nine Canyon II (Benton Co., WA)	16	http://www.energy-northwest.com/downloads/9Canyon.pdf
Hopkins Ridge (Columbia Co., WA)	157	http://www.rnp.org/News/pr_PSEHopkinsDec05.htm Adding 4 more towers according to Columbia Co. Planning 1/15/08
White Creek/Last Mile (Klickitat Co., WA)	206	Klickitat Co. Planning Dept.
Big Horn (Klickitat Co., WA)	250	http://www.efw.bpa.gov/environmental_services/ Document_Library/Big_Horn/BigHornROD03242005.pdf
Hoctor Ridge (Klickitat Co., WA)	60	Klickitat Co. Planning Dept.
Marengo (Columbia Co., WA)	140	http://www.pacificpower.net/Homepage/Homepage35750.html
Wild Horse (Kittitas Co., WA)	230	http://www.res-ltd.com/wind-farms/wf-wildhorse/htm
Biglow Canyon (Sherman Co., OR)	450	http://www.bpa.gov/corporate/pubs/ RODS/2006/RODKlondikeIIIBiglowCanyon.pdf
Klondike III (Sherman Co., OR)	272	http://egov.oregon.gov/ENERGY/SITING/docs/ KWPPublicFilingNotice.pdf
Permitted/Proposed		
Marengo II (Columbia Co., WA)	90	http://www.pacificpower.net/Homepage/Homepage35750.html Under construction Jan 2008
Seven Mile Hill (Wasco Co., OR)	50	http://www.oregon.gov/ENERGY/SITING/ review.shtml#Seven_Mile_Hill_Wind_Project
Leaning Juniper II (Gilliam Co., OR)	279	http://www.oregon.gov/ENERGY/SITING/ review.shtml#Leaning_Juniper_Wind_Power
Arlington CEP/Rattlesnake Rd. (Gilliam Co., OR)	104	http://www.bpa.gov/corporate/pubs/rods/2005/EFW/ Arlington-Wind-Interconnection-ROD-1-14-05.pdf
Shepherds Flat (Gilliam & Morrow Co., OR)	909	Data provided by BPA, Morrow County Planning Dept.
Willow Creek (Morrow Co./Gilliam Co., OR)	50	http://www.transmission.bpa.gov/PlanProj/Wind/willow.cfm

Project	Max. Capacity (MW)	Project Information Source
Combine Hills II (Umatilla Co., OR)	63	http://www.efw.bpa.gov/environmental_services/Document_Library/Combine_Hills/Combine_Hills_Cx.pdf
Windy Point (Klickitat Co., WA)	242.5	Klickitat Co. Planning Dept.
Windy Point II (Klickitat Co., WA)	152.5	Klickitat Co. Planning Dept.
Windy Flats (Klickitat Co., WA)	190	Klickitat Co. Planning Dept.
Goodnoe II (Klickitat Co., WA)	34	Klickitat Co. Planning Dept.
Juniper Canyon (Klickitat Co., WA)	250	Klickitat Co. Planning Dept.
Harvest (Klickitat Co., WA)	100	Klickitat Co. Planning Dept.
Linden Ranch (Klickitat Co., WA)	58	Klickitat Co. Planning Dept.
Miller Ranch (Klickitat Co., WA)	98	Klickitat Co. Planning Dept.
Imrie (Klickitat Co., WA)	100	Klickitat Co. Planning Dept.
Mariah (Klickitat Co., WA)	16	Klickitat Co. Planning Dept.
Nine Canyon III (Benton Co., WA)	32	http://www.energy-northwest.com/news/2006/06_07.php
Desert Claim (Kittitas Co., WA)	180	
Kittitas Valley (Kittitas Co., WA)	130	
Scenic Vista (Umatilla Co., OR)	60-80	Umatilla County Planning Dept.
Helix (Umatilla Co., OR)	102	Iberdrola Renewables, Inc.
Oregon Trail (Sherman Co., OR)	10	Sherman County Planning Dept.
Star Point (Sherman Co., OR)	102.9	Iberdrola Renewables, Inc.
Hay Canyon (Sherman Co., OR)	<105 MW	Sherman County Planning Dept.
Golden Hills (Sherman Co., OR)	400	Sherman County Planning Dept.
Three Mile (Morrow Co., OR)	15	Morrow County Planning Dept.
Oregon Wind Farms, LLC (Morrow Co., OR)	60	Morrow County Planning Dept.
Pebble Springs (PPM) (Gilliam Co, OR)	104	Gilliam Co. Planning
Wheat Field Wind (AWP) (Gilliam Co, OR)	104	Gilliam Co. Planning
Totals	**~6665**	

Table 2. Avian use estimates and avian fatality estimates for existing wind energy projects in the Columbia Plateau Ecoregion.

Project	Mean annual avian use (#/20-min survey)		Mean annual mortality (#/MW/year)			Source
	Raptors	All birds	Raptors	All birds	Nocturnal Migrants	
Combine Hills, OR	0.60	6.0	0	2.6	0.27	Young et al. 2005
Klondike, I OR	0.47	17.5	0	0.9	0.35	Johnson et al. 2003a
Klondike II, OR	0.47	17.5	0.11	3.1	2.11	NWC and WEST, 2007
Vansycle, OR	0.41	13.1	0	1.0	0.32	Erickson et al. 2000
Stateline, WA/OR	0.41	13.1	0.10	2.4	0.78	Erickson et al. 2004, 2007
Hopkins Ridge, WA	0.64	8.7	0.14	1.2	0.46	Young et al. 2007
Nine Canyon, WA	0.26	9.4	0.05	2.8	0.45	Erickson et al. 2003
Wild Horse, WA	0.40	5.0	0.09	1.6	0.88	Erickson et al. 2008
Bighorn I, WA	0.90	16.6	0.15	2.6	0.57	Kronner et al. 2008
Leaning Juniper, OR	0.52	23.6	0.06	3.2	na	Kronner et al. 2007
Condon, OR	0.37	5.8	0.02[a]	0.05[a]	NR	Fishman Ecological Services 2003
Mean	**0.50**	**12.4**	**0.07**	**2.1**	**0.69**	

[a] not adjusted for searcher efficiency or scavenger removal; study methods differed from other projects and were not as rigorous; therefore this estimate should be regarded as a minimum mortality estimate and it was not used in calculation of the mean values.

Table 3. Avian use estimates (# observed per 20 minutes per plot with 800-m radius viewshed) for Wind Resource Areas in the Columbia Plateau Ecoregion.

Wind Resource Area	Location	Mean avian use	
		Raptors	All birds
Hopkins Ridge	Columbia Co., WA	0.64	8.7
Nine Canyon	Benton Co., WA	0.26	9.4
Desert Claim	Kittitas Co., WA	0.77	15.3
Kittitas Valley	Kittitas Co., WA	0.90	12
Wild Horse	Kittitas Co., WA	0.40	5
Big Horn I	Klickitat Co., WA	0.90	16.6
White Creek	Klickitat Co., WA	0.66	11.9
Linden Ranch	Klickitat Co., WA	1.64	11.1
Hoctor Ridge	Klickitat Co., WA	1.38	15.3
Imrie	Klickitat Co., WA	0.70	19.2
Windy Point	Klickitat Co., WA	0.77	16.0
Windy Flats	Klickitat Co., WA	0.83	19.9
Reardan	Lincoln Co., WA	0.90	13
Zintel Canyon	Benton Co., WA	0.44	19
Maiden	Benton/Yakima Co., WA	0.38	11.6
Combine Hills	Umatilla Co., OR	0.60	6
Klondike I & II	Sherman Co., OR	0.47	17.5
Biglow	Sherman Co., OR	0.30	9.1
Vansycle	Umatilla Co., OR	0.41	13.1
Elkhorn	Union Co., OR	1.05	21.7
Shepherd's Ridge	Morrow Co., OR	0.61	6.5
Leaning Juniper	Gilliam Co., OR	0.52	23.6
Condon	Gilliam Co., OR	0.37	5.8
Stateline	Walla Walla Co., WA/Umatilla Co., OR	0.41	13.1
Mean		**0.68**	**13.4**
Range		**0.26 – 1.64**	**5 – 23.6**

Table 4. Number and species composition of bird fatalities found at the existing Columbia Plateau Ecoregion wind energy projects.

