Appendix B

Wildlife Reports

B-1

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

CH2M HILL

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

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.

Insert Figure 1 Study Area

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 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 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						

Insert Figure 2 Vegetation Community Map

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.

Insert Figure 3

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.

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

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B-2

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

CH2M HILL (Peggy O'Neill). 2003

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

Rare Plant Survey Report
Saddleback Wind Project
Skamania County, Washington

Prepared for

PPM Energy

October 2003

CH2MHILL
Peggy O'Neill

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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)

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(E) Listed Endangered
(T) Listed Threatened
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(PE) Proposed Endangered
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STATE STATUS DESIGNATIONS:
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(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
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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
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)

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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)

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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)

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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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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 speculariodes	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.

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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

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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
	2	4/21/03- 4/24/03	64	None	2	Barred owl detected from station: A6/B6
	3	5/23/03- 5/26/03	63	None	1	Barred owl detected from station: A10. B-17 not surveyed (logging)
	4	6/18/03- 6/21/03	63	None	2	Barred owl detected from station: A9/A11. B-17 not surveyed (logging)
	5	6/29/03- 7/2/03	63	None	1	Barred owl detected from station: A6. B-17 not surveyed (logging)
	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	
	2	6/14/04- 6/17/04	62	None	1	Barred owl detected from station: A12. B-17 & B-19 not surveyed (logging)
	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
Visit #	**Date**	**Type Of Visit**	**Results**
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.

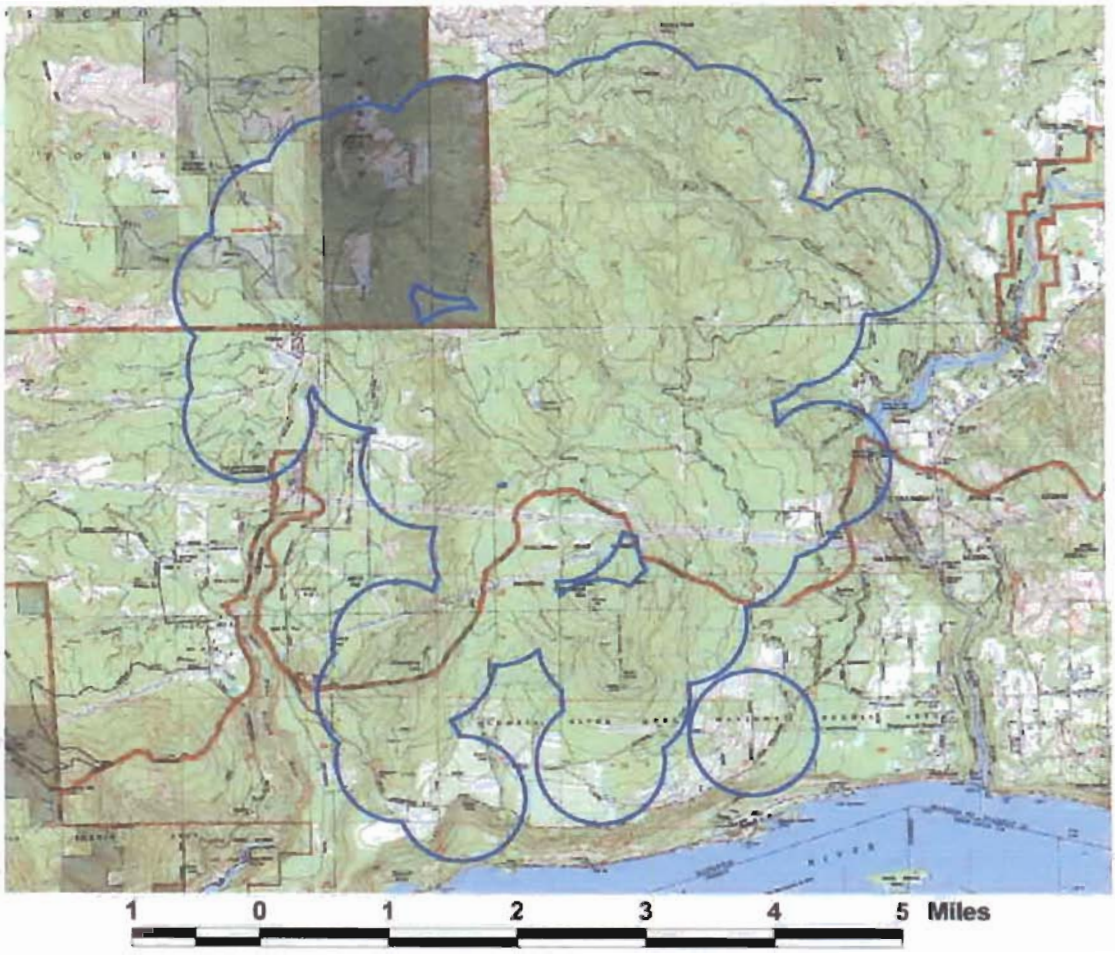
U.S FOREST SERVICE. 14 May 2002. Survey Methodology For Northern Goshawks In The Pacific Southwest Region.

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

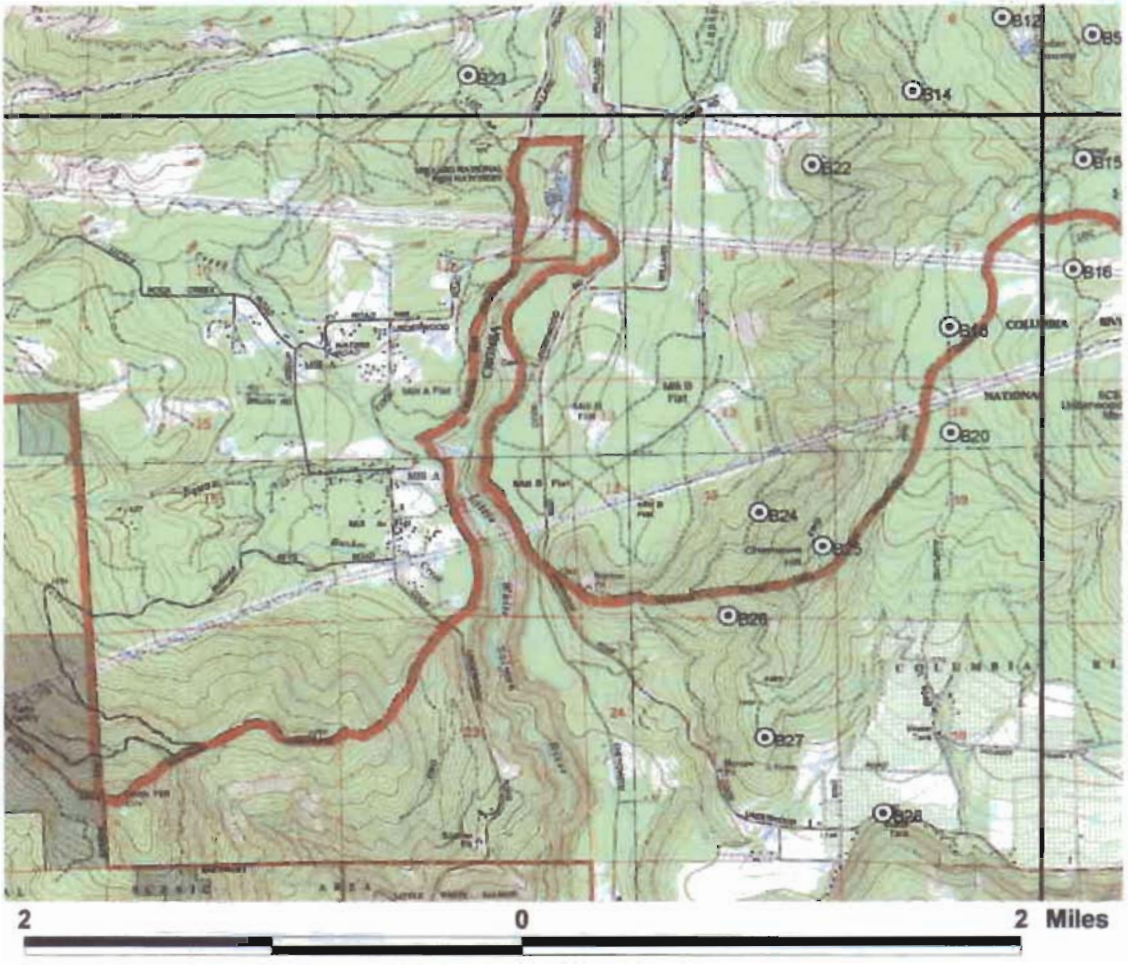


0.5 Mile Broadcast Area

TECI GIS LAB

Map 1

Saddleback Wind Power Project
Northern Spotted Owl Survey Stations
Southwest Quadrant



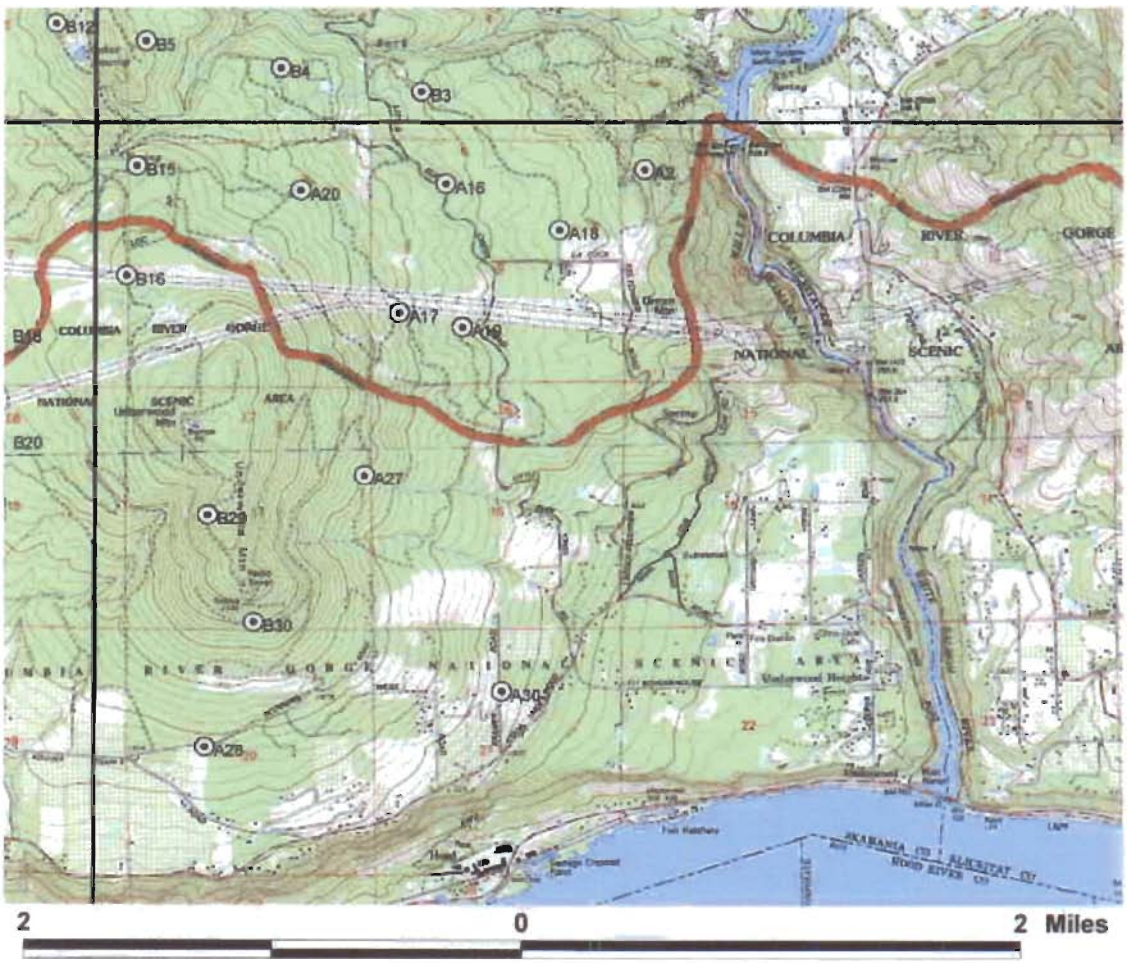
Calling Points

Quadrant Boundary

TECI GIS LAB

Map 2

Saddleback Wind Power Project
Northern Spotted Owl Survey Stations
Southeast Quadrant



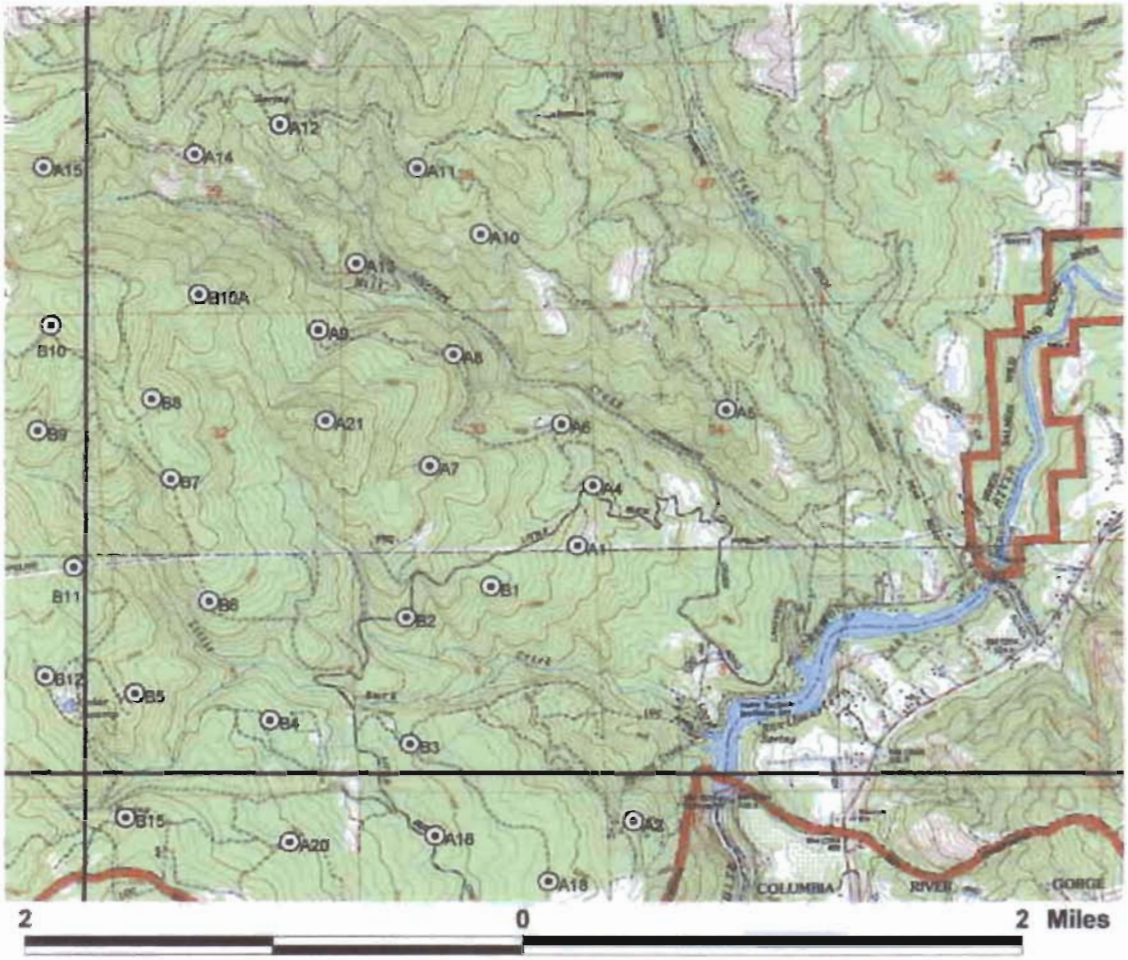
Calling Points

Quadrant Boundary

TECI GIS LAB

Map 3

Saddleback Wind Power Project
Northern Spotted Owl Survey Stations
Northeast Quadrant



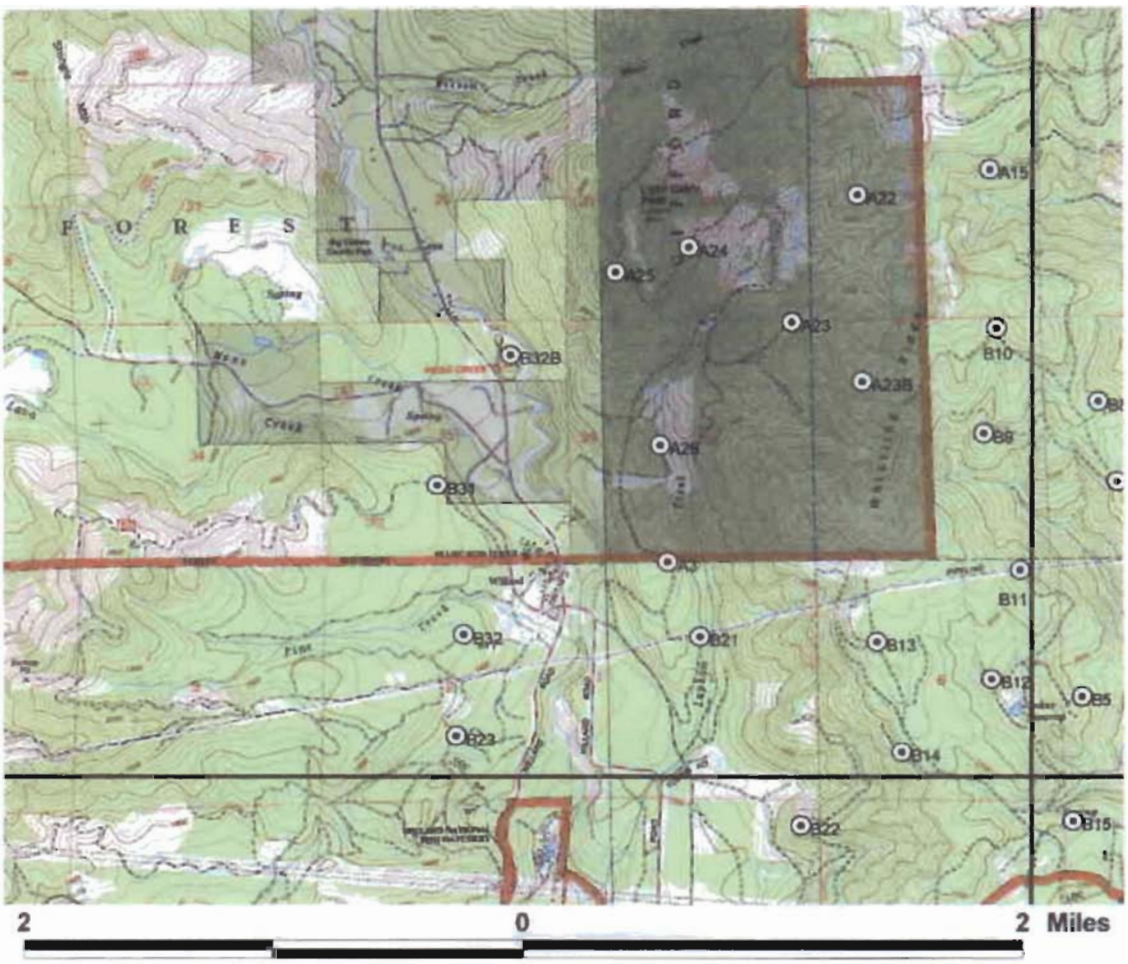
Calling Points

Quadrant Boundary

TECI GIS LAB

Map 4

Saddleback Wind Power Project
Northern Spotted Owl Survey Stations
Northwest Quadrant



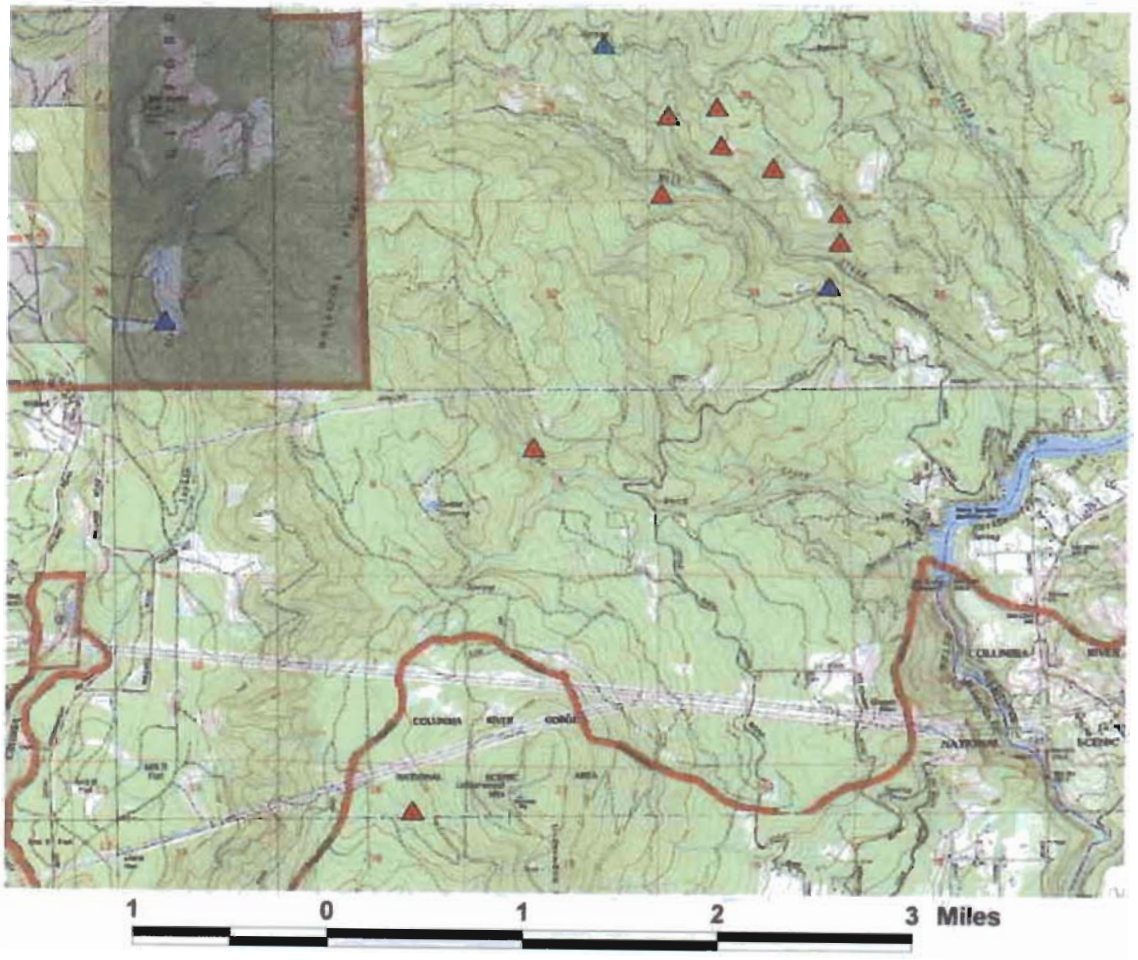
Calling Points

Quadrant Boundary

TECI GIS LAB

Map 5

Saddleback Wind Power Project
Barred Owl Locations



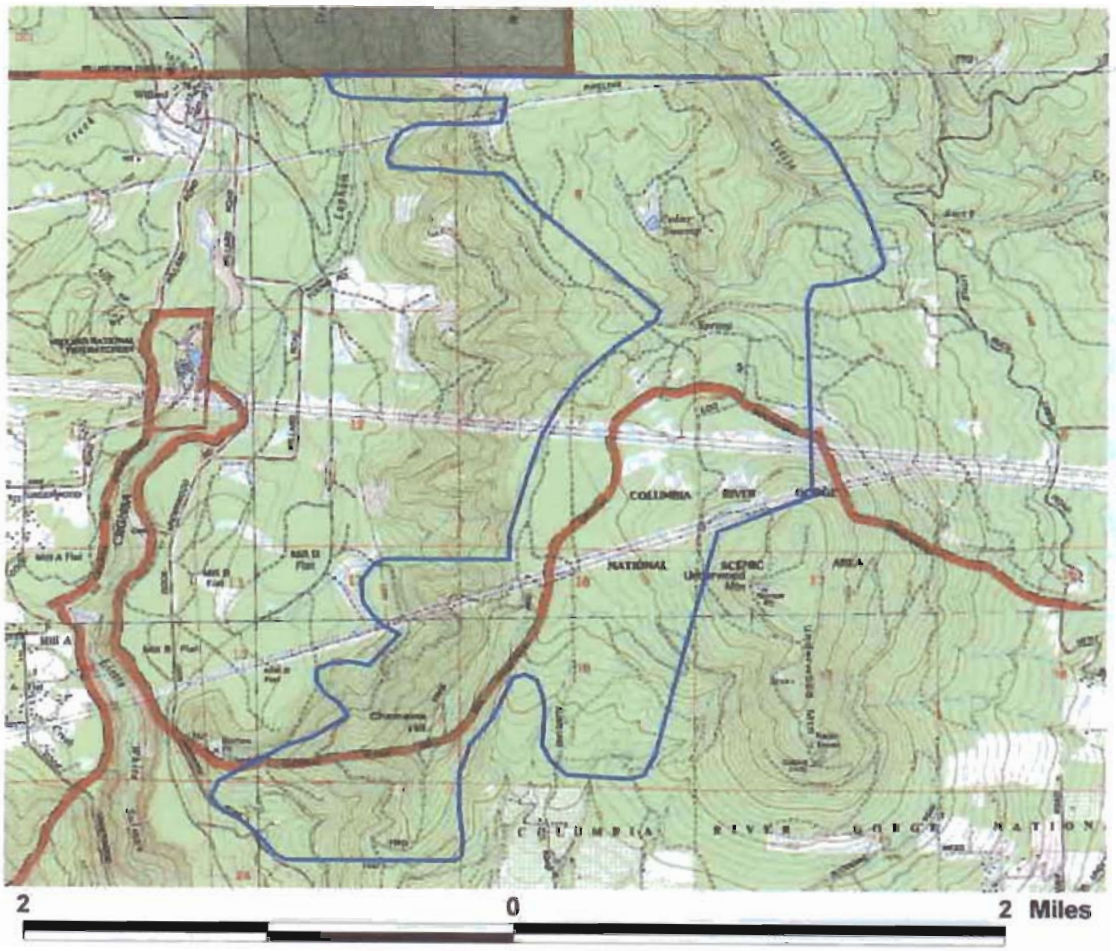
Barred Owl Location 2004

Barred Owl Location 2003

TECI GIS LAB

Map 6

Saddleback Wind Power Project
Northern Goshawk Survey Area

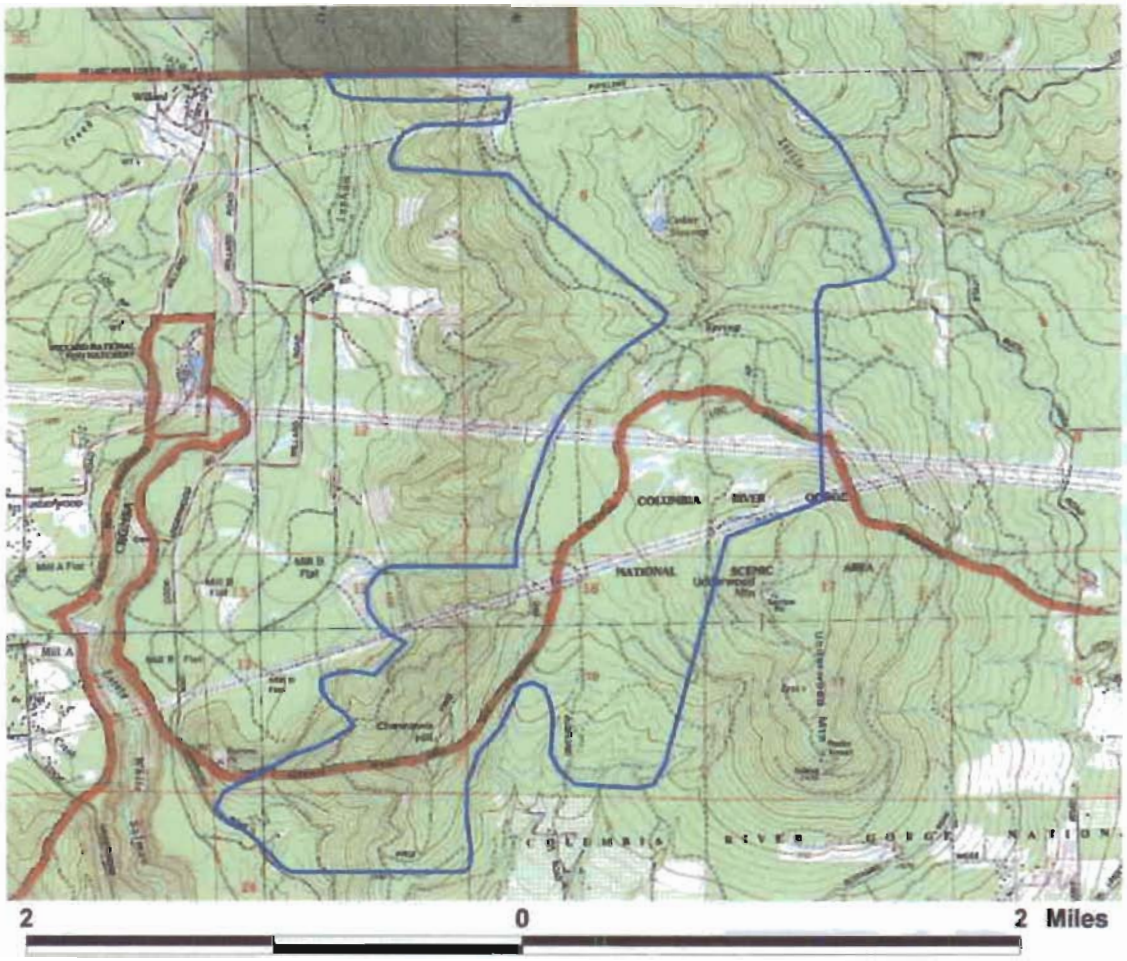


Survey Area

TECI GIS LAB

Map 7

Saddleback Wind Power Project
Western Gray Squirrel
General Survey Area

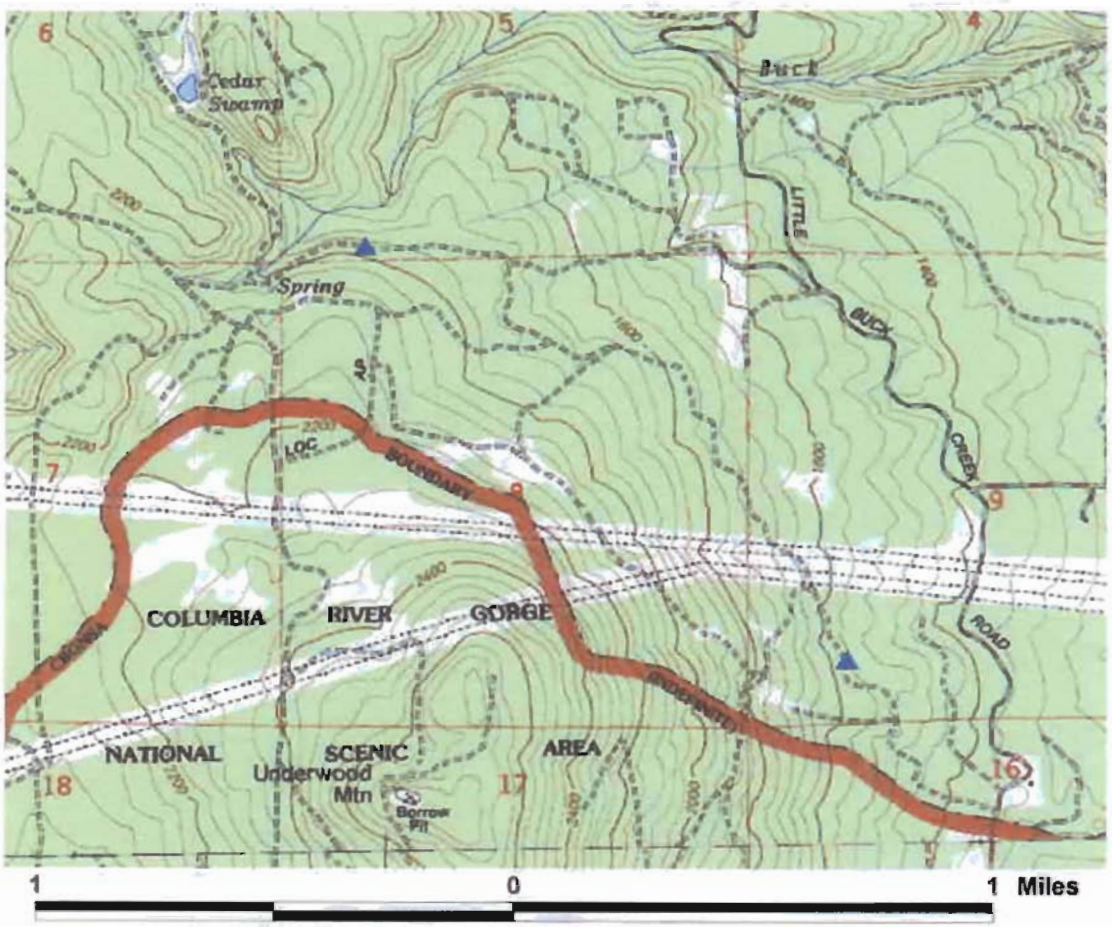


Survey Area

TECI GIS LAB

Map 8

Saddleback Wind Power Project
Western Gray Squirrel Locations

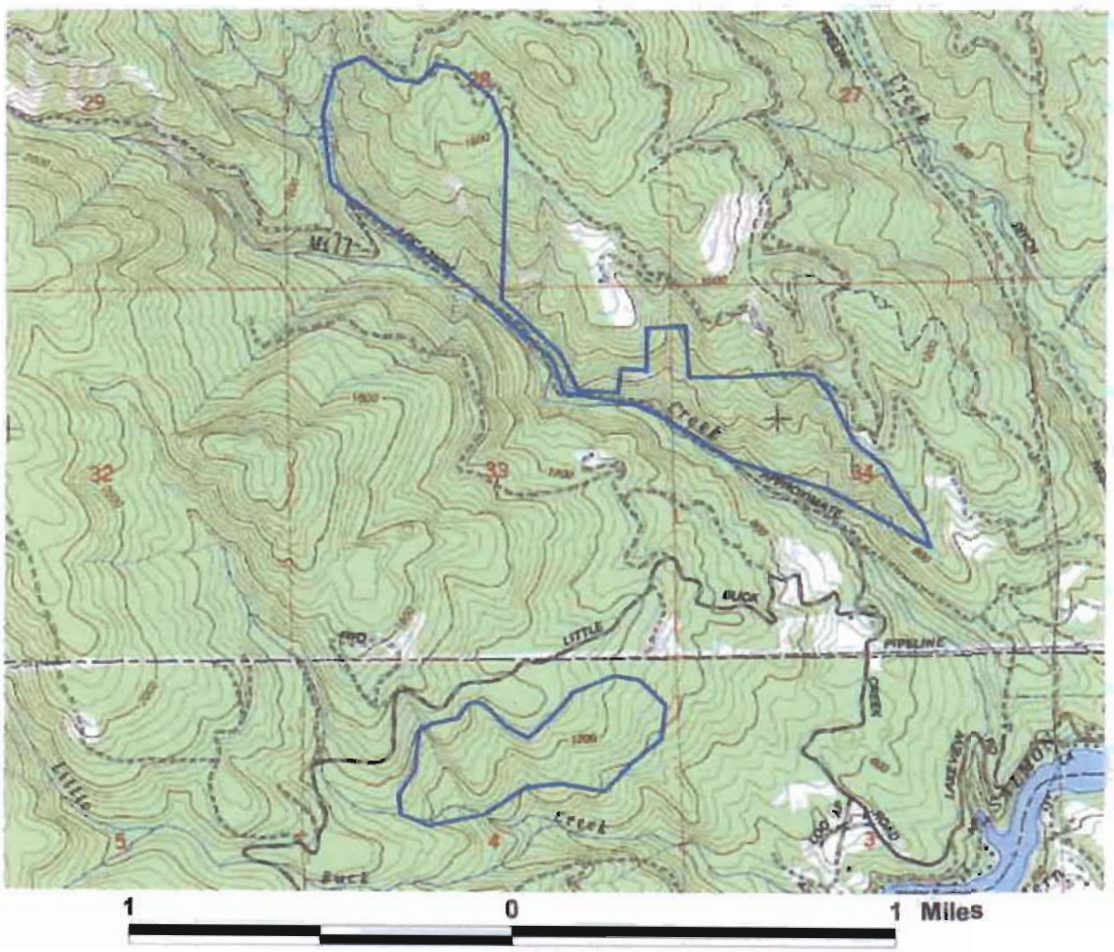


Squirrel Location

TECI GIS LAB

Map 9

Saddleback Wind Power Project
Western Gray Squirrel
Intensive Survey Area



Survey Area

TECI GIS LAB

Map 10

APPENDIX B:
2004 NORTHERN SPOTTED OWL SURVEY DATA

Appendix B, 2004 Northern Spotted Owl Survey Data, was not provided to URS.

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

62 Stations

APPENDIX D:
NORTHERN GOSHAWK DATA FORMS

NORTHERN GOSHAWK SURVEY FORM

Region/Forest/District: _____ Date: 6/15/04 Time: Begin 1030 End 1730
Analysis/Activity Area: PPM Wind Power
Proposed Project/Year of Activity Implementation: _____ Observers: Victor A Muller
Is this the (Circle One): FIRST YEAR OF SURVEY SECOND YEAR OF SURVEY
Is this a follow-up to an unsuccessful survey? YES NO
If YES, territory name: _____

Wind: 4mph (If >15mph, halt inventory)
Precipitation: NONE INT. DRIZZLE RAIN SNOW FOG (If RAIN, SNOW or FOG, halt inventory)
If significant change in weather conditions during survey, note here: NONE

Nest Search Done? YES NO -- If YES, fill out Search Form and attach.
Nest Found? YES NO -- If YES, fill out Nest Location Form and attach.

(Circle One): NESTLING PERIOD FLEDGLING PERIOD
Call(s) Used (Circle): ALARM WAIL BEGGING

RECORD INVENTORY RESULTS BELOW. DELINEATE AREAS SURVEYED ON ATTACHED AERIAL PHOTOS OR ORTHO QUAD. SHOW ALL CALLING POINTS AND DETECTIONS REFERENCED BELOW. CLEARLY SHOW QUAD/AERIAL PHOTOS NO. AND DATE

Call Sta.	Goshawk Response Information #	Age	Sex	Oth Spp	A/V	Comments (detection details, behavior, direction of fly by...)
86						
87						
88						Western gray squirrel visual
89						
90						
91						
98						
99						

NOTES: A/V: (A)udio or (V)isual detection.
Other Spp: Other raptors observed.
Age: (A)dult, (F)ledgling, (N)estling, (U)nkown
Number of Goshawks observed.
Sex: (M)ale, (F)emale, (U)nkown

COMMENTS: ACCO visual just NE of STN 102 (no vocalization) prior to surveys. Did not respond to goshawk recording.

NORTHERN GOSHAWK SURVEY FORM

Region/Forest/District: _____ Date: 6/15/04 Analysis/Activity Area: PPM Wind Power

RECORD INVENTORY RESULTS BELOW. DELINEATE AREAS SURVEYED ON ATTACHED AERIAL PHOTOS OR ORTHO QUAD. SHOW ALL CALLING POINTS AND DETECTIONS REFERENCED BELOW. CLEARLY SHOW QUAD/AERIAL PHOTOS NO., AND DATE

Call Sta.	Goshawk Response Information					Comments (prey spp? plucking post? etc)
	Detected	Oth Spp	A/V	Age	Sex	
100						
101						
102						STJA
103						
104						
110						
111						
112						
113						
114						
115						
116						
117						
118						AMCR
123						
124						

NOTES: A/V: (A)udio or (V)isual.
Other Spp: Other raptors observed.

Age: (A)dult, (F)ledgling, (N)esting, (U)nkown
#: Number of Goshawks observed.
Sex: (M)ale, (F)emale, (U)nkown

COMMENTS:

NORTHERN GOSHAWK SURVEY FORM

Region/Forest/District: _____ Date: 6/15/04 Time: Begin 10 30 End 7 30

Analysis/Activity Area: PPM Wind Power

Proposed Project/Year of Activity Implementation: _____ Observers: Victor A Mutter

Is this the (Circle One): (FIRST YEAR OF SURVEY) SECOND YEAR OF SURVEY

Is this a follow-up to an unsuccessful survey? YES (NO)

If YES, territory name: _____

Wind: 4 mph (If >15mph, halt inventory)

Precipitation: (NONE) INT. DRIZZLE RAIN SNOW FOG (If RAIN, SNOW or FOG, halt inventory)

If significant change in weather conditions during survey, note here: NONE

Nest Search Done? YES (NO) -- If YES, fill out Search Form and attach.

Nest Found? YES (NO) -- If YES, fill out Nest Location Form and attach.

(Circle One): (NESTLING PERIOD) FLEDGLING PERIOD

Call(s) Used (Circle): (ALARM) WAIL (BEGGING)

RECORD INVENTORY RESULTS BELOW. DELINEATE AREAS SURVEYED ON ATTACHED AERIAL PHOTOS OR ORTHO QUAD. SHOW ALL CALLING POINTS AND DETECTIONS REFERENCED BELOW. CLEARLY SHOW QUAD/AERIAL PHOTOS NO. AND DATE

Call	Goshawk Response Information					Comments
Sta.	#	Age	Sex	Oth Spp	A/V	(detection details, behavior, direction of fly by...)
126						
127						
128						
129						
130						
131						
140						
141						

NOTES: A/V: (A)udio or (V)isual detection.
Other Spp: Other raptors observed.

