

**Survey Protocol for
Great Gray Owl (*Strix nebulosa*)
within the
Northwest Forest Plan Area**



Photo by Steve Godwin

**Version 4.0
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**USDA Forest Service Region 6, Oregon and Washington
USDA Forest Service Region 5, California
USDI Bureau of Land Management, Oregon**

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This protocol modifies and replaces the following document:

Quintana-Coyer, D.; Gerhardt, R.; Broyles, M.; Dillion, J.; Friesen, C.; Godwin, S.; Kamrath, S. 2004. Survey protocol for the great gray owl within the Northwest Forest Plan Area, Version 3.0. Portland, OR. U.S. Department of the Interior, Bureau of Land Management, Oregon/Washington, and U.S. Department of Agriculture, Forest Service Regions 5 and 6. 46 p.

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MODIFICATIONS TO VERSION 3.0

Version 4.0 of the survey protocol for the great gray owl (*Strix nebulosa*) was developed to update and clarify survey requirements based on new information since version 3.0 was created.

This new version modifies and updates the identification of "...likely habitat where the species is of concern, geographical area and substrate where the species is typically located..." (USDA and USDI 2001: 23). Significant changes reflecting this include:

- an expansion of nesting habitat requiring surveys to include mature and old-growth forests with ≥ 50 percent canopy cover and within 660 feet of a meadow or natural opening (non-brush field) ≥ 10 acres in size, that includes either a) broken-top snags ≥ 16 inch diameter at breast height, b) trees with pre-existing stick nests from hawks, crows or squirrels, or c) mistletoe brooms present in the stand;
- the clarification that surveys for projects that modify nesting habitat structure should cover all nesting, roosting, and foraging habitat within 0.25 mile of the nesting habitat potentially impacted by the proposed habitat-disturbing activity, and
- the clarification that surveys for projects that are considered habitat-disturbing due to noise or smoke only need to cover the nesting habitat impacted by the noise or smoke.

Version 4.0 also updates "...habitat conditions or locations...where surveys are not needed for a reasonable assurance of persistence, and thus surveys are not needed" (USDA and USDI 2001: 23). Significant changes addressing this include:

- the removal of the survey requirement in these physiographic provinces: Washington Western Cascades, Washington Eastern Cascades, and most of the Oregon Coast Range. The California Cascades and California Klamath physiographic provinces were previously excluded and continue to be so, and
- as a result, surveys are required only in the Oregon Willamette Valley, Oregon Eastern and Western Cascades, Oregon Klamath, and a small portion of the Oregon Coast Range physiographic provinces.

Other significant changes are:

- a modification of the definition of resident single, and the addition of resident single to the definition of known site;
- a reduction in required survey effort from two years to one;
- the establishment of a survey longevity of 10 years for survey polygons that yield known sites, and five years for polygons that do not, and
- a reduction in the amount of natural history provided in the document, given the creation of a conservation assessment by Williams (2012) of a more comprehensive resource.

Other major changes are in the survey triggers and requirements (e.g. nest tree description), range, survey period, mapping the habitat to survey, calling techniques and timing of use, and conducting surveys and data management sections.

The rationale for each of these changes is discussed within the text of the protocol.

EXECUTIVE SUMMARY OF SURVEY CRITERIA

Pre-disturbance surveys are triggered if all three of these criteria are met. The project is:

1. within the range of the great gray owl;
2. within or (*for noise-generating activities*) nearby¹ nesting habitat, and
3. a habitat-disturbing activity (see USDA and USDI 2001; S&G 22).

If all three triggers are met, then surveys are required. Six visits within one calendar year should be conducted between March 15 and July 15.

Range of the great gray owl

Surveys are required at elevations between 500-6,000 feet in the Oregon Willamette Valley, Oregon Eastern Cascades, Oregon Western Cascades, and Oregon Klamath physiographic provinces, and a segment of the eastern portion of the Oregon Coast Range physiographic province; Lane and Douglas Counties, Oregon, up to 25 miles west of the eastern border of the physiographic province.