Species	Number of Fatalities	Percent Composition
horned lark	206	31.1
golden-crowned kinglet	43	6.5
ring-necked pheasant	37	5.6
gray partridge	36	5.4
American kestrel	22	3.3
chukar	22	3.3
western meadowlark	21	3.2
unidentified passerine	19	2.9
dark-eyed junco	18	2.7
European starling	17	2.6
white-crowned sparrow	17	2.6
mourning dove	16	2.4
red-tailed hawk	14	2.1
ruby-crowned kinglet	9	1.4
unidentified bird	9	1.4
yellow-rumped warbler	9	1.4
short-eared owl	7	1.1
winter wren	7	1.1
house wren	6	0.9
unidentified kinglet	6	0.9
black-billed magpie	5	0.8
Brewer’s sparrow	5	0.8
golden-crowned sparrow	5	0.8
rock dove	5	0.8
Townsend’s warbler	5	0.8
unidentified sparrow	5	0.8
American robin	4	0.6
Canada goose	4	0.6
common nighthawk	4	0.6
ferruginous hawk	4	0.6
northern flicker	4	0.6
rock pigeon	4	0.6
red-breasted nuthatch	3	0.5
song sparrow	3	0.5
Swainson's hawk	3	0.5
white-throated swift	3	0.5
Cassin’s vireo	2	0.3
house finch	2	0.3
Macgillivray's warbler	2	0.3

Species	Number of Fatalities	Percent Composition
mallard	2	0.3
sage thrasher	2	0.3
savannah sparrow	2	0.3
vesper sparrow	2	0.3
American coot	1	0.2
American goldfinch	1	0.2
American pipit	1	0.2
barn owl	1	0.2
black-throated sparrow	1	0.2
brown-headed cowbird	1	0.2
bufflehead	1	0.2
chipping sparrow	1	0.2
common raven	1	0.2
Cooper’s hawk	1	0.2
downy woodpecker	1	0.2
grasshopper sparrow	1	0.2
gray catbird	1	0.2
great blue heron	1	0.2
great horned owl	1	0.2
hairy woodpecker	1	0.2
house sparrow	1	0.2
killdeer	1	0.2
Lewis's woodpecker	1	0.2
long-eared owl	1	0.2
mountain bluebird	1	0.2
northern harrier	1	0.2
orange-crowned warbler	1	0.2
red-shafted flicker	1	0.2
red-winged blackbird	1	0.2
rough-legged hawk	1	0.2
sage sparrow	1	0.2
spotted towhee	1	0.2
Swainson's thrush	1	0.2
Townsend’s solitaire	1	0.2
unidentified accipiter	1	0.2
unidentified empidonax	1	0.2
unidentified partridge	1	0.2
unidentified thrush	1	0.2
varied thrush	1	0.2
Vaux’s swift	1	0.2
warbling vireo	1	0.2
western grebe	1	0.2

Species	Number of Fatalities	Percent Composition
western kingbird	1	0.2
western tanager	1	0.2
Williamson's sapsucker	1	0.2
yellow warbler	1	0.2
Totals (77 species)	**663**	**100.0**

Table 5. Percent composition of avian fatalities by species group for existing Columbia Plateau Ecoregion wind energy projects.

Species	Number of Fatalities	Percent Composition
Passerines	461	69.5
Upland gamebirds	96	14.5
Raptors	57	8.6
Doves/pigeons	21	3.2
Waterbirds/waterfowl/shorebirds	11	1.7
Other birds[a]	17	2.6
Totals	**663**	**100**

[a] woodpeckers, nighthawks, swifts

Table 6. Summary of bat mortality at existing wind energy projects in the Columbia Plateau Ecoregion.

Project Name [state]	No. Bats /turbine/year	Bats per MW[1]	Reference
Stateline [OR/WA]	0.95	1.44	Erickson et al. 2004, 2007
Vansycle [OR]	0.74	1.12	Erickson et al. 2000
Klondike [OR]	1.16	0.77	Johnson et al. 2003b
Klondike II [OR]	0.63	0.41	NWC and WEST, Inc. 2007
Hopkins Ridge [WA]	1.13	0.63	Young et al 2007
Wild Horse [WA]	0.70	0.39	Erickson et al. 2008
Nine Canyon [WA]	3.21	2.46	Erickson et al. 2001b
Leaning Juniper [OR]	1.28	0.86	Kronner et al. 2007
Big Horn I [WA]	2.85	1.90	Kronner et al. 2008
Combine Hills [OR]	1.88	1.88	Young et al. 2005
Average	**1.46**	**1.18**	

[1] Most reports do not provide number per MW of energy produced so this number was calculated based on the mortality per turbine and capacity of turbines studied.

Table 7. Number and species composition of bat fatalities found at eight existing Columbia Plateau wind energy projects.

Species	Number of Fatalities	Percent Composition
silver-haired bat	163	48.4
hoary bat	152	45.1
unidentified bat	9	2.7
little brown bat	8	2.4
big brown bat	5	1.5
Totals (4 species)	**337**	**100**

Table 8. Seasonal timing of raptor fatalities at existing wind energy facilities in the Columbia Plateau.

Wind Energy Project	Season				
	Spring	Summer	Fall	Winter	Overall
Combine Hills, OR	0	0	0	0	0
Klondike I, OR	0	0	0	0	0
Klondike II, OR	0	1	1	0	2
Vancycle, OR	0	0	0	0	0
Stateline, WA/OR	3	8	6	1	18
Hopkins Ridge, WA	1	3	1	1	6
Nine Canyon, WA	1	0	0	0	1
Wild Horse, WA	1	5	0	0	6
Bighorn I, WA	4	5	2	5	16
Leaning Juniper, OR	2	1	0	0	3
Condon, OR	1	0	0	0	1
Totals	**13**	**26**	**10**	**7**	**57**
Percent	**22.8**	**45.6**	**17.5**	**12.3**	**100**

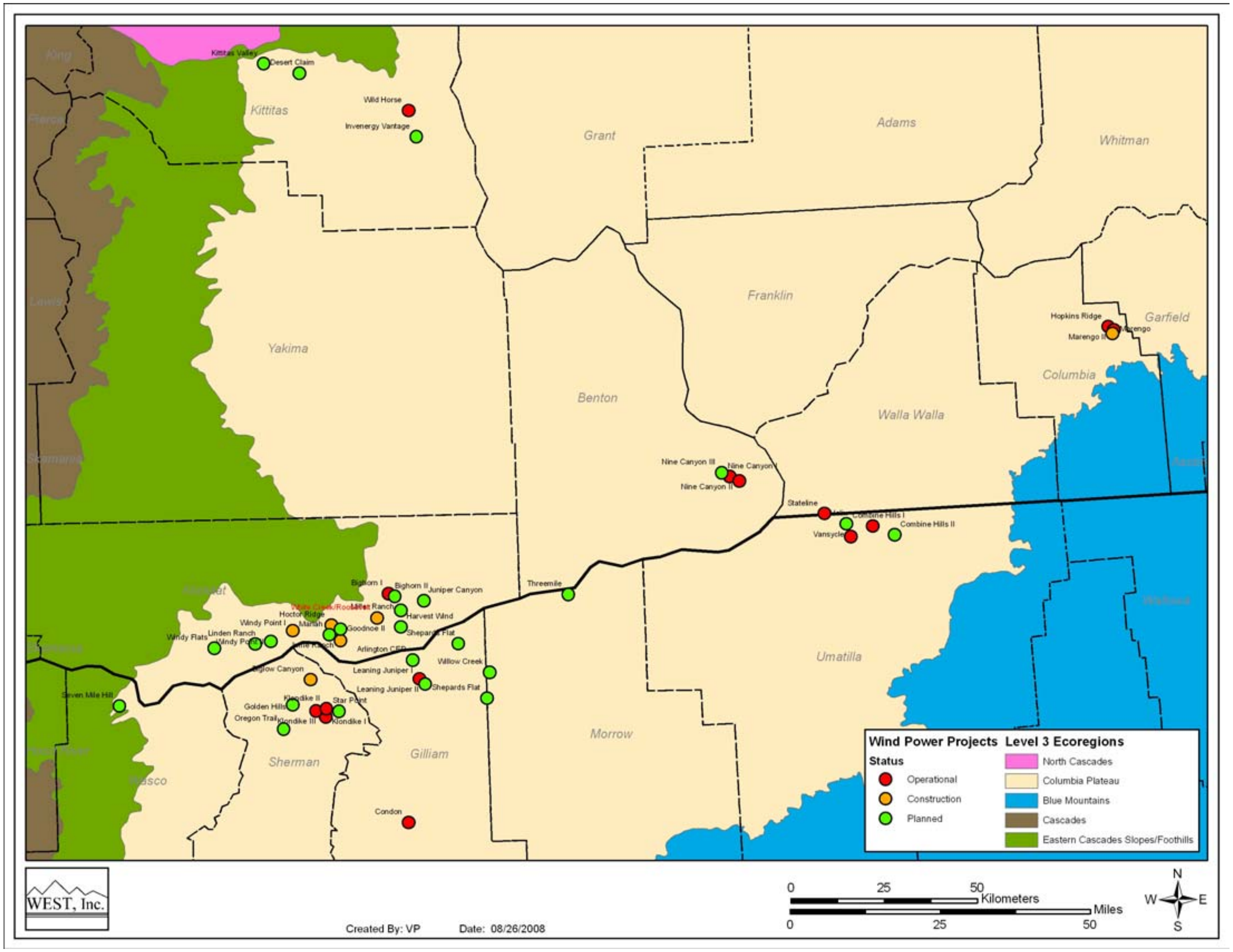

Figure 1. Location of existing and proposed wind energy facilities in the Columbia Plateau Ecoregion of southeastern Washington and northeastern Oregon.