Age: (A)dult, (F)ledgling, (N)estling, (U)nkown
Number of Goshawks observed.
Sex: (M)ale, (F)emale, (U)nkown

COMMENTS:

NORTHERN GOSHAWK SURVEY FORM

Region/Forest/District: _____ Date: 6/15 Analysis/Activity Area: PPM Wind Power

RECORD INVENTORY RESULTS BELOW. DELINEATE AREAS SURVEYED ON ATTACHED AERIAL PHOTOS OR ORTHO QUAD. SHOW ALL CALLING POINTS AND DETECTIONS REFERENCED BELOW. CLEARLY SHOW QUAD/AERIAL PHOTOS NO., AND DATE

Call Sta.	Goshawk Response Information					Comments
	Detected	Oth Spp	A/V	Age/Sex		(prey spp? plucking post? etc)
142						
143						
144						
145						
154						
155						
156						
157						
158						
168						
169						
170						AMCR
171						
172		RTHA	A/V			
173						AMCR

NOTES: A/V: (A)udio or (V)isual.
Other Spp: Other raptors observed.

Age: (A)dult, (F)ledgling, (N)esting, (U)nkown
#: Number of Goshawks observed.
Sex: (M)ale, (F)emale, (U)nkown

COMMENTS:

NORTHERN GOSHAWK SURVEY FORM

Region/Forest/District: _____ Date: 6-16-04 Time: Begin 0930 End 1515

Analysis/Activity Area: PPM Wind Power

Proposed Project/Year of Activity Implementation: _____ Observers: Victor A Muller

Is this the (Circle One): (FIRST YEAR OF SURVEY) SECOND YEAR OF SURVEY

Is this a follow-up to an unsuccessful survey? YES (NO)

If YES, territory name: _____

Wind: 2 mph (If >15mph, halt inventory)

Precipitation: (NONE) INT. DRIZZLE RAIN SNOW FOG (If RAIN, SNOW or FOG, halt inventory)

If significant change in weather conditions during survey, note here: NONE

Nest Search Done? YES (NO) -- If YES, fill out Search Form and attach.

Nest Found? YES (NO) -- If YES, fill out Nest Location Form and attach.

(Circle One): (NESTLING PERIOD) FLEDGLING PERIOD

Call(s) Used (Circle): (ALARM) WAIL (BEGGING)

RECORD INVENTORY RESULTS BELOW. DELINEATE AREAS SURVEYED ON ATTACHED AERIAL PHOTOS OR ORTHO QUAD. SHOW ALL CALLING POINTS AND DETECTIONS REFERENCED BELOW. CLEARLY SHOW QUAD/AERIAL PHOTOS NO. AND DATE

Call Sta.	Goshawk Response Information					Comments
	#	Age	Sex	Oth Spp	A/V	(detection details, behavior, direction of fly-by...)
8						
9				RTHA	A	STJA
10						
11						STJA, AMCR
19						
20						
21						
22						

NOTES: A/V: (A)udio or (V)isual detection.
Other Spp: Other raptors observed.

Age: (A)dult, (F)ledgling, (N)estling, (U)nkown
Number of Goshawks observed.
Sex: (M)ale, (F)emale, (U)nkown

COMMENTS:

NORTHERN GOSHAWK SURVEY FORM

Region/Forest/District: _____ Date: 6/16/04 Analysis/Activity Area: PPM Wind Power

RECORD INVENTORY RESULTS BELOW. DELINEATE AREAS SURVEYED ON ATTACHED AERIAL PHOTOS OR ORTHO QUAD. SHOW ALL CALLING POINTS AND DETECTIONS REFERENCED BELOW. CLEARLY SHOW QUAD/AERIAL PHOTOS NO., AND DATE

Call Sta.	Goshawk Response Information					Comments (prey spp? plucking post? etc)
	Detected	Oth Spp	A/V	Age/Sex		
28						
30						
31						
32						
33						
34						
40						
41						
42						
43						
44						
50						
51						
52						
53						
54						

NOTES: A/V: (A)udio or (V)isual.
Other Spp: Other raptors observed.

Age: (A)dult, (F)ledgling, (N)esting, (U)nkown
#: Number of Goshawks observed.
Sex: (M)ale, (F)emale, (U)nkown

COMMENTS:

NORTHERN GOSHAWK SURVEY FORM

Region/Forest/District: _____ Date: 6/16/04 Time: Begin 0930 End 1545

Analysis/Activity Area: PPM Wind Power

Proposed Project/Year of Activity Implementation: _____ Observers: Victor A Muller

Is this the (Circle One): (FIRST YEAR OF SURVEY) SECOND YEAR OF SURVEY

Is this a follow-up to an unsuccessful survey? YES (NO)

If YES, territory name: _____

Wind: 2 mph (If >15mph, halt inventory)

Precipitation: (NONE) INT. DRIZZLE RAIN SNOW FOG (If RAIN, SNOW or FOG, halt inventory)

If significant change in weather conditions during survey, note here: NONE

Nest Search Done? YES (NO) -- If YES, fill out Search Form and attach.

Nest Found? YES (NO) -- If YES, fill out Nest Location Form and attach.

(Circle One): (NESTLING PERIOD) FLEDGLING PERIOD

Call(s) Used (Circle): (ALARM) WAIL (BEGGING)

RECORD INVENTORY RESULTS BELOW. DELINEATE AREAS SURVEYED ON ATTACHED AERIAL PHOTOS OR ORTHO QUAD. SHOW ALL CALLING POINTS AND DETECTIONS REFERENCED BELOW. CLEARLY SHOW QUAD/AERIAL PHOTOS NO. AND DATE

Call	Goshawk Response Information					Comments
Sta.	#	Age	Sex	Oth Spp	A/V	(detection details, behavior, direction of fly by...)
55						
63						
64						
65						
66						
67						
[illegible]						
76						

NOTES: A/V: (A)udio or (V)isual detection.
Other Spp: Other raptors observed.

Age: (A)dult, (F)ledgling, (N)estling, (U)nkown
Number of Goshawks observed.
Sex: (M)ale, (F)emale, (U)nkown

COMMENTS:

NORTHERN GOSHAWK SURVEY FORM

Region/Forest/District: _____ Date: 6/16/04 Analysis/Activity Area: PPM Wind Power

RECORD INVENTORY RESULTS BELOW. DELINEATE AREAS SURVEYED ON ATTACHED AERIAL PHOTOS OR ORTHO QUAD. SHOW ALL CALLING POINTS AND DETECTIONS REFERENCED BELOW. CLEARLY SHOW QUAD/AERIAL PHOTOS NO., AND DATE

Call Sta.	Goshawk Response Information					Comments (prey spp? plucking post? etc)
	Detected	Oth Spp	A/V	Age	Sex	
77						
78						
79						STJA, CORA
67						

NOTES: A/V: (A)udio or (V)isual.
Other Spp: Other raptors observed.

Age: (A)dult, (F)ledgling, (N)esting, (U)nkown
#: Number of Goshawks observed.
Sex: (M)ale, (F)emale, (U)nkown

COMMENTS:

NORTHERN GOSHAWK SURVEY FORM

Region/Forest/District: _____ Date: 6/17/04 Time: Begin 13 45 End 17 30

Analysis/Activity Area: PPM Wind Power

Proposed Project/Year of Activity Implementation: _____ Observers: Victor A Muller

Is this the (Circle One): FIRST YEAR OF SURVEY SECOND YEAR OF SURVEY

Is this a follow-up to an unsuccessful survey? YES NO

If YES, territory name: _____

Wind: 2 mph (If >15mph, halt inventory)

Precipitation: NONE INT. DRIZZLE RAIN SNOW FOG (If RAIN, SNOW or FOG, halt inventory)

If significant change in weather conditions during survey, note here: NONE

Nest Search Done? YES NO -- If YES, fill out Search Form and attach.

Nest Found? YES NO -- If YES, fill out Nest Location Form and attach.

(Circle One): NESTLING PERIOD FLEDGLING PERIOD

Call(s) Used (Circle): ALARM WAIL BEGGING

RECORD INVENTORY RESULTS BELOW. DELINEATE AREAS SURVEYED ON ATTACHED AERIAL PHOTOS OR ORTHO QUAD. SHOW ALL CALLING POINTS AND DETECTIONS REFERENCED BELOW. CLEARLY SHOW QUAD/AERIAL PHOTOS NO. AND DATE

Call Sta.	Goshawk Response Information #	Age	Sex	Oth Spp	A/V	Comments (detection details, behavior, direction of fly by...)
29						
8						
17						
7						
6						
5						STJA
4						
3						

NOTES: A/V: (A)udio or (V)isual detection.
Other Spp: Other raptors observed.

Age: (A)dult, (F)ledgling, (N)estling, (U)nkown
Number of Goshawks observed.
Sex: (M)ale, (F)emale, (U)nkown

COMMENTS:

NORTHERN GOSHAWK SURVEY FORM

Region/Forest/District: _____ Date: 6/17/04 Analysis/Activity Area: PPM Wind Power

RECORD INVENTORY RESULTS BELOW. DELINEATE AREAS SURVEYED ON ATTACHED AERIAL PHOTOS OR ORTHO QUAD. SHOW ALL CALLING POINTS AND DETECTIONS REFERENCED BELOW. CLEARLY SHOW QUAD/AERIAL PHOTOS NO., AND DATE

Call Sta.	Goshawk Response Information					Comments (prey spp? plucking post? etc)
	Detected	Oth Spp	A/V	Age/Sex		
14						
15						
25						
26						
36						
37						
16						
27						
38						

NOTES: A/V: (A)udio or (V)isual.
Other Spp: Other raptors observed.

Age: (A)dult, (F)ledgling, (N)esting, (U)nkown
#: Number of Goshawks observed.
Sex: (M)ale, (F)emale, (U)nkown

COMMENTS:

NORTHERN GOSHAWK SURVEY FORM

Region/Forest/District: _____ Date: 6/18/04 Time: Begin 0845 End 1700

Analysis/Activity Area: PPM Wind Power

Proposed Project/Year of Activity Implementation: _____ Observers: Victor A Muller

Is this the (Circle One): (FIRST YEAR OF SURVEY) SECOND YEAR OF SURVEY

Is this a follow-up to an unsuccessful survey? YES (NO)

If YES, territory name: _____

Wind: 4 mph (If >15mph, halt inventory)

Precipitation: (NONE) INT. DRIZZLE RAIN SNOW FOG (If RAIN, SNOW or FOG, halt inventory)

If significant change in weather conditions during survey, note here: None

Nest Search Done? YES (NO) -- If YES, fill out Search Form and attach.

Nest Found? YES (NO) -- If YES, fill out Nest Location Form and attach.

(Circle One): (NESTLING PERIOD) FLEDGLING PERIOD

Call(s) Used (Circle): (ALARM) WAIL (BEGGING)

RECORD INVENTORY RESULTS BELOW. DELINEATE AREAS SURVEYED ON ATTACHED AERIAL PHOTOS OR ORTHO QUAD. SHOW ALL CALLING POINTS AND DETECTIONS REFERENCED BELOW. CLEARLY SHOW QUAD/AERIAL PHOTOS NO. AND DATE

Call Sta.	Goshawk Response Information					Comments (detection details, behavior, direction of fly by...)
	#	Age	Sex	Oth Spp	A/V	
190						
191						
49						
50						
14						
50						
51						
52						

NOTES: A/V: (A)udio or (V)isual detection.
Other Spp: Other raptors observed.

Age: (A)dult, (F)ledgling, (N)estling, (U)nkown
Number of Goshawks observed.
Sex: (M)ale, (F)emale, (U)nkown

COMMENTS:

NORTHERN GOSHAWK SURVEY FORM

Region/Forest/District: _____ Date: 6/18/04 Analysis/Activity Area: PPM Wind Power

RECORD INVENTORY RESULTS BELOW. DELINEATE AREAS SURVEYED ON ATTACHED AERIAL PHOTOS OR ORTHO QUAD. SHOW ALL CALLING POINTS AND DETECTIONS REFERENCED BELOW. CLEARLY SHOW QUAD/AERIAL PHOTOS NO., AND DATE

Call Sta.	Goshawk Response Information					Comments (prey spp? plucking post? etc)
	Detected	Oth Spp	A/V	Age	Sex	
153						
164						
165						
166						
167						
179						
180						
181						
182						
183						
189						
188						

NOTES: A/V: (A)udio or (V)isual.
Other Spp: Other raptors observed.

Age: (A)dult, (F)ledgling, (N)esting, (U)nkown
#: Number of Goshawks observed.
Sex: (M)ale, (F)emale, (U)nkown

COMMENTS:

NORTHERN GOSHAWK SURVEY FORM

Region/Forest/District: _____ Date: 6/18/04 Time: Begin 0845 End 1700
Analysis/Activity Area: PPM Wind Power
Proposed Project/Year of Activity Implementation: _____ Observers: Victor A Muller
Is this the (Circle One): (FIRST YEAR OF SURVEY) SECOND YEAR OF SURVEY
Is this a follow-up to an unsuccessful survey? YES (NO)
If YES, territory name: _____

Wind: 4mph (If >15mph, halt inventory)
Precipitation: (NONE) INT. DRIZZLE RAIN SNOW FOG (If RAIN, SNOW or FOG, halt inventory)
If significant change in weather conditions during survey, note here: NONE

Nest Search Done? YES (NO) -- If YES, fill out Search Form and attach.
Nest Found? YES (NO) -- If YES, fill out Nest Location Form and attach.

(Circle One): (NESTLING PERIOD) FLEDGLING PERIOD
Call(s) Used (Circle): (ALARM) WAIL (BEGGING)

RECORD INVENTORY RESULTS BELOW. DELINEATE AREAS SURVEYED ON ATTACHED AERIAL PHOTOS OR ORTHO QUAD. SHOW ALL CALLING POINTS AND DETECTIONS REFERENCED BELOW. CLEARLY SHOW QUAD/AERIAL PHOTOS NO. AND DATE

Call Sta.	Goshawk Response Information #	Age	Sex	Oth Spp	A/V	Comments (detection details, behavior, direction of fly by...)
192						
193						
201						
202						
203						
211						
212						
213						

NOTES: A/V: (A)udio or (V)isual detection.
Other Spp: Other raptors observed.
Age: (A)dult, (F)ledgling, (N)estling, (U)nkown
Number of Goshawks observed.
Sex: (M)ale, (F)emale, (U)nkown

COMMENTS:

NORTHERN GOSHAWK SURVEY FORM

Region/Forest/District: _____ Date: 6/18 Analysis/Activity Area: PPM Wind Power

RECORD INVENTORY RESULTS BELOW. DELINEATE AREAS SURVEYED ON ATTACHED AERIAL PHOTOS OR ORTHO QUAD. SHOW ALL CALLING POINTS AND DETECTIONS REFERENCED BELOW. CLEARLY SHOW QUAD/AERIAL PHOTOS NO., AND DATE

Call Sta.	Goshawk Response Information					Comments (prey spp? plucking post? etc)
	Detected	Oth Spp	A/V	Age	Sex	
222						
223						
224						
233						
234						
245						
256						
199		RTHA(2)	V/A			
200						
244						
255						
125						
139						
138						
137						

NOTES: A/V: (A)udio or (V)isual.
Other Spp: Other raptors observed.

Age: (A)dult, (F)ledgling, (N)esting, (U)nkown
#: Number of Goshawks observed.
Sex: (M)ale, (F)emale, (U)nkown

COMMENTS:

NORTHERN GOSHAWK SURVEY FORM

Region/Forest/District: _____ Date: 6/8 [illegible] Time: Begin 0900 End 1515

Analysis/Activity Area: PPM Wind Power

Proposed Project/Year of Activity Implementation: _____ Observers: Matt Gosnell

Is this the (Circle One): (FIRST YEAR OF SURVEY) SECOND YEAR OF SURVEY

Is this a follow-up to an unsuccessful survey? YES (NO)

If YES, territory name: _____

Wind: 4 mph (If >15mph, halt inventory)

Precipitation: (NONE) INT. DRIZZLE RAIN SNOW FOG (If RAIN, SNOW or FOG, halt inventory)

If significant change in weather conditions during survey, note here: NONE

Nest Search Done? YES (NO) -- If YES, fill out Search Form and attach.

Nest Found? YES (NO) -- If YES, fill out Nest Location Form and attach.

(Circle One): (NESTLING PERIOD) FLEDGLING PERIOD

Call(s) Used (Circle): (ALARM) WAIL (BEGGING)

RECORD INVENTORY RESULTS BELOW. DELINEATE AREAS SURVEYED ON ATTACHED AERIAL PHOTOS OR ORTHO QUAD. SHOW ALL CALLING POINTS AND DETECTIONS REFERENCED BELOW. CLEARLY SHOW QUAD/AERIAL PHOTOS NO. AND DATE

Call Sta.	Goshawk Response Information					Comments
	#	Age	Sex	Oth Spp	A/V	(detection details, behavior, direction of fly by...)
291						
280						
281						
270						
259						
260						
271						
282						

NOTES: A/V: (A)udio or (V)isual detection.
Other Spp: Other raptors observed.

Age: (A)dult, (F)ledgling, (N)estling, (U)nkown
Number of Goshawks observed.
Sex: (M)ale, (F)emale, (U)nkown

COMMENTS:

NORTHERN GOSHAWK SURVEY FORM

Region/Forest/District: _____ Date: 6/18/04 Analysis/Activity Area: PPM Wind Power

RECORD INVENTORY RESULTS BELOW. DELINEATE AREAS SURVEYED ON ATTACHED AERIAL PHOTOS OR ORTHO QUAD. SHOW ALL CALLING POINTS AND DETECTIONS REFERENCED BELOW. CLEARLY SHOW QUAD/AERIAL PHOTOS NO., AND DATE

Call Sta.	Goshawk Response Information					Comments (prey spp? plucking post? etc)
	Detected	Oth Spp	A/V	Age/Sex		
292						
248						
238						
261						
272						
271A						
262						
273						
284						
293						
227						

NOTES: A/V: (A)udio or (V)isual.
Other Spp: Other raptors observed.

Age: (A)dult, (F)ledgling, (N)esting, (U)nkown
#: Number of Goshawks observed.
Sex: (M)ale, (F)emale, (U)nkown

COMMENTS:

NORTHERN GOSHAWK SURVEY FORM

Region/Forest/District: _____ Date: 6/18/04 Time: Begin 0900 End 1515
Analysis/Activity Area: PPM Wind Power
Proposed Project/Year of Activity Implementation: _____ Observers: Matt Goslin
Is this the (Circle One): (FIRST YEAR OF SURVEY) SECOND YEAR OF SURVEY
Is this a follow-up to an unsuccessful survey? YES (NO)
If YES, territory name: _____

Wind: 4mph (If >15mph, halt inventory)
Precipitation: (NONE) INT. DRIZZLE RAIN SNOW FOG (If RAIN, SNOW or FOG, halt inventory)
If significant change in weather conditions during survey, note here: None

Nest Search Done? YES (NO) -- If YES, fill out Search Form and attach.
Nest Found? YES (NO) -- If YES, fill out Nest Location Form and attach.

(Circle One): (NESTLING PERIOD) FLEDGLING PERIOD
Call(s) Used (Circle): (ALARM) WAIL (BEGGING)

RECORD INVENTORY RESULTS BELOW. DELINEATE AREAS SURVEYED ON ATTACHED AERIAL PHOTOS OR ORTHO QUAD. SHOW ALL CALLING POINTS AND DETECTIONS REFERENCED BELOW. CLEARLY SHOW QUAD/AERIAL PHOTOS NO. AND DATE

Call	Goshawk Response Information					Comments
Sta.	#	Age	Sex	Oth Spp	A/V	(detection details, behavior, direction of fly by...)
210						
230						
209						
220						
221						
232						
243						
254						

NOTES: A/V: (A)udio or (V)isual detection.
Other Spp: Other raptors observed.

Age: (A)dult, (F)ledgling, (N)estling, (U)nkown
Number of Goshawks observed.
Sex: (M)ale, (F)emale, (U)nkown

COMMENTS:

NORTHERN GOSHAWK SURVEY FORM

Region/Forest/District: _____ Date: 6/18/04 Analysis/Activity Area: PPM Wind Power

RECORD INVENTORY RESULTS BELOW. DELINEATE AREAS SURVEYED ON ATTACHED AERIAL PHOTOS OR ORTHO QUAD. SHOW ALL CALLING POINTS AND DETECTIONS REFERENCED BELOW. CLEARLY SHOW QUAD/AERIAL PHOTOS NO., AND DATE

Call Sta.	Goshawk Response Information					Comments (prey spp? plucking post? etc)
	Detected	Oth Spp	A/V	Age	Sex	
196						
206						
228						
263						
274						
285						
294						
197						
207						
218						
229						
240						
208						
198						
210						

NOTES: A/V: (A)udio or (V)isual.
Other Spp: Other raptors observed.

Age: (A)dult, (F)ledgling, (N)esting, (U)nkown
#: Number of Goshawks observed.
Sex: (M)ale, (F)emale, (U)nkown

COMMENTS:

NORTHERN GOSHAWK SURVEY FORM

Region/Forest/District: _____ Date: 8/29/04 Time: Begin 0830 End 1430

Analysis/Activity Area: PPM Wind Power

Proposed Project/Year of Activity Implementation: _____ Observers: Victor A. Fisher

Is this the (Circle One): (FIRST YEAR OF SURVEY) SECOND YEAR OF SURVEY

Is this a follow-up to an unsuccessful survey? YES (NO)

If YES, territory name: _____

Wind: 10mph (If >15mph, halt inventory)

Precipitation: (NONE) INT. DRIZZLE RAIN SNOW FOG (If RAIN, SNOW or FOG, halt inventory)

If significant change in weather conditions during survey, note here: None

Nest Search Done? YES (NO) -- If YES, fill out Search Form and attach.

Nest Found? YES (NO) -- If YES, fill out Nest Location Form and attach.

(Circle One): NESTLING PERIOD (FLEDGLING PERIOD)

Call(s) Used (Circle): ALARM (WAIL) BEGGING

RECORD INVENTORY RESULTS BELOW. DELINEATE AREAS SURVEYED ON ATTACHED AERIAL PHOTOS OR ORTHO QUAD. SHOW ALL CALLING POINTS AND DETECTIONS REFERENCED BELOW. CLEARLY SHOW QUAD/AERIAL PHOTOS NO. AND DATE

Call Sta.	Goshawk Response Information					Comments
	#	Age	Sex	Oth Spp	A/V	(detection details, behavior, direction of fly by...)
1-5						
31						
8						
17						
102						
22						
104						
86						

NOTES: A/V: (A)udio or (V)isual detection.
Other Spp: Other raptors observed.

Age: (A)dult, (F)ledgling, (N)estling, (U)nkown
Number of Goshawks observed.
Sex: (M)ale, (F)emale, (U)nkown

COMMENTS:

CONTINUATION SHEET
NORTHERN GOSHAWK SURVEY FORM

Region/Forest/District: _____ Date: 8/29/04 Analysis/Activity Area: PPM Wind Power

RECORD INVENTORY RESULTS BELOW. DELINEATE AREAS SURVEYED ON ATTACHED AERIAL PHOTOS OR ORTHO QUAD. SHOW ALL CALLING POINTS AND DETECTIONS REFERENCED BELOW. CLEARLY SHOW QUAD/AERIAL PHOTOS NO., AND DATE

Call Sta.	Goshawk Response Information					Comments (prey spp? plucking post? etc)
	Detected	Oth Spp	A/V	Age/Sex		
87						
88						
89						
90						
91						
74						
75						
76						
77						STJA
78						
79						
61						
62						
63						
64						

NOTES: A/V: (A)udio or (V)isual.
Other Spp: Other raptors observed.

Age: (A)dult, (F)ledgling, (N)esting, (U)nkown
#: Number of Goshawks observed.
Sex: (M)ale, (F)emale, (U)nkown

COMMENTS:

NORTHERN GOSHAWK SURVEY FORM

Region/Forest/District: _____ Date: 8/29/04 Time: Begin 0830 End 1430

Analysis/Activity Area: PPM Wind Power

Proposed Project/Year of Activity Implementation: _____ Observers: Victor A. Muller

Is this the (Circle One): FIRST YEAR OF SURVEY SECOND YEAR OF SURVEY

Is this a follow-up to an unsuccessful survey? YES NO

If YES, territory name: _____

Wind: 10mph (If >15mph, halt inventory)

Precipitation: NONE INT. DRIZZLE RAIN SNOW FOG (If RAIN, SNOW or FOG, halt inventory)

If significant change in weather conditions during survey, note here: None

Nest Search Done? YES NO -- If YES, fill out Search Form and attach.

Nest Found? YES NO -- If YES, fill out Nest Location Form and attach.

(Circle One): NESTLING PERIOD FLEDGLING PERIOD

Call(s) Used (Circle): ALARM WAIL BEGGING

RECORD INVENTORY RESULTS BELOW. DELINEATE AREAS SURVEYED ON ATTACHED AERIAL PHOTOS OR ORTHO QUAD. SHOW ALL CALLING POINTS AND DETECTIONS REFERENCED BELOW. CLEARLY SHOW QUAD/AERIAL PHOTOS NO. AND DATE

Call Sta.	Goshawk Response Information #	Age	Sex	Oth Spp	A/V	Comments (detection details, behavior, direction of fly by...)
65						
66						
67						
49						
50						
51						
52						
53						

NOTES: A/V: (A)udio or (V)isual detection.
Other Spp: Other raptors observed.

Age: (A)dult, (F)ledgling, (N)estling, (U)nkown
Number of Goshawks observed.
Sex: (M)ale, (F)emale, (U)nkown

COMMENTS:

NORTHERN GOSHAWK SURVEY FORM

Region/Forest/District: _____ Date: 8/29/04 Analysis/Activity Area: PPM Wind Power

RECORD INVENTORY RESULTS BELOW. DELINEATE AREAS SURVEYED ON ATTACHED AERIAL PHOTOS OR ORTHO QUAD. SHOW ALL CALLING POINTS AND DETECTIONS REFERENCED BELOW. CLEARLY SHOW QUAD/AERIAL PHOTOS NO., AND DATE

Call Sta.	Goshawk Response Information					Comments (prey spp? plucking post? etc)
	Detected	Oth Spp	A/V	Age	Sex	
S4						
S5						

NOTES: A/V: (A)udio or (V)isual.
Other Spp: Other raptors observed.

Age: (A)dult, (F)ledgling, (N)esting, (U)nkown
#: Number of Goshawks observed.
Sex: (M)ale, (F)emale, (U)nkown

COMMENTS:

NORTHERN GOSHAWK SURVEY FORM

5 of 6

Region/Forest/District: _____ Date: 8/29/04 Time: Begin 15:30 End 19:00

Analysis/Activity Area: PPM Wind Power

Proposed Project/Year of Activity Implementation: _____ Observers: Victor A Muller

Is this the (Circle One): (FIRST YEAR OF SURVEY) SECOND YEAR OF SURVEY

Is this a follow-up to an unsuccessful survey? YES (NO)

If YES, territory name: _____

Wind: 10 mph (If >15mph, halt inventory)

Precipitation: (NONE) INT. DRIZZLE RAIN SNOW FOG (If RAIN, SNOW or FOG, halt inventory)

If significant change in weather conditions during survey, note here: NONE

Nest Search Done? YES (NO) -- If YES, fill out Search Form and attach.

Nest Found? YES (NO) -- If YES, fill out Nest Location Form and attach.

(Circle One): NESTLING PERIOD (FLEDGLING PERIOD)

Call(s) Used (Circle): ALARM (WAIL) BEGGING

RECORD INVENTORY RESULTS BELOW. DELINEATE AREAS SURVEYED ON ATTACHED AERIAL PHOTOS OR ORTHO QUAD. SHOW ALL CALLING POINTS AND DETECTIONS REFERENCED BELOW. CLEARLY SHOW QUAD/AERIAL PHOTOS NO. AND DATE

Call	Goshawk Response Information					Comments
Sta.	#	Age	Sex	Oth Spp	A/V	(detection details, behavior, direction of fly by...)
36						
37						
38						
39						
40						
41						
42						
43						

NOTES: A/V: (A)udio or (V)isual detection.
Other Spp: Other raptors observed.

Age: (A)dult, (F)ledgling, (N)estling, (U)nkown
Number of Goshawks observed.
Sex: (M)ale, (F)emale, (U)nkown

COMMENTS:

NORTHERN GOSHAWK SURVEY FORM

Region/Forest/District: _____ Date: 8/29/04 Analysis/Activity Area: PPM Wind Power

RECORD INVENTORY RESULTS BELOW. DELINEATE AREAS SURVEYED ON ATTACHED AERIAL PHOTOS OR ORTHO QUAD. SHOW ALL CALLING POINTS AND DETECTIONS REFERENCED BELOW. CLEARLY SHOW QUAD/AERIAL PHOTOS NO., AND DATE

Call Sta.	Goshawk Response Information					Comments (prey spp? plucking post? etc)
	Detected	Oth Spp	A/V	Age	Sex	
44						
25						
26						
27						
28						
29						
30						
31						
32						
33						

NOTES: A/V: (A)udio or (V)isual.
Other Spp: Other raptors observed.

Age: (A)dult, (F)ledgling, (N)esting, (U)nkown
#: Number of Goshawks observed.
Sex: (M)ale, (F)emale, (U)nkown

COMMENTS:

NORTHERN GOSHAWK SURVEY FORM

Region/Forest/District: _____ Date: 8/29/04 Time: Begin 0830 End 1500
Analysis/Activity Area: PPM Wind Power
Proposed Project/Year of Activity Implementation: _____ Observers: Alex Neerman
Is this the (Circle One): (FIRST YEAR OF SURVEY) SECOND YEAR OF SURVEY
Is this a follow-up to an unsuccessful survey? YES (NO)
If YES, territory name: _____

Wind: 10mph (If >15mph, halt inventory)
Precipitation: (NONE) INT. DRIZZLE RAIN SNOW FOG (If RAIN, SNOW or FOG, halt inventory)
If significant change in weather conditions during survey, note here: None

Nest Search Done? YES (NO) -- If YES, fill out Search Form and attach.
Nest Found? YES (NO) -- If YES, fill out Nest Location Form and attach.

(Circle One): NESTLING PERIOD (FLEDGLING PERIOD)
Call(s) Used (Circle): ALARM (WAIL) BEGGING

RECORD INVENTORY RESULTS BELOW. DELINEATE AREAS SURVEYED ON ATTACHED AERIAL PHOTOS OR ORTHO QUAD. SHOW ALL CALLING POINTS AND DETECTIONS REFERENCED BELOW. CLEARLY SHOW QUAD/AERIAL PHOTOS NO. AND DATE

Call Sta.	Goshawk Response Information #	Age	Sex	Oth Spp	A/V	Comments (detection details, behavior, direction of fly by...)
280						
291						
281						
270						
259						
292						
282						
271						

NOTES: A/V: (A)udio or (V)isual detection.
Other Spp: Other raptors observed.

Age: (A)dult, (F)ledgling, (N)estling, (U)nkown
Number of Goshawks observed.
Sex: (M)ale, (F)emale, (U)nkown

COMMENTS:

NORTHERN GOSHAWK SURVEY FORM

Region/Forest/District: _____ Date: 8/29/04 Analysis/Activity Area: PPM Wind Power

RECORD INVENTORY RESULTS BELOW. DELINEATE AREAS SURVEYED ON ATTACHED AERIAL PHOTOS OR ORTHO QUAD. SHOW ALL CALLING POINTS AND DETECTIONS REFERENCED BELOW. CLEARLY SHOW QUAD/AERIAL PHOTOS NO., AND DATE

Call Sta.	Goshawk Response Information					Comments (prey spp? plucking post? etc)
	Detected	Oth Spp	A/V	Age/Sex		
260						
271-A						
272						
261						
248						
293						
284						
273						
262						
238						
294						
285						
274						
263						
228						
196						

NOTES: A/V: (A)udio or (V)isual.
Other Spp: Other raptors observed.

Age: (A)dult, (F)ledgling, (N)esting, (U)nkown
#: Number of Goshawks observed.
Sex: (M)ale, (F)emale, (U)nkown

COMMENTS:

NORTHERN GOSHAWK SURVEY FORM

Region/Forest/District: _____ Date: 8/29/04 Time: Begin 0830 End 1500

Analysis/Activity Area: PPM Wind Power

Proposed Project/Year of Activity Implementation: _____ Observers: Alex Neerman

Is this the (Circle One): FIRST YEAR OF SURVEY SECOND YEAR OF SURVEY

Is this a follow-up to an unsuccessful survey? YES NO

If YES, territory name: _____

Wind: ~10mph (If >15mph, halt inventory)

Precipitation: NONE INT. DRIZZLE RAIN SNOW FOG (If RAIN, SNOW or FOG, halt inventory)

If significant change in weather conditions during survey, note here: None

Nest Search Done? YES NO -- If YES, fill out Search Form and attach.

Nest Found? YES NO -- If YES, fill out Nest Location Form and attach.

(Circle One): NESTLING PERIOD FLEDGLING PERIOD

Call(s) Used (Circle): ALARM WAIL BEGGING

RECORD INVENTORY RESULTS BELOW. DELINEATE AREAS SURVEYED ON ATTACHED AERIAL PHOTOS OR ORTHO QUAD. SHOW ALL CALLING POINTS AND DETECTIONS REFERENCED BELOW. CLEARLY SHOW QUAD/AERIAL PHOTOS NO. AND DATE

Call	Goshawk Response Information					Comments
Sta.	#	Age	Sex	Oth Spp	A/V	(detection details, behavior, direction of fly by...)
196						
197						
198						
199						
200						
201						
202						
203						

NOTES: A/V: (A)udio or (V)isual detection.
Other Spp: Other raptors observed.

Age: (A)dult, (F)ledgling, (N)estling, (U)nkown
Number of Goshawks observed.
Sex: (M)ale, (F)emale, (U)nkown

COMMENTS:

NORTHERN GOSHAWK SURVEY FORM

Region/Forest/District: _____ Date: 8/29/04 Analysis/Activity Area: PPM Wind Power

RECORD INVENTORY RESULTS BELOW. DELINEATE AREAS SURVEYED ON ATTACHED AERIAL PHOTOS OR ORTHO QUAD. SHOW ALL CALLING POINTS AND DETECTIONS REFERENCED BELOW. CLEARLY SHOW QUAD/AERIAL PHOTOS NO., AND DATE

Call Sta.	Goshawk Response Information					Comments
	Detected	Oth Spp	A/V	Age	Sex	(prey spp? plucking post? etc)
213						
212						
211						
193						
207						
208						
209						
210						
218						
219						
220						
221						
222		RTHA	A	U	U	RTHA Stationary Call
223						
224						
227						

NOTES: A/V: (A)udio or (V)isual.
Other Spp: Other raptors observed.

Age: (A)dult, (F)ledgling, (N)esting, (U)nkown
#: Number of Goshawks observed.
Sex: (M)ale, (F)emale, (U)nkown

COMMENTS:

-3 of 7

NORTHERN GOSHAWK SURVEY FORM

Region/Forest/District: _____ Date: 8/29/04 Time: Begin 15 30 End 19 00

Analysis/Activity Area: PPM Wind Power

Proposed Project/Year of Activity Implementation: _____ Observers: Alex Neerman

Is this the (Circle One): (FIRST YEAR OF SURVEY) SECOND YEAR OF SURVEY

Is this a follow-up to an unsuccessful survey? YES (NO)

If YES, territory name: _____

Wind: 10mph (If >15mph, halt inventory)

Precipitation: (NONE) INT. DRIZZLE RAIN SNOW FOG (If RAIN, SNOW or FOG, halt inventory)

If significant change in weather conditions during survey, note here: None

Nest Search Done? YES (NO) -- If YES, fill out Search Form and attach.

Nest Found? YES (NO) -- If YES, fill out Nest Location Form and attach.

(Circle One): NESTLING PERIOD (FLEDGLING PERIOD)

Call(s) Used (Circle): ALARM (WAIL) BEGGING

RECORD INVENTORY RESULTS BELOW. DELINEATE AREAS SURVEYED ON ATTACHED AERIAL PHOTOS OR ORTHO QUAD. SHOW ALL CALLING POINTS AND DETECTIONS REFERENCED BELOW. CLEARLY SHOW QUAD/AERIAL PHOTOS NO. AND DATE

Call Sta.	Goshawk Response Information #	Age	Sex	Oth Spp	A/V	Comments (detection details, behavior, direction of fly by...)
229						
230						
240						
232						
233						
234						
243						
244						

NOTES: A/V: (A)udio or (V)isual detection.
Other Spp: Other raptors observed.

Age: (A)dult, (F)ledgling, (N)estling, (U)nkown
Number of Goshawks observed.
Sex: (M)ale, (F)emale, (U)nkown

COMMENTS:

NORTHERN GOSHAWK SURVEY FORM

Region/Forest/District: _____ Date: 8/29/04 Analysis/Activity Area: PPM Wind Power

RECORD INVENTORY RESULTS BELOW. DELINEATE AREAS SURVEYED ON ATTACHED AERIAL PHOTOS OR ORTHO QUAD. SHOW ALL CALLING POINTS AND DETECTIONS REFERENCED BELOW. CLEARLY SHOW QUAD/AERIAL PHOTOS NO., AND DATE

Call Sta.	Goshawk Response Information					Comments (prey spp? plucking post? etc)
	Detected	Oth Spp	A/V	Age/Sex		
245						
254						
255						
256						
188						
189						
190						
191						
192						
179						
180						
181						
182						
183						
164						
165						

NOTES: A/V: (A)udio or (V)isual.
Other Spp: Other raptors observed.

Age: (A)dult, (F)ledgling, (N)esting, (U)nkown
#: Number of Goshawks observed.
Sex: (M)ale, (F)emale, (U)nkown

COMMENTS:

NORTHERN GOSHAWK SURVEY FORM

Region/Forest/District: _____ Date: 8/29/04 Time: Begin 1530 End 1900
Analysis/Activity Area: PPM Wind Power
Proposed Project/Year of Activity Implementation: _____ Observers: Alex Meerma.
Is this the (Circle One): (FIRST YEAR OF SURVEY) SECOND YEAR OF SURVEY
Is this a follow-up to an unsuccessful survey? YES (NO)
If YES, territory name: _____

Wind: 10mph (If >15mph, halt inventory)
Precipitation: (NONE) INT. DRIZZLE RAIN SNOW FOG (If RAIN, SNOW or FOG, halt inventory)
If significant change in weather conditions during survey, note here: None

Nest Search Done? YES (NO) -- If YES, fill out Search Form and attach.
Nest Found? YES (NO) -- If YES, fill out Nest Location Form and attach.

(Circle One): NESTLING PERIOD (FLEDGLING PERIOD)
Call(s) Used (Circle): ALARM (WAIL) BEGGING

RECORD INVENTORY RESULTS BELOW. DELINEATE AREAS SURVEYED ON ATTACHED AERIAL PHOTOS OR ORTHO QUAD. SHOW ALL CALLING POINTS AND DETECTIONS REFERENCED BELOW. CLEARLY SHOW QUAD/AERIAL PHOTOS NO. AND DATE

Call Sta.	Goshawk Response Information #	Age	Sex	Oth Spp	A/V	Comments (detection details, behavior, direction of fly by...)
166						
167						
168						

NOTES: A/V: (A)udio or (V)isual detection.
Other Spp: Other raptors observed.

Age: (A)dult, (F)ledgling, (N)estling, (U)nkown
Number of Goshawks observed.
Sex: (M)ale, (F)emale, (U)nkown

COMMENTS:

NORTHERN GOSHAWK SURVEY FORM

Region/Forest/District: _____ Date: 8/30/04 Time: Begin 07:10 End 12:00
Analysis/Activity Area: PPM Wind Power
Proposed Project/Year of Activity Implementation: _____ Observers: Alex Neerman
Is this the (Circle One): (FIRST YEAR OF SURVEY) SECOND YEAR OF SURVEY
Is this a follow-up to an unsuccessful survey? YES (NO)
If YES, territory name: _____

Wind: 12 mph (If >15mph, halt inventory)
Precipitation: (NONE) INT. DRIZZLE RAIN SNOW FOG (If RAIN, SNOW or FOG, halt inventory)
If significant change in weather conditions during survey, note here: None

Nest Search Done? YES (NO) -- If YES, fill out Search Form and attach.
Nest Found? YES (NO) -- If YES, fill out Nest Location Form and attach.

(Circle One): NESTLING PERIOD (FLEDGLING PERIOD)
Call(s) Used (Circle): ALARM (WAIL) BEGGING

RECORD INVENTORY RESULTS BELOW. DELINEATE AREAS SURVEYED ON ATTACHED AERIAL PHOTOS OR ORTHO QUAD. SHOW ALL CALLING POINTS AND DETECTIONS REFERENCED BELOW. CLEARLY SHOW QUAD/AERIAL PHOTOS NO. AND DATE

Call	Goshawk Response Information					Comments
Sta.	#	Age	Sex	Oth Spp	A/V	(detection details, behavior, direction of fly by...)
150						
151						
152						
153						
154						
155						
156						
157						

NOTES: A/V: (A)udio or (V)isual detection.
Other Spp: Other raptors observed.
Age: (A)dult, (F)ledgling, (N)estling, (U)nkown
Number of Goshawks observed.
Sex: (M)ale, (F)emale, (U)nkown

COMMENTS:

NORTHERN GOSHAWK SURVEY FORM

Region/Forest/District: _____ Date: 8/30/04 Analysis/Activity Area: PPM Wind Power

RECORD INVENTORY RESULTS BELOW. DELINEATE AREAS SURVEYED ON ATTACHED AERIAL PHOTOS OR ORTHO QUAD. SHOW ALL CALLING POINTS AND DETECTIONS REFERENCED BELOW. CLEARLY SHOW QUAD/AERIAL PHOTOS NO., AND DATE

Call Sta.	Goshawk Response Information					Comments (prey spp? plucking post? etc)
	Detected	Oth Spp	A/V	Age/Sex		
158						
169						
170						
171						
172						
173						
137						
138						
139						
140						
141						
142						
143						
144						
123						
124						

NOTES: A/V: (A)udio or (V)isual.
Other Spp: Other raptors observed.