Nesting habitat

Nesting habitat includes stands that meet all four of these criteria:

1. mature or old-growth conifer stands;
2. with >50 percent canopy cover;
3. within 660 feet of a natural, grassy opening ≥ 10 acres, and
4. containing potential nest trees, generally: a) broken-top snags (≥ 16 inch dbh), b) trees containing pre-existing stick nests from hawks, ravens, or squirrels, or c) mistletoe brooms.

Activities that are generally habitat-disturbing

The following activities are generally expected to result in significant negative impacts to the habitat, life cycle, microclimate, life support systems, or persistence of great gray owls at the site. These include activities that significantly modify the structure of the nesting habitat by falling potential nest trees or by falling other trees and reducing canopy cover in the nesting habitat to <50 percent. Examples include:

1. timber harvest;
 - a. regeneration harvest
 - b. commercial thinning, if removing potential nest trees or taking the canopy cover below 50 percent
2. road construction/reconstruction;
3. logging landings, and
4. guy line or tail hold trees.²

¹ This distance varies based on the activity. For blasting, the activity may be up to a mile away from nesting habitat and cause a disturbance. For other noise generating activities, in general, the distance is considered to be ≤ 330 feet.

² In situations where few potential nest trees might be affected by the proposed action, a visual examination of the impacted trees to locate nests may suffice, and additional survey efforts are not needed.

Activities that do not significantly modify nesting habitat may be considered a habitat-disturbing activity by harassing owls, if the activity occurs during the breeding season (March 15-July 15), thereby affecting the owl's life cycle. Certain activities that do not significantly modify nesting habitat can trigger pre-disturbance surveys if they produce noise above ambient levels within 330 feet of nesting habitat or within 1 mile of nesting habitat for blasting. Burning, where smoke persistently goes into the canopy of the nesting habitat during the breeding season, may also be considered a habitat-disturbing activity. Burning conducted outside the breeding season could be considered a habitat-disturbing activity if nest trees could be ignited or nesting habitat canopy cover reduced below 50%.

Pre-disturbance survey exemptions

There are survey (and site management) exemptions that have been identified through a settlement agreement associated with survey and manage litigation. These exemptions (Pechman 2006) are still valid and include:

1. thinning projects in stands younger than 80 years old;
2. replacing culverts on roads that are in use and part of the road system, and removing culverts if the road is temporary or to be decommissioned;
3. riparian and stream improvement projects where the riparian work is riparian planting, obtaining material for placing in-stream, and road or trail decommissioning; and where the stream improvement work is the placement [of] large wood, channel and floodplain reconstruction, or removal of channel diversions; and
4. the portions of projects involving hazardous fuel treatments where prescribed fire is applied. Any portion of a hazardous fuel treatment project involving commercial logging will remain subject to the survey and management requirements except for thinning of stands younger than 80 years old.

Areas where pre-disturbance surveys are not needed

Pre-disturbance surveys are not required within the Washington Western Lowlands, Washington Olympic Peninsula, Washington Western Cascades, Washington Eastern Cascades, California Cascades and California Klamath physiographic provinces, and most of the Oregon Coast Range physiographic province.

In addition, surveys are not required in habitats adjacent to natural openings <10 acres or human-made openings of any size, nor in areas below 500 feet or above 6,000 feet.

NATURAL HISTORY

A brief description of great gray owl (*Strix nebulosa*) natural history as it relates to key parts of the survey protocol is provided below. For additional information on great gray owl ecology, see the conservation assessment of the great gray owl (Williams 2012).

A. Species description

The great gray owl is one of the largest of the North American owls. Like the majority of owls, they exhibit sexual dimorphism where the male is smaller than the female; however it is hard to tell male from female unless they are together and holding still for a good comparison (Broyles 2014). They have bright yellow eyes, an obvious white patch over the gular region (commonly known as a bowtie), and do not have ear tufts. Their plumage tends to be dusky-gray to sooty, with white mottling over the crown, nape, back, rump and shoulders, and with streaked underparts (Duncan and Hayward 1994). The facial disk is grayish-white with distinct concentric semicircular bars of dusky brown. The bill color is a dull to bright yellow or a pale olive green (Johnsgard 1988).