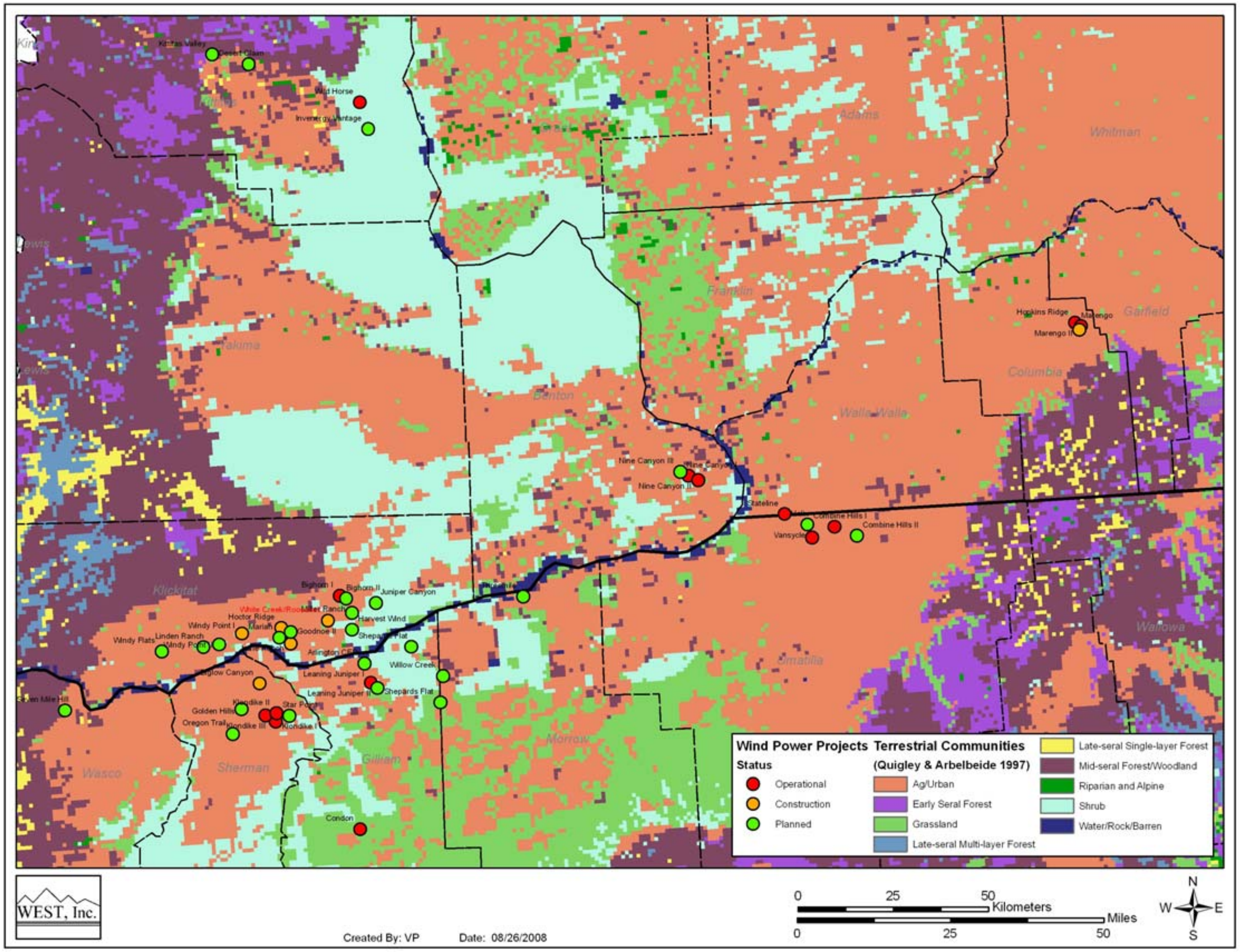

Figure 2. Terrestrial vegetative communities within the Columbia Plateau Ecoregion.

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Avian and Bat Cumulative Impacts Analysis. Shepherds Flat Wind Project. Gilliam and Morrow Counties, Oregon. Prepared for LifeLine Renewable Energy, Inc.

David P. Young, Jr. and Victoria K. Poulton, WEST, Inc. 2007.

AVIAN AND BAT
CUMULATIVE IMPACTS ANALYSIS
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March 2007

Prepared For:

LifeLine Renewable Energy, Inc

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1.0 INTRODUCTION AND BACKGROUND

Over the last decade, there has been a surge of interest in wind power development in Oregon and Washington along the Columbia River corridor and within the Columbia Plateau physiographic region (ecoregion). A central issue for wind power developments is the potential impacts to avian and bat resources, and in particular direct impacts such as avian or bat fatalities. Wind power proposals are commonly reviewed by natural resource agencies, private conservation groups, permitting authorities and other stakeholders. Frequently, baseline studies are conducted that are designed to estimate avian presence and abundance at proposed development sites for use in the impact assessment and siting of the project followed by monitoring studies post construction which are designed to measure impacts from the project. As more wind power projects are constructed along the Columbia River and surrounding region, cumulative impacts from multiple projects have become a concern and are important to consider.

The proposed Shepherds Flat wind power project is located in Gilliam and Morrow Counties, in north-central Oregon. The proposed project would have from 300-326 turbines, each with a capacity of 2.3-2.5 megawatts (MW), for an overall project capacity of 750 MW. The total proposed project area using the lease area boundaries is approximately 31,270 acres (48.9 mi^2). The project boundary comes within 1 mile of the Columbia River to the north. Land use is typical of other existing and proposed wind projects in the region and consists primarily of dryland agriculture, of which small amounts have been converted to Conservation Reserve Program (CRP) lands, and areas of native grassland rangeland.

Most wind power development in northern Oregon and southern Washington has been within the Columbia Plateau Level III Ecoregion (Thorson et al. 2003; Figure 1). The Columbia Plateau was historically characterized by open, arid shrub-steppe and grassland-steppe habitats. The current predominant land use of the Ecoregion is dryland agriculture, CRP lands, and rangeland. Precipitation through the region is 6-12 inches per year (Thorson et al. 2003). Surrounding ecoregions are more mountainous, receive more precipitation, and are more forested than the Columbia Plateau. While the Columbia Plateau has less vegetative strata than surrounding ecoregions, and is an excellent place for wind power development, plant and animals species that are specialized for this type of habitat may be recipient of a larger portion of the cumulative impacts from wind development.