Age: (A)dult, (F)ledgling, (N)esting, (U)nkown
#: Number of Goshawks observed.
Sex: (M)ale, (F)emale, (U)nkown

COMMENTS:

NORTHERN GOSHAWK SURVEY FORM

Region/Forest/District: _____ Date: 8/30/04 Time: Begin 0710 End 1200
Analysis/Activity Area: PPM Wind Power
Proposed Project/Year of Activity Implementation: _____ Observers: Victor A Muller
Is this the (Circle One): (FIRST YEAR OF SURVEY) SECOND YEAR OF SURVEY
Is this a follow-up to an unsuccessful survey? YES (NO)
If YES, territory name: _____

Wind: 12 mph (If >15mph, halt inventory)
Precipitation: (NONE) INT. DRIZZLE RAIN SNOW FOG (If RAIN, SNOW or FOG, halt inventory)
If significant change in weather conditions during survey, note here: None

Nest Search Done? YES (NO) -- If YES, fill out Search Form and attach.
Nest Found? YES (NO) -- If YES, fill out Nest Location Form and attach.

(Circle One): NESTLING PERIOD (FLEDGLING PERIOD)
Call(s) Used (Circle): ALARM (WAIL) BEGGING

RECORD INVENTORY RESULTS BELOW. DELINEATE AREAS SURVEYED ON ATTACHED AERIAL PHOTOS OR ORTHO QUAD. SHOW ALL CALLING POINTS AND DETECTIONS REFERENCED BELOW. CLEARLY SHOW QUAD/AERIAL PHOTOS NO. AND DATE

Call Sta.	Goshawk Response Information #	Age	Sex	Oth Spp	A/V	Comments (detection details, behavior, direction of fly by...)
3						
4						
5						
6						
7						
8						
9						STJA
10						

NOTES: A/V: (A)udio or (V)isual detection.
Other Spp: Other raptors observed.

Age: (A)dult, (F)ledgling, (N)estling, (U)nkown
Number of Goshawks observed.
Sex: (M)ale, (F)emale, (U)nkown

COMMENTS:

NORTHERN GOSHAWK SURVEY FORM

Region/Forest/District: _____ Date: 8/30/04 Analysis/Activity Area: PPM Wind Power

RECORD INVENTORY RESULTS BELOW. DELINEATE AREAS SURVEYED ON ATTACHED AERIAL PHOTOS OR ORTHO QUAD. SHOW ALL CALLING POINTS AND DETECTIONS REFERENCED BELOW. CLEARLY SHOW QUAD/AERIAL PHOTOS NO., AND DATE

Call Sta.	Goshawk Response Information					Comments (prey spp? plucking post? etc)
	Detected	Oth Spp	A/V	Age	Sex	
11						
14						
15						
16						
17						
18						
19						
20						
21						
22						
125						
126						
127						
128						
129						
130						

NOTES: A/V: (A)udio or (V)isual.
Other Spp: Other raptors observed.

Age: (A)dult, (F)ledgling, (N)esting, (U)nkown
#: Number of Goshawks observed.
Sex: (M)ale, (F)emale, (U)nkown

COMMENTS:

NORTHERN GOSHAWK SURVEY FORM

Region/Forest/District: _____ Date: 8/30 Time: Begin 0710 End 13'30

Analysis/Activity Area: PPM Wind Power

Proposed Project/Year of Activity Implementation: _____ Observers: _____

Is this the (Circle One): (FIRST YEAR OF SURVEY) SECOND YEAR OF SURVEY

Is this a follow-up to an unsuccessful survey? YES (NO)

If YES, territory name: _____

Wind: 12 (If >15mph, halt inventory)

Precipitation: (NONE) INT. DRIZZLE RAIN SNOW FOG (If RAIN, SNOW or FOG, halt inventory)

If significant change in weather conditions during survey, note here: None

Nest Search Done? YES (NO) -- If YES, fill out Search Form and attach.

Nest Found? YES (NO) -- If YES, fill out Nest Location Form and attach.

(Circle One): NESTLING PERIOD (FLEDGLING PERIOD)

Call(s) Used (Circle): ALARM (WAIL) BEGGING

RECORD INVENTORY RESULTS BELOW. DELINEATE AREAS SURVEYED ON ATTACHED AERIAL PHOTOS OR ORTHO QUAD. SHOW ALL CALLING POINTS AND DETECTIONS REFERENCED BELOW. CLEARLY SHOW QUAD/AERIAL PHOTOS NO. AND DATE

Call	Goshawk Response Information					Comments
Sta.	#	Age	Sex	Oth Spp	A/V	(detection details, behavior, direction of fly by...)
110						
111						
112						
113						
114						
115						
116						
98						

NOTES: A/V: (A)udio or (V)isual detection.
Other Spp: Other raptors observed.

Age: (A)dult, (F)ledgling, (N)estling, (U)nkown
Number of Goshawks observed.
Sex: (M)ale, (F)emale, (U)nkown

COMMENTS:

NORTHERN GOSHAWK SURVEY FORM

Region/Forest/District: _____ Date: 8/30/04 Analysis/Activity Area: PPM Wind Power

RECORD INVENTORY RESULTS BELOW. DELINEATE AREAS SURVEYED ON ATTACHED AERIAL PHOTOS OR ORTHO QUAD. SHOW ALL CALLING POINTS AND DETECTIONS REFERENCED BELOW. CLEARLY SHOW QUAD/AERIAL PHOTOS NO., AND DATE

Call Sta.	Goshawk Response Information					Comments (prey spp? plucking post? etc)
	Detected	Oth Spp	A/V	Age/Sex		
99						
100						
101						

NOTES: A/V: (A)udio or (V)isual.
Other Spp: Other raptors observed.

Age: (A)dult, (F)ledgling, (N)esting, (U)nkown
#: Number of Goshawks observed.
Sex: (M)ale, (F)emale, (U)nkown

COMMENTS:

APPENDIX E:
WESTERN GRAY SQUIRREL DATA FORMS

Western Gray Squirrel Data Form

Analysis/Activity Area: PPM / Saddle back
Date 06 / 15 / 04
Weather Clear / light wind / warm
Location Description: T4N R10E sec 5,6,7,8
T3N R9E sec 13, 24
T3N R10E sec 18
Habitat Type Douglas Fir (PSME) forest

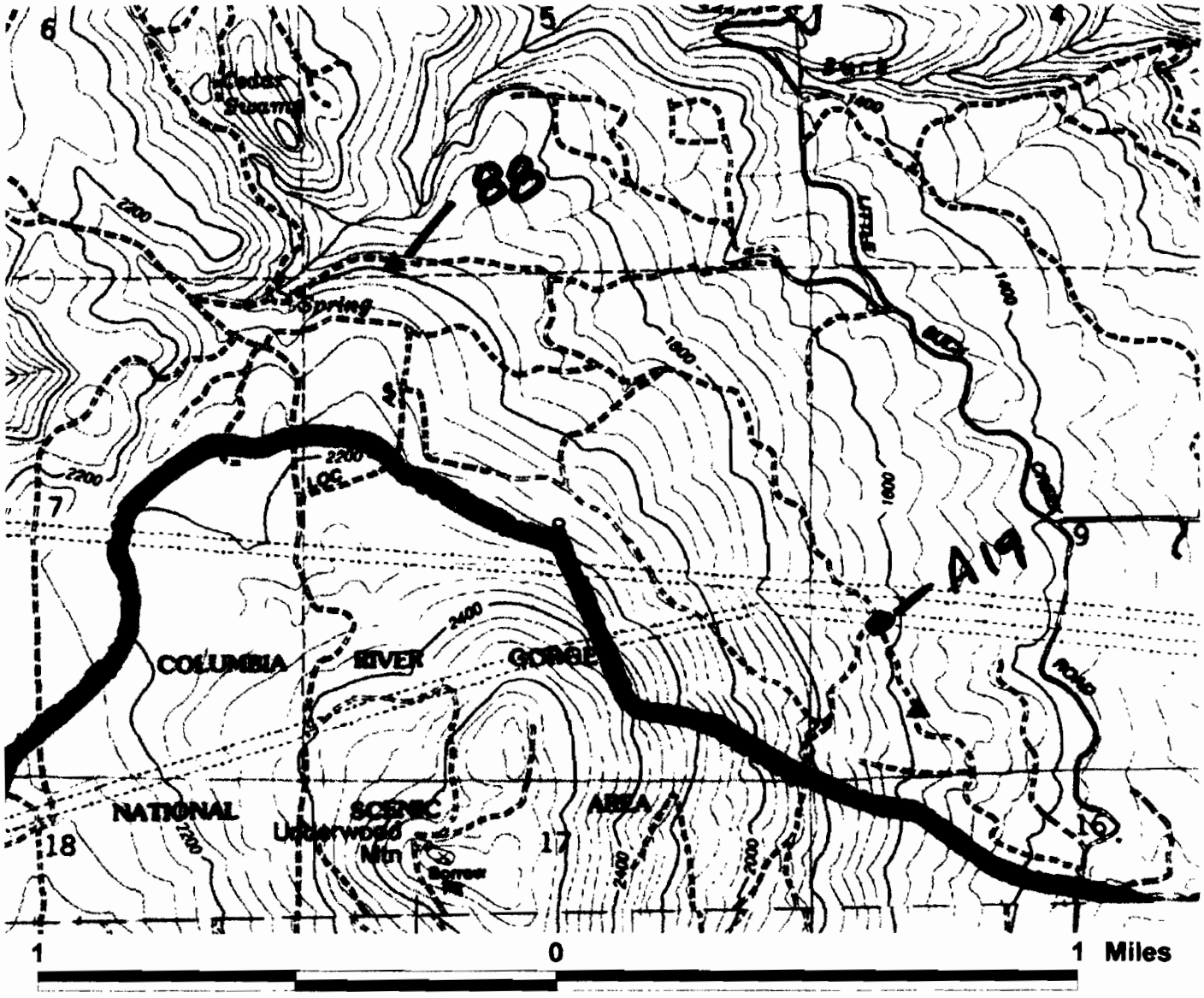
Observers: Victor Muller
Start 1000 End 1730

[2] Western gray squirrels found (number)

[0] Western gray squirrel nest found (number)

Comments (include detailed locations of squirrels and squirrel nests): Visit #1
This was a general survey while conducting goshawk station placement and surveys.
2 adults sighted. 1st adult seen at goshawk station 88 (Map attached)
2nd adult sighted 0.2 mi south of spotted owl calling point A17 (Map attached)

Saddleback Wind Power Project
Western Gray Squirrel Locations



▲ Squirrel Location

TECI GIS LAB

Western Gray Squirrel Data Form

Analysis/Activity Area: PPM/Saddleback
Date 06/16/04
Weather Clear/warm/light wind
Location Description: T4N R10E sec 5,6,7,8
T3N R9E sec 13,14
T3N R10E sec 18
Habitat Type Douglas fir (PSME) forest

Observers: Victor Muller
Start 0930 End 1545

☒ Western gray squirrels found (number) 0

☒ Western gray squirrel nest found (number) 0

Comments (include detailed locations of squirrels and squirrel nests): visit #1
General Survey

Western Gray Squirrel Data Form

Analysis/Activity Area: PPM / Saddleback
Date 06 / 17 / 04
Weather Clear / Warm / light wind
Location Description: T4N R10E sec 5,6,7,8
T3N R9E sec 13,14
T3N R10E sec 18
Habitat Type Douglars Fir (PSME) Forest

Observers: Victor Muller
Start 13:45 End 17 30

☒ 0 Western gray squirrels found (number)

☒ 0 Western gray squirrel nest found (number)

Comments (include detailed locations of squirrels and squirrel nests): Visit #1
General Survey

Western Gray Squirrel Data Form

Analysis/Activity Area: PPM / Saddleback
Date 06/18/04
Weather Clear / Warm / light Wind
Location Description: T4N R10E sec 5,6,7,8
T3N R9E sec 13,14
T3N R10E sec 18
Habitat Type Douglas Fir (PSME) forest

Observers: Victor Muller / Matt Gostin
Start 0900 End 1700

☒ Western gray squirrels found (number) 0

☒ Western gray squirrel nest found (number) 0

Comments (include detailed locations of squirrels and squirrel nests): Visit #1
General Survey

Western Gray Squirrel Data Form

Analysis/Activity Area: PPM/ Saddleback
Date 08/29/04
Weather Clear / warm / wind ~10mph
Location Description: T4N R1DE Sec 5,6,7,8
T3N R9E Sec 13,14
T3N R1DE Sec 18
Habitat Type Douglas fir (PSME) Forest

Observers: Victor Muller / Alex Neerman
Start 0830 End 1900

☒ 0 Western gray squirrels found (number)

☒ 0 Western gray squirrel nest found (number)

Comments (include detailed locations of squirrels and squirrel nests): Visit #2
General Survey

Western Gray Squirrel Data Form

Analysis/Activity Area: PPM / Saddleback
Date 08/30/04
Weather Clear / Warm / Wind ~12mph
Location Description: T4N R10E sec 5,6,7,8
T3N R9E sec 13,24
T3N R10E sec 18
Habitat Type Douglas Fir (PSME) forest

Observers: Victor Muller / Alex Neerman
Start 0710 End 1330

☒ 0 Western gray squirrels found (number)

☒ 0 Western gray squirrel nest found (number)

Comments (include detailed locations of squirrels and squirrel nests): Visit #2
General Survey

Western Gray Squirrel Data Form

Analysis/Activity Area: PPM / Saddleback

Observers: Jeff Reams

Date 08/16/04

Start 1500 End 1700

Weather Clear, Hot

Location Description: T 4N R10E Portions of sec 28, 33, 34

Habitat Type Oregon white oak (QUGA) Young stand with larger remant trees

☒ 0 Western gray squirrels found (number)

☒ 0 Western gray squirrel nest found (number)

Comments (include detailed locations of squirrels and squirrel nests): Visit # 3 (Intensive)

Walked serpentine transect through drainage looking for potential nests. No western gray squirrels or nests were observed. There is good connectivity amongst the oaks, food source seems adequate, and there was a water source down at the bottom of the drainage

Western Gray Squirrel Data Form

Analysis/Activity Area: PPM / Saddleback
Date 08/17/04
Weather Clear, Hot
Location Description: T3N R10E sec 4
NE and NW 1/4s

Observers: Jeff Reams
Start 0600 End 0830

Habitat Type Oregon white oak (QUGA)
Mostly young stand with some widely scattered remant trees

☒ Western gray squirrels found (number) 0

☒ Western gray squirrel nest found (number) 0

Comments (include detailed locations of squirrels and squirrel nests): Visit #3 (Intensive)
Habitat type continued: There was some mixed conifer in the stand with large old-growth trees located at the top of the stand and along some of the finger ridges coming up and through the stand. Big leaf maple (ACMA) was also present and scattered through the stand. Good connectivity throughout the oak stand for squirrels to travel. Water source was present at the bottom of the drainage, saw no apparent water source within the oak stand. Douglas squirrels were present, saw many individuals with at least 30 bract piles present at the bottom of Douglas fir trees (PSME). Also saw black-bear scat and pileated woodpecker in the stand.

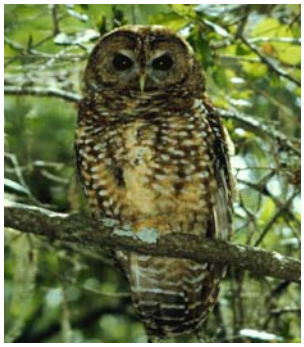
B-4

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

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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

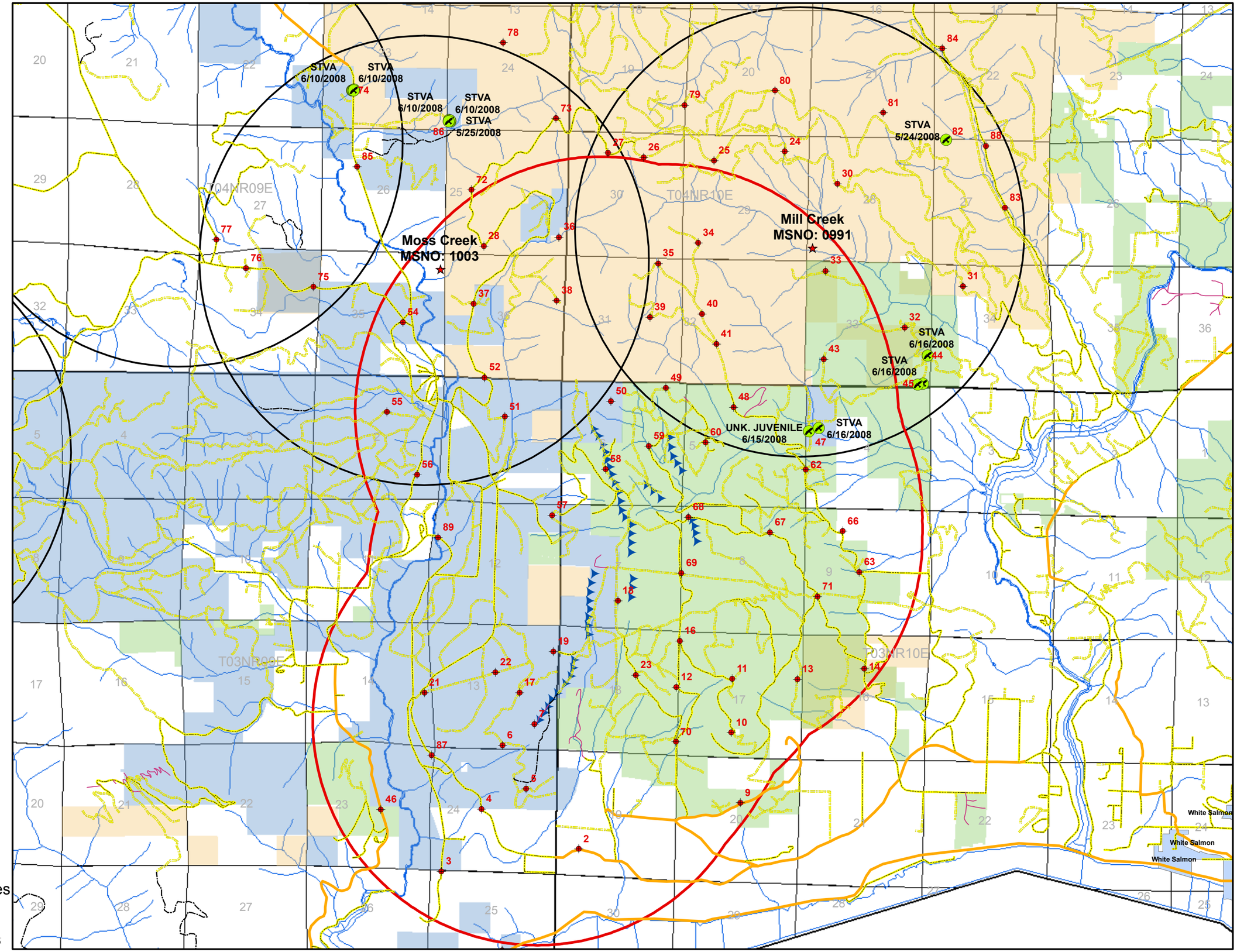
2008 Owl Survey Results

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

Saddleback Mt. Project Area

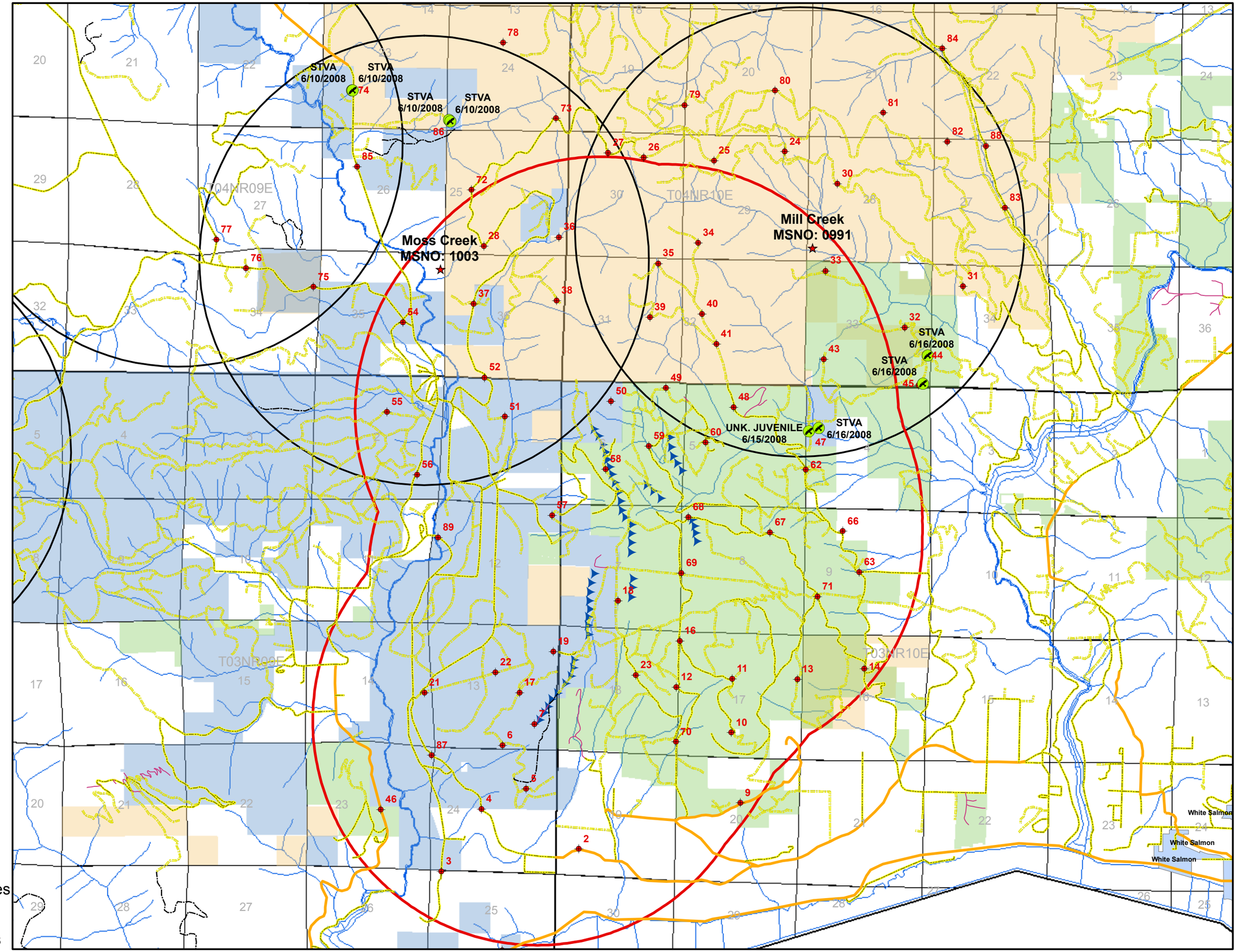
2008 Owl Survey Results

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

0 0.4 0.8 1.6 Miles

Map Created 8/25/2008

Saddleback Mt. Project Area

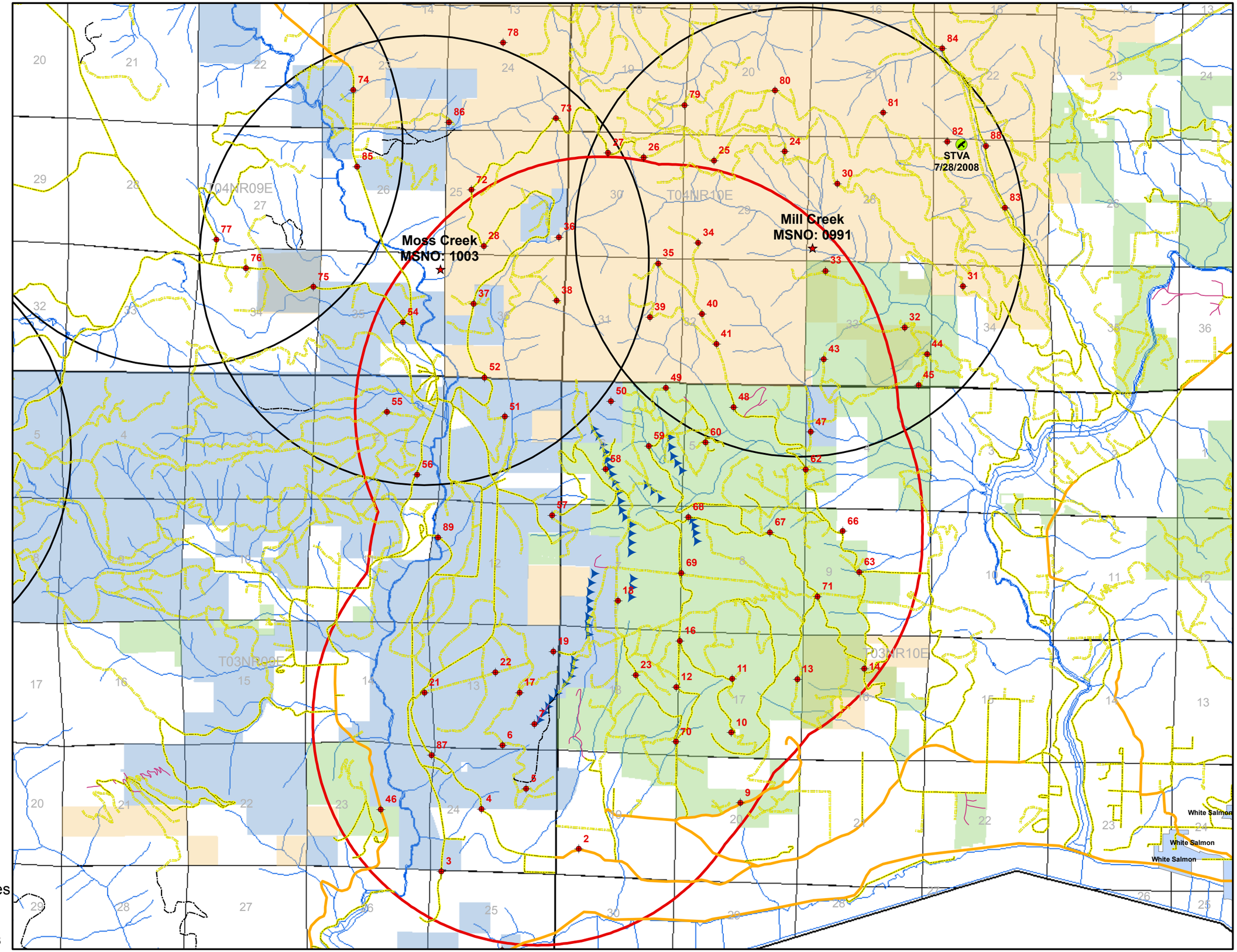
2008 Owl Survey Results

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

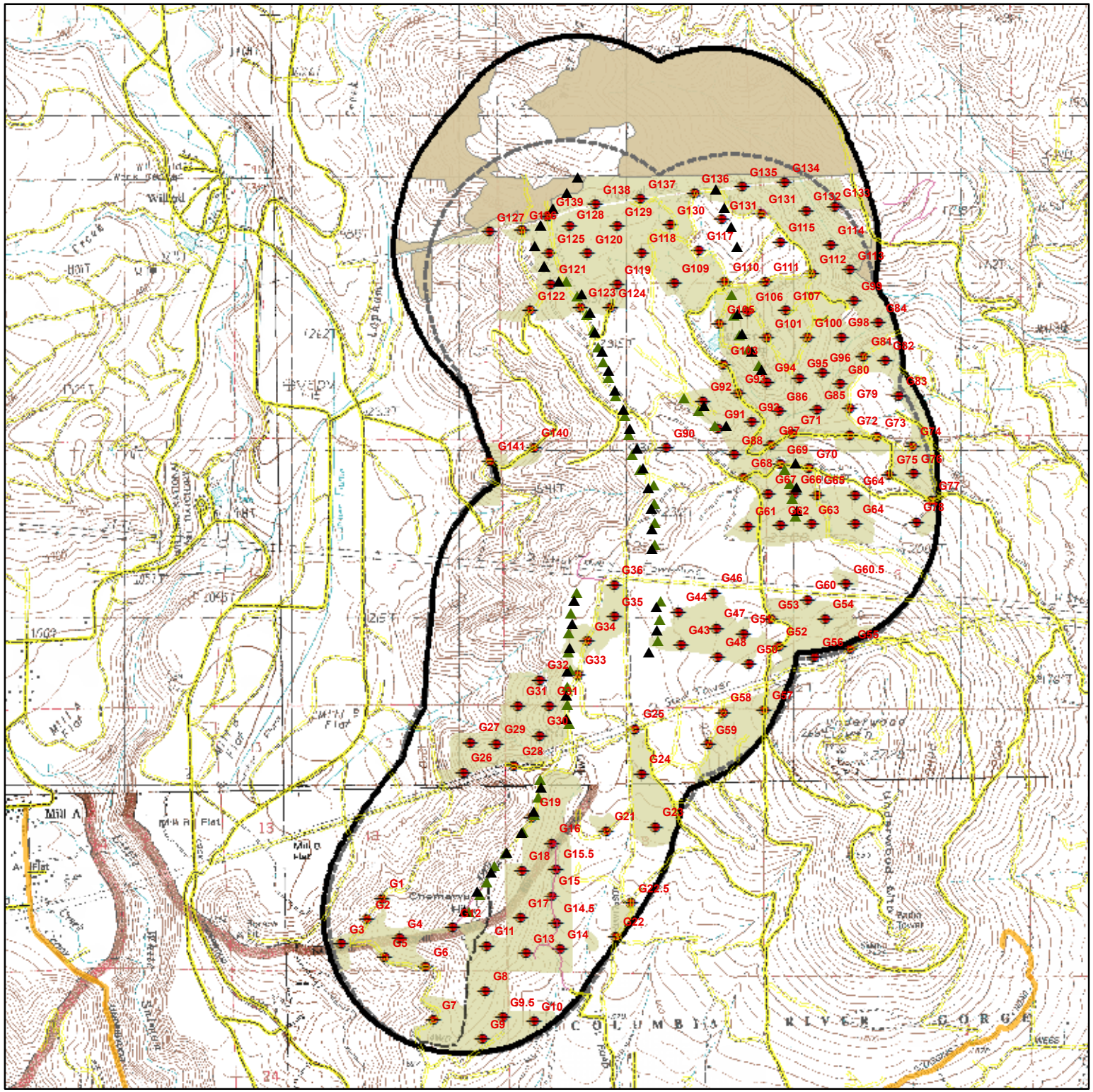
Roads

- 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

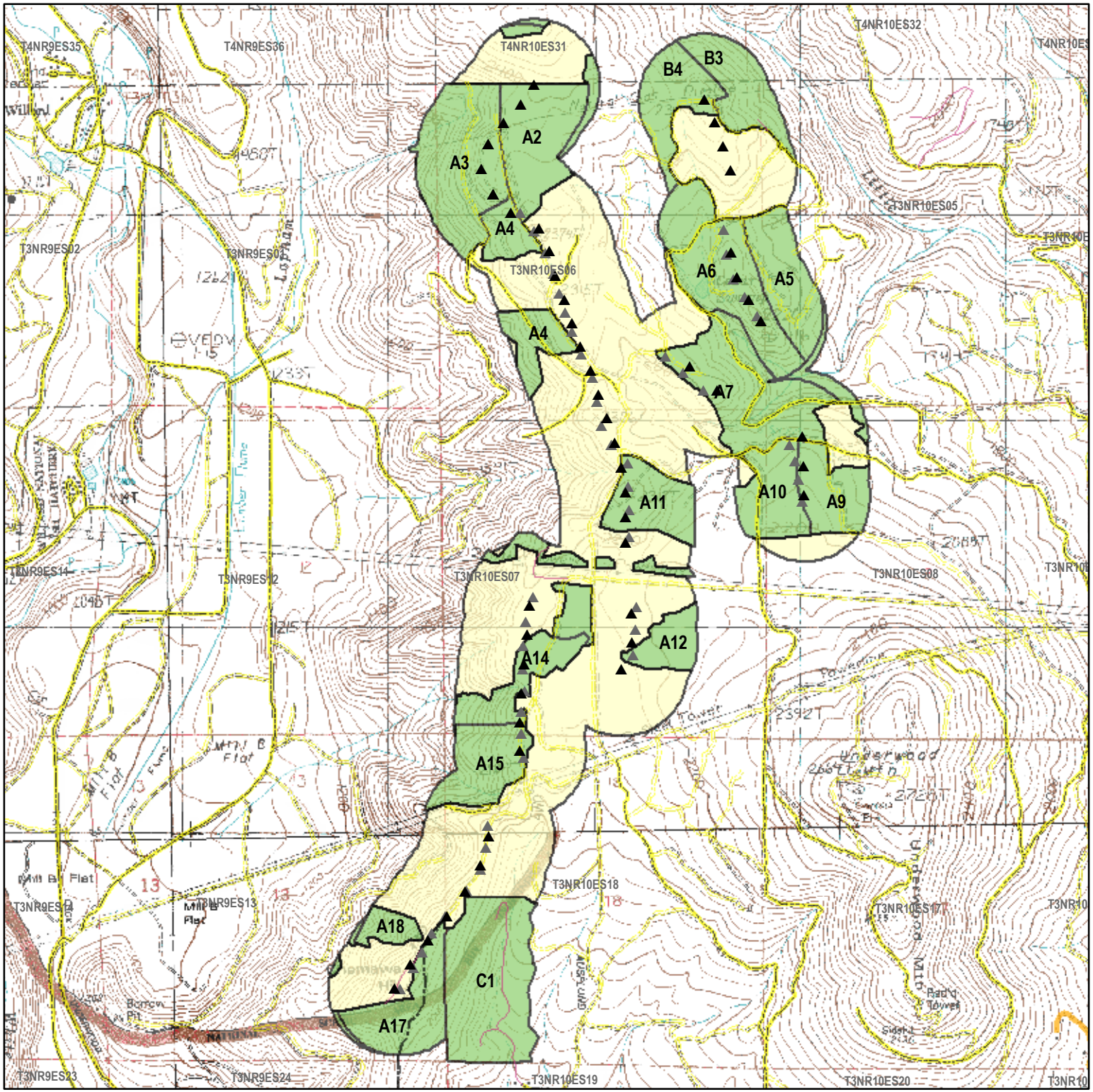
2008 Western Gray Squirrel Survey Areas Overview Map

- 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	Location 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

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
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														
48		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														
18		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	Location ¼	UTMX NAD83-GPS data only	UTMY NAD83-GPS data only
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														
87		2330	2341	1	PC	N														
88		2345	2356	1	PC	N														
63		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														
90		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 Come 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	Location ¼	UTMX NAD83-GPS data only	UTMY NAD83-GPS data only
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:** 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	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	Ø	DR	N														
72		0323	0333	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:** 26, 2008

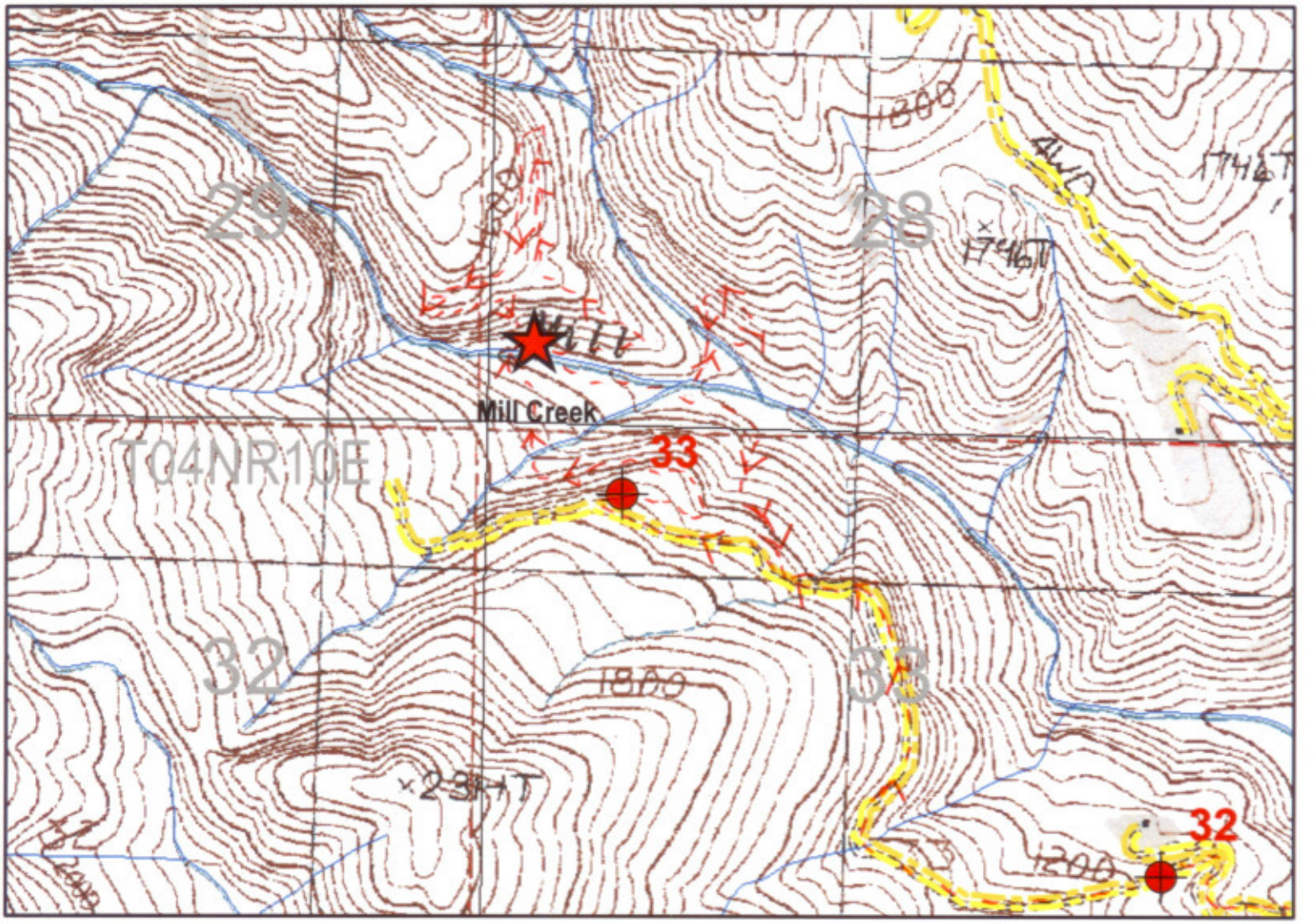
Tape Voice Flute Other: _____ **Block/Area ID:** _____

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	Location ¼	UTMX NAD83-GPS data only	UTMY NAD83-GPS data only
33		2001	2011	1	DR	N														
32		2022	2052	1	DR	N														
34		2121	2131	1	DR	N														
55		2209	2219	2	DR	N														
77		2232	2242	2	DR	N														
89		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:** 5/24/2006 **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:* _____

Observation Location UTM (nad83) Xcoord:_____ **Ycoord:**_____

Please Provide Notes & Description of Events on Reverse

See Comments on Reverse

N

1:12,000

0 375 750 1,500 Feet

- SDS NSO Calling Points
- Other
- HWY
- DIRT
- ROCK
- TRAIL-4WD

TURNSTONE

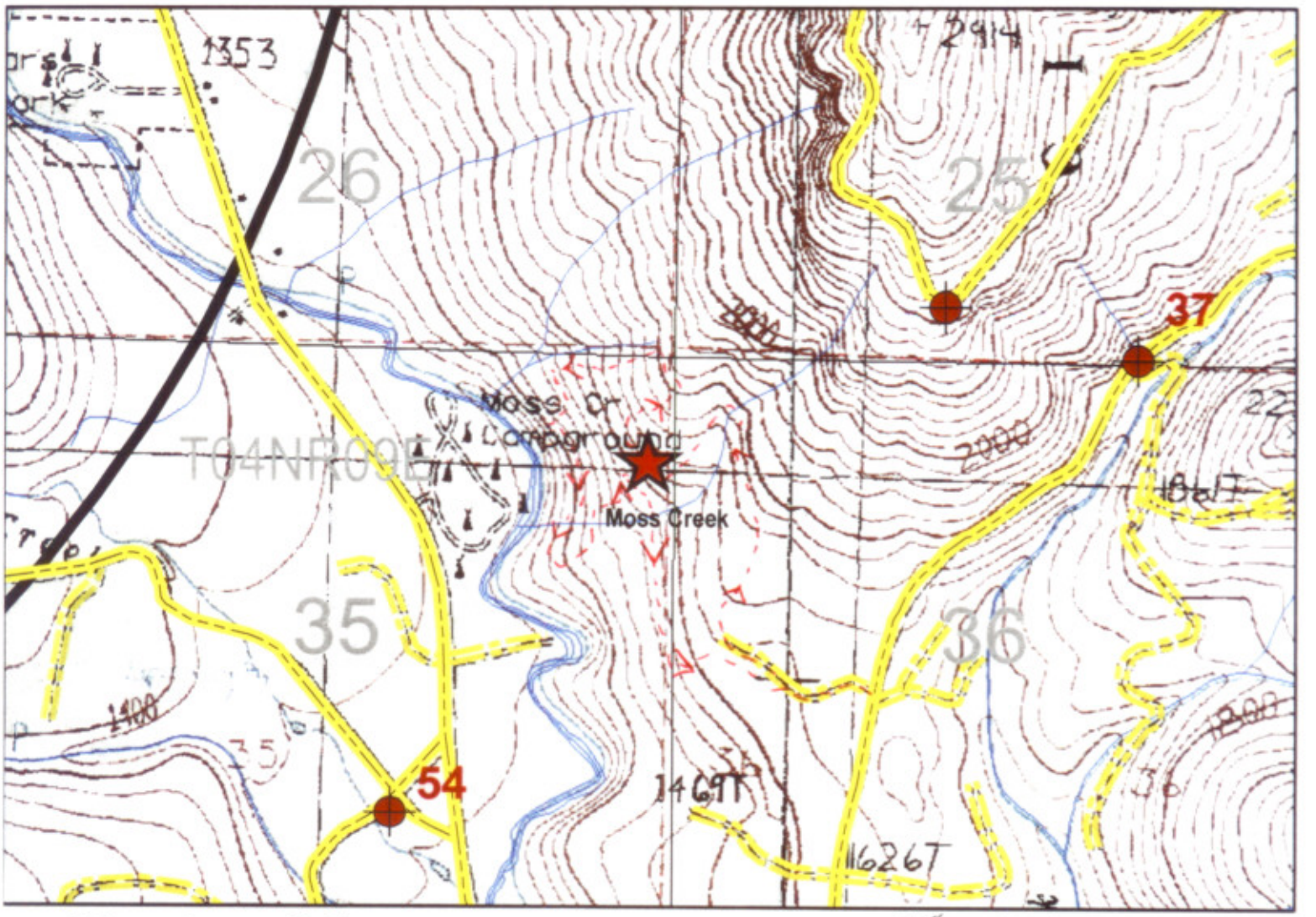
From field notes:

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: 5/25/2006 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

N

1:12,000

0 360 720 1,440 Feet

- SDS NSO Calling Points
- Other
- HWY
- DIRT
- ROCK
- TRAIL-4WD
- Route HIKED

TURNSTONE

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														
73		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 Birds #32
*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: SDS LUMBER **Owl Site(s):** _____ **Visit #** 2

Project Area: SADDLE BACK MT. PROJECT **Crew:** D. SAHL **Month:** Oct **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
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	Location 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		2318	2328	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**

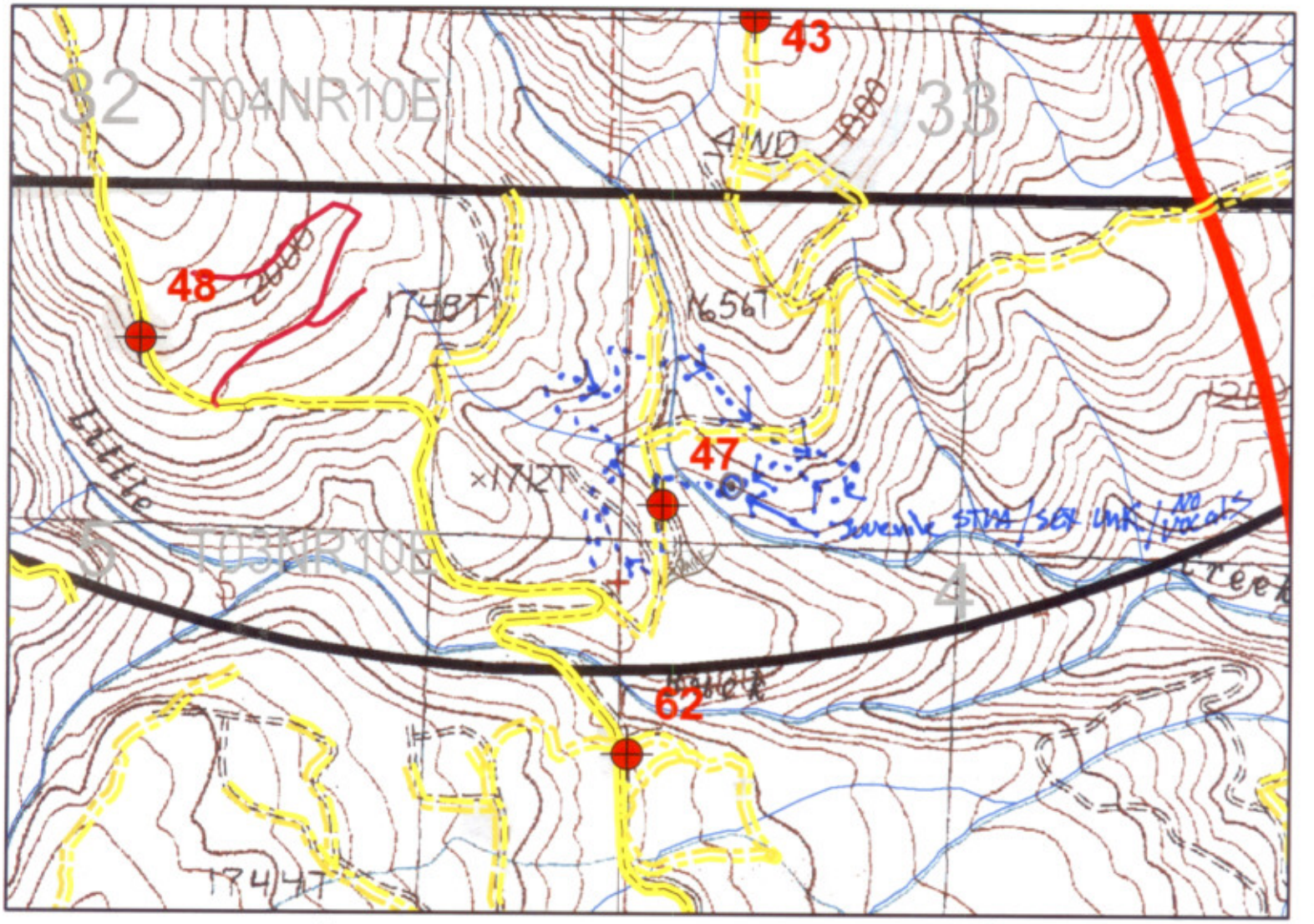
Tape Voice Flute Other: _____ **Block/Area ID:** _____

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	UK	JB	2203	2215	270	150	3N	10E	4	NW		
* 48.5		2223	2233	2	CL	N														
49		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 over of large Bird while driving by, no Response / likely same Bird as #47, likely a Juvenile out of some 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:** 5071821

Please Provide Notes & Description of Events on Reverse

N

1:12,000

0 385 770 1,540 Feet

SDS NSO Calling Points
Other
HWY
DIRT
ROCK
TRAIL-4WD

TURNSTONE

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.