B. Range

The great gray owl is the only member of the *Strix* genus found both in North America and Eurasia. It is essentially a bird of the boreal forests, occupying a latitudinal band from Scandinavia through much of the former Soviet Union (Mikkola 1983) and from Alaska through Ontario (Bull and Duncan 1993). The owl's northern limits generally coincide with the treeline; trees are critical for nesting, for cover and for hunting perches. The owl is unevenly distributed throughout its range, and in the western United States, the breeding range is extended outside boreal forests. In Montana, Wyoming, Idaho, Washington, Oregon, Nevada and California, great gray owls are found in montane and subalpine forests (Winter 1986, Bull and Henjum 1987, Forsman and Bryan 1987, Franklin 1987, Bull and Duncan 1993).

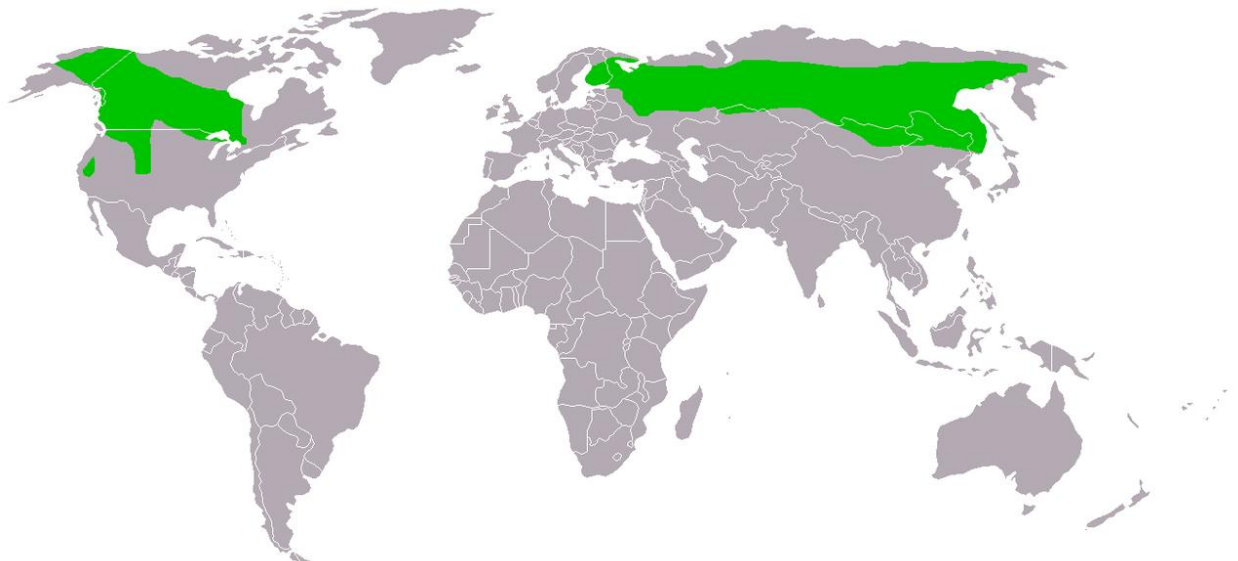


Figure 1. Global range of great gray owl (*Strix nebulosa*). Map from <https://en.wikipedia.org/>, public domain.

In Oregon and Washington, great gray owl breeding range is somewhat disjointed. A recent effort by Thiemann and Fuller (2015) compiled great gray owl observations from a number of sources. Their mapping suggests that in Washington, breeding great gray owls are limited to an area within the northeastern portion of the state, encompassing the Colville National Forest and the eastern portion of the Okanogan-Wenatchee National Forest.

In Oregon, great gray owl breeding range is more widespread, displayed as patches of populations stretching from the northeast portion of the state, through the center, and then spreading out over the Klamath and central and southern Cascade Mountains.