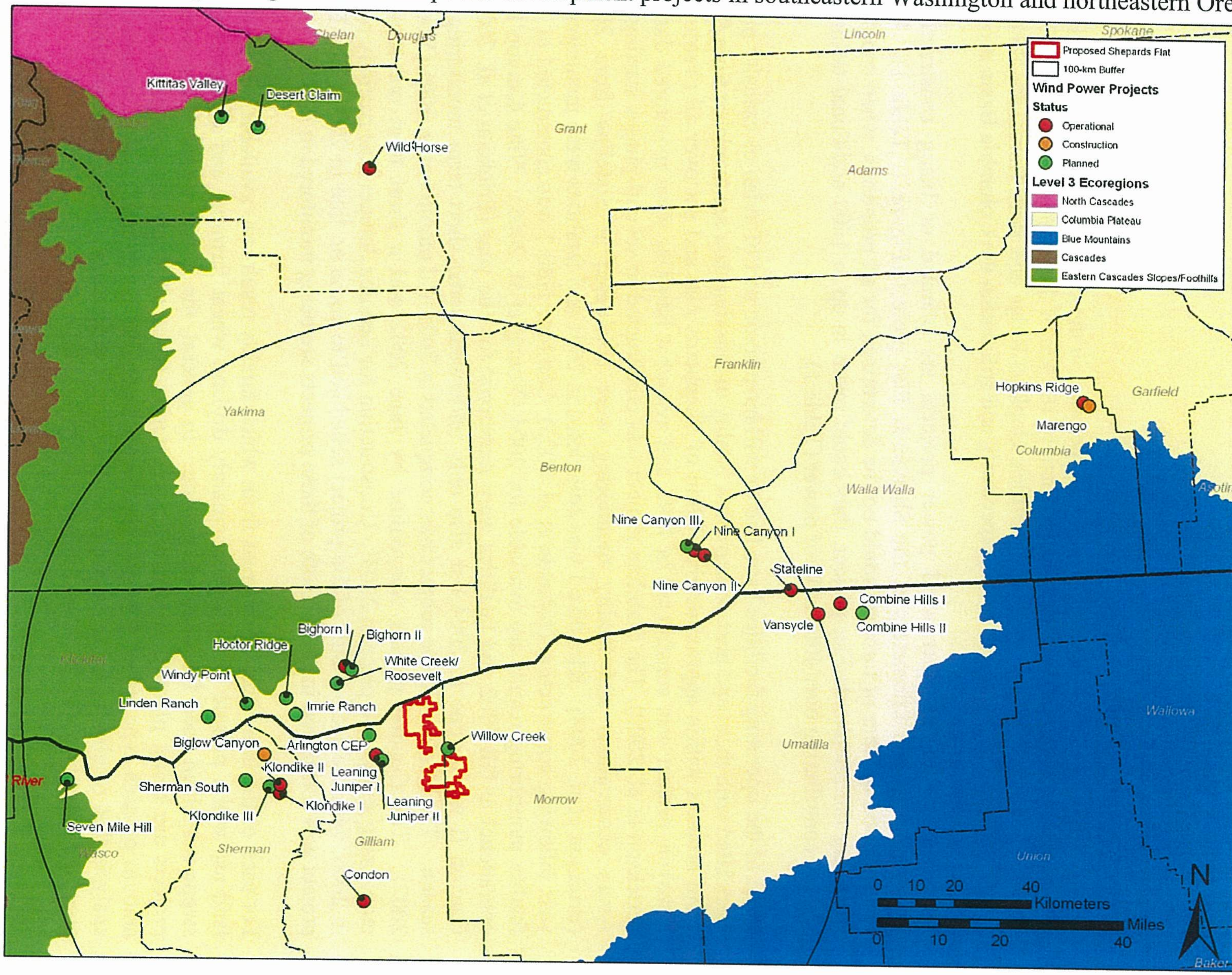
2.0 METHODS

This report is intended to provide a broad, qualitative analysis using existing public information about existing wind projects and wind project proposals in the region and results of monitoring (fatality) studies to compile a cumulative impact analysis for avian and bat resources. The analysis relies heavily on existing information from studies in the Columbia Plateau Ecoregion. Information about wind project proposals was gathered from a variety of sources such as federal and state agencies (e.g., BPA, Oregon EFSC), permitting agencies (e.g., Kickitat County), non-profit renewable energy advocates (e.g. Renewable Northwest Project), and other public sources such as internet resources. Basic information such as the proposed capacity, turbine size and number, and location about each project identified was gathered and summarized to the extent possible. In many cases the actual boundary of the proposal could not be identified and only a general location was known.

The general approach to the cumulative effects analysis was to summarize results of fatality monitoring studies at operational wind projects within the same ecoregion, and then use the results to estimate impacts for all constructed and proposed wind projects within approximately 100 km of the proposed Shepherds Flat project (Figure 1). The 100km buffer is somewhat arbitrary but due to similarities of habitat and land use throughout the whole Columbia Plateau ecoregion the resources potentially impacted by wind projects are similar for all projects. The Vansycle and Combine Hills wind projects occur just outside a 100km distance from Shepherds Flat and are included in the analysis (Figure 1).

This cumulative effects analysis considers data from seven projects in the Columbia Plateau ecoregion where monitoring for fatalities has occurred. Predominant vegetation type and land use for all the projects where monitoring occurred is similar (dryland agriculture, grassland and shrub-steppe rangeland), and the fatality and avian survey data were all collected using similar methods. The data sets used in this report were collected using similar methods, where observed fatality rates calculated from standardized carcass searches were adjusted for searcher efficiency and carcass removal biases. The analysis operates under the assumption that the avian and bat communities are similar across all projects because of habitat and land use similarities throughout the ecoregion, and thus applicable to the new proposed projects in this same ecoregion. Details about results, methods, and estimates of potential avian impacts from each individual project are available in the referenced project reports.

Figure 1. Level III ecological regions and wind power development projects in southeastern Washington and northeastern Oregon.



3.0 RESULTS

3.1 Study Area and Wind Projects

As of early 2007, 12 wind projects were in operation in the Columbia Plateau Ecoregion and 10 of these were in operation within approximately 100 km of the proposed Shepherds Flat project (Figure 1, Table 1). Two operating facilities, Hopkins Ridge and Wild Horse, are about 180 km to the east and 140 km to the north respectively and still within the Columbia Basin ecoregion.

Currently, up to 19 other wind power projects are planned or being constructed within approximately 100 kilometers of the Shepherds Flat project (Figure 1, Table 1). While the capacity and number of turbines could not be determined for all proposals, when completed and including the Shepherds Flat project, they could result in up to 1600 additional turbines in the region, contributing over 4060 MW of power (Table 1).

Most of the operating facilities have had or will have some sort of avian or casualty monitoring associated with them and post-construction fatality monitoring data are available from five of the wind projects within approximately 100km of Shepherds Flat and six over all (Table 2). The Vansycle project was constructed in 1998 and avian/bat fatalities were monitored during 1999 (Erickson et al. 2000). The Stateline project was constructed in several phases starting in 2001. Avian observations and fatality monitoring were conducted at Stateline from 2001-2003 (Erickson et al. 2004). Klondike I was completed in 2001 and fatalities were monitored for one year following construction (Johnson et al. 2003) Combine Hills I was constructed in 2003 and fatality monitoring results are available for 2004 (Young et al. 2005). Nine Canyon I became operational in fall 2002 and fatalities were monitored for one year (Erickson et al. 2003). Nine Canyon II was online in 2004 but also only underwent some short term monitoring for one season. The Hopkins Ridge project was completed in 2005 and monitored in 2006 (Young et al. 2007). The Condon project was online by June 2002 and a short term non-standardized monitoring study took place in 2003[1]. Construction for Leaning Juniper was partially completed in 2006, with the second half of the project scheduled to come on line in 2007. The Big Horn project was completed in 2006. Both of these projects are being monitored in 2007.

For each of the individual study areas from which fatality results are available, the predominant land use was a mosaic of agriculture, mainly dryland wheat farming, and grassland or shrub-steppe rangeland used for livestock grazing. In general, the region where future wind power projects are being planned is similar in vegetation types although for any given project the amount of each type varies (Quigley and Arbelbeide 1997, Figure 2). It is assumed for the analysis that results from the existing studies, which are similar, would be applicable to new proposed projects.

[1] Monitoring at the Condon wind project took place for less than one year in 2002-2003 (Fishman 2003). This study did not use similar methods to the other studies and was not as rigorous. No searcher efficiency or carcass removal surveys were conducted so the reported results are simply observed number of fatalities for the study and not comparable to the other studies.

Table 1. Wind power projects constructed or planed in the Columbia Plateau ecological region of Washington and Oregon.