1640 Located Juvenile STUA, 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 STUA or other STRIX.

1830 Left Site, Young STUA 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 STUA's have been observed/documented ~0.95 miles to the NE of where this Juvenile STUA 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/8	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	3+	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 load 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	Location ¼	UTMX NAD83-GPS data only	UTMY NAD83-GPS data only
SH		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

Page 1 of 1 (including maps)

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	Location 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

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	Location 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 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
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:

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	Location 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	Location ¼	UTMX NAD83-GPS data only	UTMY NAD83-GPS data only
19	X	0301	0311	2	CL	N														
19		0319	0389	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[illegible]
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
061208-II									U	A	OSPR	1149	1150	110	20	3N	10E	8	SW	0609710	5065535
061208-III									U	A	RTHA	1216	1217	60	50	3N	10E	8	SW	0609816	5062177
	G46	1409	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															
	G605	1648	1[illegible]	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: Nestling / Fledgling **Calls Used:** Alarm / Wail / Begging

Survey Year: 1st 2nd

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

Turnstone Environmental Consultants
Goshawk Survey Form

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 NAD83-GPS data only
	61	0753	0757	2	CL	0															
	62	0804	0808	2	CL	0															
	63	0817	0821	2	CL	0															
	64	0838	0842	2	CL	0															
	65	0857	0901	2	CL	0															
	66	0914	0918	2	CL	0															
	67	0928	0932	2	CL	0															
	633	1023	1027	2	CL	20															
	634	1038	1042	2	CL	20															
	635	1055	1059	2	CL	20															
	636	1116	1120	3	CL	20															
[illegible] 8-12									U	A	RTHA	1145	1146	56	150m	3N	9E	7	SW	5x' NE of 632	
	632	1156	1200	2	CL	20															
	631	1219	1223	2	CL	20															
	630	1238	1242	2	CL	0															
	631	1300	1304	2	CL	0															
	629	1327	1331	2	CL	20															
	627	1345	1349	1	CL	10															
	626	1407	1411	3	CL	10															
	628	1436	1440	2	CL	5															
	625	1526	1530	3	CL	5															
	624	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

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

Turnstone Environmental Consultants
Goshawk Survey Form

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 NAD83-GPS data only
	G22	0801	0805	1	PC	40															
	G22S	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

		Sta. Time		Wind	Weather	Cloud	Detection	Detection	Sex	Age		Contact Time		Bearing	Dist	Location				UTMX	UTMY
Det._ID	ST#	Begin	End	Code	Code	Cover	Code	Location			Species	Initial	Final	(Azimuth)	(meters)	Town	Range	Sect	¼	NAD83-GPS data only	
	G32	0857	0901	2	PC	50															
	G33	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															
	G110	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: SOS / 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 NAD83-GPS data only
	G79	0740	0744	1	CL	1															
	G85	0801	0805	1	CL	1															
	G86	0821	0825	1	CL	1															
	G94	0845	0849	1	CL	1															
	G95	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															
	G111	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 ISDS **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)	Location Town	Location Range	Location Sect	Location ¼	UTMX NAD83-GPS data only	UTMY NAD83-GPS data only
	G66	1547	1551	2	CL	1															
	G62	1601	1605	2	CL	1															
071508-1				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															
071508-2	1			3	PC	3			U	A	RTHA	1747	1749	80	30	3N	10E	5	SW	0609561	5067[illegible]
	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

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

Turnstone Environmental Consultants
Goshawk Survey Form

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
	690	0856	0900	2	CL	1															
	691	0919	0923	2	CL	1															
	6124	0956	1000	2	CL	1															
	6119	1008	1012	3	CL	1															
	6120	1022	1026	2	CL	1															
	6123	1036	1040	2	CL	1															
	6139	1054	1058	2	CL	1															
	625	1115	1119	1	CL	1															
	626	1145	1149	2	CL	1															
071608 01				2	CL	1			U	I	COHA	1154	1[illegible]2	186	30	3N	10E	6	NJ	1[illegible]	5070029
	622	1210	1214	2	CL	1															
	6[illegible]	1226	1230	3	CL	1															
	628	1241	1245	3	CL	1															
	627	1341	1345	3	CL	1															
	640	1436	1440	2	CL	1															
	641	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

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

		Sta. Time		Wind	Weather	Cloud	Detection	Detection	Sex	Age		Contact Time		Bearing	Dist	Location				UTMX	UTMY
Det._ID	ST#	Begin	End	Code	Code	Cover	Code	Location			Species	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															

band

band 2

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 ISDS **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 NAD83-GPS data only
	G56	1436	1440	3	CL	1															
	G55	1449	1453	4	CL	1															
	G54	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															
073 08021				2	CL	1			U	A	RTHA	1724	1734	80	30	3N	10E	7	NE	06094156	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

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

Turnstone Environmental Consultants
Goshawk Survey Form

Survey Area/Project Area: Hood River / SDS **Crew:** W Beard **Month:** 7 **Day:** 31, **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
	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	TUVU	1018	1019	270	70	3N	10E	5	SW	0610045	5[illegible]9446
	G94	1043	1047	3	CL	1															
	G86	1116	1120	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	0610245	506 2588
	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 ISDS **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	Location ¼	UTMX NAD83-GPS data only	UTMY NAD83-GPS data only
	673	0741	0745	2	DR	6															
	672	0755	0759	2	DR	6															
	671	0835	0839	2	DR	6															
	687	0843	0847	2	DR	6															
	688	0900	0904	2	DR	6															
	690	0920	0924	2	DR	6															
	691	0937	0941	2	DR	6															
	691	0953	0957	2	DR	6															
	692	1016	1020	2	DR	6															
	703	1038	1042	2	DR	6															
	692	1048	1052	2	DR	6															
	636	1130	1134	2	DR	6															
	635	1144	1148	2	DR	6															
	631	1219	1223	2	DR	6															
	633	1226	1230	2	DR	6															
	632	1246	1250	2	DR	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 NAD83-GPS data only
	G25	0920	0924	1	CL	1															
	G26	0946	0950	1	CL	1															
	G27	1002	1006	1	CL	1															
	G29	1017	1021	1	CL	1															
	G31	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															
080408001				1	CL	1			U	A	RTHA	1410	1410	350	100	3N	9E	18	NW	0609752	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 1702
Intensive Nest Search Time: Start — End —
Temperature (°F): Begin 76 End 86

Turnstone Environmental Consultants
Goshawk Survey Form

Survey Area/Project Area: Hood River 1505 **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
	619	0858	0902	3	CL	1															
	618	0920	0924	1	CL	1															
	616	0937	0941	2	CL	1															
	615.5	0950	0954	1	CL	1															
	615	1004	1008	1	CL	1															
	614.5	1018	1022	1	CL	1															
	614	1037	1041	1	CL	1															
	613	1052	1056	1	CL	1															
	617	1111	1115	2	CL	1															
	611	1132	1137	2	CL	1															
	608	1151	1155	2	CL	1															
	605	1205	1209	2	CL	1															
	610	1220	1224	2	CL	1															
	609	1245	1246	2	CL	1															
[illegible] 01				2	CL	1			U	U	SSHA	1259	1259	300	40	3N	9E	13	SE	0607934	5065[illegible]
	612	1332	1337	1	CL	1															
[illegible] 02				1	CL	1			U	U	TUVU	1404	1404	60	200	3N	10E	17	NW	0609901	5066[illegible]
	611	1448	1452	1	CL	1															
	612	1501	1505	1	CL	1															
	607.5	1518	1522	2	CL	1															
	600	1532	1537	2	CL	1															
	607	1550	1554	1	CL	1															
	601	1604	1608	1	CL	1															
	606	1610	1614	1	CL	1															
	605	1639	1643	1	CL	1															

TUVU

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

605.5 1646 1650 1 CL 1

[illegible] 1612 1[illegible] 1 CL 1

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

Survey Year: 1st 2nd

Survey Time: Start 0902 End 1503
Intensive Nest Search Time: Start — End —
Temperature (°F): Begin 75 End 78

Turnstone Environmental Consultants
Goshawk Survey Form

Survey Area/Project Area: Hood River / SDS **Crew:** W. Beard **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	Location ¼	UTMX NAD83-GPS data only	UTMY NAD83-GPS data only
	6115	0902	0906	1	OC	5															
	6131	0912	0916	1	OC	5															
	6135	0930	0934	1	OC	6															
	6134	0945	0949	1	OC	6															
	6132	1005	1009	2	OC	6															
	6133	1032	1036	1	OC	5															
	6114	1056	1100	1	OC	6															
	6113	1119	1123	1	OC	6															
	6109	1216	1220	1	OC	6															
	6117	1230	1234	2	DR	6															
	6116	1250	1254	1	DR	6															
	6[illegible]	1306	1310	1	DR	6															
	6130	1323	1327	2	RN	6															
	6129	1345	1349	1	OC	6															
	6138	1402	1406	1	OC	6															
	6139	1417	1421	1	OC	6															
	6128	1529	1533	1	OC	6															
	6120	1543	1547	2	OC	6															
	6118	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 68 End 74

Turnstone Environmental Consultants
Goshawk Survey Form

Survey Area/Project Area: Hood River 150S **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

		Sta. Time		Wind	Weather	Cloud	Detection	Detection	Sex	Age		Contact Time		Bearing	Dist	Location				UTMX	UTMY
Det._ID	ST#	Begin	End	Code	Code	Cover	Code	Location			Species	Initial	Final	(Azimuth)	(meters)	Town	Range	Sect	¼	NAD83-GPS data only	
	940	0930	0934	1	OC	5															
	941	0941	0945	1	OC	5															
	922	1013	1017	1	OC	5															
	926	1029	1033	1	OC	5															
	927	1048	1052	2	PC	4															
	925	1131	1135	1	OC	6															
	921	1144	1148	1	OC	6															
	923	1159	1203	2	OC	5															
	919	1213	1217	2	OC	5															
	924	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.

B-5

Final Baseline Avian use of the Saddleback Wind Energy Project, Skamania County, Washington, Fall Migration 2004. Prepared for CH2M HILL.

WEST, Inc and Northwest Wildlife Consultants, Inc. 2005

FINAL REPORT

Baseline Avian use of the Saddleback Wind Energy Project
Skamania County, Washington

Fall Migration 2004

Prepared for:

CH2M Hill

Prepared by:

Greg Johnson

WEST Inc.
2003 Central Avenue
Cheyenne, WY

&
Karen Kronner
Bob Gritski

Northwest Wildlife Consultants
Goldendale, WA

March 3, 2005

INTRODUCTION AND BACKGROUND

Wind energy is one of the fastest growing sources of "green" energy in the U.S. However, wind plants can have negative effects on wildlife. Although studies have shown both the direct and indirect effects on wildlife by most wind farms to be minimal, state wildlife agencies, the U.S. Fish and Wildlife Service and environmental organizations have shown concern over the potential effects of wind farms on wildlife. The U.S. Fish and Wildlife Service is charged with enforcing the Endangered Species Act, The Bald and Golden Eagle Protection Act, and the Migratory Bird Treaty Act, and is concerned about impacts to migratory birds and listed species (candidate, proposed, threatened, or endangered).

PPM Energy is currently considering a site for potential wind power development in Skamania County, Washington (Figure 1). Substantial baseline data have previously been collected at this site, including habitat mapping, late spring/early summer avian use surveys, rare plant surveys, and targeted surveys for other species of concern including spotted owl and northern goshawk. This supplemental report provides results of avian use surveys of the project area conducted from September through October 2004, during the Fall 2004 migration season. The primary purpose of the study was to obtain data on raptor use of the site during fall migration; however, all bird species observed during surveys were recorded. The protocol for the fall avian baseline study is similar to protocols used at numerous other wind power developments throughout the Pacific Northwest as well as the U.S.

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

The principal goals of the avian baseline study were to quantitatively describe the temporal and spatial use by birds of the study area during the fall migration using diurnal point count surveys and to determine how diurnal indices of avian use of the study area compare to other windplant sites that have been studied in North America. Circular plots were surveyed on the project area using the method described by Reynolds et al. (1980). Six survey points were selected to achieve good coverage of the project site (Figure 1). Because of the close proximity of points to each other, the variability of our estimates of avian use and other endpoints were based on survey to survey variability (i.e., temporal).

Each plot was an approximate 800-m radius circle centered on an observation point. Landmarks were located to identify the 800-m boundary of each observation point. Observations of birds beyond the 800-m radius were recorded, but were analyzed separately from data within the plot. All sightings of birds in and near plots during the 20-minute plot surveys were recorded. A unique observation number was assigned to each sighting. Weather information such as temperature, wind speed, wind direction, and cloud cover was collected for each survey point. The date, start and end time of observation period, plot number, species, number of individuals, sex and age class, distance from plot center when first

observed, closest distance, altitude above ground, activity, and habitat(s) were recorded.

Behavior categories recognized include perched, soaring, flapping, flushed, circle soaring, hunting, gliding, and other. Initial flight patterns and habitats were circled on the data sheet and subsequent patterns, and habitats (if any) recorded as "x". For example, if a raptor was first sighted while perched, and then left its perch and flew out of the study area, then a 1 was written in the box next to perching, and an x was written in the box for flapping. The flight direction in which the bird headed was recorded. Perched birds were also recorded. Flight altitude at first observation was recorded to the nearest meter and any other altitude categories traversed by the bird were marked. Altitude categories correspond to the height below, within, and above the space occupied by turbine blades. Flight heights and distances to the nearest meter were also recorded if the bird was observed during an instantaneous count. Any comments or unusual observations were recorded in the comment section of the data form. Locations of raptors, other large birds, and any species of concern seen in each instantaneous count were recorded on the field maps by observation number. Locations of raptors, other large birds and any species of concern detected between instantaneous counts were coded as such and were also recorded on field maps with unique observation numbers.

Observation Schedule

All 6 survey plots in the study area were scheduled to be surveyed one time per week. Weekly surveys were conducted from September 11 through November 4, 2004. Visual observations were made so as to cover all daylight hours. During a set of surveys, each selected plot was visited once. Surveys took place during daylight hours. Observation days were divided into two periods, morning (6-12) and afternoon (12-6), with each station surveyed for 20 minutes. A pre-established schedule was developed by the study team leader prior to field work to ensure that each station was surveyed about the same number of times each period of the day during each season and to efficiently utilize personnel time. The proposed schedule was subject to change in response to adverse weather conditions that required delays and/or rescheduling of observations.

Statistical Analysis and Report Products

The number of raptors and other species seen during each point count survey were standardized to a unit area and unit time searched. For example, if 4 raptors were seen during the 20 minutes at a point with a viewing area of 2.01 km^2, these data were standardized to 4/2.01 = 1.98 raptors/km^2 in a 20-minute survey. Data were plotted to illustrate differences in raptor and other bird use between stations. Mean values and 90% confidence intervals were reported. Comparisons of bird use indices were made between the Saddleback site and other wind resource areas to aid in projecting potential impacts from this project.

A relative index to collision risk (R) was calculated for bird species observed in the project area using the following formula:

$$R = A*P_f*P_t$$

Where A = mean use for species i averaged across all surveys, P_f = 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 = proportion of all flight height observations of species i within the rotor-swept height (RSH). This index does not account for differences in behavior other than flight characteristics (i.e., flight heights and proportion of time spent flying).

Data Compilation, Storage, and Quality Assurance/Quality Control (QA/QC)

A database was established to store, retrieve and organize field observations. Data from field forms were keyed into electronic data files using a pre-defined format that made subsequent data analysis straightforward. All field data forms, field notebooks, and electronic data files were retained for ready reference. QA/QC measures were implemented at all stages of the study, including field data collection, data entry, data analysis, and report preparation. At the end of each survey day, each observer was responsible for inspecting his or her data forms for completeness, accuracy, and legibility. The study team leader periodically reviewed data forms to insure completeness and legibility, and any problems detected were corrected. Any changes made to the data forms were initialed and dated by the person making the change. Data were entered into electronic files and printouts of the data were compared to the original data sheets. Any irregular codes detected, or any data suspected as questionable, were discussed with the observer and study team leader. All changes made to the raw data were documented for future reference.

RESULTS

Species Abundance and Composition

Thirty-nine species of birds were observed during 53 point count surveys over 9 visits to the project site (Table 1). Over the course of the study, 238 groups comprised of 763 individual birds were recorded. The number of birds observed by species used to obtain use and composition estimates are presented in Appendix A. Avian richness (defined as number of species per survey) was 4.0 (Table 1). The mean number of birds observed per survey of each plot was 14.3 (Table 1).

Passerines (songbirds) were the most abundant group (12.5/survey), followed by raptors (0.71), doves/pigeons (0.54), and other birds (swifts and woodpeckers; 0.54/survey) (Table 2). Passerines comprised 87.4% of all birds observed, raptors comprised 4.9%, and doves/pigeons comprised 3.8%. The most frequently occurring groups observed, regardless of the number observed, were passerines (94.4% of surveys), raptors (38.5%), other birds (26.7%), and doves/pigeons (9.3%). Species with the highest use of the project area were all passerines and included dark-eyed junco (2.19/survey), American goldfinch (1.72), Steller's jay (1.42), common raven (1.12), and white-crowned sparrow (1.07) (Table 3 and 4). Eight species of raptor were observed during the survey. Those with the highest use of the site were sharp-shinned hawk (0.13/survey), Cooper's hawk (0.12), and red-tailed hawk (0.12) (Table 4). The species of birds most frequently observed during fall surveys were common raven (48.9% of surveys), Steller's jay (47.0%), dark-eyed junco (41.5%), red-breasted nuthatch (20.4%), and golden-crowned kinglet (19.3%) (Table 3 and 4).

Flight Behavior

During the study, 124 flocks comprised of 519 birds were observed flying during point count surveys (Table 4). Mean flight height for all species combined was 40.6 m. For avian groups with at least 5 observations of flying flocks, mean flight height was lowest for passerines (29.9 m). Highest mean flight heights were recorded for buteos (128.9 m) and accipiters (50.2 m). For all raptors combined, mean flight height was 84.0 m (Table 5).

For all species combined, 54.1% of all flying birds observed were below the rotor-swept height (<25 m), 43.0% were within the rotor-swept height (25 – 125 m), and 2.9% were above the rotor-swept

height (>125 m) (Table 4). For groups with at least 5 observations of flying flocks, those most often observed flying within the turbine rotor-swept height were accipiters (66.7%), passerines (42.0%), and buteos (27.3%). For all flying raptors combined, 51.6% were observed flying within the rotor-swept height. For species with at least 5 observations of flying flocks, those most often observed at rotor-swept heights were common raven (71.8%), Steller's jay (64.4%), red-tailed hawk (60.0%), Cooper's hawk (40.0%) and American goldfinch (32.6%) (Table 6).

Turbine Exposure Index

Based on the exposure index derived from abundance, how often each species is observed in the project area, and flight behavior, the species most likely to collide with turbines are Steller's jay (index = 0.71), American goldfinch (0.56), red crossbill (0.56), common raven (0.53), and western bluebird (0.44). The highest index for any raptor was 0.07 for sharp-shinned hawk, indicating a risk 10 times lower than Steller's jay (Table 6). This analysis may provide insight into what species might be the most likely turbine casualties. However, this index only considers relative probability of exposure based on abundance, proportion of daily activity budget spent flying, and flight height of each species. This analysis is based on observations of birds during the daylight period and does not take into consideration flight behavior or abundance of nocturnal migrants. It also does not take into consideration varying ability among species to detect and avoid turbines, habitat selection and other factors that may influence exposure to turbine collision; therefore, the actual risk may be lower or higher than indicated by these data. For example, in the Altamont Pass WRA in California, mortality among the five most common species was not related to their abundance. American kestrels, red-tailed hawks, and golden eagles were killed more often, and turkey vultures and common ravens were killed less often than predicted based on abundance (Orloff and Flannery 1992). Similarly, at the Tehachapi Pass WRA in California, common ravens were found to be the most common large bird in the WRA, yet no fatalities for this species were documented during intensive studies (Anderson *et al.* 1996).

Temporal and Spatial Use

The highest raptor use of the site occurred between September 11 and October 12, 2004, when it averaged 1.0/survey (Figure 2). The peak use (1.67/survey) occurred on October 7, 2004. During the last two weeks of October, raptor use averaged only 0.17/plot. No raptors were observed during the last survey conducted on November 4, 2004. Use of the project area by all birds (primarily passerines) increased from the start of the surveys on September 11, 2004 (11.2/survey) until reaching a peak of 37.7/survey on September 27, 2004. Use by all birds than gradually declined to 4.5/survey on November 4, 2004 (Figure 2).

No raptors were observed on Plot F (Figure 1) during the study; however, this plot had the lowest visibility of the 6 plots surveyed. The highest use by raptors (1.11/survey) occurred at Plot A, which was located along a powerline right-of-way in the eastern portion of the project area. Use among the other four plots was fairly consistent, ranging from 0.44–0.89/survey (Figure 3). The available data do not indicate any portions of the project area have substantially higher raptor use than other areas.

For all birds combined, Plot A had the lowest use (3.8/survey). Highest use occurred at Plot C (21.7/survey) and Plot D (23.8/survey), both of which were located along the ridgetop on the western end of the project area.

Sensitive Avian Species

No species classified as endangered or threatened by the U.S. FWS or WDFW were observed during the study. Four species classified as candidate species by the WDFW were observed in the project area, including golden eagle, northern goshawk, pileated woodpecker, and Vaux's swift (Table 7). Point count observations consisted of 2 single golden eagles, 2 single northern goshawks, 6 single pileated woodpeckers, and 3 groups totaling 15 Vaux's swifts. Two State Monitor species were also observed, including 4 single turkey vultures and 4 groups totaling 27 western bluebirds. Overall use of the project area by WDFW candidate species was relatively low given that so few individuals were observed over 18 hours of survey effort. Therefore, significant impacts to these species are unlikely. Western bluebirds were one of the more common birds on the study area, and those present tended to fly often at turbine rotor-swept height (89% of the time). Erickson et al. (2001) summarized all available wind farm mortality data for the entire U.S. Of 1036 avian fatalities collected at U.S. wind farms, 6 bluebirds have been found, including 4 of 613 birds found at Altamont Pass, California and 2 of 96 birds found at Foote Creek Rim, Wyoming. These data indicate that although bluebird fatalities do occur at wind farms, collisions are very rare and it is unlikely the Saddleback Project would have any negative impacts on bluebird populations in the area.

DISCUSSION

Use of the Saddleback area in the Fall of 2004 by all birds (14.3/survey) was higher than that observed in the spring (7.8) and summer (11.5) of 2002 at the two points on the Saddleback project surveyed as part of the Klickitat County Energy Overlay Zone EIS (Johnson et al. 2003). Avian use of wind resource areas is generally highest in the fall, presumable due to recruitment of new birds into the population after the breeding season. Use of the Saddleback Project by raptors in the fall (0.71/survey) was also somewhat higher than that observed in the spring and summer of 2002 (0.50/survey both seasons). Our data suggest that the Saddleback project area is not a major raptor migration corridor, at least in relation to other WRAs studied in eastern Washington and Oregon (Table 8). Fall raptor use data collected using similar protocols are available for 11 other WRAs in eastern Oregon and Washington. Mean use in the spring (0.51/survey) and summer (0.53/survey) at these 11 sites is very similar to use observed at the Saddleback Site. In the Fall, mean use at the other 11 WRAs ranged from 0.16/survey at Nine Canyon to 0.81/survey at the CARES site in the Columbia Hills of Klickitat County, Washington, and averaged 0.48/survey. Therefore, raptor use of the Saddleback area in fall is approximately 1.5 times higher than mean fall use at the other WRAs.

Wind plant design has changed significantly since the first large wind plants were developed in California; many of these changes have appeared to reduce risk to birds. Turbines are now typically installed on tubular steel towers instead of lattice towers and without open platforms at the top of the tower, eliminating perching opportunities for raptors and other birds. No observations have been made of raptors perched on the new turbine types during studies at Foote Creek Rim (WY) (Johnson *et al.* 2000a), Buffalo Ridge (MN) (Johnson *et al.* 2000b), Vansycle (OR) (Erickson *et al.* 2000a) and Stateline (OR/WA) (Jeffrey and Kronner 2002, pers. comm.). The nacelle, which houses the generator, drive train and gearbox on top of the tower, is typically completely enclosed. Electrical lines between turbines and from the turbine strings to substations in new-generation wind plants are often buried underground to eliminate perching opportunities, collisions with wires, and electrocutions. Collisions with wires and electrocutions have been a common source of mortality at Altamont Pass (CA) (Orloff and Flannery 1992) and other older wind projects. Most electrical lines are buried in new wind plants and the necessary overhead lines have often been designed to be raptor safe and anti-perching devices

are often installed (e.g., Stateline [OR/WA] ad Nine Canyon [WA] wind farms). Turbines are much larger, with blades moving at slower revolutions per minute (rpm) and are therefore presumably more visible than blades on the smaller older turbines. For example, the blades of the 1.5 MW turbines commonly installed at new-generation wind farms turn at approximately 20 rpm's, contrasted to greater than 60 rpm's for the Kenetech 56-100 downwind turbine, the most common turbine at the Altamont Pass (CA) wind plant. Blade tip speeds of both large and small turbines are still fast (often 150+ mph). Studies by Howell (1997) and Hunt (2002) provide some evidence indicating the Kenetech 56-100 turbines (100 kW, 9 m blades) have a higher associated raptor mortality rate than other turbine types, including larger turbines. Hunt (2002) attributes the higher risk in part to the blade proximity to the ground and the low altitude foraging behavior of golden eagles. The 56-100 model is a downwind turbine, with the blades on the downwind side of the nacelle, which some researchers believe may also increase risk of collision of birds that perch on the turbine. Birds perched on this downwind turbine may be blown towards the blades when leaving the perch. Most newer-generation turbines, including those proposed for this Project, are upwind turbines.

In addition to changes in technology, significant effort has been devoted to developing standardized methods for siting wind plants (NWCC 1999), monitoring for avian impacts associated with the wind plants (Anderson *et al.* 1999, Erickson *et al.* 2000b), and developing measures to mitigate impacts (Johnson *et al.* in press). Primarily due to the avian collision concerns and through the development of siting and monitoring guidelines, baseline avian use, raptor nesting and operational monitoring data (Erickson *et al.* 2001a) have been collected at many of the new developments outside California. These data have been used to predict wind project impacts on wildlife and habitats, and in some cases, for siting individual wind turbines at a particular site. This large and significant source of information has greatly improved our ability to predict impacts for new projects and to aid in wind plant/wind turbine siting. Raptor mortality at these new wind projects has been absent or low in virtually all cases. Intensive monitoring programs in place at newly constructed wind projects such as the Stateline project (OR/WA), the Nine Canyon (WA) project, the Buffalo Mountain (TN) project, and the Backbone Mountain (WV) project continue to add to the already available information for other new wind projects.

Substantial data on avian mortality at windplants are currently available. Of 841 avian fatalities reported from California studies (>70% from Altamont Pass, CA), 39% were diurnal raptors, 19% were passerines (excluding house sparrows and European starlings), and 12% were owls. Non-protected birds including house sparrows, European starlings, and rock doves comprised 15% of the fatalities. Other avian groups generally made up <10% of the fatalities. Outside of California, diurnal raptor fatalities comprised only 2% of the wind plant-related fatalities. Passerines (excluding house sparrows and European starlings) were the most common collision victims, comprising 82% of the 225 fatalities documented. No other group (e.g., raptors, waterfowl) comprised more than 5% of the fatalities.

Avian mortality in the Altamont Pass Wind Resource Area (APWRA) has been documented since the mid 1980s (Smallwood and Thelander 2004). The most recent studies conducted within the APWRA estimate between 1,766 and 4,721 birds are killed by collision with the 5400 wind turbines annually within the APWRA, with between 881 and 1,300 fatalities being raptors. These estimates translate to 1.5 to 2.2 raptor fatalities/MW/year, and 3.0 to 8.1 bird fatalities/MW/year. Over 40 different bird species are represented in the fatalities. Raptor species estimates include 75 to 116 golden eagles, 209 to 300 red-tailed hawks, 73 to 333 American kestrels, and 99 to 380 burrowing owls.

Studies at newer generation wind plants (turbines on tubular towers with 33-meter rotor diameters and

larger) have typically suggested relatively low raptor mortality (0 to 0.07 per MW per year), and fatality rates for all bird species have ranged from 0 to 10 birds per MW per year (Erickson et al. 2001, Erickson et al. 2002). Overall raptor use is measurably lower at the sites reported in Erickson et al. (2001) and Erickson et al. (2002) than in the APWRA. This much lower raptor activity level may be the best explanation for the lower raptor fatalities at Tehachapi Pass and San Gorgonio wind farms, as well as at some of the newer wind turbine sites outside California when compared to the APWRA. However, an ongoing study at the new High Winds Wind Project in the Montezuma Hills of Solano County, a 162 MW facility consisting of 90 1.8-MW turbines, reported 99 bird fatalities during its first 11 months of operation, including 32 American kestrels, 10 red-tailed hawks, 2 white-tailed kites, 1 ferruginous hawk, and 1 golden eagle. Raptor mortality estimates unadjusted for scavenging, carcass searcher efficiency, and other biases are approximately 0.3/MW/year. Estimates of raptor use from previous studies (Howell and Noone 1992, Orloff and Flannery 1992, Howell and DiDonato 1991) in Solano County ranged between 2 to 3 raptors per 10 minute count, while studies at Altamont indicated raptor use of 1 to 2 raptors per 10 minute count (Orloff and Flannery 1992). More recent studies in the adjacent High Winds Wind Project (Kerlinger et al. 2001) also suggested a higher raptor estimated use than in the Altamont. Much of the difference in raptor use in the Montezuma Hills can be attributed to apparently higher abundance of red-tailed hawks, American kestrels and turkey vultures. Red-tailed hawks and American kestrels are common fatalities observed at wind plants (Smallwood and Thelander 2004; Erickson et al. 2001; Erickson et al. 2002), while turkey vultures do not appear very susceptible to collision (Orloff and Flannery 1992).

With the exception of the Solano County site, the available information regarding wind turbine design and wind plant/wind turbine siting strongly suggests that the level of raptor mortality observed at Altamont Pass is quite unique (e.g., unique in the number and arrangement of turbines in a small area, turbine types, prey availability, raptor use), and may be avoided at other locations. Raptor use (e.g., golden eagle use) may be a predictor of raptor risk (e.g., likelihood of mortality) when comparing several sites and when comparing different areas within a site. However, low raptor mortality at most new generation wind plants has resulted in low correlation between use and fatality rates at these new projects. It is possible that the new turbine designs reduce risk to raptors, and the combinations of new designs and turbine and wind plant siting decisions made based on avian use patterns or patterns observed at other projects have resulted in reduced avian mortality. However, this has not been experimentally tested.

For all avian species combined, estimates of the number of bird fatalities per turbine per year from individual studies have ranged from 0 at the Searsburg, Vermont (Kerlinger 1997) and Algona, Iowa sites (Demastes and Trainer 2000) to 7.7 at the Buffalo Mountain (TN) site (Nicholson 2003). Using updated mortality from wind farms throughout the entire U.S., the average number of avian collision fatalities is 3.1 per megawatt per year.

Raptor mortality for this Project is expected to be low given the relatively few turbines, moderate raptor use of the site, and the low raptor mortality observed at other new wind plants in the Pacific Northwest. Raptor fatality estimates are available for four wind plants recently constructed in the Pacific Northwest, including the Klondike and Vansycle Projects in Oregon, the Stateline Project on the Oregon/Washington border, and the Nine Canyon Project in Washington. Raptor mortality was not documented at two of these wind plants (Klondike and Vansycle) and was very low at the other two (i.e., 0.07/turbine/year at Nine Canyon and 0.05/turbine/year at Stateline). Yearlong raptor use of the Saddleback site does not appear to be substantially higher than these other wind energy developments, and raptor mortality rates would likely be similar.

The predictions of avian mortality for the Saddleback Project were made with available data from other regional wind plants. However, the Saddleback Mountain project is located in coniferous forest habitat, whereas the other wind power projects are located in shrub steppe and agricultural areas. Therefore, avian mortality at Saddleback Mountain may not follow similar patterns. There is no post-construction mortality monitoring data for wind plants situated in coniferous forest in the western U.S.

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Table 1. Mean use, mean # species/survey, total number of species, and total number of fixed-point surveys conducted during the fall migration at the Saddleback Project site from September 11 through November 4, 2004.

Season	# Visits	Mean Use	#Species/Survey	# Species	# Surveys
Fall	9	14.337	4.022	39	53

Table 2. Mean use, percent composition and percent frequency of occurrence for avian groups during the fall migration for the Saddleback Project site from September 11 through November 4, 2004.

group	Mean Use (#/20-minutes) fall
Raptors	0.707
Accipiters	0.307
Buteos	0.244
Northern Harriers	0.019
Golden Eagles	0.041
Prairie Falcons	0.019
Turkey Vultures	0.078
Passerines	12.530
Ruffed Grouse	0.019
Doves/Pigeons	0.537
Other Birds	0.544
Overall	14.337

group	% Group Composition Fall
Raptors	4.93
Accipiters	2.14
Buteos	1.70
Northern Harriers	0.13
Golden Eagles	0.28
Prairie Falcons	0.13
Turkey Vultures	0.54
Passerines	87.39
Ruffed Grouse	0.13
Doves/Pigeons	3.75
Other Birds	3.80

group	% Frequency of Occurrence Fall
Raptors	38.52
Accipiters	25.19
Buteos	15.19
Northern Harriers	1.85
Golden Eagles	4.07
Prairie Falcons	1.85
Turkey Vultures	5.93
Passerines	94.44
Ruffed Grouse	1.85
Doves/Pigeons	9.26
Other Birds	26.67

Table 3. Small bird species observed within 800 m of observer and estimated mean use and percent frequency based on stations surveyed during the fall migration for the Saddleback Project site.

	Fall	
species	use	% frequency
dark-eyed junco	2.185	41.48
American goldfinch	1.715	17.41
white-crowned sparrow	1.074	5.56
American robin	0.815	14.81
yellow-rumped warbler	0.759	14.81
red crossbill	0.556	7.41
unidentified passerine	0.519	9.26
band-tailed pigeon	0.500	5.56
western bluebird	0.500	5.56
golden-crowned sparrow	0.370	3.70
tree swallow	0.300	4.07
Vaux's swift	0.281	4.07
varied thrush	0.259	9.26
Steller’s jay	1.419	47.04
Clark's nutcracker	0.019	1.85
golden-crowned kinglet	0.248	19.26
red-breasted nuthatch	0.222	20.37
black-capped chickadee	0.148	11.11
pileated woodpecker	0.115	11.48
northern flicker	0.111	7.41
spotted towhee	0.100	10.00
ruby-crowned kinglet	0.056	5.56
hairy woodpecker	0.037	3.70
mourning dove	0.037	3.70
mountain chickadee	0.037	1.85
purple finch	0.037	1.85
chestnut-backed chickadee	0.019	1.85
Lincoln's sparrow	0.019	1.85
song sparrow	0.019	1.85
western tanager	0.019	1.85

Table 4. Large bird species observed within 800 m of observer and estimated mean use and percent frequency based on stations surveyed during the fall migration for the Saddleback Project site.

	Fall	
species	use	% frequency
common raven	1.119	48.89
sharp-shinned hawk	0.130	7.41
unidentified buteo	0.130	5.56
Cooper's hawk	0.119	11.85
red-tailed hawk	0.115	11.48
turkey vulture	0.078	5.93
golden eagle	0.041	4.07
northern goshawk	0.041	4.07
northern harrier	0.019	1.85
prairie falcon	0.019	1.85
ruffed grouse	0.019	1.85
unidentified accipiter	0.019	1.85

Table 5. Flight height characteristics by avian group during the fall migration fixed-point surveys for the Saddleback Project site.