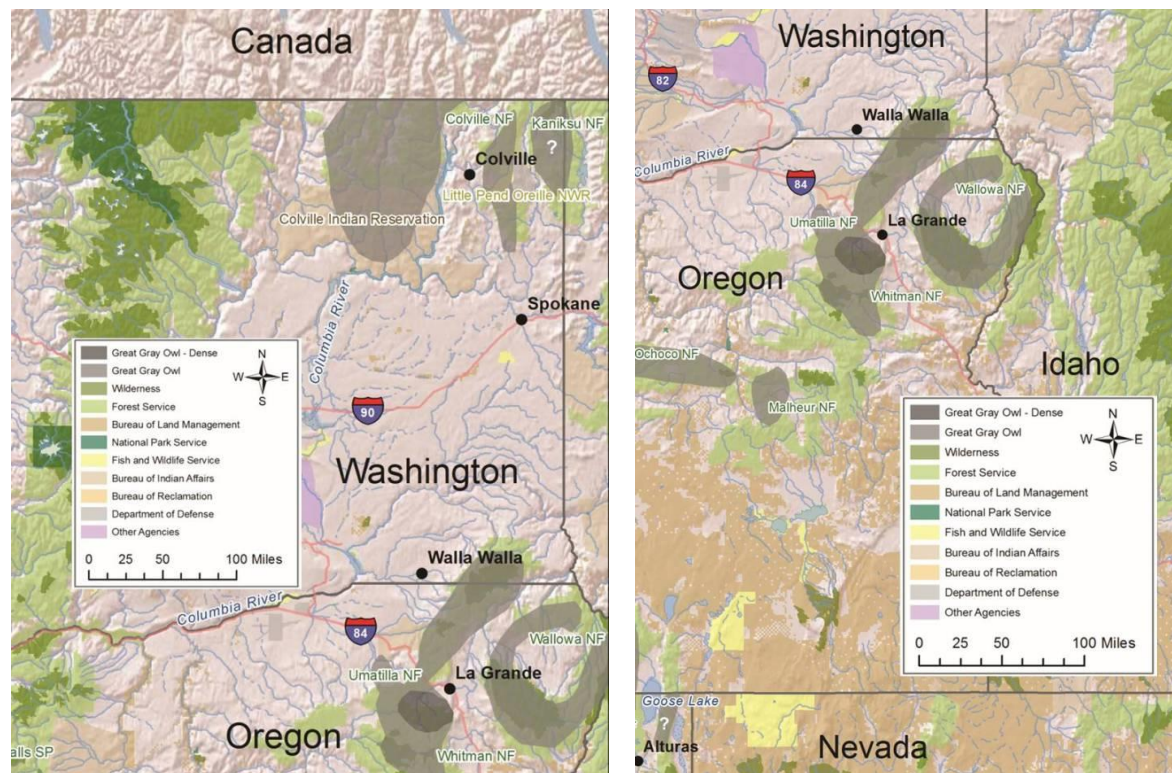


Figure 2. Breeding great gray owl range maps for eastern Washington and Oregon (Thiemann and Fuller 2015).

In Oregon and Washington, the most westerly and southerly portions of this breeding range include areas covered under the Northwest Forest Plan (NWFP; Huff et al. 1996). Within the NWFP area, nesting great gray owls are only known from the Oregon Western Cascades, Oregon Eastern Cascades, and Oregon Klamath physiographic provinces (GeoBOB 2016, NRIS 2016, ORBIC 2013, WDFW 1997, Williams 2012).



Figure 3. Great gray owl range in the NWFP area, all in Oregon (Thiemann and Fuller 2015). The NWFP area in Oregon includes the area roughly defined as west of a line from Klamath Falls due north to the Columbia River. The “dense” area on the map is located between Medford and Klamath Falls.