Project	Max. Capacity (MW)	No. Turbines	Turbine Size (MW)	General Habitat and Land Use	Dist. To Shepherds Flat (km)	Project Information Source
Existing						
Combine Hills I (Umatilla Co., OR)	41	41	1	dryland ag, grazed shrub steppe	105	http://www.rnp.org/News/pr_EurusCombineJun03.html
Vansycle Ridge (Umatilla Co., OR)	25	38	0.66	dryland ag,	100	http://www.rnp.org/Projects/vansycle.html
Stateline (Umatilla Co., OR)	300	399	0.66	dryland ag, grazing, shrub steppe	95	http://www.ppmenergy.com/cs_stateline.html
Klondike I (Sherman Co., OR)	24	16	1.5	dryland ag	35	http://www.rnp.org/Resources/Klondike%201%20pager.pdf
Klondike II (Sherman Co., OR)	75	50	1.5	dryland ag	35	http://www.portlandgeneral.com/about_pgc/ current_issues/klondikeII/Default.asp?bhcp=1
Condon (Gilliam Co., OR)	50	83	0.6	farming, grazing	30	http://www.efw.bpa.gov/environmental_services/ Document_Library/Condon_Wind/RODwMAP.pdf
Leaning Juniper I (Gilliam Co., OR)	104	63	1.5	farming, grazing	5	http://www.efw.bpa.gov/environmental_services/ Document_Library/Arlington_PPM/ROD031105.pdf
Nine Canyon I (Benton Co., WA)	64	49	1.3	farming, steppe	80	http://www.energy-northwest.com/downloads/ninecan.pdf
Nine Canyon II (Benton Co., WA)	16	12	1.3	farming, steppe	80	http://www.energy-northwest.com/downloads/9Canyon.pdf
Hopkins Ridge (Columbia Co., WA)	150	83	1.8	farming, crp, grazing, steppe	180	http://www.rnp.org/News/pr_PSEHopkinsDec05.htm
Big Horn I (Klickitat Co., WA)	250	167	1.5	drylnd ag, crp, lithosol-grassland	13	http://www.efw.bpa.gov/environmental_services/ Document_Library/Big_Horn/BigHornROD03242005.pdf
Wild Horse (Kittitas Co., WA)	230	127	1.8	lithosol, shrub steppe	140	http://www.res-ltd.com/wind-farms/wf-wildhorse/htm
Under Construction						
Biglow Canyon (Sherman Co., OR)	450	211	1.65	farming, grazing	30	http://www.bpa.gov/corporate/pubs/ RODS/2006/RODKlondikeIIIBiglowCanyon.pdf
Marengo (Columbia Co., WA)	140	78	1.8	dryland ag, shrub steppe	180	http://www.pacificpower.net/Homepage/Homepage35750.html
Proposed						
Seven Mile Hill (Wasco Co., OR)	50				~90	http://www.oregon.gov/ENERGY/SITING/ review.shtml#Seven_Mile_Hill_Wind_Project

Project	Max. Capacity (MW)	No. Turbines	Turbine Size (MW)	General Habitat and Land Use	Dist. To Shepherds Flat (km)	Project Information Source
Klondike III (Sherman Co., OR)	272	165	1.8	farming, grazing	30	http://egov.oregon.gov/ENERGY/SITING/docs/ KWPPublicFilingNotice.pdf
Leaning Juniper II (Gilliam Co., OR)	279			farming, grazing	~5	http://www.oregon.gov/ENERGY/SITING/ review.shtml#Leaning_Juniper_Wind_Power
Arlington CEP (Gilliam Co., OR)	104	63	1.65	grazed shrub-steppe	6.5	http://www.bpa.gov/corporate/pubs/rods/2005/EFW/ Arlington-Wind-Interconnection-ROD-1-14-05.pdf
Shepherds Flat (Gilliam Co., OR)	750	300-326	2.3-2.5		0	Data provided by BPA
Willow Creek (Morrow Co., OR)	180			farming, grazing	<1	http://www.transmission.bpa.gov/PlanProj/Wind/willow.cfm
Combine Hills II (Umatilla Co., OR)	63	41	1.5	dryland ag, grazed shrub steppe	~105	http://www.efw.bpa.gov/environmental_services/ Document_Library/Combine_Hills/Combine_Hills_Cx.pdf
Big Horn II (Klickitat Co., WA)	150			agriculture, crp	~15	
White Creek/Roosevelt (Klickitat Co., WA)	205	166-200	1.5-1.8	farming, grazing	13	http://www.efw.bpa.gov/environmental_services/ Document_Library/Rock_Creek/RockCreekSubstationROD.pdf
Windy Point (Klickitat Co., WA)	242.5	97	2.5	farming, grazing	~32	http://www.bpa.gov/corporate/pubs/RODS/2006/ WindyPointI_IIRODFINAL.pdf
Hoctor Ridge (Klickitat Co., WA)	60			ag/grazing, woodland	31	
Linden Ranch/DNR (Klickitat Co., WA)	56			agriculture, grazing	52	
Imrie Ranch (Klickitat Co., WA)	100	35	2.8	agriculture, grazing	31	
Windtricity (Klickitat Co., WA)	12					
Mariah Energy (Klickitat Co., WA)	4					
Nine Canyon III (Benton Co., WA)	32	14	2.3	dryland wheat	~80	http://www.energy-northwest.com/news/2006/06_07.php
Desert Claim (Kittitas Co., WA)	180	90	2.0	grassland, agriculture shrub steppe	160	
Kittitas Valley (Kittitas Co., WA)	130	65	2.0	grassland, grazing	170	
Totals	~4800	~2950				

Figure 2. Terrestrial vegetative communities in southeastern Washington and northeastern Oregon.

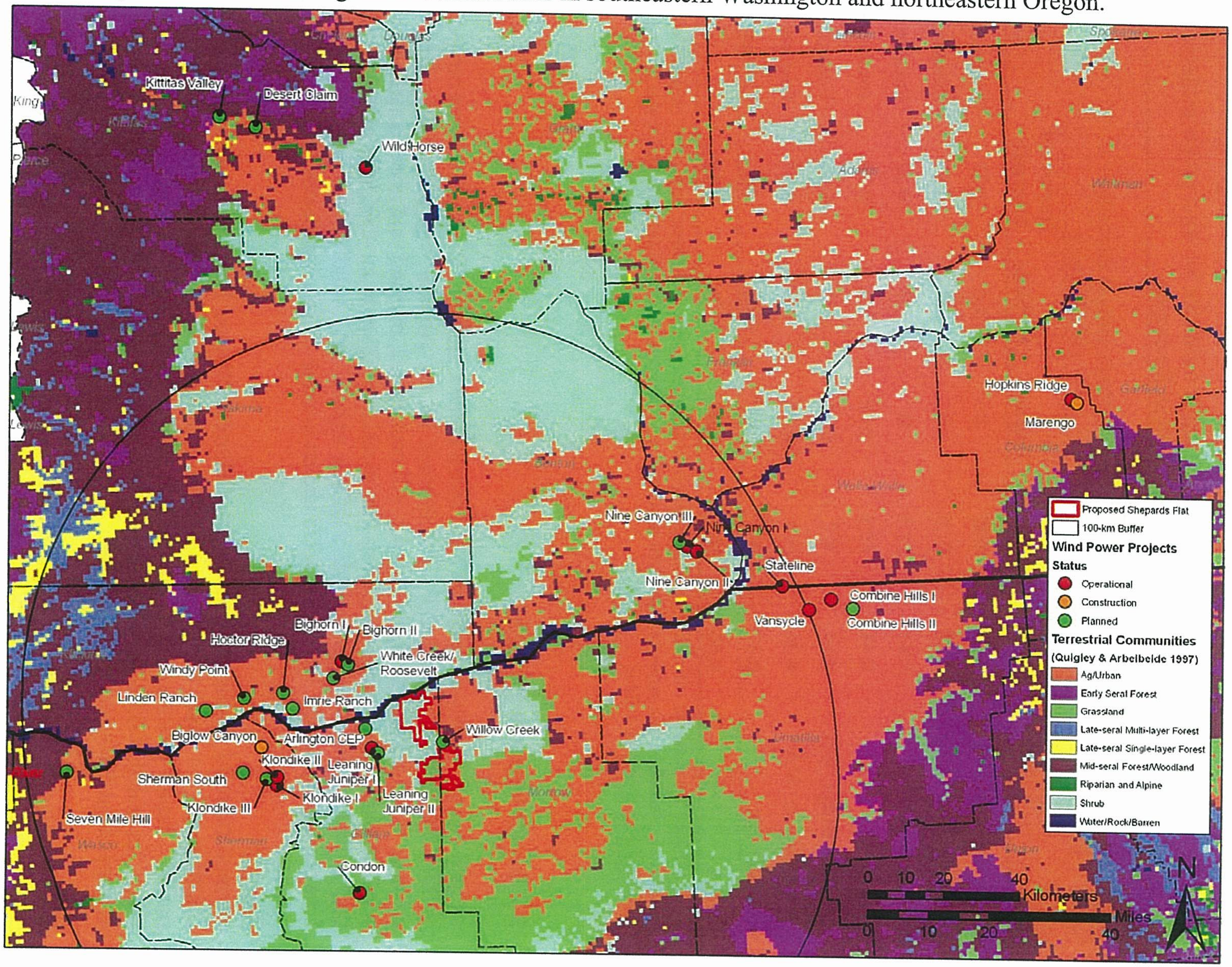


Table 2. Avian use estimates and avian fatality estimates for wind power projects in the Columbia Plateau Ecoregion.