Group	# flocks flying	# birds flying	Mean flight height(m)	% birds flying	Relation to rotor-swept height		
					below	within	above
Raptors	27	31	84.03	83.78	12.90	51.61	35.48
Accipiters	12	12	50.19	75.00	25.00	66.67	8.33
Buteos	7	11	128.86	84.62	0.00	27.27	72.73
Northern Harriers	1	1	20.00	100.00	100.00	0.00	0.00
Golden Eagles	2	2	125.00	100.00	0.00	50.00	50.00
Prairie Falcons	1	1	40.00	100.00	0.00	100.00	0.00
Turkey Vultures	4	4	147.50	100.00	0.00	75.00	25.00
Passerines	88	460	29.88	68.97	57.17	41.96	0.87
Ruffed Grouse	1	1	1.00	100.00	100.00	0.00	0.00
Doves/Pigeons	4	11	18.20	37.93	90.91	9.09	0.00
Other Birds	4	16	18.83	55.17	18.75	81.25	0.00
Subtotal	124	519	40.62	68.02	54.14	42.97	2.89

Table 6. Mean exposure indices calculated by species observed during fixed-point surveys at the Saddleback Project site.

Species	# flocks flying	Overall mean use	% flying	% Flying Within RSA	Exposure Index
Steller's jay	17	1.419	77.63	64.41	0.709
American goldfinch	10	1.715	100.00	32.58	0.559
red crossbill	4	0.556	100.00	100.00	0.556
common raven	20	1.119	66.10	71.79	0.531
western bluebird	4	0.500	100.00	88.89	0.444
unidentified passerine	5	0.519	100.00	75.00	0.389
tree swallow	3	0.300	100.00	100.00	0.300
Vaux's swift	3	0.281	100.00	86.67	0.244
American robin	4	0.815	50.00	31.82	0.130
sharp-shinned hawk	4	0.130	57.14	100.00	0.074
turkey vulture	4	0.078	100.00	75.00	0.058
red-tailed hawk	5	0.115	83.33	60.00	0.057
northern goshawk	2	0.041	100.00	100.00	0.041
Cooper's hawk	5	0.119	83.33	40.00	0.040
golden eagle	2	0.041	100.00	50.00	0.020
mourning dove	2	0.037	100.00	50.00	0.019
Clark's nutcracker	1	0.019	100.00	100.00	0.019
prairie falcon	1	0.019	100.00	100.00	0.019
dark-eyed junco	13	2.185	75.00	0.00	0.000
white-crowned sparrow	2	1.074	87.93	0.00	0.000
yellow-rumped warbler	1	0.759	14.63	0.00	0.000
band-tailed pigeon	2	0.500	33.33	0.00	0.000
golden-crowned kinglet	1	0.248	15.38	0.00	0.000
black-capped chickadee	1	0.148	12.50	0.00	0.000
unidentified buteo	2	0.130	85.71	0.00	0.000
ruby-crowned kinglet	1	0.056	33.33	0.00	0.000
hairy woodpecker	1	0.037	50.00	0.00	0.000
mountain chickadee	1	0.037	100.00	0.00	0.000
northern harrier	1	0.019	100.00	0.00	0.000
ruffed grouse	1	0.019	100.00	0.00	0.000
unidentified accipiter	1	0.019	100.00	0.00	0.000

Table 6 *(continued)*.

Species	# flocks flying	Overall mean use	% flying	% Flying Within RSA	Exposure Index
golden-crowned sparrow	0	0.370	0.00	N/A	N/A
varied thrush	0	0.259	0.00	N/A	N/A
red-breasted nuthatch	0	0.222	0.00	N/A	N/A
pileated woodpecker	0	0.115	0.00	N/A	N/A
northern flicker	0	0.111	0.00	N/A	N/A
spotted towhee	0	0.100	0.00	N/A	N/A
purple finch	0	0.037	0.00	N/A	N/A
chestnut-backed chickadee	0	0.019	0.00	N/A	N/A
Lincoln's sparrow	0	0.019	0.00	N/A	N/A
song sparrow	0	0.019	0.00	N/A	N/A
western tanager	0	0.019	0.00	N/A	N/A

Table 7. Sensitive avian species observed at the Saddleback Project Area during the Fall 2004 survey period

Species	Status[a]	Number observed	
		Groups	Individuals
Golden Eagle	State Candidate	2	2
Northern Goshawk	State Candidate	2	2
Pileated Woodpecker	State Candidate	6	6
Vaux's Swift	State Candidate	3	15
Turkey Vulture	State Monitor	4	4
Western Bluebird	State Monitor	4	27

[a] State Candidate: Candidate animal that will be reviewed for possible listing as Endangered, Threatened, or Sensitive. There is sufficient evidence to suggest that its status may meet the listing criteria.

State Monitor: Animal taxon of potential concern in some areas of state, but for which no official status has yet been assigned. This taxon is in need of additional field work before a status can be assigned. Populations in some areas of Washington do not have 'monitor' status.

Table 8. Mean spring, summer and fall raptor use estimates for wind resource areas in the Pacific Northwest (all adjusted for 20-minute surveys using an 800-m radius viewshed)

Project Area	Spring	Summer	Fall
CARES	0.58	0.63	0.81
Columbia Hills	0.94	1.34	0.78
Saddleback	**0.50**	**0.50**	**0.71**
Zintel Canyon	0.19	0.30	0.70
Maiden	0.28	0.40	0.62
White Creek	0.46	0.87	0.56
Combine Hills	0.79	0.55	0.43
Klondike	0.47	0.39	0.39
Wild Horse	0.45	0.45	0.30
Condon	0.53	0.33	0.29
Stateline/Vansycle	0.52	0.33	0.26
Nine Canyon	0.35	0.20	0.16
Mean[a]	**0.51**	**0.53**	**0.48**

[a] Mean is for the 11 other WRA and does not include estimates for the Saddleback Project

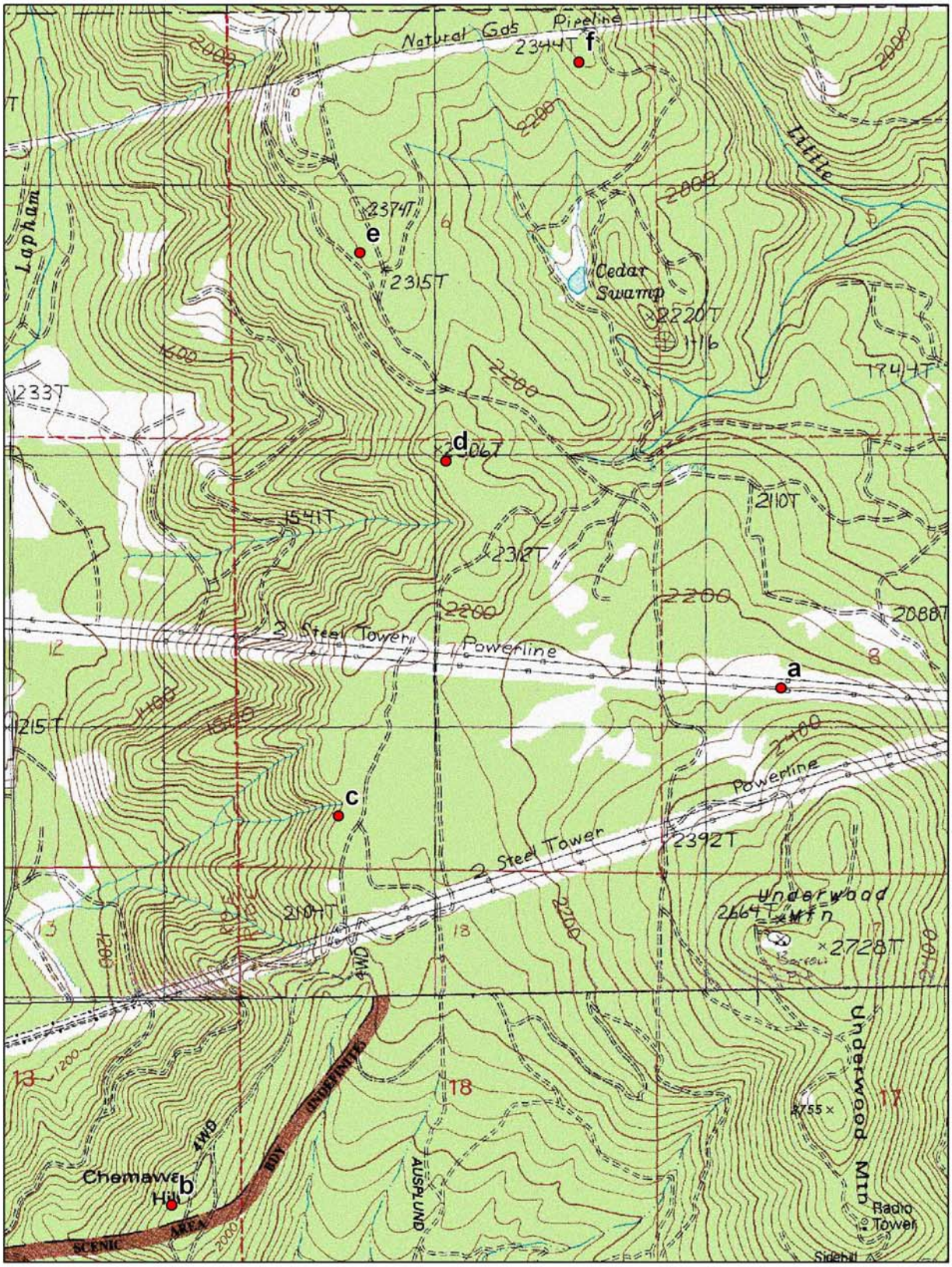

Figure 1. Location of the 6 avian survey points on the Saddleback Project Area, Fall 2004

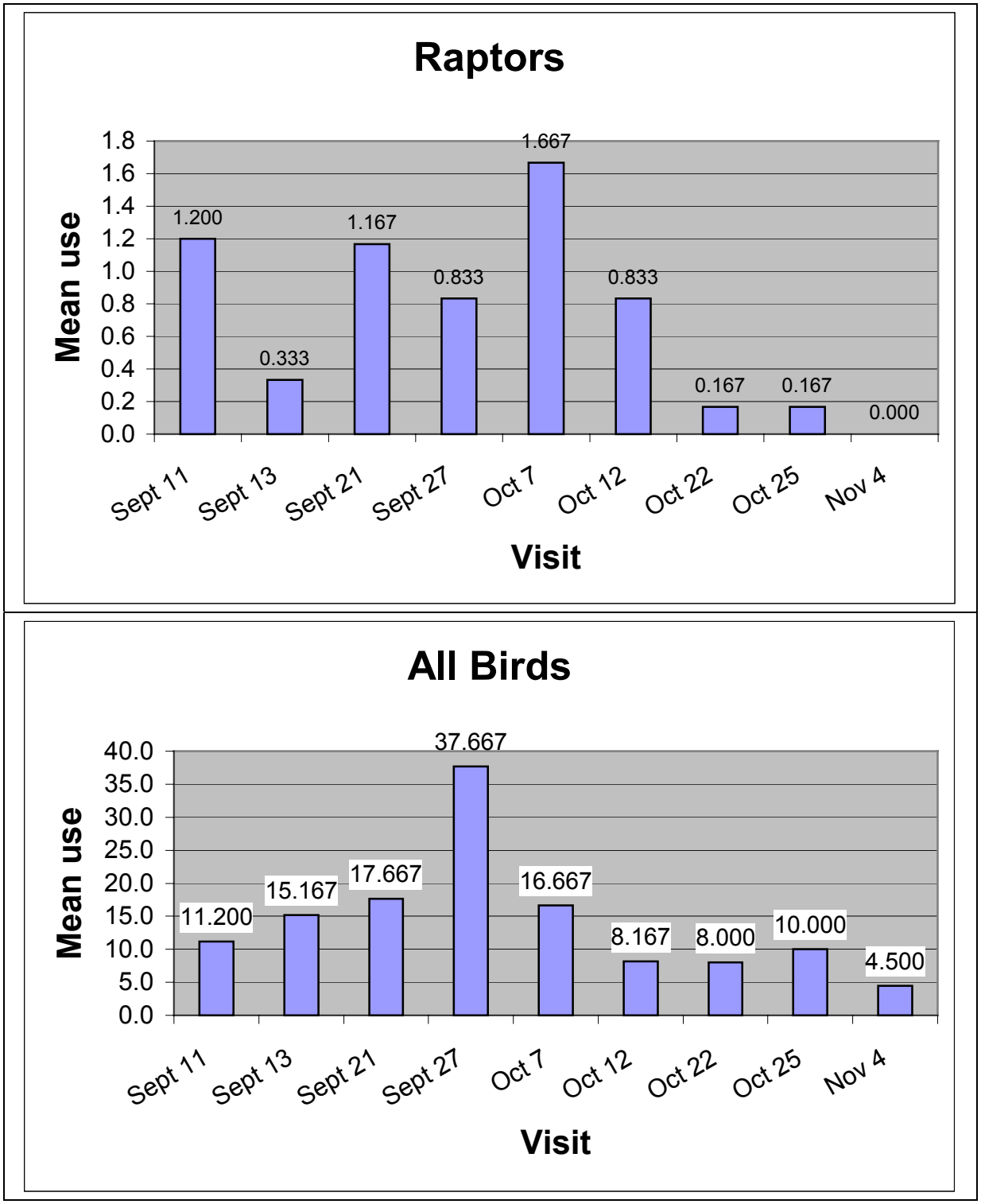

Figure 2. Avian use of the Saddleback Project Area by date during Fall 2004

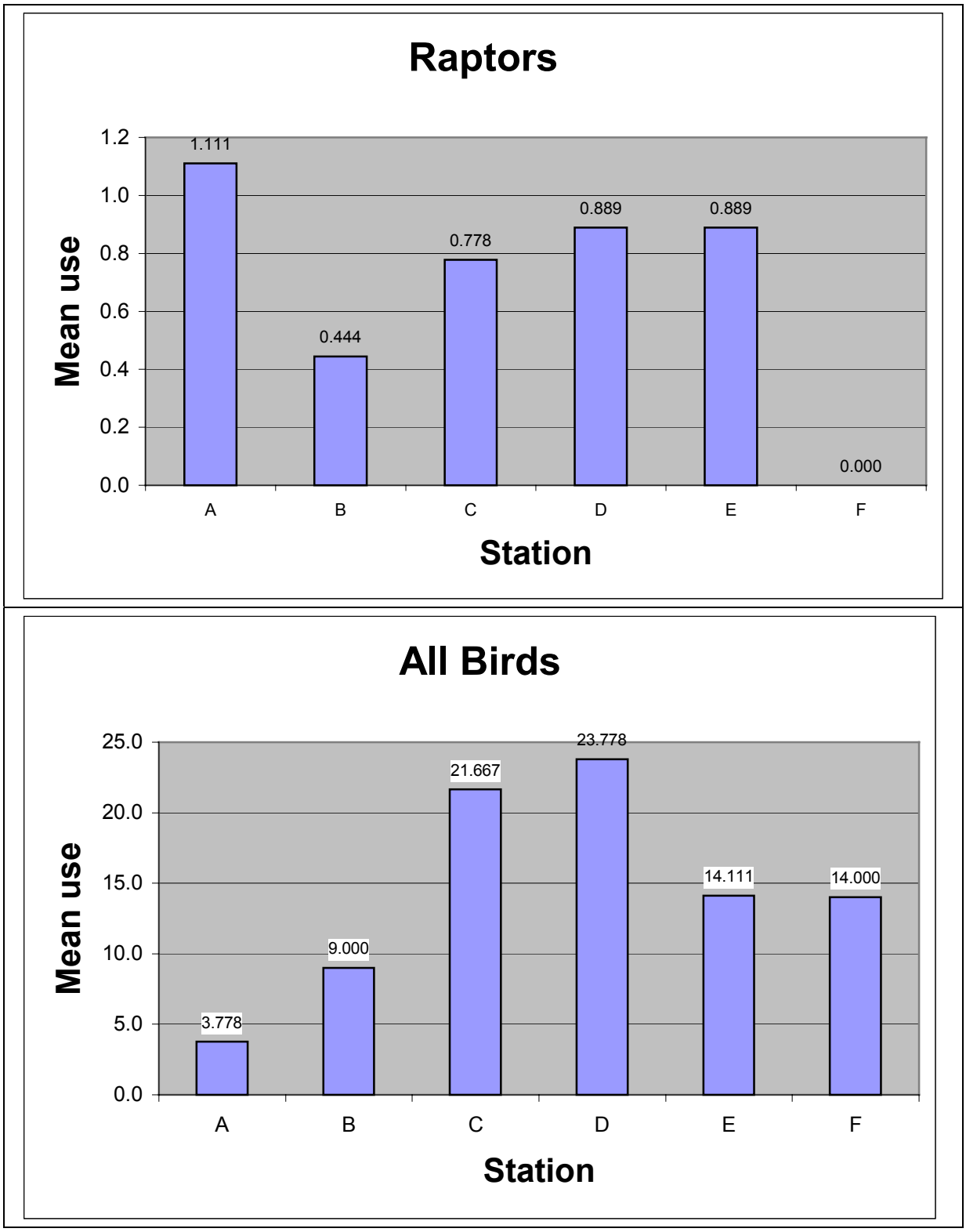

Figure 3. Avian use of the Saddleback Project Area by Station during the Fall 2004 surveys

Appendix A. Number of avian groups and individuals by species observed during the fall migration fixed-point surveys for the Saddleback Project site.

	Fall	
Species	# individuals	# groups
Raptors	**37**	**33**
Accipiters	*16*	*16*
Cooper's hawk	6	6
northern goshawk	2	2
sharp-shinned hawk	7	7
unidentified accipiter	1	1
Buteos	*13*	*9*
red-tailed hawk	6	6
unidentified buteo	7	3
northern harrier	*1*	*1*
golden eagle	*2*	*2*
prairie falcon	*1*	*1*
turkey vulture	*4*	*4*
Passerines	**667**	**184**
American goldfinch	89	10
American robin	44	9
black-capped chickadee	8	6
chestnut-backed chickadee	1	1
Clark's nutcracker	1	1
common raven	59	34
dark-eyed junco	116	23
golden-crowned kinglet	13	10
golden-crowned sparrow	20	2
Lincoln's sparrow	1	1
mountain chickadee	2	1
purple finch	2	1
red crossbill	30	4
red-breasted nuthatch	12	11
ruby-crowned kinglet	3	3
song sparrow	1	1
spotted towhee	5	5
Steller's jay	76	31
tree swallow	15	3
unidentified passerine	28	5
varied thrush	14	5
western bluebird	27	4
western tanager	1	1
white-crowned sparrow	58	3
yellow-rumped warbler	41	9

Appendix A *(continued)*.

Species	Fall # individuals	Fall # groups
Upland Gamebirds		
ruffed grouse	1	1
Doves/Pigeons	**29**	**5**
band-tailed pigeon	27	3
mourning dove	2	2
Other Birds	**29**	**15**
hairy woodpecker	2	2
northern flicker	6	4
pileated woodpecker	6	6
Vaux's swift	15	3
Overall	**763**	**238**

B-6

Baseline Avian use of the Saddleback Wind Energy Project, Skamania County, Washington, Fall Migration 2004 and Spring Breeding Season 2006. Prepared for CH2M HILL

WEST, Inc and Northwest Wildlife Consultants, Inc. 2006

FINAL REPORT

Baseline Avian use of the Saddleback Wind Energy Project Skamania County, Washington

Fall Migration 2004
And
Summer Breeding Season 2006

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INTRODUCTION AND BACKGROUND

SDS Lumber is currently considering a site for potential wind power development in Skamania County, Washington (Figure 1). Other baseline data have previously been collected at this site, including habitat mapping, late spring/early summer avian use surveys, rare plant surveys, and targeted surveys for other species of concern including spotted owl and northern goshawk. The results are included in other reports. This supplemental report provides results of avian use surveys of the project area conducted from September 11 through November 4, 2004 during the fall migration season, and from May 15 through July 14, 2006 during the primary avian breeding/nesting season. The primary purpose of the 2004 field investigation was to obtain data on bird use of the site during fall migration. The primary purpose of the 2006 field investigation was to obtain data on birds during the breeding/nesting period. The study protocol is similar to protocols used at numerous other wind power developments throughout the Pacific Northwest as well as the U.S.

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

The principal goals of the avian baseline study were to quantitatively describe the temporal and spatial use by birds of the study area during the fall migration and summer breeding/nesting season using diurnal point count surveys and to determine how diurnal indices of avian use of the study area compare to other wind resource areas (WRA) sites that have been studied in North America. Circular plots were surveyed on the project area using the method described by Reynolds et al. (1980). In 2004 six survey points were selected to achieve good coverage of the project site (Figure 1). Because of the close proximity of points to each other, the variability of our estimates of avian use and other endpoints were based on survey to survey variability (i.e., temporal). Because of changes to the wind project configuration, one point (A) was eliminated prior to starting the 2006 surveys and five of the original six plots were surveyed.

Each plot was an approximate 800-m radius circle centered on an observation point. Due to constraints imposed by the topography of the project area, not all of the area included in each plot could be observed. Landmarks were located to identify the 800-m boundary of each observation point. Observations of birds beyond the 800-m radius were recorded, but were analyzed separately from data within the plot. All sightings of birds in and near plots during the 20-minute plot surveys were recorded. A unique observation number was assigned to each sighting. Weather information such as temperature, wind speed, wind direction, and cloud cover was collected for each survey point. The date, start and end time of observation period, plot number, species, number of individuals, sex and age class, distance from plot center when first observed, closest distance, altitude above ground, activity, and habitat(s) were recorded.

Behavior categories recognized include perched, soaring, flapping, flushed, circle soaring, hunting,

gliding, and other. Initial flight patterns and habitats were circled in the data sheet and subsequent patterns, and habitats (if any) recorded as "x". For example, if a raptor was first sighted while perched, and then left its perch and flew out of the study area, then "perched" was circled and an x was written in the box for flapping. The flight direction in which the bird headed was recorded. Flight altitude at first observation was recorded to the nearest meter and any other altitude categories traversed by the bird were marked. Altitude categories correspond to the height below, within, and above the space occupied by turbine blades. Any comments or unusual observations were recorded in the comment section of the data form. Locations of raptors, other large birds, and any species of concern seen during surveys were recorded on the field maps by observation number.

Observation Schedule

All survey plots in the study area were scheduled to be surveyed one time per week. Weekly surveys were conducted from September 11 through November 4, 2004 and from May 15 through July 14, 2006. Visual observations were made so as to cover all daylight hours. During a set of surveys, each selected plot was visited once. Surveys took place during daylight hours. Observation days were divided into two periods, morning (6-12) and afternoon (12-6), with each station surveyed for 20 minutes. A pre-established schedule was developed by the study team leader prior to field work to ensure that each station was surveyed about the same number of times each period of the day during each season and to efficiently utilize personnel time. The proposed schedule was subject to change in response to adverse weather conditions that required delays and/or rescheduling of observations.

Statistical Analysis and Report Products

The number of raptors and other species seen during each point count survey were standardized to a unit area and unit time searched. For example, if 4 raptors were seen during the 20 minutes at a point with a viewing area of 2.01 km^2, these data were standardized to 4/2.01 = 1.98 raptors/km^2 in a 20-minute survey. Data were plotted to illustrate differences in raptor and other bird use between stations and seasons. Comparisons of bird use indices were made between the Saddleback site and other wind resource areas to aid in projecting potential impacts from this project.

A relative index to collision risk (R) was calculated for bird species observed in the project area using the following formula:

$$R = A * P_f * P_t$$

Where A = mean use for species i averaged across all surveys, P_f = 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 = proportion of all flight height observations of species i within the rotor-swept height (RSH). This index does not account for differences in behavior other than flight characteristics (i.e., flight heights and proportion of time spent flying).

Data Compilation, Storage, and Quality Assurance/Quality Control (QA/QC)

A database was established to store, retrieve and organize field observations. Data from field forms were keyed into electronic data files using a pre-defined format that made subsequent data analysis straightforward. All field data forms, field notebooks, and electronic data files were retained for ready reference. QA/QC measures were implemented at all stages of the study, including field data collection, data entry, data analysis, and report preparation. At the end of each survey day, each

observer was responsible for inspecting his or her data forms for completeness, accuracy, and legibility. The study team leader periodically reviewed data forms to insure completeness and legibility, and any problems detected were corrected. Any changes made to the data forms were initialed and dated by the person making the change. Data were entered into electronic files and printouts of the data were compared to the original data sheets. Any irregular codes detected, or any data suspected as questionable, were discussed with the observer and study team leader. All changes made to the raw data were documented for future reference.

RESULTS

Species Abundance and Composition

Sixty-eight species of birds were observed during 98 point count surveys over 18 visits to the project site (Table 1). During the study, 1482 individual birds in 774 groups were recorded. The number of birds observed by species used to determine use and composition estimates are presented in Appendix A. Avian richness (defined as number of species per survey) was 4.0 in the fall and 10.8 in the summer, and averaged 7.4 over both seasons (Table 1). The mean number of birds observed per survey of each plot was fairly similar in the fall (14.3) and summer (16.0), and averaged 15.2 over both seasons (Table 1).

Fall 2004. Thirty-nine species of birds were observed during 53 point count surveys over 9 visits to the project site (Table 1). Over the course of the study, 238 groups comprised of 763 individual birds were recorded. The number of birds observed by species used to obtain use and composition estimates are presented in Appendix A.

Passerines (songbirds) were the most abundant group (12.5/survey), followed by raptors (0.71), and doves/pigeons (0.54; Table 2). Passerines comprised 87.4% of all birds observed, raptors comprised 4.9%, and doves/pigeons comprised 3.8%. The most frequently occurring groups observed, regardless of the number observed, were passerines (94.4% of surveys), raptors (38.5%), woodpeckers (22.6%), and doves/pigeons (9.3%). Species with the highest use of the project area were all passerines and included dark-eyed junco (2.19/survey), American goldfinch (1.72), Steller's jay (1.42), common raven (1.12), and white-crowned sparrow (1.07) (Table 3 and 4). Eight species of raptor were observed during the survey. Those with the highest use of the site were sharp-shinned hawk (0.13/survey), Cooper's hawk (0.12), and red-tailed hawk (0.12) (Table 4). The species of birds most frequently observed during fall surveys were common raven (48.9% of surveys), Steller's jay (47.0%), dark-eyed junco (41.5%), red-breasted nuthatch (20.4%), and golden-crowned kinglet (19.3%) (Table 3 and 4).

Summer 2006. Fifty-five species of birds were observed during 45 point count surveys over 9 visits to the project site (Table 1). Over the course of the study, 536 groups comprised of 719 individual birds were recorded. The number of birds observed by species used to obtain use and composition estimates are presented in Appendix A.

Passerines were the most abundant group (14.1/survey), followed by raptors (0.53), woodpeckers (0.53), and doves/pigeons (0.51/survey) (Table 2). Passerines comprised 88.5% of all birds observed, raptors and woodpeckers each comprised 3.3%, and doves/pigeons comprised 3.2%. The most frequently occurring groups observed, regardless of the number observed, were passerines (100% of

surveys), woodpeckers (35.6%), and raptors (31.1%). Species with the highest use of the project area were all passerines and included white-crowned sparrow (2.07/survey), red crossbill (1.07), western tanager (0.91), spotted towhee (0.78), and Macgillivray's warbler (0.73) (Table 3 and 4). Three species of raptor were observed during the summer survey, including red-tailed hawk (0.13/survey), northern goshawk (0.07), and sharp-shinned hawk (0.02) (Table 4). The species of birds most frequently observed during summer surveys were white-crowned sparrow (77.8% of surveys), western tanager (75.6%), spotted towhee (64.4%), Macgillivray's warbler (48.9%), and dark-eyed junco (48.9%) (Table 3 and 4).

Flight Behavior

During the study, 208 flocks comprised of 698 birds were observed flying during point count surveys (Table 4). For all species combined, 46.3% of all flying birds observed were below the rotor-swept height (<30 m), 49.1% were within the rotor-swept height (30 – 130 m), and 4.6% were above the rotor-swept height (>130 m) (Table 4). For groups with at least 10 observations of flying flocks, those most often observed flying within the turbine rotor-swept height were accipiters (73.3%), doves/pigeons (66.7%), and vultures (61.1%). For all flying raptors combined, 57.4% were observed flying within the rotor-swept height. For species with at least 10 observations of flying flocks, those most often observed at rotor-swept heights were purple finch, black-headed grosbeak, olive-sided flycatcher, and northern flicker, all of which were recorded flying within the rotor-swept height 100% of the time (Table 6).

Turbine Exposure Index

Based on the exposure index derived from abundance, how often each species is observed in the project area, and flight behavior, the species most likely to collide with turbines are red crossbill (index = 0.69), Steller's jay (0.37), common raven (0.30), American goldfinch (0.29), and western bluebird (0.22). The highest index for any raptor was 0.07 for red-tailed hawk, indicating a risk 10 times lower than that for red crossbill (Table 6). This analysis may provide insight into what species might be the most likely turbine casualties. However, this index only considers relative probability of exposure based on abundance, proportion of daily activity budget spent flying, and flight height of each species. This analysis is based on observations of birds during the daylight period and does not take into consideration flight behavior or abundance of nocturnal migrants. It also does not take into consideration varying ability among species to detect and avoid turbines, habitat selection and other factors that may influence exposure to turbine collision; therefore, the actual risk may be lower or higher than indicated by these data. For example, in the Altamont Pass WRA in California, mortality among the five most common species was not related to their abundance. American kestrels, red-tailed hawks, and golden eagles were killed more often, and turkey vultures and common ravens were killed less often than predicted based on abundance (Orloff and Flannery 1992). Similarly, at the Tehachapi Pass WRA in California, common ravens were found to be the most common large bird in the WRA, yet no fatalities for this species were documented during intensive studies (Anderson *et al.* 1996). In other cases, however, risk indices calculated using the above formula have been found to be fairly accurate predictors of actual mortality (e.g., Johnson *et al*. 2000a).

Temporal and Spatial Use

Raptor use in the fall (0.71/survey) was only slightly higher than during the summer breeding season (0.53/survey) (Figure 2). For all bird species combined, use of the Saddleback project was slightly higher during the summer breeding season (15.98/survey) than during the fall migration period (14.34/survey). No raptors were observed on Plot F (Figure 1) during the study; however, this plot had

the lowest visibility of the 6 plots surveyed. The highest use by raptors occurred at Plot A (1.11/survey) and plot D (1.06/survey). Plot A was located along a powerline right-of-way in the eastern portion of the project area and Plot D was located along a ridgeline on the western side of the project area. Use among the other three plots was fairly consistent, ranging from 0.44–0.83/survey (Figure 3). The available data do not indicate any portions of the project area have substantially higher raptor use than other areas.

For all birds combined, Plot A had the lowest use (3.8/survey). Highest use occurred at Plot C (20.3/survey) and Plot D (19.7/survey), both of which were located along the ridgetop on the western end of the project area.

Sensitive Avian Species

No species classified as endangered or threatened by the U.S. Fish & Wildlife Service (USFWS) or Washington Department of Fish & Wildlife (WDFW) were observed during the study. Four species classified as candidate species by the WDFW were observed in the project area, including 2 golden eagles, 5 northern goshawks, 6 pileated woodpeckers, and 19 Vaux's swifts (Table 7). Three State Monitor species were also observed, including 18 turkey vultures, 1 prairie falcon and 28 western bluebirds. Finally, two federal species of concern not considered sensitive species by the WDFW were observed, including 21 olive-sided flycatchers and 9 willow flycatchers. It is not known to what extent these observations represented different individuals or multiple observations of the same individual. Overall use of the project area by golden eagle, northern goshawk, pileated woodpecker, prairie falcon, and willow flycatcher was very low given the number of surveys that were conducted, and significant impacts to these species are unlikely.

Of the species that were more commonly observed, turkey vultures have very low susceptibility to turbine collisions based on studies in California (Orloff and Flannery 1992) and this species has not been found as a turbine fatality in the Pacific Northwest. Vaux's swifts, western bluebirds and olive-sided flycatchers were commonly observed flying at turbine rotor-swept heights, and some turbine mortality may occur for these species over the life of the project. These collisions would likely be rare occurrences and it is unlikely the Saddleback Project would have any negative impacts on population levels in and near the project area. Based on seasonality of the observations, the western bluebird and Vaux's swift appear to be migrants through the project area rather than local breeders, whereas the olive-sided flycatcher appears to primarily use the project area for breeding.

DISCUSSION

Mean annual raptor/vulture use at the Saddleback Project was 0.81/survey, and 23% of this value was comprised of turkey vulture use. Turkey vultures have shown very low susceptibility to turbine collision at other wind farms (e.g., Orloff and Flannery 1992). Actual use of the Saddleback site by raptors (excluding vultures) was 0.62/survey. Based on studies of 28 other WRAs using similar protocols, mean annual raptor/vulture use (defined as number of raptors and vultures observed per 20–minute period at a station with an 800–m radius) typically ranges from 0.10/survey to 1.3/survey (Figure 4). The only areas studied with higher than typical raptor use are Altamont Pass, California, where annual use averaged 2.4/survey, and the High Winds site in Solano County, California, where annual raptor use averaged 3.5/survey. Raptor/vulture use at the Saddleback site is only 23% of that observed at High Winds and 34% of that observed at Altamont. Of the 28 WRAs with similar raptor use data, 6 have higher raptor/vulture use than that observed at the Saddleback site, while 22 of the 28

sites have lower raptor use (Figure 4). Therefore, raptor use at Saddleback is higher than most other wind farms with similar data, but it is still substantially lower than that observed at Altamont and High Winds, California.

The Altamont Pass, California WRA contains 5,400 turbines, most of which are small, obsolete, lattice tower, Kenetech turbines. The latest raptor fatality estimates at Altamont based on searches using 30 – 90 day search intervals indicate that annual mortality averages 1.5 to 2.2 raptor fatalities per megawatt (MW) per year when adjusted for searcher efficiency and scavenging bias. The High Winds Project is a modern wind farm with 1.8 MW turbines, and estimated mortality was 0.30 raptors per MW per year (unadjusted for scavenger removal or searcher efficiency) with searches conducted every 14 days. Most of the raptor mortality at the High Winds Project involved American kestrels, and the relative use of the High Winds site by kestrels was approximately 6 times higher than at the Altamont Pass. With the exception of American kestrels at the High Winds Project in California, raptor mortality at new-generation wind projects both within and outside California has been relatively low (Table 8).

We conducted a regression analysis of raptor use and raptor collision mortality for several new-generation wind farms where similar methods were used to obtain raptor use estimates and found that the correlation between raptor use and raptor collision mortality is highly significant (r^2 = 90.3%; Figure 5). The data are from the High Winds project in Solano County, California, Diablo Winds repowering project in Altamont Pass, Buffalo Ridge project in Minnesota, Foote Creek Rim project in Wyoming, and five projects in the Pacific Northwest, including the Stateline project on the Washington/Oregon border, the Combine Hills, Vansycle, and Klondike projects in Oregon and the Nine Canyon Project in Washington. Using this regression to predict raptor collision mortality at Saddleback based on mean annual raptor/vulture use of 0.81/survey yields an estimated fatality rate of 0.075/MW/year, or 7-8 raptors per 100 MW per year, which is relatively low compared to many wind projects. A 95% prediction interval around this estimate is 0 to 0.22 raptors/MW/year.

The Saddleback project area received no use by waterfowl, waterbirds, or shorebirds during this study, and mortality involving these groups is expected to be inconsequential. Due perhaps to their abundance, passerines have been the most abundant avian fatality at other wind projects studied. Both migrant and resident passerine fatalities have been observed. Therefore, it is expected that passerines will make up the largest proportion of fatalities at the Saddleback site. Total avian use at Saddleback from site-specific surveys averaged 15.16 per survey. Similar data are available for 19 other WRA in eastern Washington and Oregon, where total avian use ranged from 5–23.6/survey and averaged 12.1/survey (Figure 6). Use of the Saddleback site by all bird species combined is moderate compared to these other WRAs, as 6 of the 20 sites had higher bird use than that observed at Saddleback while 14 sites had lower use. Total avian use at the 6 wind farms in eastern Washington and Oregon with post-construction fatality data ranged from 5.8/survey at Condon, Oregon to 17.5/survey at Klondike, Oregon. Fatality estimates for all bird species combined at the five existing eastern Washington and Oregon projects with standardized mortality data have ranged from 0.9 to 2.9 fatalities/MW/year. Compared with raptors, there is less 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. For example, of the 6 existing wind farms in eastern Washington and Oregon with fatality data, the wind farm with the highest avian use (Klondike – 17.5/survey) had the lowest fatality rate (0.9/MW). Therefore, because total avian use at Saddleback is within the range of similar avian use values for other regional wind farms, and assuming that mortality of all birds combined at Saddleback would be similar to that observed at the other regional wind energy projects, we estimate

that total avian mortality would range from 0.9–2.9 fatalities/MW/year, or 90–290 per 100 MW. As is the case at other wind farms, most of the total avian mortality would likely be composed of song birds.

The above estimates for both raptors and total avian fatalities are based on avian use and collision fatality data from wind farms constructed in open habitats such as croplands, grasslands and shrublands. Because the Saddleback project is located in a forested area, actual fatality rates may differ from those measured at wind farms in open areas. In addition, the mortality data used to make predictions for the Saddleback project are from wind farms that all have turbines ranging in size from 0.66 to 1.8 MW. If substantially larger turbines are used at the Saddleback project, actual mortality may differ because there are no data on turbines larger than 1.8 MW to use in the prediction analyses.

Some fatalities of nocturnal migrating birds have been observed at wind energy projects within the U.S. (Erickson et al. 2001), although the rates of fatalities at individual wind farms appear to be relatively low compared to estimates of the numbers of migrants flying over the sites. Most nocturnal songbird migration is believed to occur above 500 feet above ground level (Longcore *et al*. 2005). There are several records of large mortality events at tall guyed communications towers (Kerlinger 2000, Kemper 1996) and these events are typically associated with bad weather conditions (low ceilings, fog). There has been no reported large episodic mortality event (e.g., >50 birds during a single night) recorded at a U.S. wind farm. The largest mortality events reported at U.S. wind energy projects to date have been 14 migrant songbirds killed at two turbines during spring migration at the Buffalo Ridge, Minnesota Wind Project (Johnson et al. 2002) and a kill involving 33 migrants at a West Virginia project (Kerns and Kerlinger 2004). The West Virginia mortalities apparently occurred during inclement weather and the fatalities occurred at a turbine near a heavily lit substation. Most migrant songbird casualties recorded during systematic carcass searches at turbines have been a single fatality found during a single search (Erickson et al. 2001). Most searches at individual turbines result in no documented fatalities.

The data collected during this study suggest that the Saddleback project is not within a major migratory pathway, at least during the fall migration. Raptor use during the fall migration period (0.71/survey) was only slightly higher than that observed during the summer breeding season (0.53/survey), and use of the project area by all birds combined was actually somewhat higher in the summer breeding season (15.98) than the fall migration period (14.34/survey). This suggests that the Saddleback area does not provide important migrant stopover habitat, at least during fall migration.

The presence of wind turbines may alter the landscape so that wildlife habitat use patterns are altered, thereby displacing wildlife away from the project facilities. In Europe, displacement effects related to wind energy projects are considered to have a greater impact on birds than collision mortality, and several European studies have addressed this issue. Avian displacement associated with wind power development has not received as much research attention in North America. 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 of land surrounding a wind project was 5.94/39 mi^2 , yet no nests were present in the 12 mi^2 wind project facility itself, even though habitat was similar (Usgaard *et al.* 1997). No red-tailed hawks or golden eagles are known to nest within the Altamont Pass Wind Resource Area (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 farm in southern Wyoming, one pair of red-tailed hawks nested within 0.3 miles of the turbine strings, and seven red-tailed hawk, one great horned owl, and one golden eagle nests located within 1 mile of the wind farm successfully fledged young (Johnson *et al*. 2000b). The golden eagle pair

successfully nested ½ mile from the wind farm for three different years after it became operational. A Swainson's hawk nested within 0.5 miles of the Klondike, Oregon Wind Project (Johnson *et al.* 2003). Studies at the Stateline Wind Project in Oregon and Washington have not shown any measurable short-term effects to nesting raptors (Erickson *et al.* 2004).

At a large wind project on 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 100 meters of the turbines (Johnson *et al*. 2000a). These results are similar to those of Osborn *et al.* (1998), who reported that birds at Buffalo Ridge avoided flying in areas with turbines. Some birds apparently did become accustomed to turbines, as Osborn *et al*. (1998) also reported a mallard nest within 31 m of a turbine. Also at Buffalo Ridge, Leddy *et al*. (1999) found that densities of male songbirds were significantly lower in Conservation Reserve Program (CRP) grasslands containing turbines than in CRP grasslands without turbines. Grasslands without turbines and portions of grasslands located at least 180 meters from turbines had bird densities four times greater than grasslands located near turbines. Reduced avian 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*. 2000a).

Preliminary results from the Stateline Wind Project in Oregon and Washington (Erickson *et al.* 2004) suggest a relatively small-scale impact of the wind facility on grassland nesting passerines. Transect surveys conducted prior to and after construction of the wind farm indicated that grassland songbird use was significantly reduced only within 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. Because the Saddleback Wind Farm will be sited in forested habitats common to the region, and other similar habitats are abundant, it is unlikely that displacement of birds would result in any population impacts.

CONCLUSIONS

Based on data collected during this study, raptor use of the Saddleback project area is substantially lower than that observed at the Altamont Pass and High Winds projects in California, but is moderate to moderately high compared to most other WRAs evaluated throughout the western and Midwestern U.S. Based on point count surveys, use of the site by all bird species combined is also moderate compared to many other WRAs evaluated throughout the U.S. Diurnal point counts during the fall 2004 migration indicate the project area is not within a large raptor migration corridor and does not appear to provide important stopover habitat for migrant songbirds. The studies at this site suggest that mortality at the Saddleback site would likely be similar to perhaps somewhat higher than that documented at several other wind farms located in the western U.S., where avian collision mortality has been relatively low. However, there are no post-construction mortality monitoring data for wind farms situated in coniferous forest in the western U.S., and avian collision rates in forested environments may differ from those in more open habitats.