C. Abundance

According to Williams (2012; p.17-18):

Accurate population estimates for Great Gray Owls are challenging due to uneven and variable distribution and movements, low density of occurrence, lack of long-term data, and population fluctuations over three to five year periods that are thought to be related to prey population cycles (Nero 1980; Bull and Duncan 1993; Duncan 1992; Duncan et al. 1997; Duncan 1997)...Global population estimates range from 10,000 to 1,000,000 individuals. Nero (1969) estimated the North American population to be between 5,000 and 50,000 individuals, while Duncan (1992) estimated the North American population to be between 20,000 and 70,000 breeding pairs...Great Gray Owl abundance estimates for North America range from 0.15 pairs/km² in Minnesota (Spreyer 1987) to 1.88 pairs/km² in Manitoba and northern Minnesota (Duncan 1987a). Bull and Henjum (1990) reported 0.74-1.72 pairs/km² in northeastern Oregon, while Winter (1986) recorded a nesting density of 0.66 pairs/km² in California. Reported densities are much higher in Europe (Mikkola 1983; Duncan 1987a; Bull and Henjum 1990)...There are no reliable population estimates for Great Gray Owls across Oregon and Washington. The Partners in Flight Landbird Species Assessment Database estimates 1,200 individuals for Oregon, with no data available for Washington... In Washington there have been few detections of Great Gray Owls and it is unknown whether there is a viable breeding population in the state...With the [Survey and Manage] Standards and Guidelines came a requirement to conduct surveys when projects might potentially impact nesting habitat. Prior to the NWFP Standard and Guidelines, the species was known from few sites in these areas. Now, over 115 known sites (pairs or nests) are known within this geographic area.

Currently (GeoBOB 2016, NRIS 2016) there have been 125 pairs documented within the NWFP area all located within the Oregon Western Cascades, Oregon Eastern Cascades, and Oregon Klamath physiographic provinces.

D. Home ranges and movement

Among great gray owls occurring in the western United States, high site fidelity and little movement appears to be characteristic. A telemetry study in southwestern Oregon (Godwin 2006a) indicated home ranges of nine great gray owls averaged 20,000 acres and ranged from 3,580 to 39,816 acres. In general, great gray owls usually only defend and hoot around the immediate nest site (Bull 1995). Single owls will also hoot and establish a small territory.

E. Breeding

Data on breeding great gray owls within the NWFP area are limited and are drawn from localized studies and anecdotal descriptions (Duncan and Hayward 1994, Verner 1994, Bull and Henjum 1990). Courtship generally begins in late February or early March. Breeding and egg-laying may take place as early as late March or as late as early June (Bull 1995, Goggans and Platt 1992) and egg-laying may be delayed in areas with heavier snows or lows in the prey cycle. Incubation takes about 28-29 days. Actual dates of nesting vary with weather and elevation, and may vary from year to year at the same site.

Fledglings leave the nest between three and four weeks of age. Both the male and female feed the young, with the female staying close to protect them. After another three to six weeks, the adult females tend to leave the site and the care of the young to the male. Males will continue to feed the young for up to three months after the young leave the nest (Bull and Henjum 1990).

F. Diet

Great gray owl prey items in the western United States are primarily pocket gophers (*Thomomys* spp.) and voles (*Microtus* and *Myodes* spp.). In the Oregon Western Cascades physiographic province, Goggans and Platt (1992) found that Townsend's chipmunks (*Tamias townsendii*) were also a primary prey item. Fetz et al. (2003) found that California voles (*Microtus californicus*) and moles (*Scapanus* spp.) were the most common prey items at nest sites and below roosts. Botta's pocket gopher (*Thomomys bottae*) was the only other species accounting for >5 percent of the prey species. A pellet study in southwestern Oregon (Godwin 2006b) discovered pocket gophers were the most abundant prey by number and weight with other primary prey being broad-footed mole (*Scapanus latimanus*), *Microtus* vole spp., and western red-backed vole (*Myodes californicus*).

G. Habitat

Availability of nest sites and foraging habitat are considered the most important factors governing habitat use by breeding great gray owls (Collins 1980, Nero 1980, Mikkola 1983). Since foraging and nesting habitat can be quite different, proximity of these key components to each other are considered crucial as well.