Project	Mean annual avian use (#/20-min survey)		Mean annual mortality (#/MW/year)			Source
	Raptors	All birds	Raptors	All birds	Nocturnal Migrants	
Combine Hills, OR	0.60	6.0	0	2.6	0.27	Young et al. 2005
Klondike, OR	0.47	17.5	0	0.9	0.35	Johnson et al. 2003
Vansycle, OR	0.41	13.1	0	1.0	0.32	Erickson et al. 2000
Stateline, WA/OR	0.41	13.1	0.09	2.9	0.73	Erickson et al. 2004
Hopkins Ridge, WA	0.64	8.7	0.14	1.2	0.46	Young et al. 2007
Nine Canyon, WA	0.26	9.4	0.05	2.8	0.45	Erickson et al. 2001
Condon, OR	0.37	5.8	0.02[a]	0.05[a]	NR	Fishman 2003
Mean	**0.45**	**10.5**	**0.05**	**1.9**	**0.43**	

[a] not adjusted for searcher efficiency or scavenger removal; study methods differed from other projects and were not as rigorous; therefore this estimate should be regarded as a minimum mortality estimate and it was not used in calculation of the mean values.

3.2 Direct Impacts to Birds

Annual avian mortality estimates at wind farms in the Columbia Plateau Ecoregion ranged from 0.9 to 2.9 birds per MW (Table 2). The average for six projects with comparable data collection methods was 1.9 avian deaths/MW/year. All constructed, planned, and under construction projects within 100km and including Shepherds Flat would contribute about 4060 MW of power. Assuming that mortality rates are representative of the region, new wind power generation could cause between approximately 3,650 and 11,775 and on average 7,715 avian deaths per year in the region.

Raptors

At modern wind power projects in the Columbia Plateau Ecoregion, raptor species generally constitute only a small portion of avian use, ranging from 0.26 to 0.64 observation per 20-min survey. Raptor mortality has also been low ranging from 0 to 0.14 raptor fatalities per MW per year. An added 4060 MW of capacity in the region could result in between 0 and 568, and on average about 200 raptor deaths per year.

Red-tailed hawk, American kestrel, and northern harrier account for most of the raptor use at other projects where avian use was studied (see Erickson et al 2001, 2002). In the winter, rough-legged hawk and red-tailed hawk account for majority of the raptor use. If it is assumed that raptor use is correlated with mortality, these species are expected to be the raptor species with the highest collision risk across the projects. The potential exists for other species to collide with turbines, including Swainson's hawk, ferruginous hawk, turkey vulture, golden eagle, Cooper's hawk, sharp-shinned hawk, prairie falcon, and bald eagle; however, the mortality risk associated with these species is expected to be lower than the mortality for red-tailed hawks and American kestrel due to the lower use by these species in general. In addition, American kestrel and red-tailed hawk have been the most common fatality at regional wind projects (Table 3; Erickson et al. 2001, 2004, Young et al. 2007). Common owl species such as great-horned, which are typically not effectively surveyed during the day, may also be at risk of collision, although short-eared owl has been the only owl species fatality recorded at the regional wind projects (Table 3). While use is often high for turkey vultures, they appear less susceptible to collision than most other raptors (see Orloff and Flannery 1992, Erickson et al. 2001). In addition, there have been very few northern harrier, ferruginous hawk, rough-legged hawk, and *Accipiter* species fatalities recorded at wind projects (Table 3, Erickson et al. 2001, 2002).

Passerines

Passerines have been the most abundant avian fatality at wind projects studied (see Erickson et al. 2000, 2001, 2002, Johnson et al. 2002, Young et al. 2003, 2005, 2007), often representing more than 80% of the avian fatalities. For projects in the Columbia Plateau Ecoregion on average approximately 69% of the avian fatalities have been passerines (Table 4). Both migrant and resident passerine fatalities have been observed, with migrants generally making up 20-30% of the avian fatalities. Assuming that 69% of all bird mortality would be passerine fatalities between approximately 2,518 and 8,125 and on average 5,323 passerine deaths per year in the region would occur. Some impacts are expected for nocturnal migrating species, however, impacts are not expected to be great for the Columbia Plateau Ecoregion. Estimates for nocturnal migrant mortality at the regional wind projects have ranged from 0.27 to 0.73 per MW per year (Table 2). Assuming these estimates are representative of Columbia Plateau wind projects, between approximately 1,090 and 2,960 nocturnal migrant fatalities would be expected if 4060 MW of wind power were constructed.

Passerine species most common to the project sites will likely be most at risk, including horned lark, western meadowlark, and European starling, however, there is generally little concern over potential mortality of this non-native, non-protected species. Horned larks have been the most commonly observed fatality at several wind projects, including Vansycle, Combine Hills, and Stateline (Table 3, Erickson et al. 2003, Young et al. 2005, Erickson et al. 2004) and represent approximately 35% of the avian fatalities in the Columbia Plateau ecoregion at wind projects. Golden crowned kinglet, a tree/forest dwelling species, have been recorded as fatalities at a few projects and are generally considered migrants.

Table 3. Number and species composition of bird fatalities found at the seven Pacific Northwest regional wind projects.

Species	Number of Fatalities	Percent Composition
Horned lark	128	35.2
Ring-necked pheasant *(n)*	35	9.6
Golden-crowned kinglet	23	6.3
Chukar *(n)*	17	4.7
Western meadowlark	15	4.1
European starling *(n)*	15	4.1
Gray partridge *(n)*	14	3.8
White-crowned sparrow	12	3.3
Red-tailed hawk	9	2.5
American kestrel	9	2.5
Unidentified passerine	8	2.2
Yellow-rumped warbler	6	1.6
Winter wren	5	1.4
Rock dove *(n)*	5	1.4
Canada goose	4	1.1
Dark-eyed junco	4	1.1
Unidentified bird	4	1.1
House wren	3	0.8
Red-breasted nuthatch	3	0.8
Black-billed magpie	3	0.8
Northern flicker	3	0.8
Golden-crowned sparrow	3	0.8
Unidentified sparrow	2	0.5
Short-eared owl	2	0.5
Savannah sparrow	2	0.5
Ruby-crowned kinglet	2	0.5
Vesper sparrow	2	0.5
White-throated swift	2	0.5
Rough-legged hawk	2	0.5
Great blue heron	2	0.5
Red-winged blackbird	1	0.3
Ferruginous hawk	1	0.3
Grasshopper sparrow	1	0.3
American pipit	1	0.3
Mallard	1	0.3
Swainson's thrush	1	0.3
Swainson's hawk	1	0.3
Spotted towhee	1	0.3
Lewis's woodpecker	1	0.3
American robin	1	0.3
Macgillivray's warbler	1	0.3

Species	Number of Fatalities	Percent Composition
House finch	1	0.3
Virginia rail	1	0.3
American coot	1	0.3
Cooper's hawk	1	0.3
Gray catbird	1	0.3
Northern harrier	1	0.3
Townsend's warbler	1	0.3
Unidentified flycatcher	1	0.3
Totals (47 species)	363	100

n = non-native species

Table 4. Percent composition of avian fatalities by species group for the seven Pacific Northwest regional wind project monitoring studies.

Species	Number of Fatalities	Percent Composition
Passerines	251	69.1
Upland gamebirds *(n)*	66	18.2
Raptors	26	7.2
Other birds[a]	20	5.5
Totals	363	100
Non-protected species[b]	20	5.5

[a] Waterbirds, waterfowl, rails, doves, woodpeckers, swifts
[b] European starling and rock dove

Upland gamebirds

For projects in the Columbia Plateau Ecoregion, upland gamebirds have composed a higher percentage of avian fatalities than in other regions of the U.S., approximately 18% of all avian fatalities (Table 4). Three introduced species, ring-necked pheasant, chukar, and gray (Hungarian) partridge are the most commonly found non-passerine fatalities (Table 3). Estimates for upland game bird mortality in the Columbia Plateau Ecoregion have varied from 0.27 to 0.47 per MW per year. Provided these estimates are representative, between 1,090 and 1,910 upland gamebird fatalities would be expected per year for 4060 MW of wind power.

3.3 Direct Impacts to Bats

Results of fatality monitoring for the Columbia Plateau Ecoregion wind projects indicate mortality ranges of approximately 0.63 to 2.46 bats per MW per year (Table 5). Based on these results, and considering the similarities in the characteristics of the project areas and other regional projects, a conservative estimate of total bat mortality would be between 2,550 and 9,990 bats per year, assuming 4060 MW of wind power is constructed.

Table 5. Summary of Bat Mortality at newer generation wind project monitoring studies in the Columbia Plateau ecoregion.