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Table 1. Mean use, mean # species/survey, total number of species, and total number of fixed-point surveys conducted at the Saddleback Project site from September 11 through November 4, 2004 and May 21 through July 14, 2006.

Season	# Visits	Mean Use	#Species/Survey	# Species	# Surveys
Fall	9	14.337	4.022	39	53
Summer	9	15.978	10.844	55	45
Overall	18	15.157	7.433	68	98

Table 2. Mean use, percent composition and percent frequency of occurrence for avian groups at the Saddleback Project site, September 11 through November 4, 2004 and May 21 through July 14, 2006.

	Mean Use (#/20-minutes)	
Group	Fall	Summer
Raptors	0.707	0.533
Accipiters	0.307	0.089
Buteos	0.244	0.133
Harriers	0.019	0.000
Eagles	0.041	0.000
Falcons	0.019	0.000
Vultures	0.078	0.311
Passerines	12.530	14.133
Upland Gamebirds	0.019	0.022
Doves/Pigeons	0.537	0.511
Swifts/Hummingbirds	0.281	0.244
Woodpeckers	0.263	0.533
Overall	14.337	15.978
	% Group Composition	
Group	Fall	Summer
Raptors	4.93	3.34
Accipiters	2.14	0.56
Buteos	1.70	0.83
Harriers	0.13	0.00
Eagles	0.28	0.00
Falcons	0.13	0.00
Vultures	0.54	1.95
Passerines	87.39	88.46
Upland Gamebirds	0.13	0.14
Doves/Pigeons	3.75	3.20
Swifts/Hummingbirds	1.96	1.53
Woodpeckers	1.83	3.34
	% Frequency of Occurrence	
Group	Fall	Summer
Raptors	38.52	31.11
Accipiters	25.19	8.89
Buteos	15.19	13.33
Harriers	1.85	0.00
Eagles	4.07	0.00
Falcons	1.85	0.00
Vultures	5.93	11.11
Passerines	94.44	100.00
Upland Gamebirds	1.85	2.22
Doves/Pigeons	9.26	17.78
Swifts/Hummingbirds	4.07	17.78
Woodpeckers	22.59	35.56

Table 3. Small bird species observed within 800 m of observer and estimated mean use and percent frequency based on stations surveyed at the Saddleback Project site from September 11 through November 4, 2004 and May 21 through July 14, 2006.

	Fall			Summer	
Species	use	% freq.	Species	use	% freq.
dark-eyed junco	2.185	41.48	white-crowned sparrow	2.067	77.78
American goldfinch	1.715	17.41	red crossbill	1.067	20.00
white-crowned sparrow	1.074	5.56	western tanager	0.911	75.56
American robin	0.815	14.81	spotted towhee	0.778	64.44
yellow-rumped warbler	0.759	14.81	Macgillivray's warbler	0.733	48.89
red crossbill	0.556	7.41	dark-eyed junco	0.667	48.89
unidentified passerine	0.519	9.26	American robin	0.600	46.67
band-tailed pigeon	0.500	5.56	black-headed grosbeak	0.556	44.44
western bluebird	0.500	5.56	band-tailed pigeon	0.511	17.78
golden-crowned sparrow	0.370	3.70	black-throated gray warbler	0.489	46.67
tree swallow	0.300	4.07	olive-sided flycatcher	0.467	40.00
Vaux's swift	0.281	4.07	chestnut-backed chickadee	0.467	26.67
varied thrush	0.259	9.26	purple finch	0.444	31.11
golden-crowned kinglet	0.248	19.26	Wilson's warbler	0.356	35.56
red-breasted nuthatch	0.222	20.37	northern flicker	0.333	26.67
black-capped chickadee	0.148	11.11	yellow-rumped warbler	0.311	31.11
pileated woodpecker	0.115	11.48	Townsend's warbler	0.311	24.44
northern flicker	0.111	7.41	red-breasted nuthatch	0.267	24.44
spotted towhee	0.100	10.00	Swainson's thrush	0.267	24.44
ruby-crowned kinglet	0.056	5.56	western wood-pewee	0.267	24.44
hairy woodpecker	0.037	3.70	pine siskin	0.244	6.67
mourning dove	0.037	3.70	warbling vireo	0.222	22.22
mountain chickadee	0.037	1.85	cedar waxwing	0.222	8.89
purple finch	0.037	1.85	willow flycatcher	0.200	17.78
chestnut-backed chickadee	0.019	1.85	evening grosbeak	0.200	4.44
Lincoln's sparrow	0.019	1.85	chipping sparrow	0.178	15.56
song sparrow	0.019	1.85	hairy woodpecker	0.178	13.33
western tanager	0.019	1.85	American goldfinch	0.178	11.11
			rufous hummingbird	0.156	15.56
			lazuli bunting	0.156	15.56
			brown-headed cowbird	0.133	11.11
			orange-crowned warbler	0.133	11.11
			Hammond's flycatcher	0.111	11.11
			house wren	0.111	6.67
			violet-green swallow	0.089	6.67
			Vaux's swift	0.089	4.44
			Cassin's vireo	0.044	4.44
			hermit thrush	0.044	4.44
			Nashville warbler	0.044	4.44
			northern rough-winged swallow	0.044	4.44
			ruby-crowned kinglet	0.044	4.44
			Townsend's solitaire	0.044	4.44
			unidentified passerine	0.044	4.44
			downy woodpecker	0.022	2.22

Table 3 (*continued*). Small bird species observed within 800 m of observer and estimated mean use and percent frequency based on stations surveyed at the Saddleback Project site from September 11 through November 4, 2004 and May 21 through July 14, 2006.

Fall			Summer		
species	use	% freq.	species	use	% freq.
			Bewick's wren	0.022	2.22
			black-capped chickadee	0.022	2.22
			golden-crowned kinglet	0.022	2.22
			unidentified empidonax	0.022	2.22
			unidentified warbler	0.022	2.22
			western bluebird	0.022	2.22
			yellow warbler	0.022	2.22

Table 4. Large bird species observed within 800 m of observer and estimated mean use and percent frequency based on stations surveyed at the Saddleback Project site from September 11 through November 4, 2004 and May 21 through July 14, 2006.

	Fall			Summer	
species	use	% freq.	species	use	% freq.
Steller's jay	1.419	47.04	Steller's jay	0.356	26.67
common raven	1.119	48.89	turkey vulture	0.311	11.11
sharp-shinned hawk	0.130	7.41	red-tailed hawk	0.133	13.33
unidentified buteo	0.130	5.56	common raven	0.111	11.11
Cooper's hawk	0.119	11.85	northern goshawk	0.067	6.67
red-tailed hawk	0.115	11.48	ruffed grouse	0.022	2.22
turkey vulture	0.078	5.93	sharp-shinned hawk	0.022	2.22
golden eagle	0.041	4.07			
northern goshawk	0.041	4.07			
ruffed grouse	0.019	1.85			
Clark's nutcracker	0.019	1.85			
northern harrier	0.019	1.85			
prairie falcon	0.019	1.85			
unidentified accipiter	0.019	1.85			

Table 5. Flight height characteristics by avian group during fixed-point surveys for the Saddleback Project site.

Group	# flocks flying	# birds flying	Mean flight height(m)	% birds flying	Relation to rotor-swept height		
					below	within	above
Raptors	42	54	90.217	88.52	11.11	57.41	31.48
Accipiters	15	15	54.895	75.00	20.00	73.33	6.67
Buteos	13	17	122.462	89.47	0.00	41.18	58.82
Northern Harriers	1	1	20.000	100.00	100.00	0.00	0.00
Eagles	2	2	125.000	100.00	0.00	50.00	50.00
Falcons	1	1	40.000	100.00	0.00	100.00	0.00
Vultures	10	18	120.500	100.00	11.11	61.11	27.78
Passerines	138	583	12.541	44.74	50.43	47.00	2.57
Upland Gamebirds	1	1	0.500	50.00	100.00	0.00	0.00
Doves/Pigeons	12	30	49.714	57.69	33.33	66.67	0.00
Swifts/Hummingbirds	12	26	21.000	100	34.615	65.385	0.00
Woodpeckers	3	4	3.611	10.53	75.00	25.00	0.00
Overall	208	698	19.041	47.10	46.28	49.14	4.58

Table 6. Mean exposure indices calculated by species observed during fixed-point surveys at the Saddleback Project site.

Species	# flocks flying	Overall mean use	% flying	% Flying Within RSA	Exposure Index
red crossbill	13	0.811	94.87	89.19	0.686
Steller's jay	43	0.887	67.39	61.29	0.366
common raven	39	0.615	67.19	72.09	0.298
American goldfinch	15	0.946	95.88	32.26	0.293
western bluebird	5	0.261	96.43	88.89	0.224
unidentified passerine	7	0.281	96.67	75.86	0.206
band-tailed pigeon	12	0.506	56.00	67.86	0.192
Vaux's swift	5	0.185	100.00	89.47	0.166
tree swallow	3	0.150	100.00	100.00	0.150
pine siskin	3	0.122	100.00	100.00	0.122
turkey vulture	10	0.194	100.00	61.11	0.119
cedar waxwing	4	0.111	90.00	100.00	0.100
evening grosbeak	2	0.100	77.78	100.00	0.078
red-tailed hawk	12	0.124	91.67	63.64	0.072
American robin	31	0.707	30.99	31.82	0.070
sharp-shinned hawk	8	0.076	62.50	100.00	0.047
purple finch	15	0.241	18.18	100.00	0.044
northern goshawk	5	0.054	80.00	100.00	0.043
black-headed grosbeak	23	0.278	8.00	100.00	0.022
violet-green swallow	3	0.044	100.00	50.00	0.022
northern rough-winged swallow	2	0.022	100.00	100.00	0.022
Cooper's hawk	6	0.059	83.33	40.00	0.020
olive-sided flycatcher	21	0.233	4.76	100.00	0.011
brown-headed cowbird	5	0.067	33.33	50.00	0.011
western tanager	39	0.465	16.67	14.29	0.011
northern flicker	16	0.222	4.76	100.00	0.011
golden eagle	2	0.020	100.00	50.00	0.010
mourning dove	2	0.019	100.00	50.00	0.009
Clark's nutcracker	1	0.009	100.00	100.00	0.009
prairie falcon	1	0.009	100.00	100.00	0.009
white-crowned sparrow	60	1.570	38.41	0.00	0.000

Table 6 *(continued)*.

Species	# flocks flying	Overall mean use	% flying	% Flying Within RSA	Exposure Index
dark-eyed junco	46	1.426	62.33	0.00	0.000
yellow-rumped warbler	23	0.535	10.91	0.00	0.000
Macgillivray's warbler	27	0.367	9.09	0.00	0.000
golden-crowned kinglet	11	0.135	14.29	0.00	0.000
hairy woodpecker	8	0.107	30.00	0.00	0.000
black-capped chickadee	7	0.085	11.11	0.00	0.000
lazuli bunting	7	0.078	14.29	0.00	0.000
rufous hummingbird	7	0.078	100.00	0.00	0.000
unidentified buteo	3	0.065	85.71	0.00	0.000
ruby-crowned kinglet	5	0.050	40.00	0.00	0.000
Nashville warbler	2	0.022	50.00	0.00	0.000
ruffed grouse	2	0.020	50.00	0.00	0.000
mountain chickadee	1	0.019	100.00	0.00	0.000
unidentified warbler	1	0.011	100.00	0.00	0.000
northern harrier	1	0.009	100.00	0.00	0.000
unidentified accipiter	1	0.009	100.00	0.00	0.000
spotted towhee	39	0.439	0.00	N/A	N/A
black-throated gray warbler	21	0.244	0.00	N/A	N/A
red-breasted nuthatch	22	0.244	0.00	N/A	N/A
chestnut-backed chickadee	13	0.243	0.00	N/A	N/A
golden-crowned sparrow	2	0.185	0.00	N/A	N/A
Wilson's warbler	16	0.178	0.00	N/A	N/A
Townsend's warbler	13	0.156	0.00	N/A	N/A
Swainson's thrush	11	0.133	0.00	N/A	N/A
western wood-pewee	11	0.133	0.00	N/A	N/A
varied thrush	5	0.130	0.00	N/A	N/A
warbling vireo	10	0.111	0.00	N/A	N/A
willow flycatcher	8	0.100	0.00	N/A	N/A
chipping sparrow	7	0.089	0.00	N/A	N/A
orange-crowned warbler	5	0.067	0.00	N/A	N/A
pileated woodpecker	6	0.057	0.00	N/A	N/A

Table 6 *(continued)*.

Species	# flocks flying	Overall mean use	% flying	% Flying Within RSA	Exposure Index
Hammond's flycatcher	5	0.056	0.00	N/A	N/A
house wren	3	0.056	0.00	N/A	N/A
Cassin's vireo	2	0.022	0.00	N/A	N/A
hermit thrush	2	0.022	0.00	N/A	N/A
Townsend's solitaire	2	0.022	0.00	N/A	N/A
Bewick's wren	1	0.011	0.00	N/A	N/A
downy woodpecker	1	0.011	0.00	N/A	N/A
unidentified empidonax	1	0.011	0.00	N/A	N/A
yellow warbler	1	0.011	0.00	N/A	N/A
Lincoln's sparrow	1	0.009	0.00	N/A	N/A
song sparrow	1	0.009	0.00	N/A	N/A

Table 7. Sensitive avian species observations at the Saddleback Project Area during fall 2004 and summer 2006 surveys

Species	Status	Number Observed	
		Fall 2004	Summer 2006
Northern goshawk	State candidate	2	3
Golden eagle	State candidate	2	0
Prairie falcon	State monitor	1	0
Turkey vulture	State monitor	4	14
Pileated woodpecker	State candidate	6	0
Vaux's swift	State candidate	15	4
Western bluebird	State monitor	27	1
Olive-sided flycatcher	Federal species of concern	0	21
Willow flycatcher	Federal species of concern	0	9

Table 8. Regional annual fatality estimates on a per megawatt (MW) basis for existing wind farms in California and other portions of the western U.S.

Wind Energy Project	All birds #/ MW	Raptors #/ MW
Altamont Pass, CA	3.0 - 8.14[a]	1.5 - 2.24[a]
High Winds, CA	0.74[b]	0.30[b]
San Gorgonio, CA	2.31	0.01
Tehachapi Pass, CA West Ridge	0.15 [b]	0.06 [b]
Tehachapi Pass, CA Middle Ridge	0.05 [b]	0.01 [b]
Tehachapi Pass, CA East Slope	0.04 [b]	0.01 [b]
Foote Creek Rim, WY	2.3	0.05
Combine Hills, OR	2.6	0
Stateline, OR/WA	2.9	0.09
Vansycle, OR	1.0	0.00
Klondike, OR	1.4	0.00
Nine Canyon, WA	2.8	0.05

[a] range provided in Smallwood and Thelander (2004)

[b] unadjusted for scavenger removal and searcher efficiency. High winds site was based on 14 day carcass search interval, Tehachapi Pass was based on approximately 90 day carcass search interval.

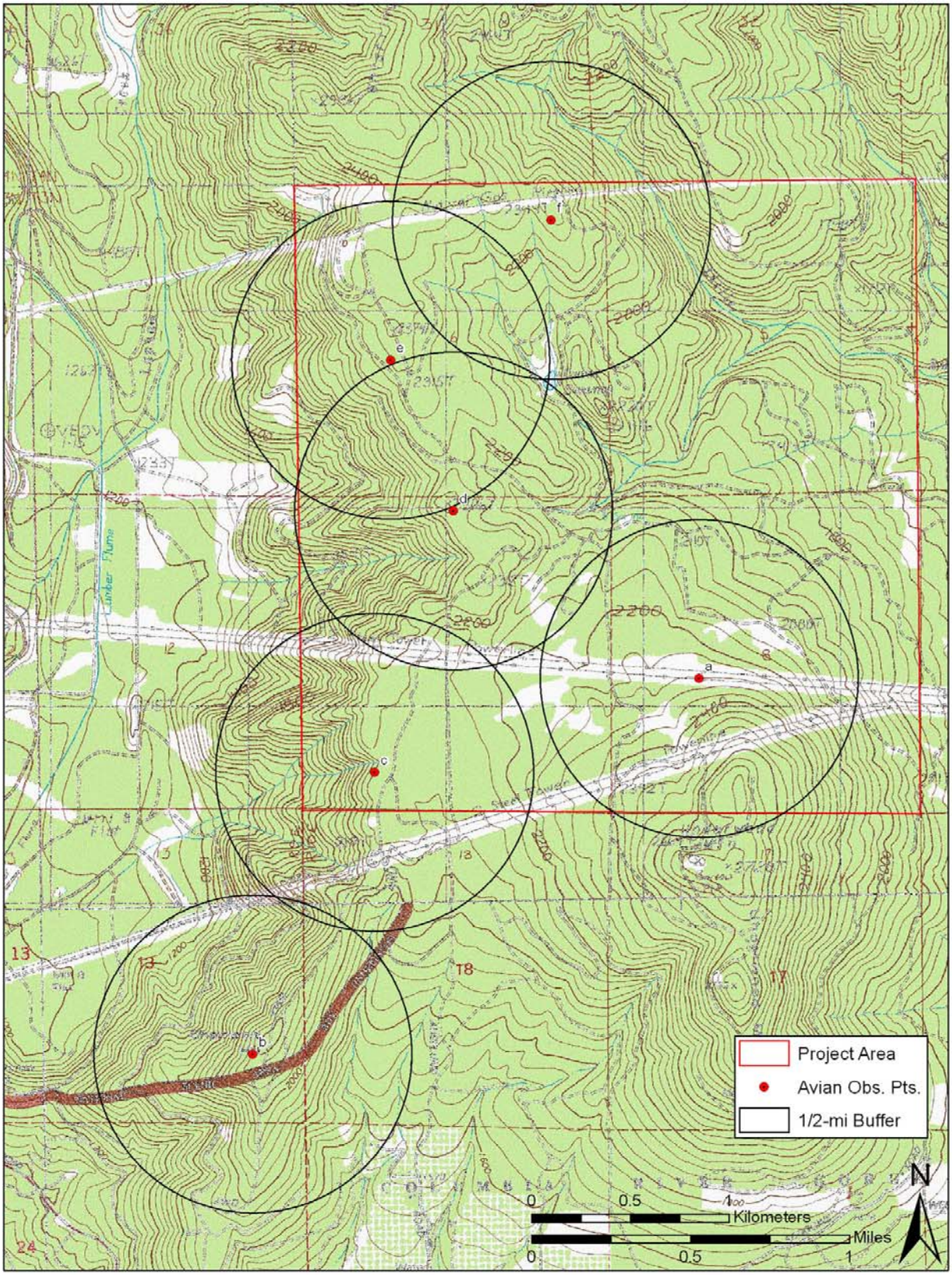
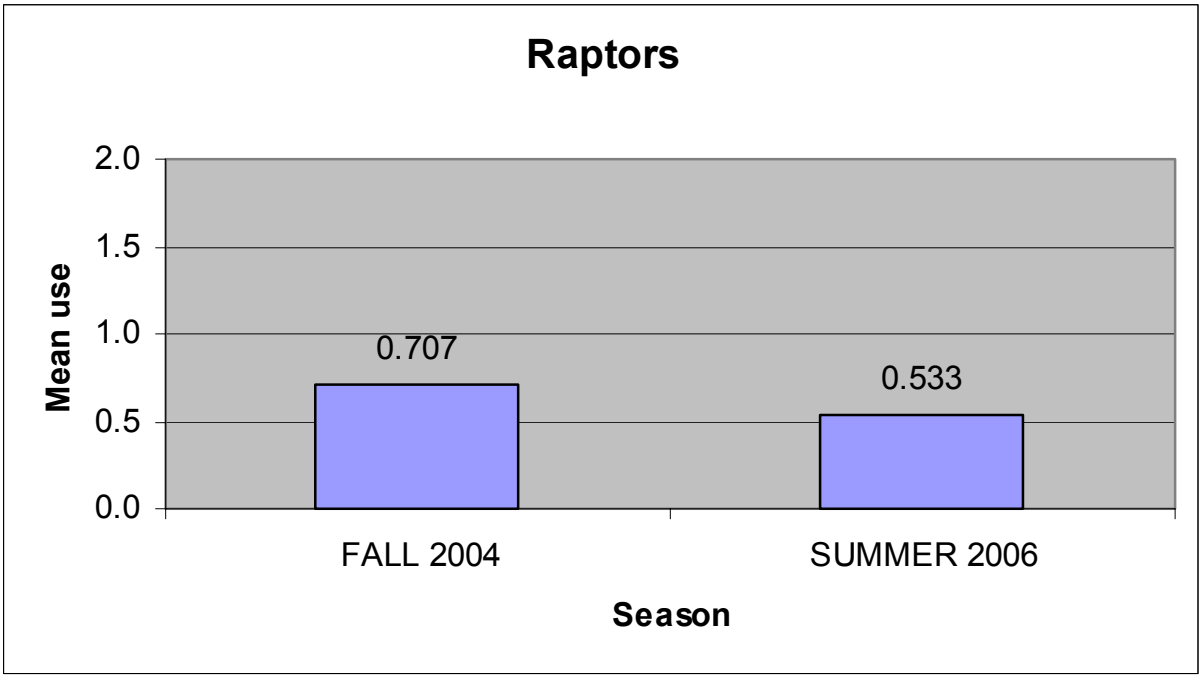


Figure 1. Location of the 6 avian survey points on the Saddleback Project Area, fall 2004 and five avian survey points (excludes A) for summer 2006.



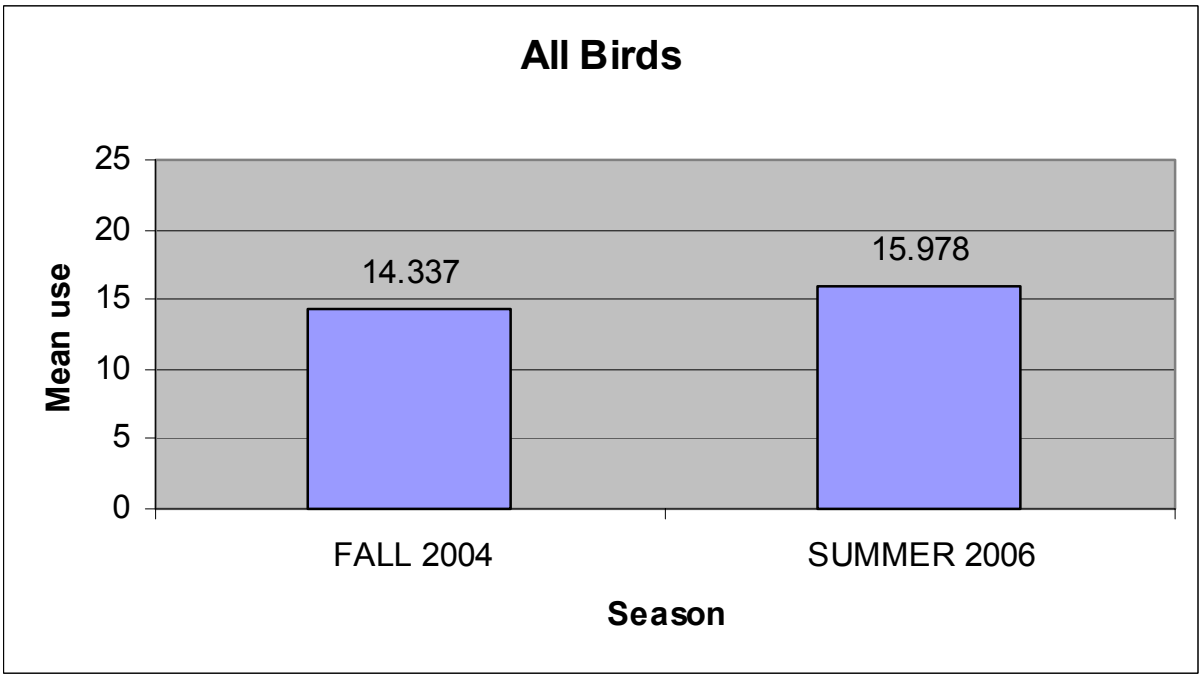
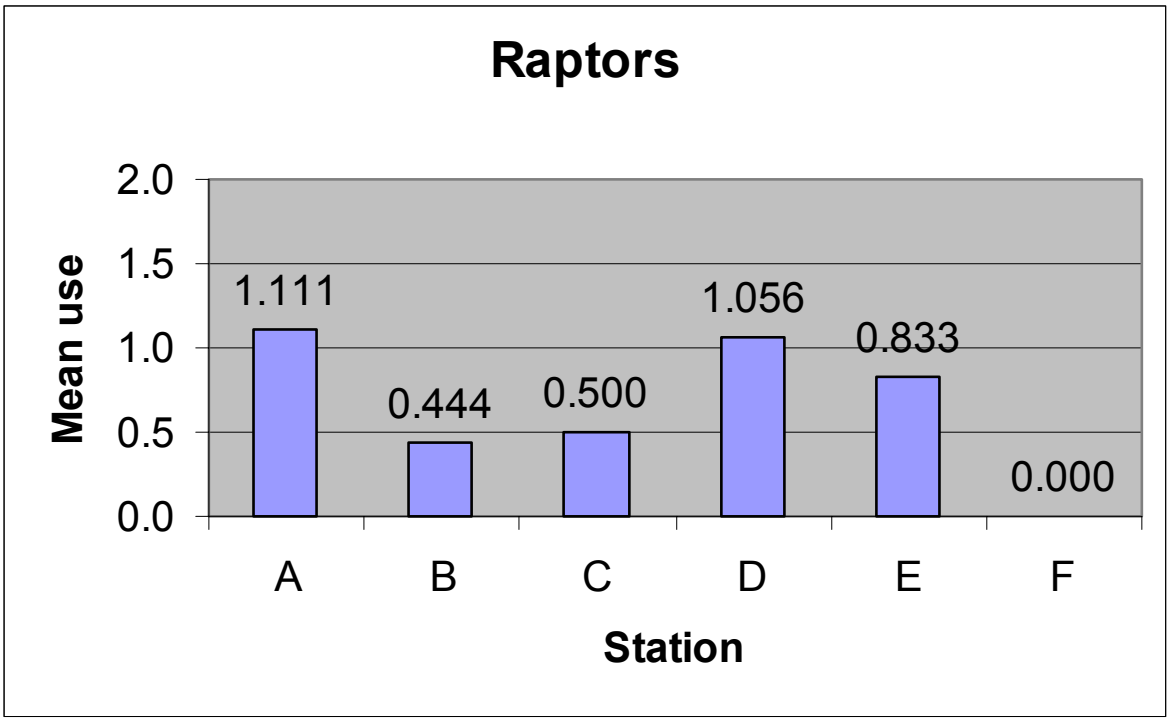


Figure 2. Avian use of the Saddleback Project Area by Season



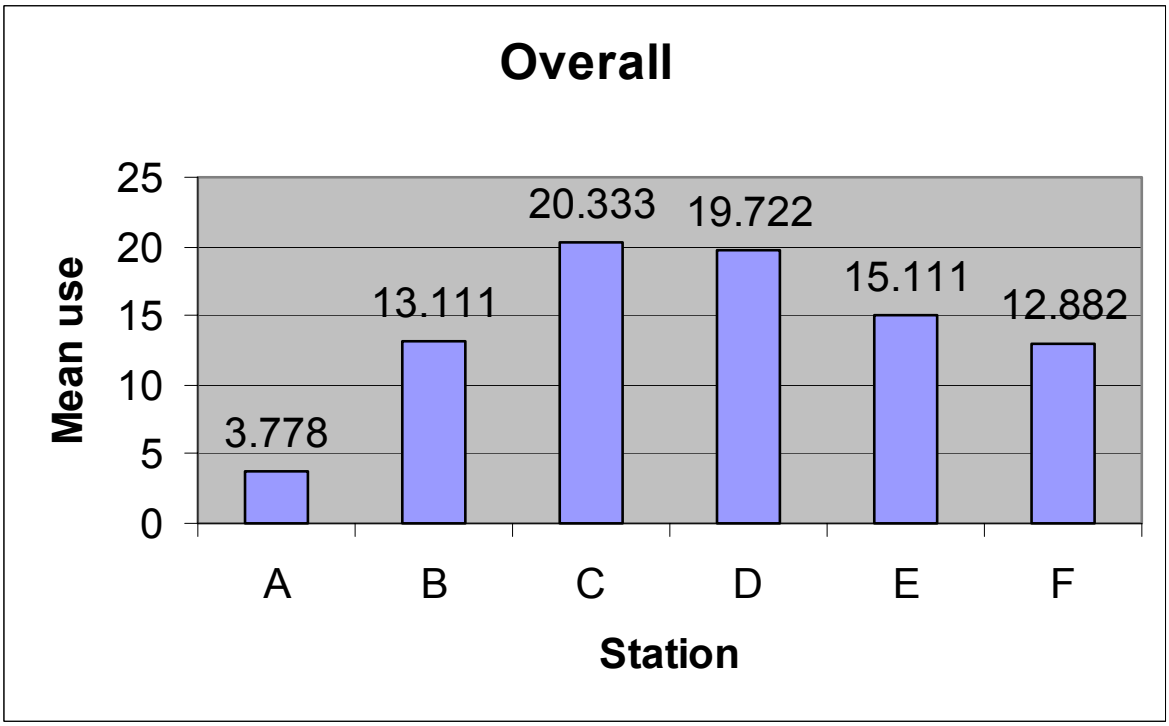


Figure 3. Avian use of the Saddleback Project Area by Station

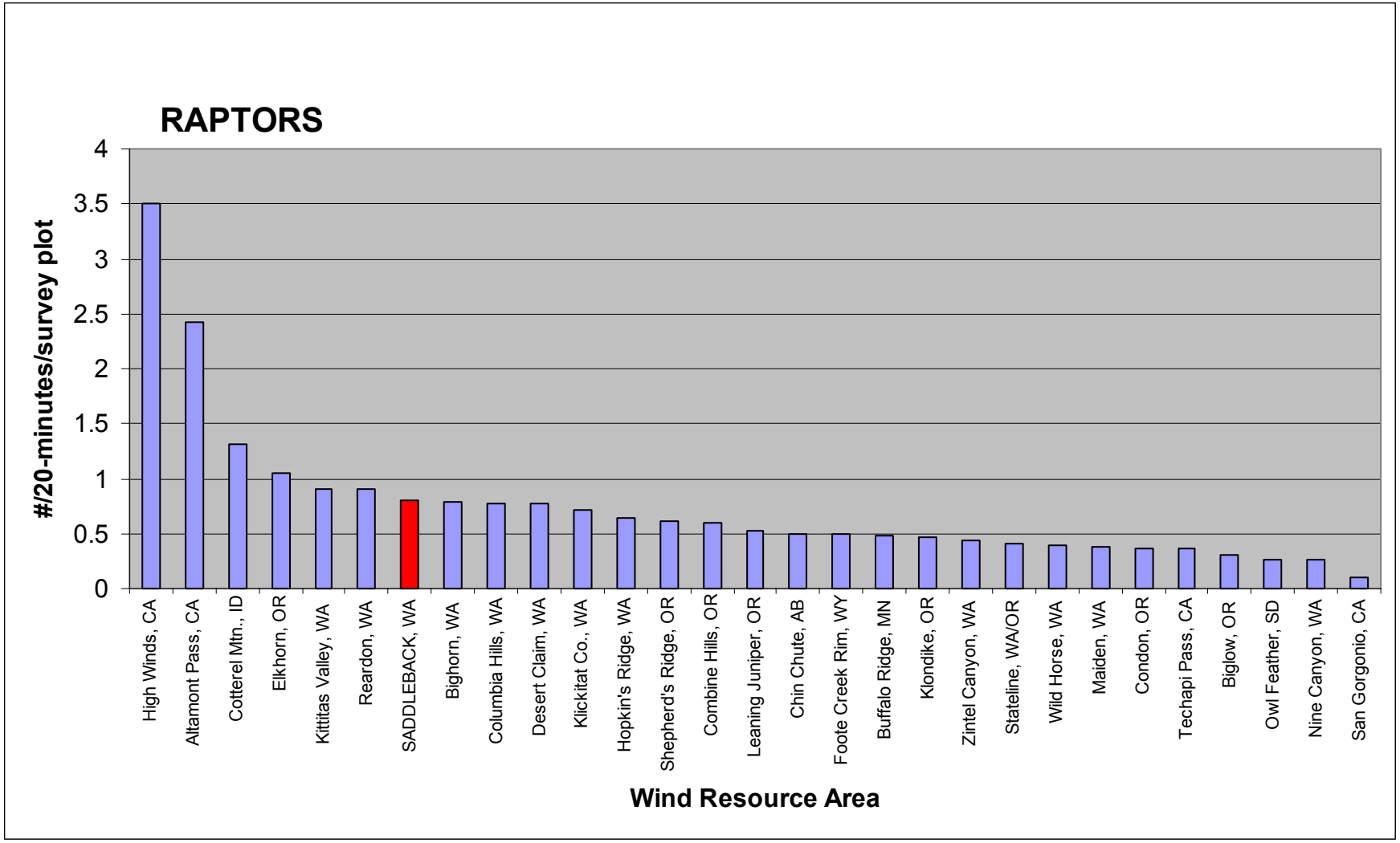


Figure 4. Raptor/vulture use estimates for 28 wind resource areas in the U.S.

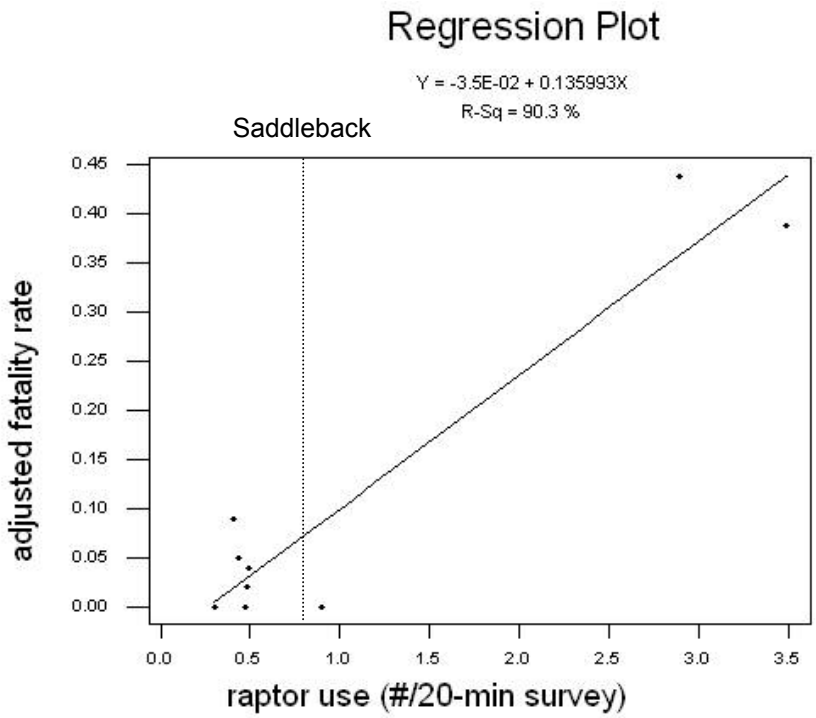


Figure 5. Relationship between raptor use and adjusted fatality rates for 9 newer wind projects.

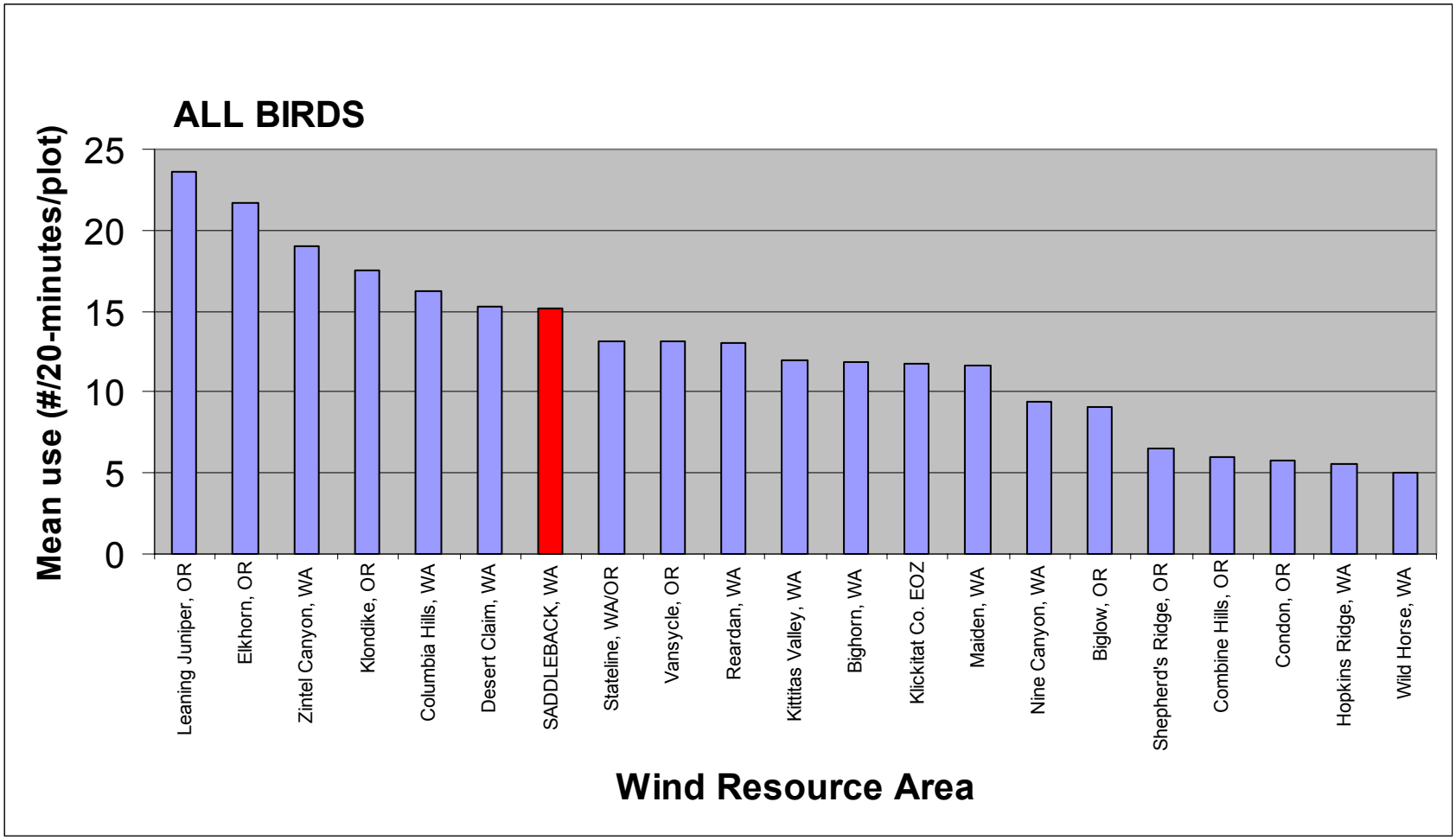


Figure 6. Avian use estimates (all species) for several wind resource areas in eastern Washington and Oregon

Appendix A. Number of avian groups and individuals by species observed during the fall migration fixed-point surveys for the Saddleback Project site.

	Fall		Summer	
Species	# obs.	# groups	# obs.	# groups
Raptors	**37**	**33**	**24**	**16**
Accipiters	*16*	*16*	*4*	*4*
Cooper's hawk	6	6	0	0
northern goshawk	2	2	3	3
sharp-shinned hawk	7	7	1	1
unidentified accipiter	1	1	0	0
Buteos				
red-tailed hawk	6	6	6	6
unidentified buteo	7	3	0	0
Northern Harriers				
northern harrier	1	1	0	0
Eagles				
golden eagle	2	2	0	0
Falcons				
prairie falcon	1	1	0	0
Vultures				
turkey vulture	4	4	14	6
Passerines	**667**	**184**	**636**	**482**
American goldfinch	89	10	8	5
American robin	44	9	27	22
Bewick's wren	0	0	1	1
black-capped chickadee	8	6	1	1
black-headed grosbeak	0	0	25	23
black-throated gray warbler	0	0	22	21
brown-headed cowbird	0	0	6	5
Cassin's vireo	0	0	2	2
cedar waxwing	0	0	10	4
chestnut-backed chickadee	1	1	21	12
chipping sparrow	0	0	8	7
Clark's nutcracker	1	1	0	0
common raven	59	34	5	5
dark-eyed junco	116	23	30	23
evening grosbeak	0	0	9	2
golden-crowned kinglet	13	10	1	1
golden-crowned sparrow	20	2	0	0
Hammond's flycatcher	0	0	5	5
hermit thrush	0	0	2	2
house wren	0	0	5	3
lazuli bunting	0	0	7	7

Appendix A (*continued*). Number of avian groups and individuals by species observed during the fall migration fixed-point surveys for the Saddleback Project site.

	Fall		Summer	
Species	# obs.	# groups	# obs.	# groups
Lincoln's sparrow	1	1	0	0
Macgillivray's warbler	0	0	33	27
Mountain chickadee	2	1	0	0
Nashville warbler	0	0	2	2
northern rough-winged swallow	0	0	2	2
olive-sided flycatcher	0	0	21	21
orange-crowned warbler	0	0	6	5
pine siskin	0	0	11	3
purple finch	2	1	20	14
red crossbill	30	4	48	9
red-breasted nuthatch	12	11	12	11
ruby-crowned kinglet	3	3	2	2
song sparrow	1	1	0	0
spotted towhee	5	5	35	34
Steller's jay	76	31	16	12
Swainson's thrush	0	0	12	11
Townsend's solitaire	0	0	2	2
Townsend's warbler	0	0	14	13
tree swallow	15	3	0	0
unidentified empidonax	0	0	1	1
unidentified passerine	28	5	2	2
unidentified warbler	0	0	1	1
varied thrush	14	5	0	0
violet-green swallow	0	0	4	3
warbling vireo	0	0	10	10
western bluebird	27	4	1	1
western tanager	1	1	41	38
western wood-pewee	0	0	12	11
white-crowned sparrow	58	3	93	57
willow flycatcher	0	0	9	8
Wilson's warbler	0	0	16	16
yellow warbler	0	0	1	1
yellow-rumped warbler	41	9	14	14
Doves/Pigeons	**29**	**5**	**23**	**9**
band-tailed pigeon	27	3	23	9
Mourning dove	2	2	0	0
Upland Gamebirds				
ruffed grouse	1	1	1	1

Appendix A (*continued*). Number of avian groups and individuals by species observed during the fall migration fixed-point surveys for the Saddleback Project site.

	Fall		Summer	
Species	# obs.	# groups	# obs.	# groups
Swifts/Hummingbirds	**15**	**3**	**11**	**9**
rufous hummingbird	0	0	7	7
Vaux's swift	15	3	4	2
Woodpeckers	**14**	**12**	**24**	**19**
downy woodpecker	0	0	1	1
hairy woodpecker	2	2	8	6
northern flicker	6	4	15	12
pileated woodpecker	6	6	0	0
Total	763	238	719	536

B-7

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

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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

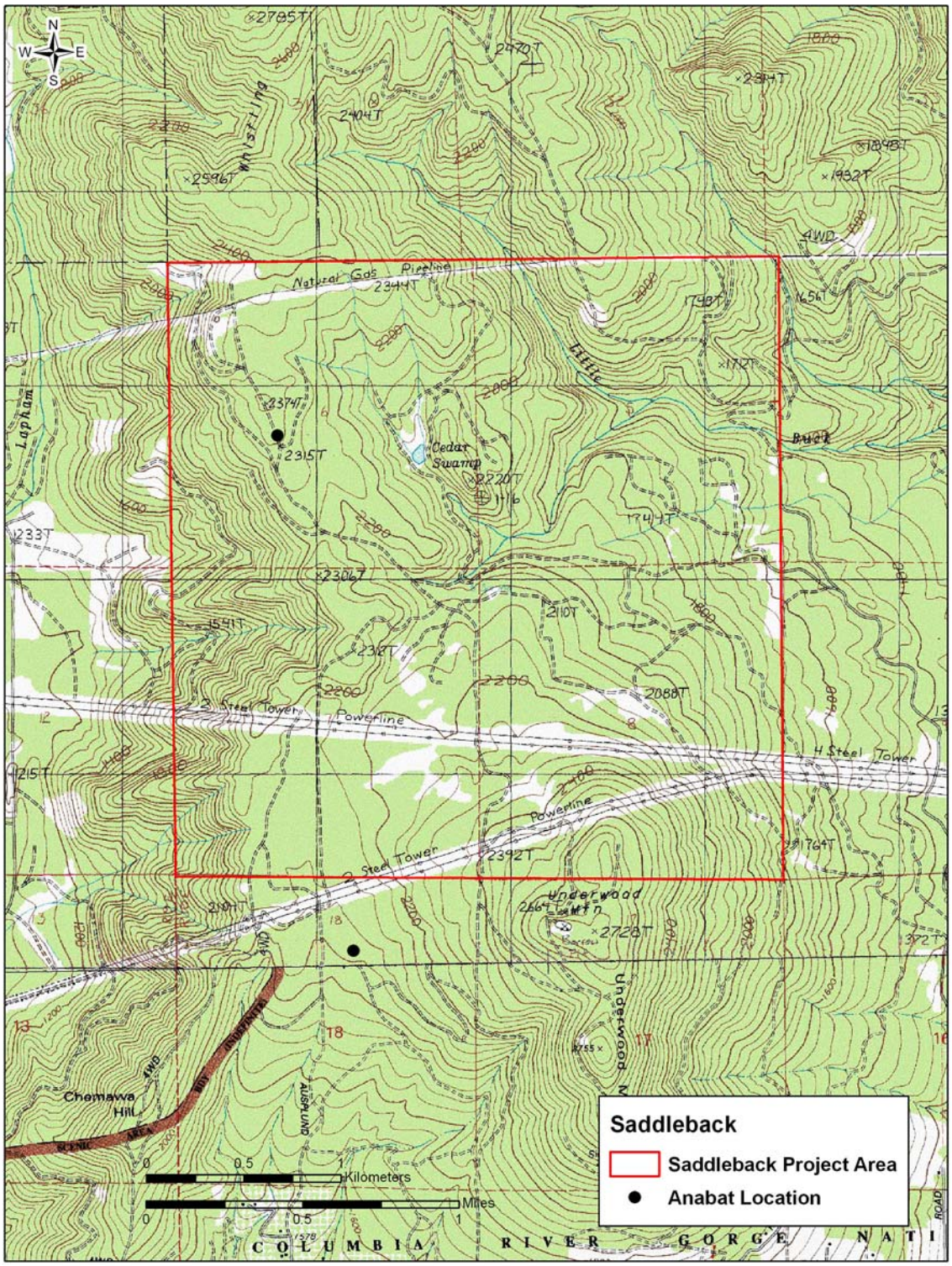

Figure 1. Study area map showing project area and Anabat sampling stations at the SWRA.

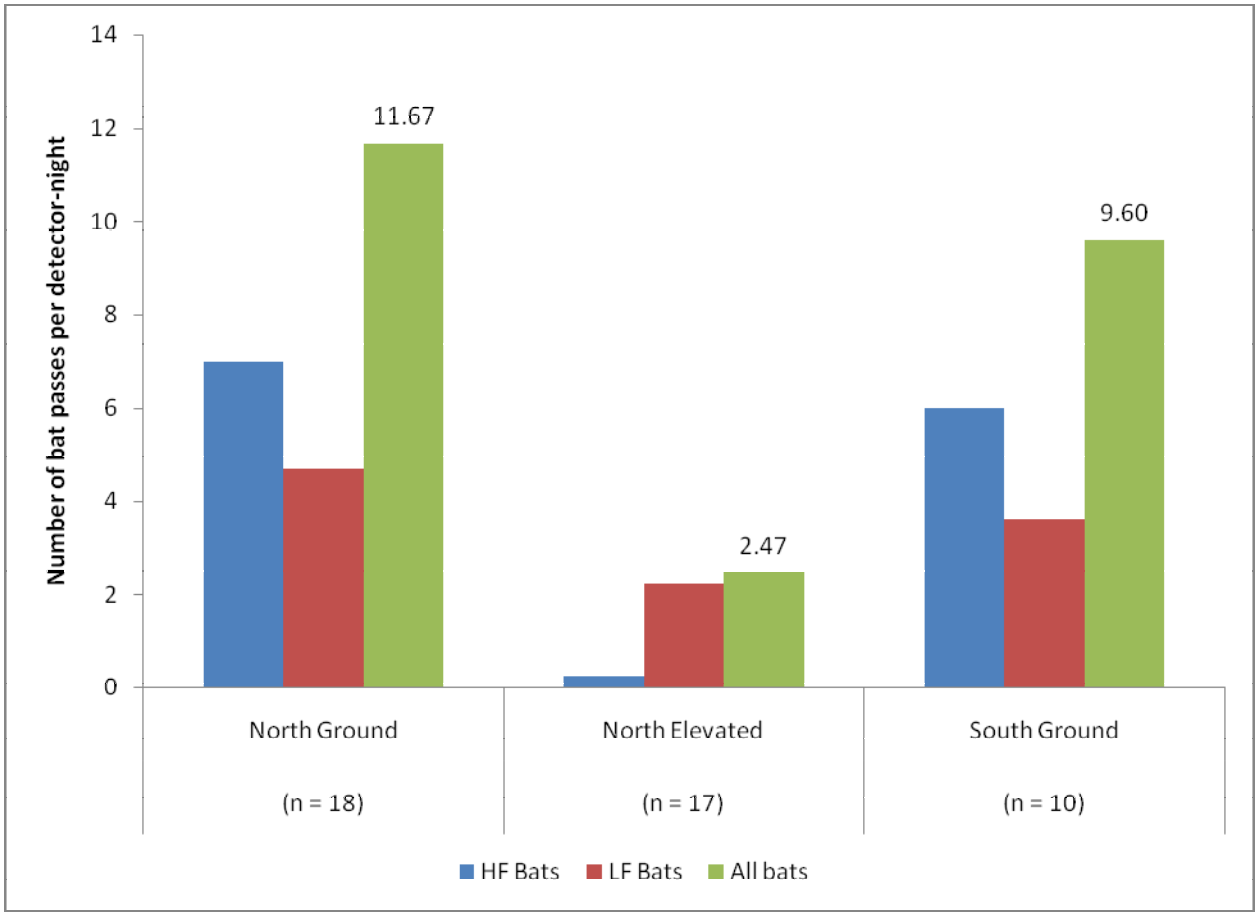

Figure 2a. Number of bat passes per detector-night by location at the SWRA.

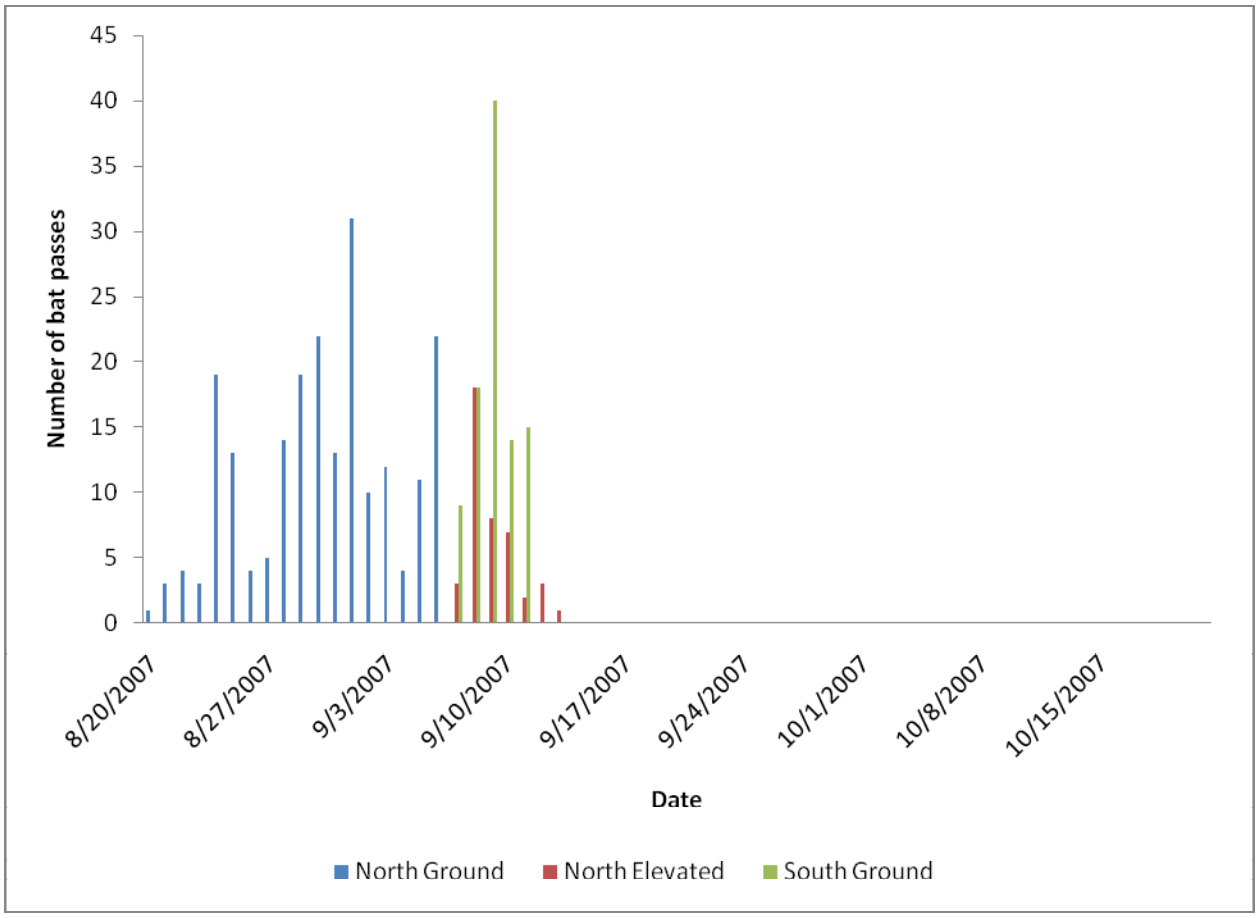

Figure 2b. Number of nightly bat passes, grouped by Anabat location, at the SWRA.

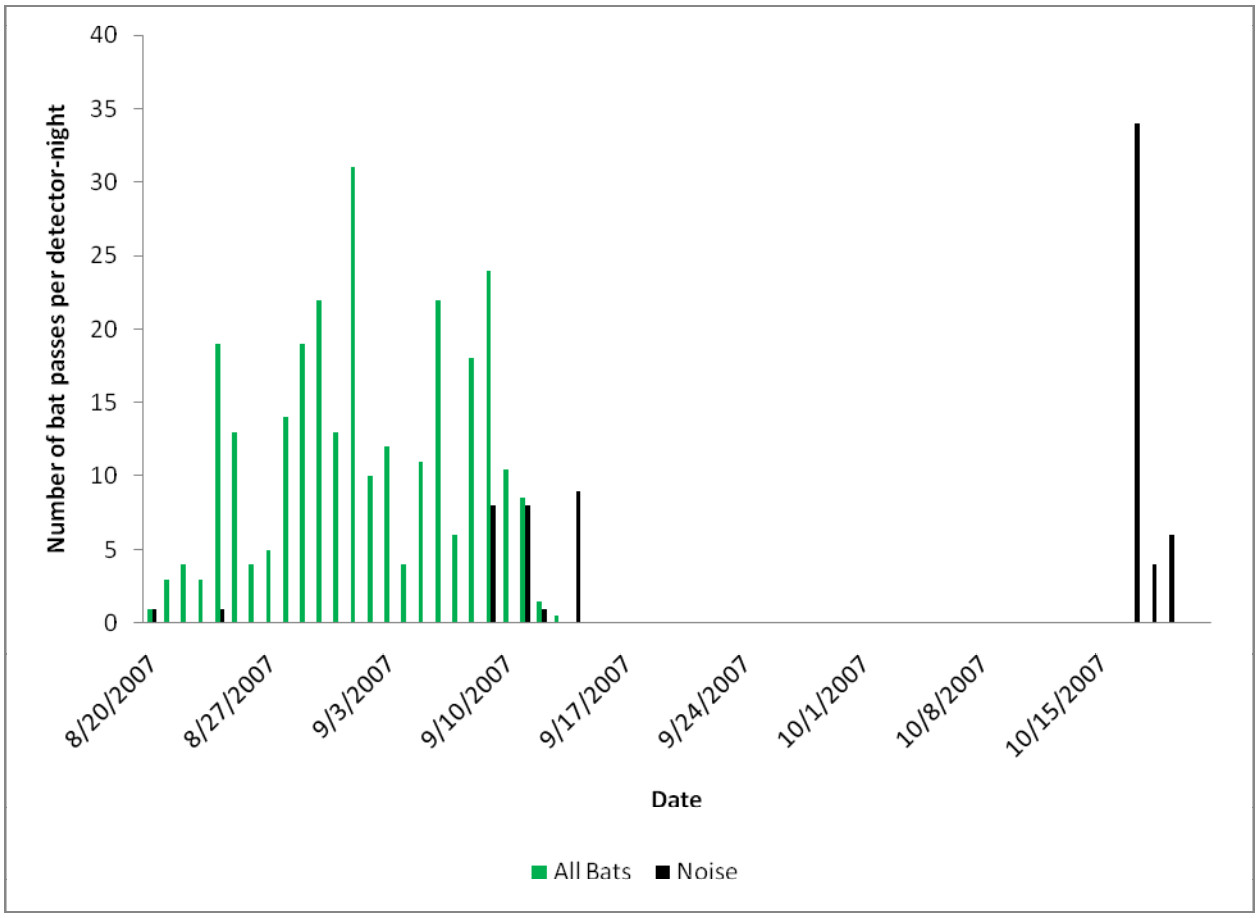

Figure 3. Number of bat passes and noise files detected per detector–night, presented nightly, at the SWRA.

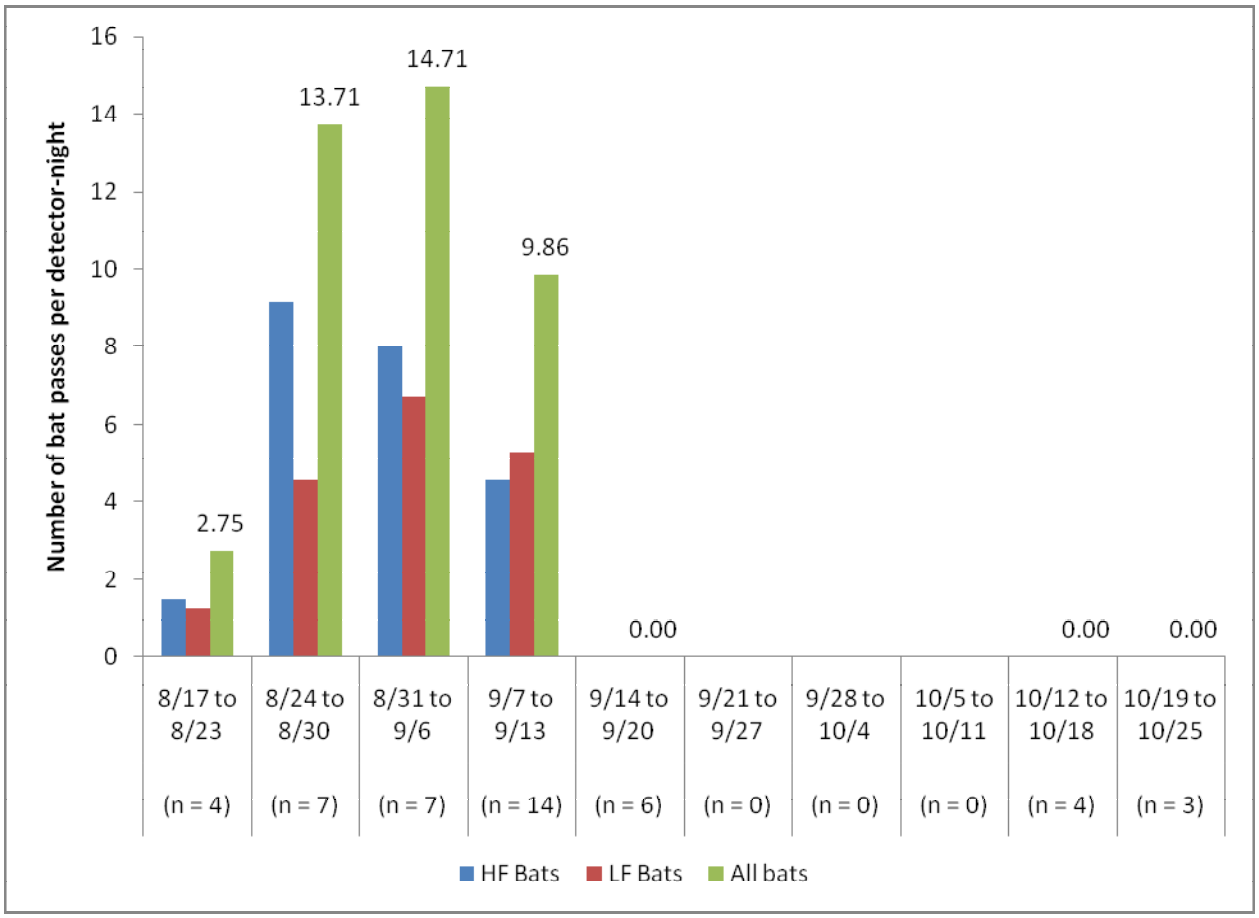

Figure 4a. Weekly activity by high- and low-frequency bats at the SWRA. (Equipment failures prevented data collection between September 17 and October 14, 2007.)

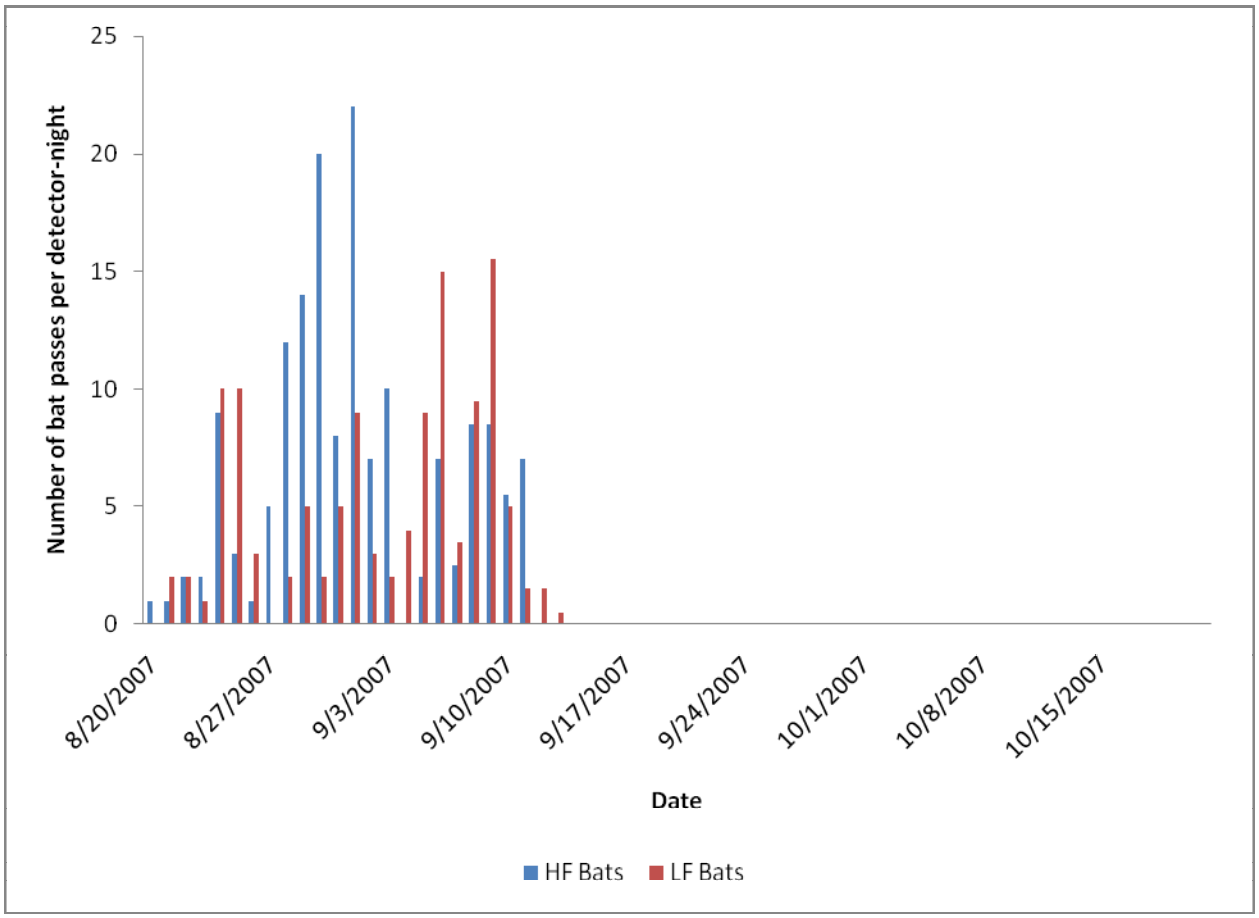

Figure 4b. Nightly activity by high- and low-frequency bats at the SWRA. (Equipment failures prevented data collection between September 17 and October 14, 2007.)

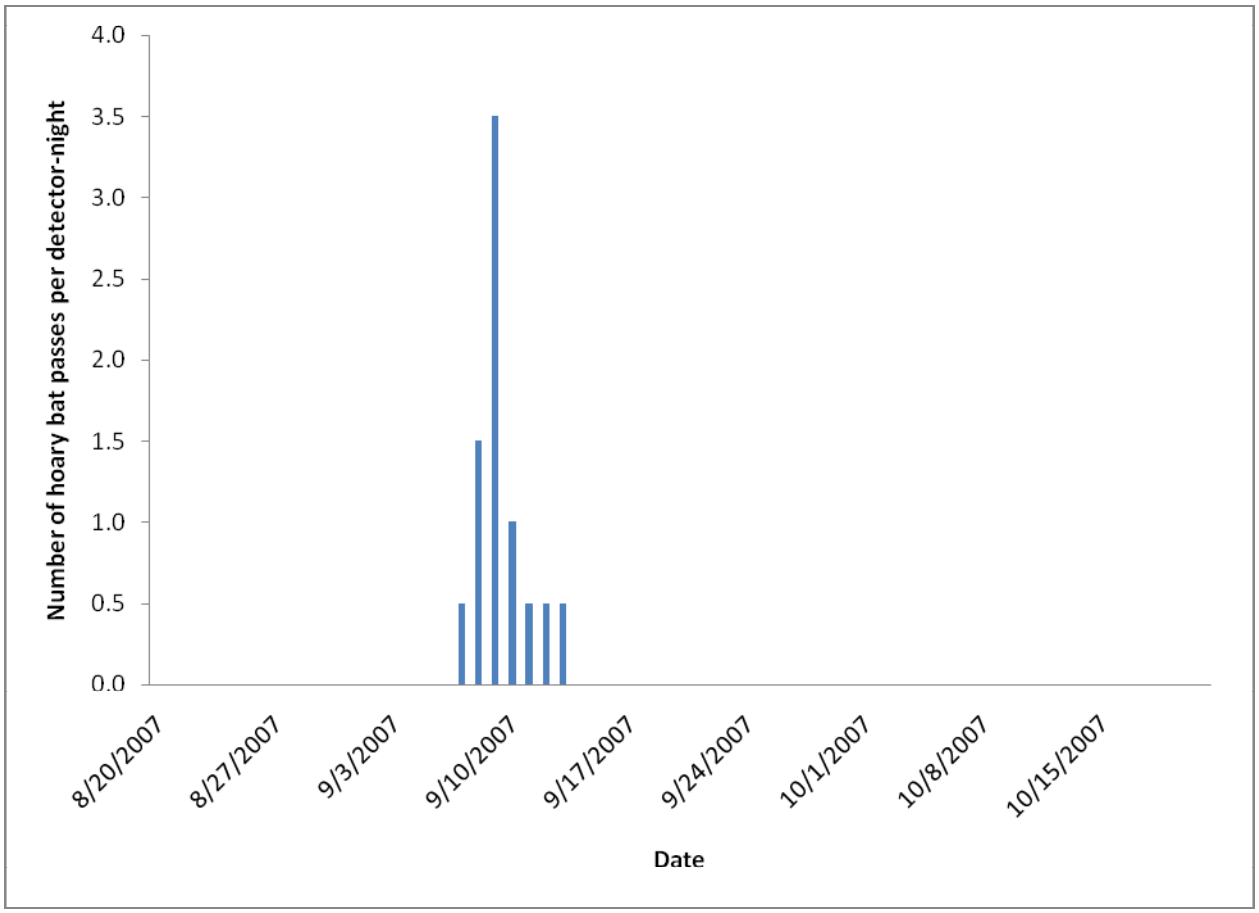

Figure 5. Number of passes per detector–night by hoary bats, presented nightly, at the SWRA. (Equipment failures prevented data collection between September 17 and October 14, 2007.)

B-8

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

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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

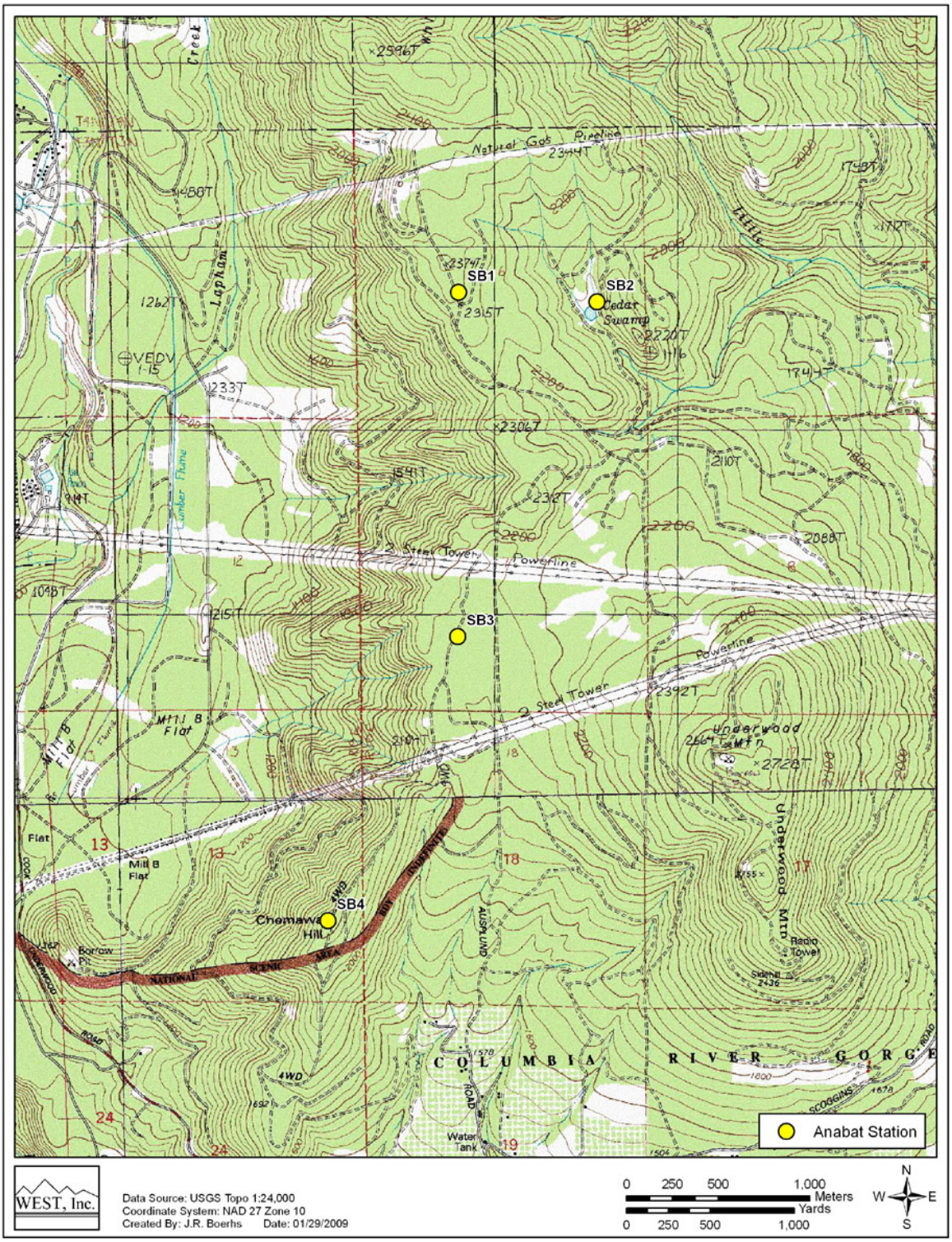

Figure 1. Anabat sampling locations at the Saddleback Wind Resource Area.

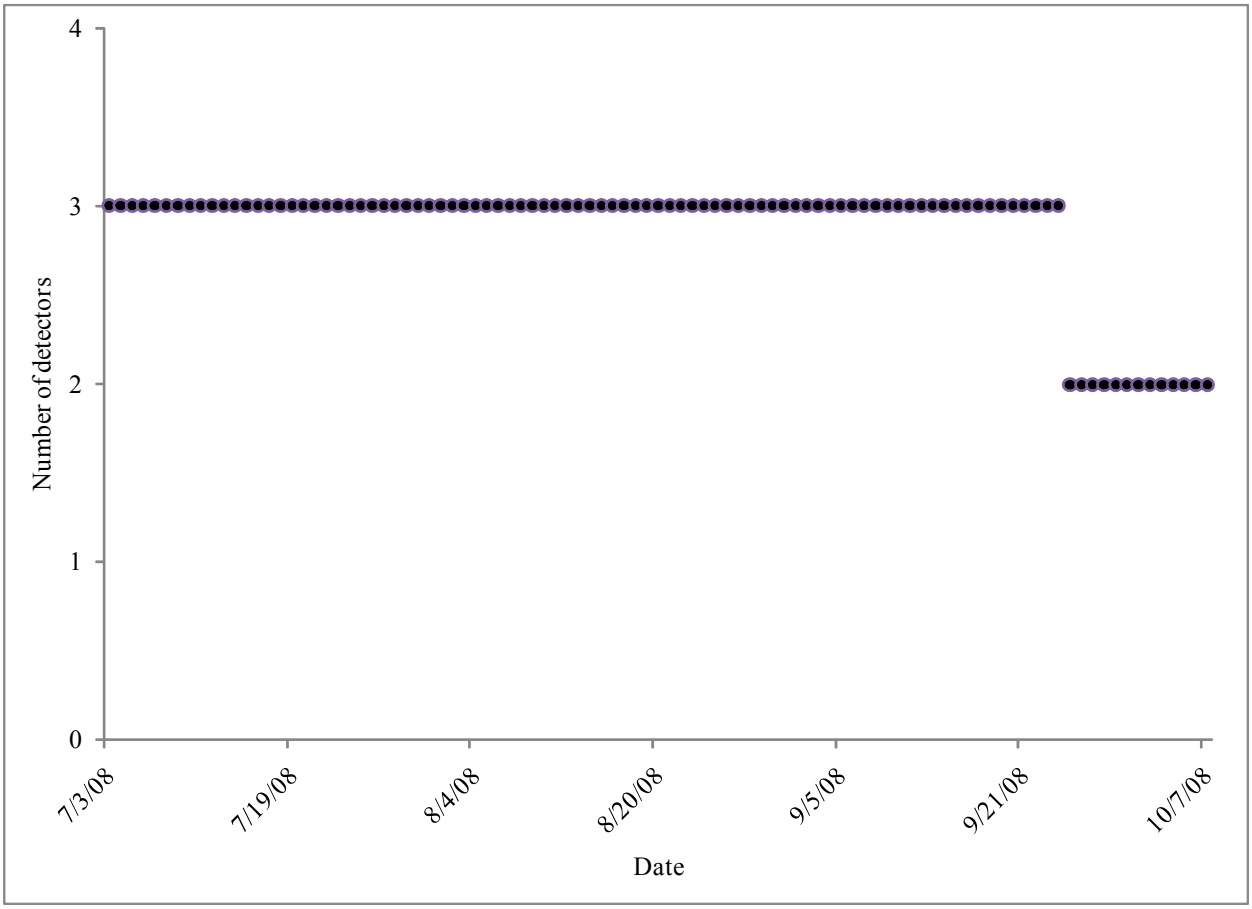

Figure 2. Number of Anabat detectors (n = 3) at the Saddleback Wind Resource Area operating during each night of the study period July 3 – October 7, 2008.

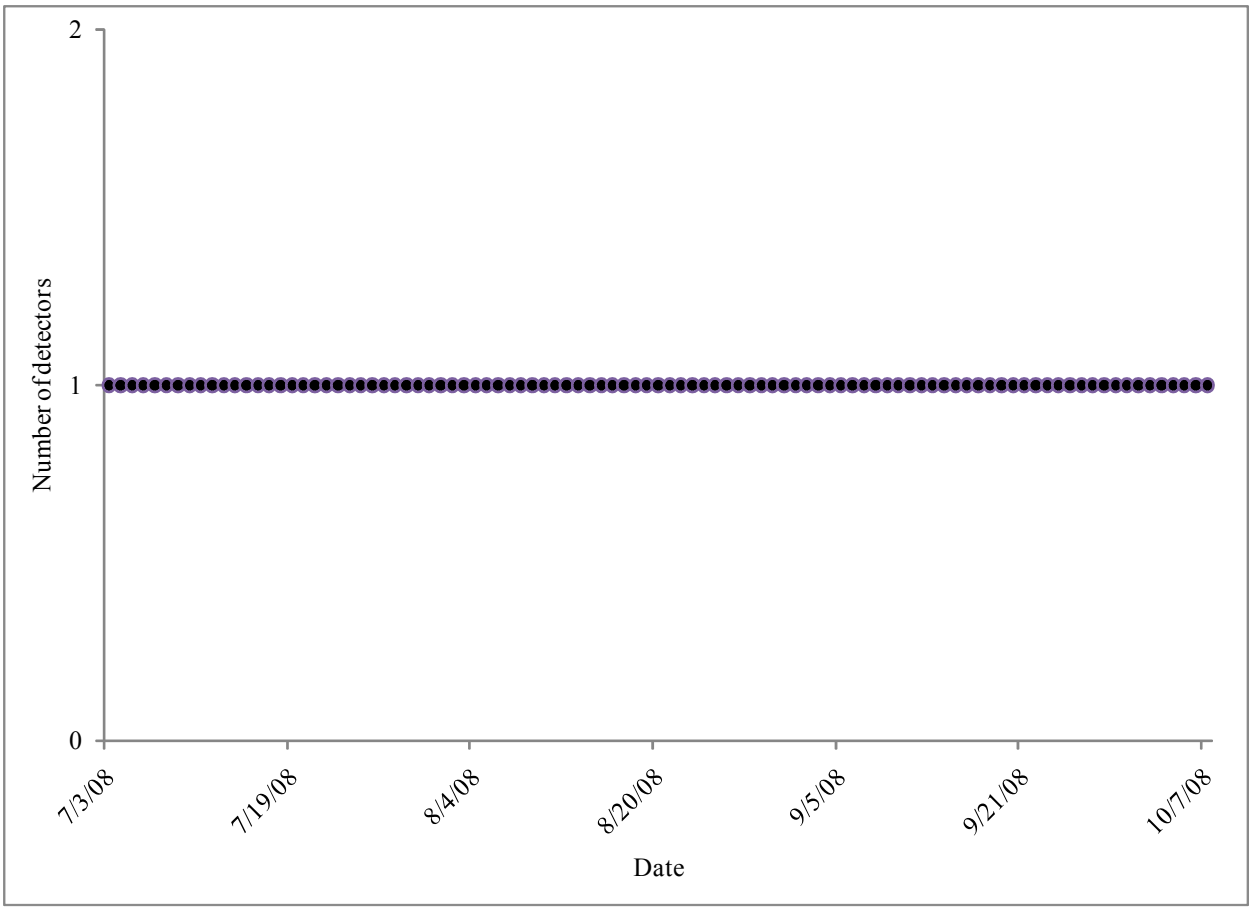

Figure 3. Number of Anabat detectors at wetland station SB2, operating during each night of the study period July 3 – October 7, 2008.

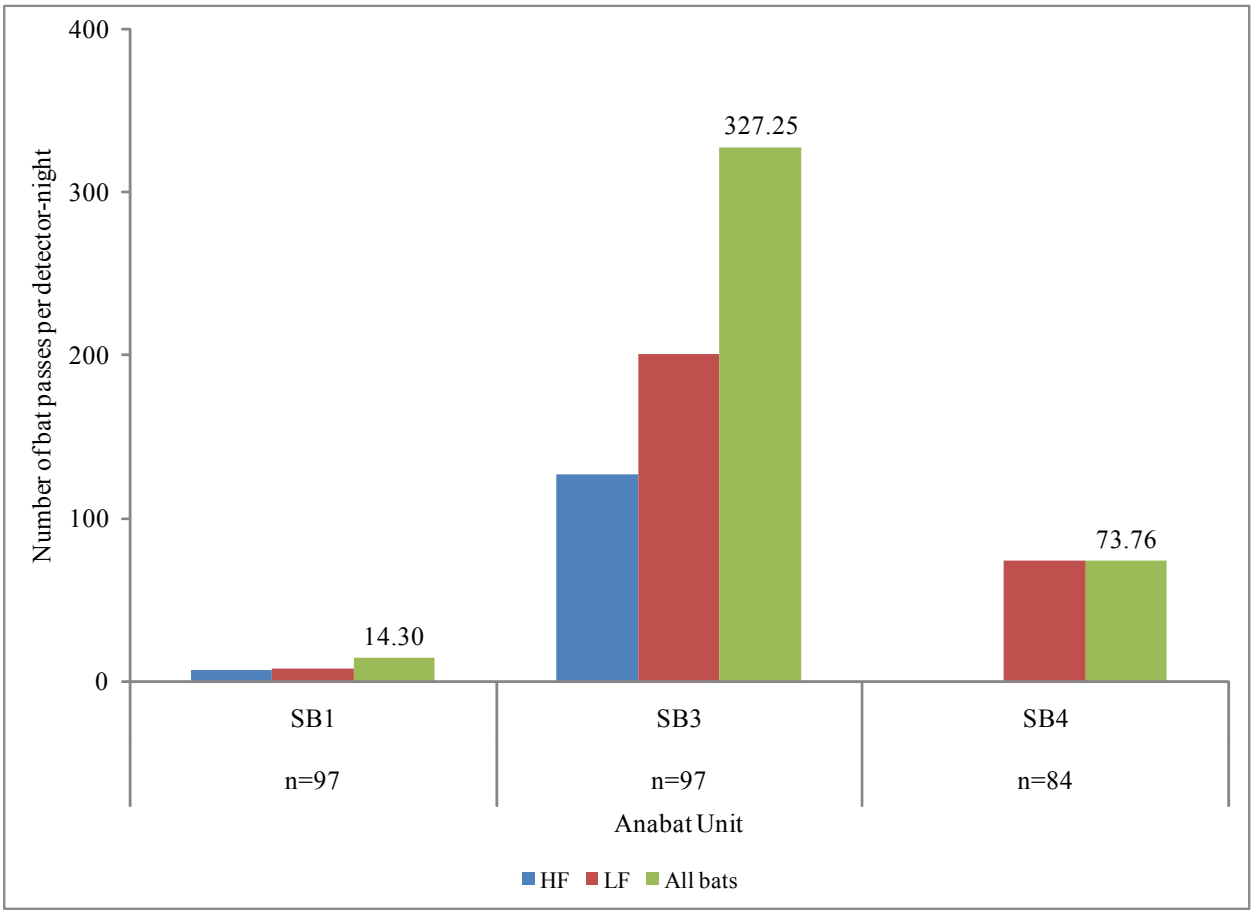

Figure 4. Number of bat passes per detector-night at upland Anabat locations at the Saddleback Wind Resource Area for the study period July 3 – October 7, 2008.