Project Name [state]	**No. Bats /turbine/year**	**Bats per MW[1]**	**Reference**
Stateline [OR/WA]	1.12	1.70	Erickson et al. 2004
Vansycle [OR]	0.74	1.12	Erickson et al. 2000
Klondike [OR]	1.16	0.77	Johnson et al. 2003
Hopkins Ridge [WA]	1.13	0.63	Young et al 2007
Nine Canyon [WA]	3.21	2.46	Erickson et al. 2001b
Combine Hills [OR]	1.88	1.88	Young et al. 2005
Average	1.54	1.43	

[1] Most reports do not provide number per MW of energy produced so this number was calculated based on the mortality per turbine and capacity of turbines studied.

Only four species of bat fatalities have been documented for six wind projects monitored in the Columbia Plateau Ecoregion (Table 6). The vast majority of the fatalities were composed of two species: silver-haired bat (48%) and hoary bat (46%), two species of foliage (tree) dwelling migratory bats (see Erickson et al. 2003, 2004; Young et al. 2005, Johnson et al. 2003, Young et al 2007). Monitoring studies at other wind projects nationwide have documented impacts to bats with some common results for all regions (Johnson 2005). The species at highest risk appear to be foliage dwelling (forest, trees) fall migratory species. The annual period when most bat fatalities occur is in August and September. Hoary and silver-haired bats are wide spread across North America and breed into the boreal forests regions of Canada and migrate south to winter in the southern U.S., Mexico, and potentially further south in Central America. Many bats will migrate short distances to suitable hibernacula for the winter; however, short distance migrant species do not appear to be at as great a risk based on the monitoring studies results.

Table 6. Number and species composition of bat fatalities found at six Pacific Northwest regional wind projects.

Species	Number of Fatalities	Percent Composition
Silver-haired bat	115	48.3
Hoary bat	110	46.2
Unidentified bat	7	2.9
Little brown bat	3	1.3
Big brown bat	3	1.3
Totals (4 species)	238	100

Bat foraging areas such as riparian zones, shrublands, streams, and other water sources are generally limited in the Columbia Plateau Ecoregion and usually confined to river and stream corridors. The sites chosen for wind development in the ecoregion generally have few bat foraging or concentration areas. At several wind projects studied in the U.S., bat collision mortality during the breeding season was far less, despite the fact that relatively large populations of resident bats of several species were documented in proximity to the wind plant (see Gruver 2002; Johnson et al., 2002; Johnson 2005). Based on these studies, it appears that wind projects, especially those in open habitats, pose little risk to non-migratory bat populations.

3.4 Habitat Impacts

Grassland and shrub-steppe habitat is one of the most abundant habitat types in Eastern Oregon and Washington, but it is also highly subjected to development and conversion to agriculture (Johnson and O'Neil 2001). In addition to potentially thousands of new vertical structures, added wind generation in the region will result in more roads (mostly dirt and gravel) and increased human activity due to turbine construction and maintenance. Most habitat impacts will be to already heavily disturbed agriculture fields and moderately disturbed grazing/rangeland. The percent of direct impacts actually occurring in grassland or shrub-steppe habitat are difficult to predict and would be based on individual project design and layout.

Because of the location of the proposed wind projects (Figure 2, Table 1), it is expected that the majority of habitat impacts will occur in dryland agriculture vegetation. Under a set of assumptions about impacts and project location, the amount of cumulative impacts to vegetation communities can be estimated. Assuming that: (1) on average the permanent impacts associated with a turbine and the associated roads are between 1.5 and 2.5 acres per turbine; (2) 25% of a project layout occurs in non-agricultural vegetation types, which in many cases is a drastic overestimate; and (3) 1.5-2.5 MW turbines are used for the proposed build out identified (Table 1), then between 630 and 1750 acres of non-agricultural vegetation type, primarily grassland shrub-steppe vegetation, would be lost in the Columbia Plateau Ecoregion with 4060 MW of wind projects. These impacts would be spread over a large area geographically (see Figure 1) and are considered an overestimate because of efforts to locate projects in agricultural vegetation types. On a local (project) scale, these impacts are generally on the edge of native vegetation areas where they abut agriculture fields.

While the Columbia Plateau covers a large area, and characteristic grassland shrub-steppe habitat is widespread, it is also heavily fragmented by agricultural activities. Species that depend on native habitat face physical and ecological barriers within the region and at the region's edges. The Columbia River and other smaller rivers in the area cut deep canyons and present linear alteration to the general physiography and potential barriers to some animal species movement. Large swaths of agricultural land are less obvious, but may pose significant obstacles to small or less mobile animals. While many birds are not impeded by such physical barriers, some smaller, habitat specific birds that depend on brushy habitats for cover could be affected by such habitat fragmentation. Habitat specialists and obligates such as sage-grouse (*Centrocercus urophasianus*) and sage sparrow (*Amphispiza belli*) require large tracts of continuous sage habitat (Johnson and O'Neil 2001), which is largely missing from the Columbia Plateau, and the range for these species in the Columbia Plateau is already severely restricted. Assuming that agricultural vegetation types are not critical wildlife habitat, habitat loss impacts are not expected to be a significant loss to any given species.

4.0 DISCUSSION

This cumulative effects analysis was based largely on results of other studies of wind projects in the region and in particular monitoring studies that estimated the direct impacts of a particular wind project. The overall design for these studies incorporates several assumptions or factors that affect the results of the fatality estimates. First, all bird casualties found within the standardized search plots during the study periods were included in the analyses. It is assumed that carcass found incidentally within a search plot during other activities would have been found during a standardized carcass search. Second, it was assumed that all carcasses found during the studies were due to collision with wind turbines. True cause of death is unknown for most of the fatalities. It is highly likely that some of the casualties included in the data pool for the various projects were due to natural causes or background mortality such as predation, disease, other natural causes, or manmade causes such as farming activity or vehicles on county/project roads. The overall effect of these assumption is that the analyses provide a conservative estimate (an over estimate) of mortality due to the studied wind project.

A few wind studies in other regions of the country have provided information on background mortality. During a four-year study at Buffalo Ridge, Minnesota, 2,482 fatality searches were conducted on study plots without turbines to estimate reference mortality in the study area. Thirty-one (31) avian fatalities comprising 15 species were found (Johnson *et al.* 2000). Reference mortality adjusted for searcher efficiency and carcass removal for the study was estimated to average 1.1 fatalities per plot per year. At a second study, pre-project carcass searches were conducted at a proposed wind project in Montana (Harmata *et al.* 1998). Three bird fatalities were found during 8 searches of 5 transects, totaling 17.61 km per search. On average, approximately 1.8 km of transect is searched within the turbine plots in the referenced studies for the Columbia Plateau region (Table 2). The amount of transect searched at the Montana site per search was equivalent to searching approximately 7-9 turbines for the regional studies. The background estimate for observed mortality would be approximately 0.33 per turbine plot per year, unadjusted for scavenging and searcher efficiency. The background mortality information from the Minnesota and Montana studies suggests that the estimates of bird mortality include some avian fatalities not related to turbine collision, and this factor alone would lead to an over-estimate of true avian collision mortality for wind projects.

It should also be noted that the fatality estimates may vary from the expected range based on many factors that may influence bird and bat use of a project site such as habitat, topography, foraging areas, migratory patterns, as well as project characteristics such as turbine size, met towers, proximity to high bird use areas and other site specific and/or weather variables. It is difficult to determine the influence these parameters have on impacts from wind projects; however, because of the general similarities of results from the monitoring studies within the Columbia Plateau Ecoregion (see Table 2) it is generally believed that future direct impacts from new wind development in the region are also likely to be similar.

4.1 Significance of Impacts to Birds

Despite several thousand bird fatalities from 4060 MW of wind power, these impacts are divided across numerous species and groups of species and also across seasons, and thus the overall mortality to any given species or population of a species is substantially less and not expected to be significant.

Passerines

For most studies that have occurred in agricultural settings, a few common species make up the majority of bird observations and fatalities at the site, however, a variety of other species, including migrants, have been recorded as fatalities but typically in low numbers and frequency. The majority of avian deaths (69%) due to wind power facilities in the Columbia Plateau region were of common passerines in mixed agriculture and grassland habitat (see Table 3). Horned larks are the most common fatality at most of the projects studied. For example at the Stateline, Combine Hills, Nine Canyon I, horned larks were 39%, 41%, and 47% of all avian fatalities, respectively and a much higher percentage of the passerine fatalities. Other shrub-steppe and open country passerines such as western meadowlarks and European starling were also found regularly. For example, European starling made up 18% of the fatalities at the Hopkins Ridge project (Young et al. 2007).