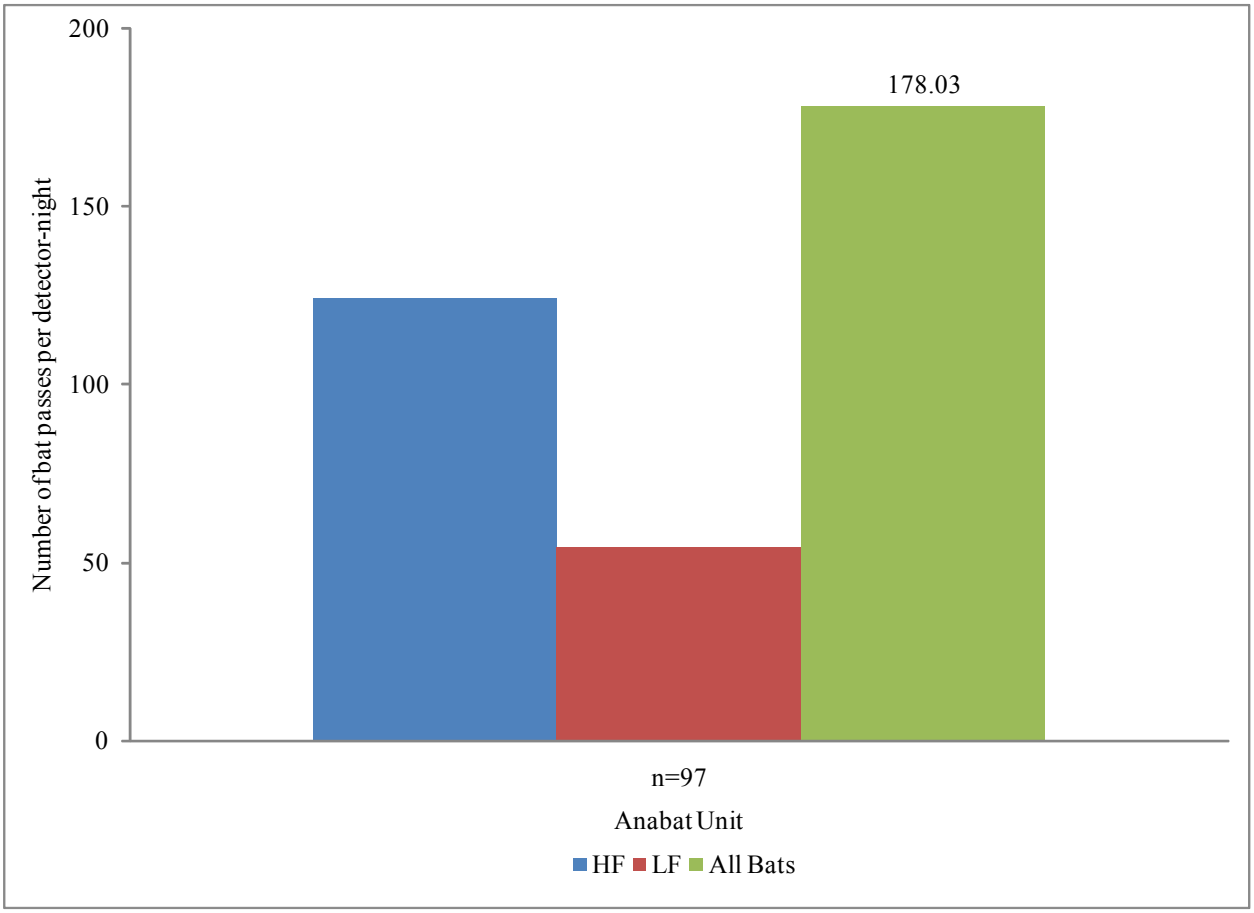

Figure 5. Number of bat passes per detector-night at Anabat wetland location SB2 for the study period July 3 – October 7, 2008.

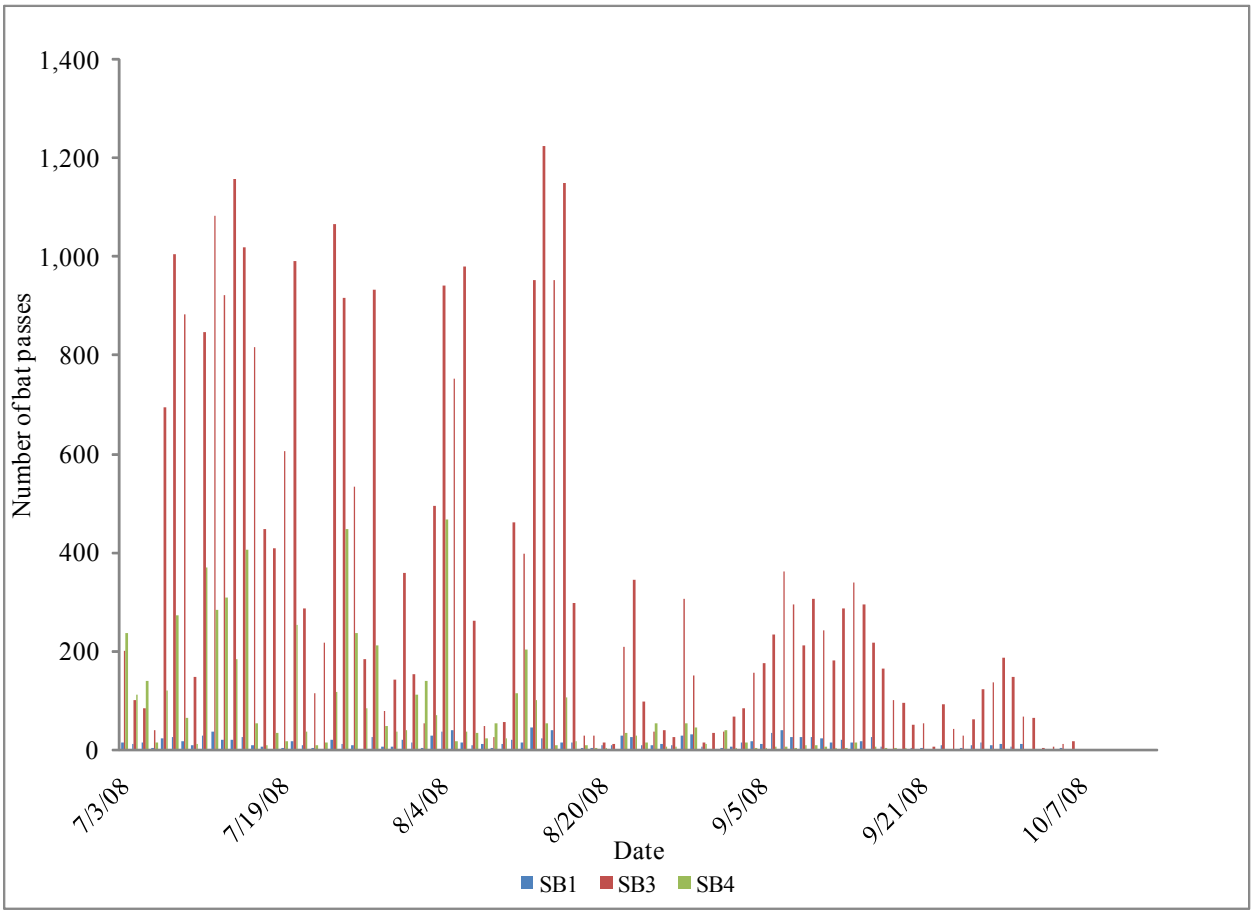

Figure 6. Number of nightly bat passes by station for the study period July 3 – October 7, 2008.

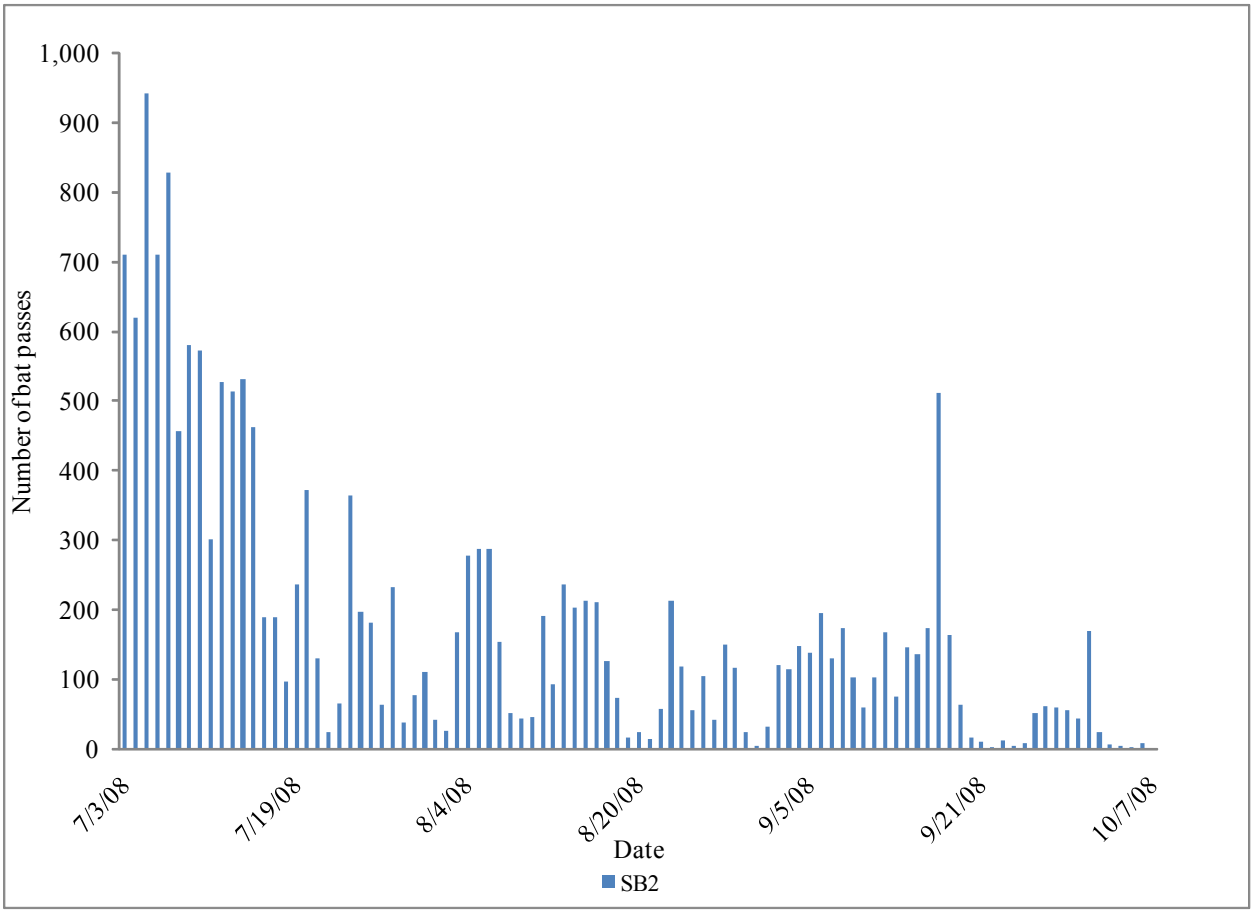

Figure 7. Number of nightly bat passes at wetland station SB2 for the study period July 3 – October 7, 2008.

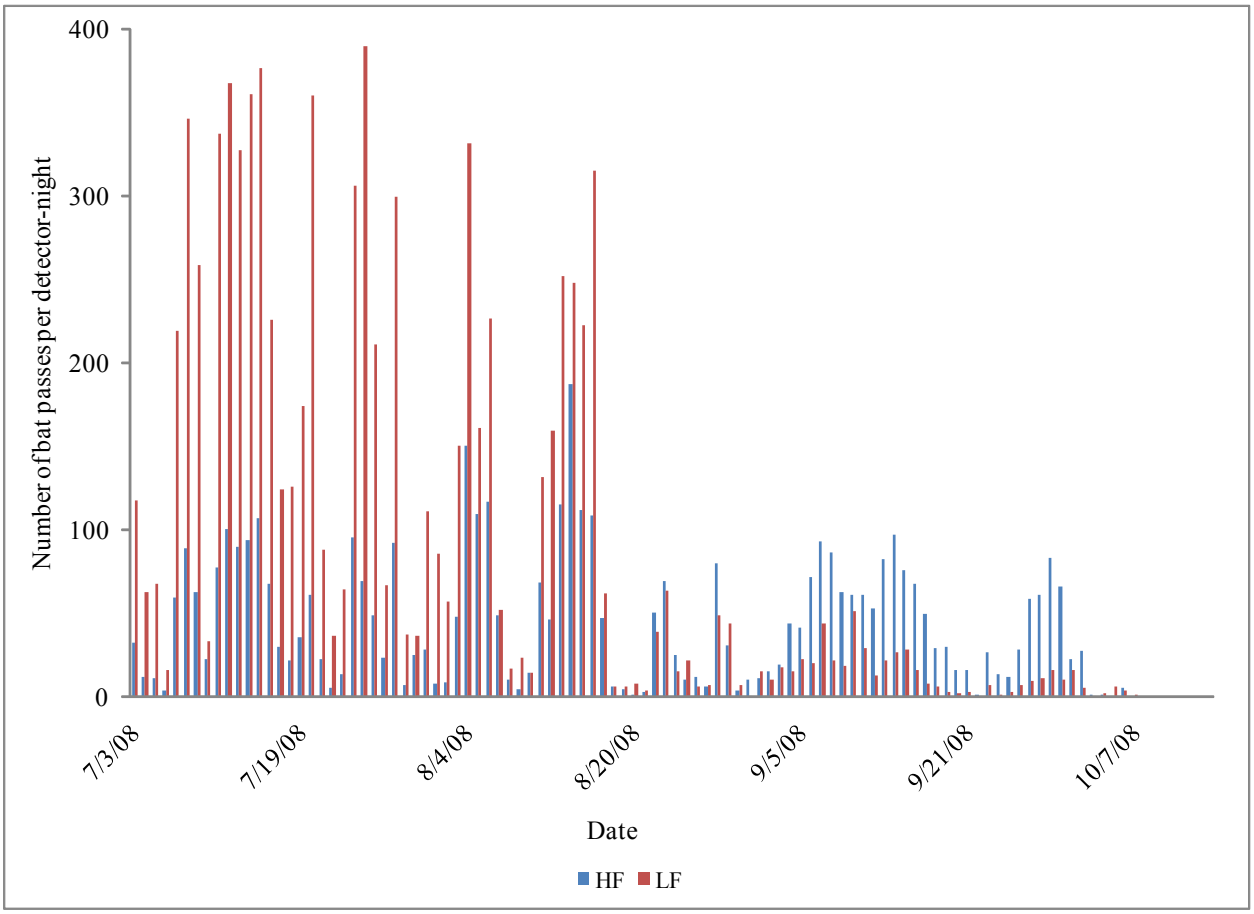

Figure 8. Nightly activity by high-frequency (HF) and low-frequency (LF) bats at upland stations at the Saddleback Wind Resource Area for the study period July 3 – October 7, 2008.

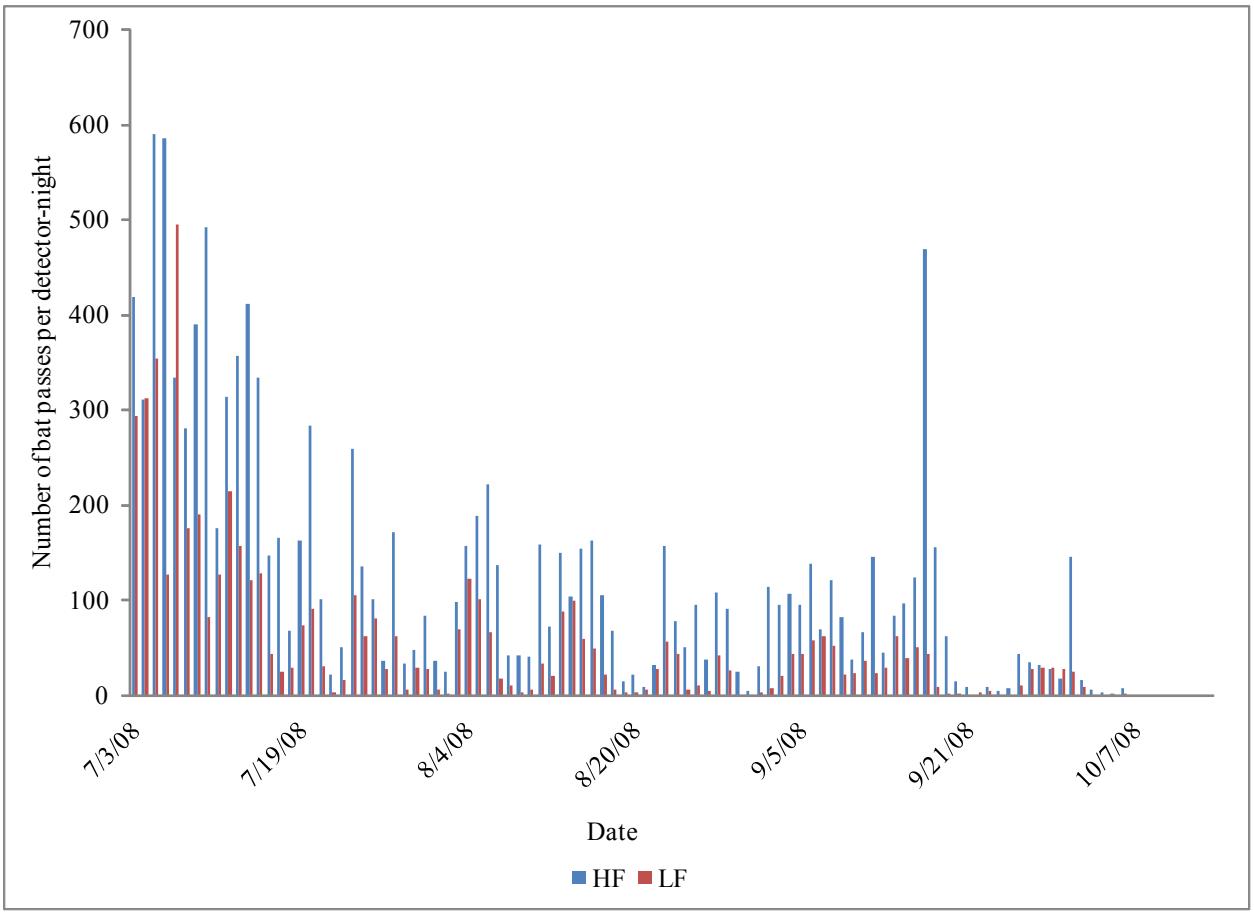

Figure 9. Nightly activity by high-frequency (HF) and low-frequency (LF) bats at wetland station SB2 for the study period July 3 – October 7, 2008.

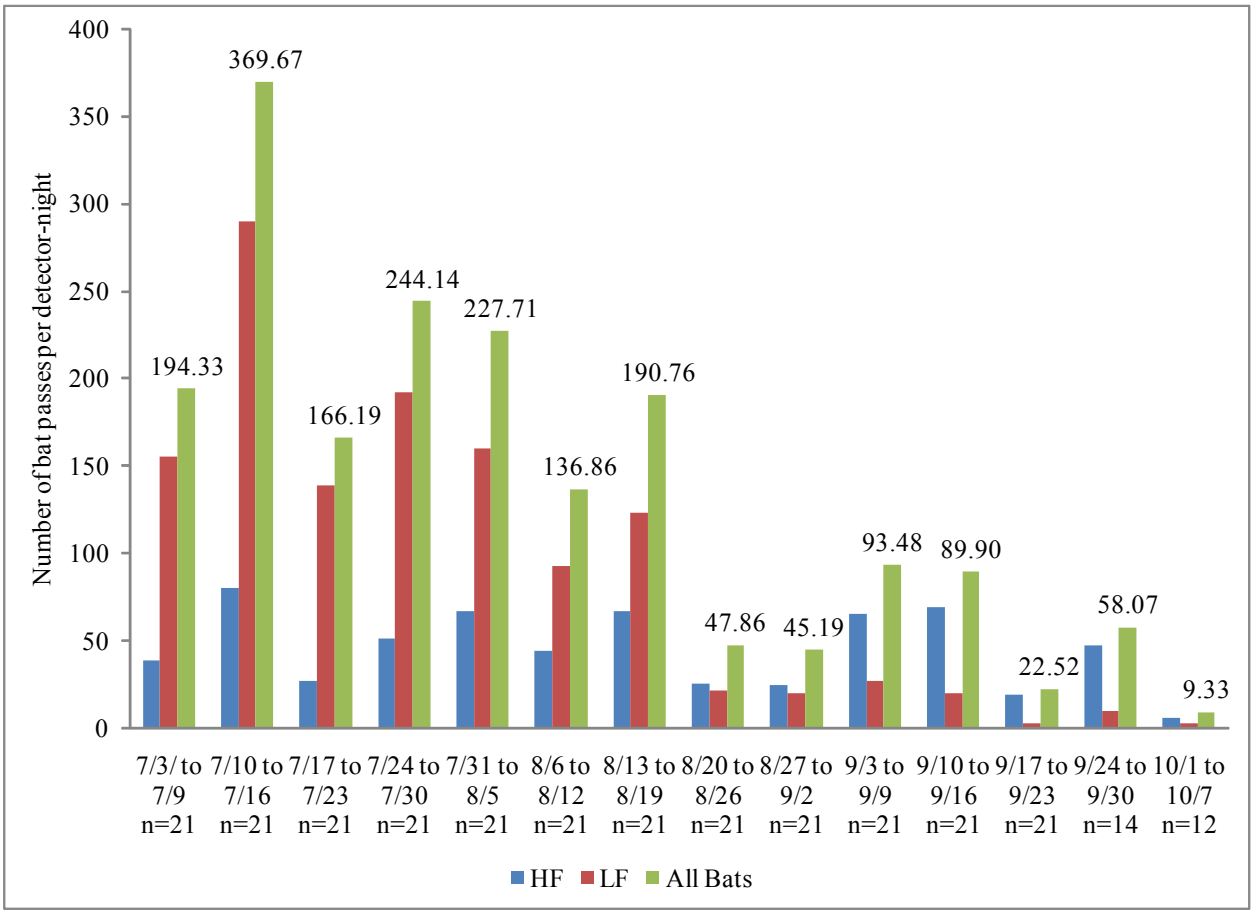

Figure 10. Weekly activity by high-frequency (HF) and low-frequency (LF) bats at upland stations for the study period July 3 – October 7, 2008.

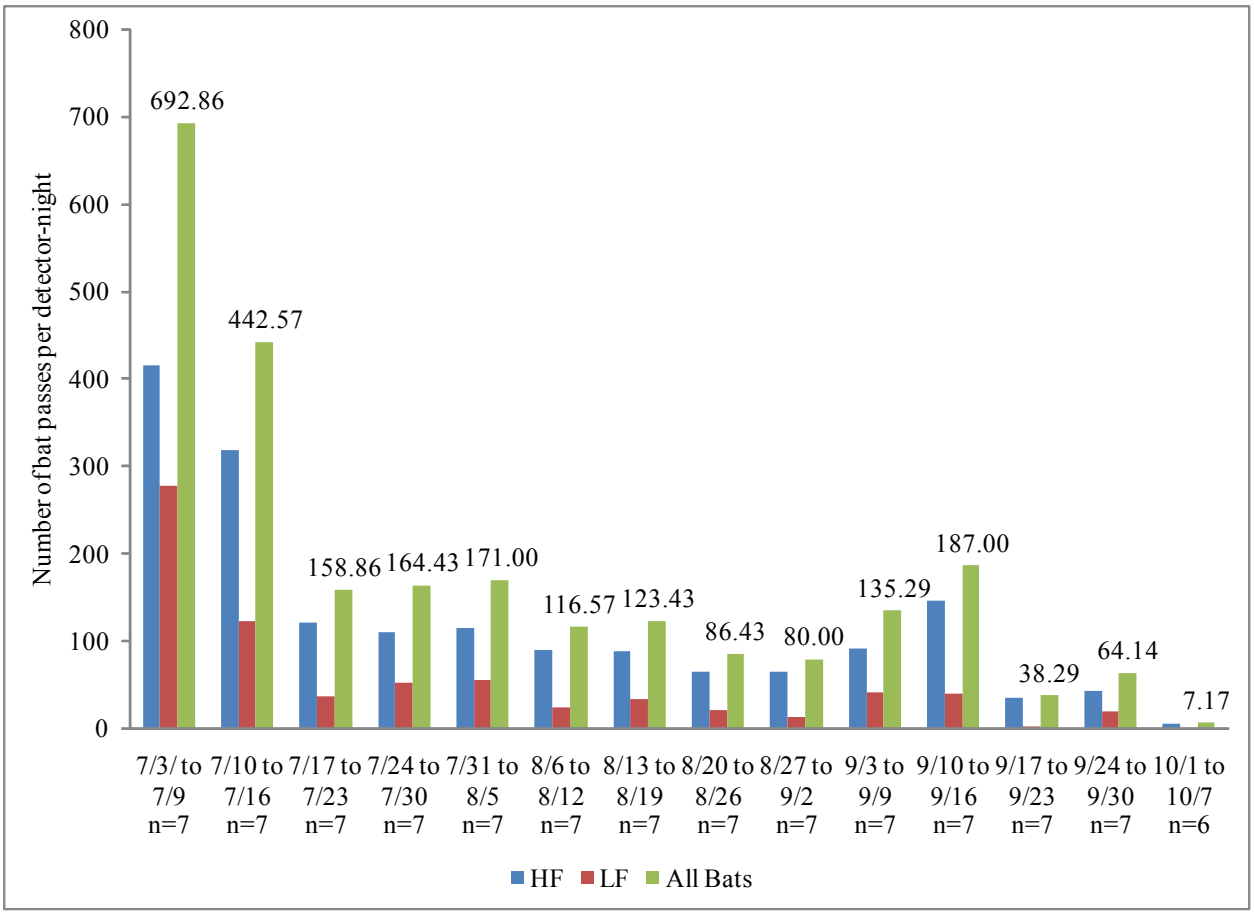

Figure 11. Weekly activity by high-frequency (HF) and low-frequency (LF) bats at wetland station SB2 for the study period July 3 – October 7, 2008.

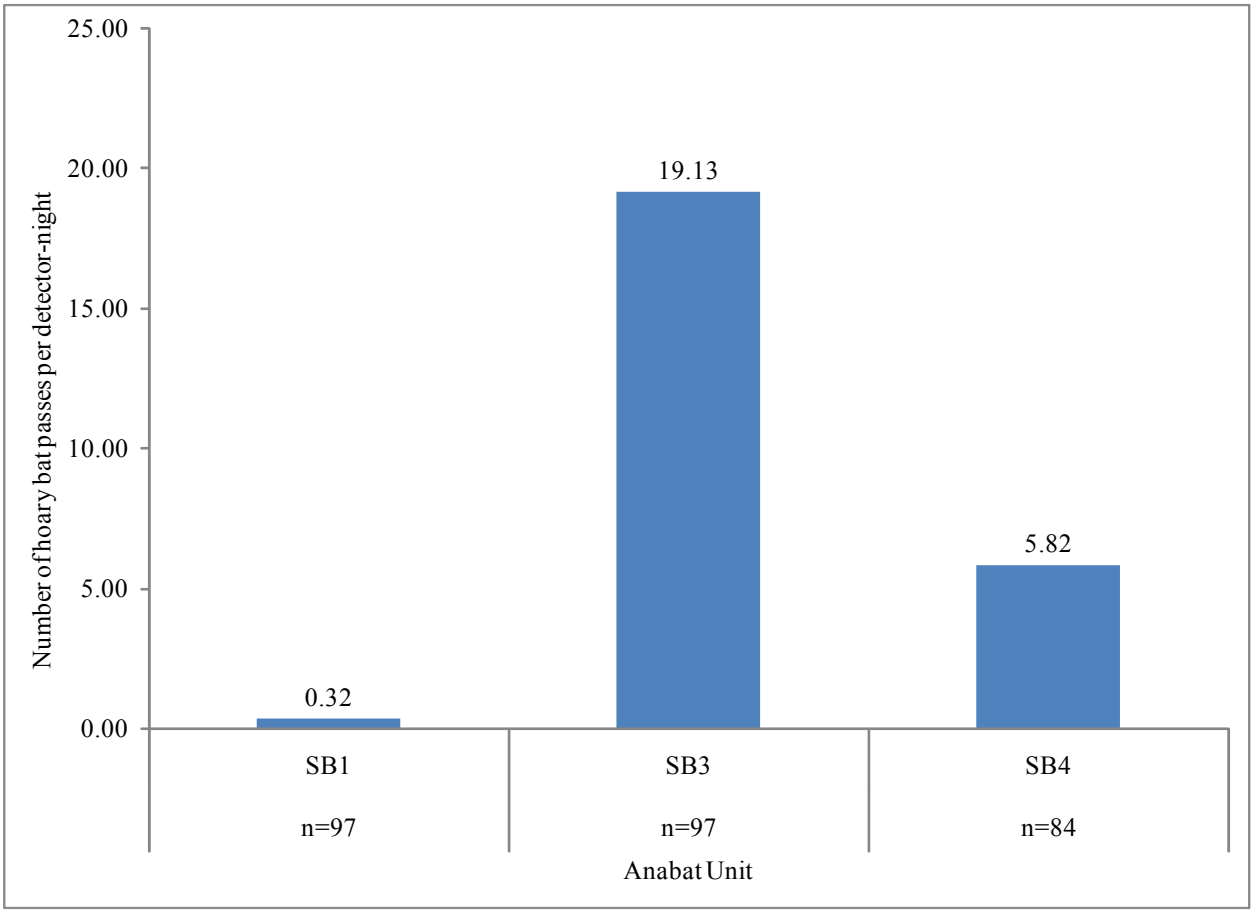

Figure 12. Number of passes per detector–night by hoary bats at upland Anabat stations at the Saddleback Wind Resource Area, for the study period July 3 – October 7, 2008.

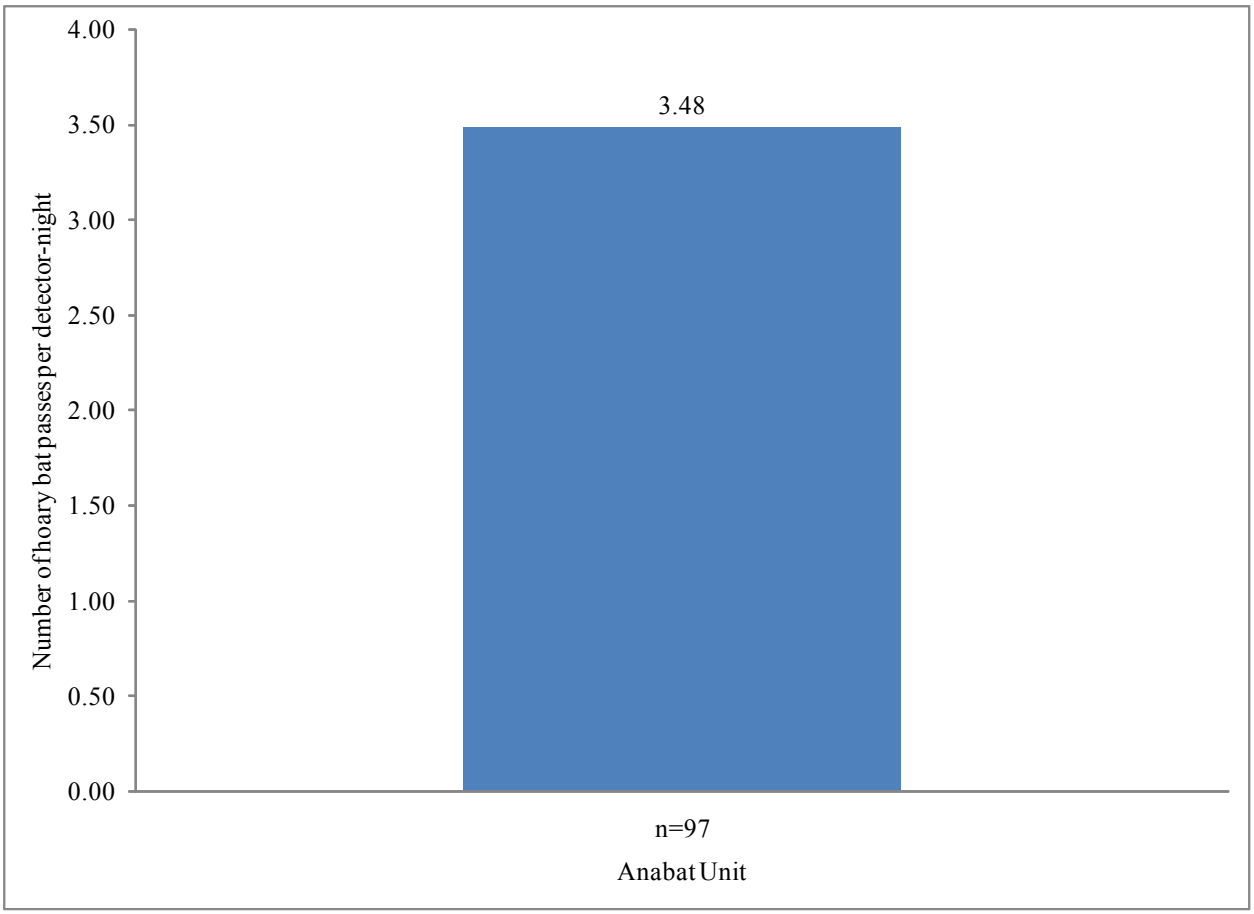

Figure 13. Number of passes per detector–night by hoary bats at Anabat wetland station SB2 for the study period July 3 – October 7, 2008.

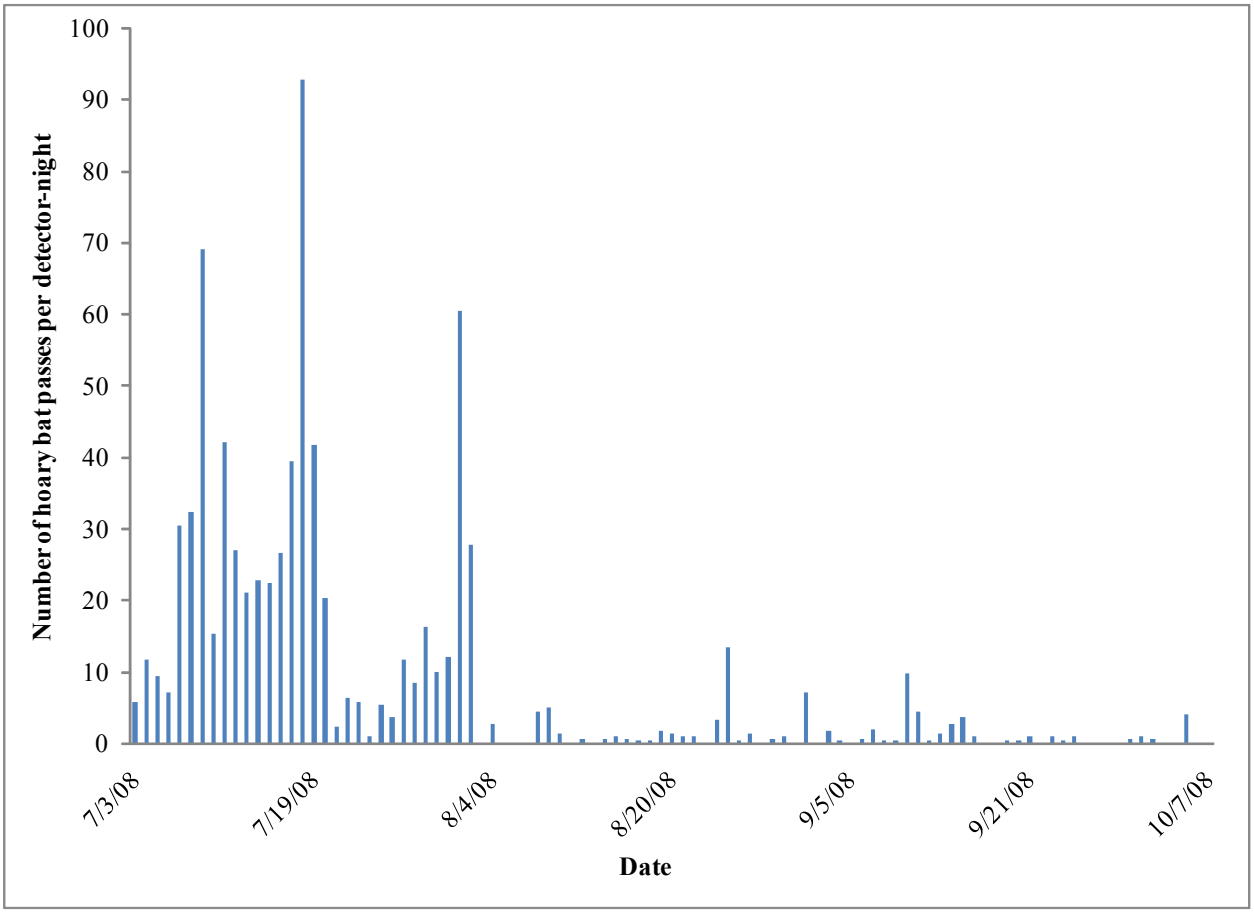

Figure 14. Number of passes per detector–night by hoary bats at upland stations at the Saddleback Wind Resource Area, presented nightly for the study period July 3 – October 7, 2008.

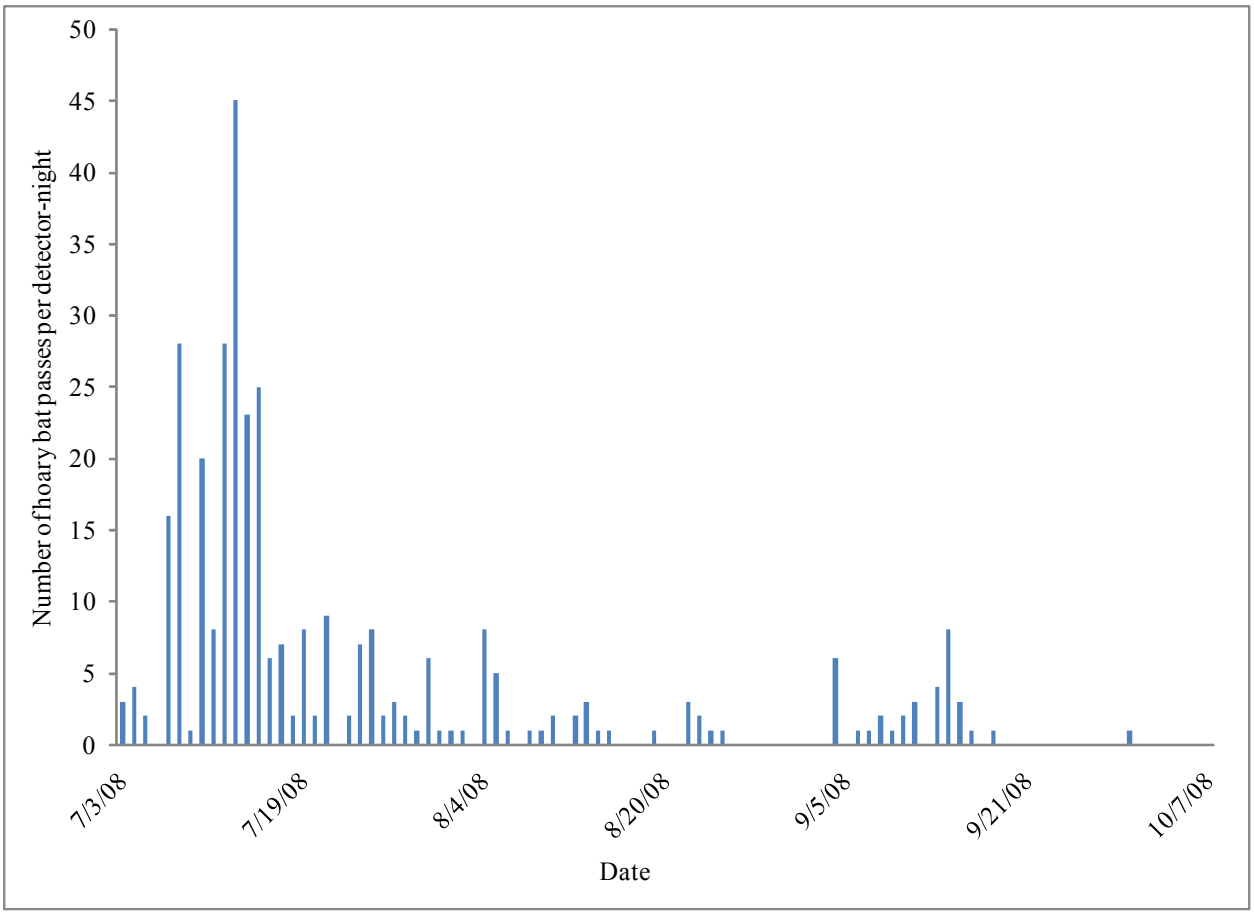

Figure 15. Number of passes per detector–night by hoary bats at wetland station SB2, presented nightly for the study period July 3 – October 7, 2008.