Given that most of the mortality will be common species with widespread distribution and large populations, impacts are expected to be to individuals and not populations. For example, over all passerines recorded during the regional monitoring studies, horned lark made up over half (51%) of the fatalities. Assuming this pattern holds for the regional wind development, it could be expected that on average there would be 2,715 horned lark fatalities per year. Local populations of horned larks are difficult to define because of the vast amount of suitable habitat for this species in the Columbia Plateau. Based on data from the USGS Breeding Bird Survey routes in the Columbia Plateau, the long term average was 50.3 horned larks detected for 71 routes in the ecoregion (Saur et al. 2005). Each BBS route covers 25 miles with a survey plot radius of 0.25 mile for a total survey area of roughly 12.5 square miles or 8,000 acres. The total area surveyed in the 71 routes (~568,000 acres) represent ~2.8% of the 20,280,000 acre Columbia Plateau. The annual average observed number of horned larks for the 71 routes was approximately 3,573. Assuming this represents 2.8% of the breeding horned lark population in the Columbia Plateau, the total would be approximately 127,500 horned larks. This is a likely a minimum estimate because horned larks are a small bird that is detected with relatively low probability beyond 200 m. If it is further assumed that the 2,715 horned lark fatalities are spread equally over the year, then roughly one-quarter of these (~679) would be during the breeding season. This represents approximately 0.5% of the breeding horned larks and is not considered significant. It is likely that other background mortality of breeding horned larks is greater than this estimate.

While this example represents a plausible means of addressing potential population impacts under a number of assumptions, it illustrates the low level of effect on the common grassland/agricultural species that have been the most impacted. Similar examples could be used for the other species which illustrate lower effects. For example the BBS data indicates a long term average of 77.61 western meadowlarks for routes in the Columbia Plateau (Saur et al. 2005). Western meadowlark represents approximately 6% of the passerine fatalities at wind projects. Based on similar calculations the impact on the western meadowlark breeding population in the Columbia Plateau would be minor and insignificant. The number of fatalities from other species are even fewer (see Table 3) and unlikely to have any population effects.

Nocturnal Migrants

In general, while modern turbines are getting taller, new wind projects do not appear to have a large impact on migrant birds. Results of marine radar surveys for proposed wind projects have indicated that the vast majority of nocturnal migrants fly at altitudes that do not put them at risk of collision with turbines (Young and Erickson 2006). Also, there have been only two multiple individual mortality events during a migration season reported at newer wind projects in the U.S. At Buffalo Ridge, Minnesota, fourteen migrating passerine fatalities (vireos, warblers, flycatchers) were observed at two turbines during a single night in May 2002 (Johnson et al. 2002), and 33 migrating passerine fatalities (mostly warblers) were observed near one turbine and a well-lit substation at the Mountaineer, West Virginia, wind project in May 2004 (Kerns and Kerlinger 2004). In general for wind projects in the Columbia Plateau, approximately 25% of the fatalities have been considered migrants spread over many species. The most common migrant fatality was golden-crowned kinglet (Table 3). Approximately 9% of the passerine fatalities were of this species. Golden-crowned kinglets are typically associated with tree or wooded habitats during the breeding season so it is assumed that many of the impacted individuals were from surrounding more mountainous ecoregions or populations further north (e.g., Canada). As with horned lark, estimating the potential population size from which these birds came requires a number of assumptions. However, while it is unknown, it is possible that the individual fatalities came from multiple populations in surrounding or more northern ecoregions, thus diluting the impacts on any one population. Other potential migrant species were found in lower numbers. Cumulatively the impacts to migrants would be spread over a much larger population base and are not considered significant.

Raptors

Red-tailed hawk and American kestrel account for more than 69% of the raptor fatalities recorded at the regional wind projects studied (see Table 3). Assuming this trend holds true for all proposed wind projects in the Columbia Plateau, it would be expected that on average 70 red-tailed hawk and 70 American kestrels would be killed each year. Following a similar analysis as that used for horned lark (above) it would be expected that approximately 18 red-tails and kestrels fatalities would occur during the breeding season. An estimate of the breeding population in the Columbia Plateau based on the BBS long-term average data is approximately 6820 breeding red-tailed hawks and 6288 breeding American kestrels. The impact to the breeding population would represent approximately 0.26% and 0.28% respectively. Background mortality for these species is likely higher than this estimate and it is considered insignificant. The other species of raptors have been impacted far less and would represent a much smaller number of fatalities.

Upland Gamebirds

Upland gamebird species represent a higher percentage (18%) of the avian fatality pool in the Columbia Plateau than in other regions in the U.S., although it is believed that many of the fatalities that are recorded are not wind turbine related. A large percentage of the upland gamebird fatalities are feather spots, suggesting the possible cause of death was predation or other non-turbine related cause. The species impacted, ring-necked pheasant, gray partridge, and chukar are introduced species common in mixed agricultural native grass/steppe habitats. Habitat throughout the Columbia Plateau is highly suitability for these species and the large populations likely influence the higher mortality rate for the regional wind projects. As with non-native (non-protected) passerine species, there is generally low concern over impacts to upland gamebirds. These species are regulated by state agencies as game species. Impacts to these species are not expected to be significant and given the vast amounts of suitable habitat and other impacts to these species (i.e., hunting) it is unlikely that fatalities from wind development to these species would be significant.

4.2 Significance of Impacts to Bats

Unlike with birds, there is little information available about populations of bat species. For most species that are not threatened or endangered and have large distributions, very little is known about potential numbers that exist. Results of monitoring studies across the U.S. and Canada have found similar trends in impacts such as risk to bats from wind turbines is unequal across species and across seasons. The majority of bat fatalities at wind projects in the U.S. and Canada have been foliage/tree or forest dwelling long-distance migrant species. Species in the *Lasiurus* genus, hoary bat (*L. cinereus*) in the west and red bat (*L. borealis*) in the east, and silver-haired bats (*Lasionycteris noctivagans*) are the most abundant fatalities found at wind projects. Less common fatalities are of big brown bats and *Myotis* species. Numerous studies across the U.S. and Canada have shown this trend (see Johnson 2005). The highest mortality occurs during what is believed to be the fall migration period for bats from roughly late-July through September. Numerous studies across the U.S. and Canada have also shown this trend (see Johnson 2005). Much lower mortality rates, and particular in the Columbia Plateau Ecoregion, occur in the spring and summer.

More recently however, studies at different location in the U.S. and Canada, appear to indicate that bat mortality is not related to site features or habitat and dissimilar results for ecologically similar projects have been found. While it is hypothesized that eastern deciduous forests in mountainous areas may be the highest risk areas, higher bat mortality has also occurred at wind projects in prairie/agricultural settings (Alberta, Canada) and mixed deciduous woods and agricultural settings (Maple Ridge, New York). For example, a wind project in dryland agricultural prairie type habitats in southern Alberta has reported fairly high observed bat mortality (not corrected for searcher and carcass removal biases) of 12-15 bats per turbine per year or 7-8 bats per MW per year (Baerwald 2006). In contrast, other nearby (within 25 km) wind projects to that site have reported similar bat mortality (1-2 bats per MW per year) to the wind projects studied in the Columbia Plateau Ecoregion (Baerwald, pers. comm.).

Bat mortality in the Columbia Plateau Ecoregion would involve primarily silver-haired and hoary bats (see Table 6), and no impacts to threatened or endangered bat species are anticipated. The regional monitoring studies suggest resident bats do not appear to be significantly affected because in general, very low numbers of resident bat species have been observed fatalities. Hoary bats and silver-haired bats generally occupy forested or treed habitats during the breeding season – habitat distinctly lacking and localized in the Columbia Plateau Ecoregion. Most mortality is observed during the fall migration period and of these migrant species. The significance of this impact on hoary and silver-haired bat populations is difficult to predict, as there is very little information available regarding the overall population size and distribution of the bats potentially affected. Hoary bat and silver-haired bats are widely distributed in North America. In general, mortality levels on the order of 1-2 bats per turbine or per MW are thought to be on individuals and not significant to populations, however, cumulative effects may have greater consequences for long-lived low-fecundity species such as bats. Unlike many avian species that may have multiple clutches of multiple young per year, hoary bats and silver-haired bats likely only raise one or two young per year and only breed once per year (Shump and Shump 1982, Kunz 1982). Bats tend to live longer than birds, however, and may have a long breeding lifespan. The impact of the loss of breeding individuals to populations such as these is generally unknown but may have greater consequences.

Since it is most likely breeding populations from surrounding mountainous/forested ecoregions or from more northern area (e.g., Canada) that are affected at the Columbia Plateau wind projects during the fall migration, the dynamics of these populations would need to be know to predict population effects. If these populations are large and stable the level of impact is not expected to be significant. However, if population trends are decreasing the added impact from wind development may continue to cause population declines. This information is generally unknown and future study is needed before the significance of the impacts can be estimated.

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