Nest structure

Great gray owls rely on abandoned nests of common raven (*Corvus corax*), hawks (*Buteo* and *Accipiter* spp.), and squirrel (*Sciurus* spp.), or natural depressions on broken-topped snags or stumps for nest sites (Duncan and Hayward 1994). They also nest on natural platforms formed by dwarf-mistletoe (*Arceuthobium* spp.). Great gray owls will utilize artificial nest structures as well (Bull et al. 1987, Bull and Henjum 1990).

We conducted a review of agency databases to look at nest tree size in support of this protocol revision. In the Oregon Western Cascades physiographic province a review of 46 trees showed the diameter at breast height (dbh) ranged from 7.5-66 inches, with a mean = 30.6 inches, and the nests were primarily on broken-top trees. In the Oregon Klamath physiographic province, the range of the 14 nest trees assessed was 13-42 inches dbh, with a mean = 22.2 inches, and almost all were pre-existing stick nests. In the Oregon Eastern Cascades physiographic province the 46 nest trees reviewed varied from 23-31 inches dbh. Mean dbh and nest structure could not be determined for this physiographic province with the available data. Fetz et al. (2003) noted aspect of the nest sites or pair locations in the Siskiyou Mountains of southern Oregon was predominately north; 20 of 28 sites were on northerly aspects.

Nesting habitat

Goggans and Platt (1992) noted in their review of three great gray owl pairs that they tend to select nest sites in mature or remnant old-growth mixed-conifer forests within 660 feet of

openings that have sufficient prey numbers. Bull and Henjum (1990) found that great gray owls preferred to nest in mature or older stands, with a fairly open understory and dense overstory (>60 percent canopy closure). In support of the protocol revision, we reviewed data for 60 nests in the NWFP area and noted none occurred in stands <50 percent canopy cover. Nesting habitat may have a sufficiently open understory to allow for grass and forbs, which in turn support vole and pocket gopher populations. This creates a situation whereby the same area functions as both nesting and foraging habitat. Conversely, the nest stand may not provide foraging habitat but may be near openings that do. Leaning trees and dense cover are important habitat components for fledglings. Since fledglings leave the nest before being able to fly, leaning trees enable the owlets to climb above the ground, making them less susceptible to predation (Bull et al. 1988).

A minimum patch size of habitat needed to provide for great gray owl nesting is unknown; however we note that in southwest Oregon all of the 50 nests we have encountered are within patches >40 acres in size.

Breeding sites are often occupied for many consecutive years (Gerhardt 2003, Bull and Henjum 1990). Monitoring during the breeding season in southern Oregon suggested that great gray owls exhibit site fidelity during subsequent years. Great gray owls also nest within 0.40-0.48 kilometer (0.25-0.30 mile) of conspecifics (Bull and Henjum 1990).

Roosting habitat

Great gray owl roosting habitat provides a place for the owls to find refuge from predators and the elements. Roosting habitat ranges from mature to old-growth forests, but can include some younger forest stands. Important components of roosting habitat include: adequate flying space, suitable perches (limbs, broken off trees), and canopy cover sufficient to provide some shelter. Great gray owls typically roost near the bole of the tree. They roost in trees with fairly dense canopy during hot weather and close to the trunk in inclement weather. In winter, owls occasionally roost in sunny open areas atop snags (Duncan and Hayward 1994). Although great gray owls frequently use meadows or open areas for foraging, they typically roost away from meadow edges (Winter 1986).

Foraging habitat

Foraging habitat throughout the great gray owl's range is relatively open and grassy and includes bogs, natural meadows, open forests and selective/regeneration harvest areas (Nero 1980, Winter 1986, Goggans and Platt 1992). Brushfields are not foraging habitat. As great gray owls eat mostly voles and gophers – fossorial and semi-fossorial mammals – access to bare ground or the herbaceous layer while on the wing is critical for the owl. Large meadows without perches are rarely used; the birds seem to prefer the forest edges or adjacent small meadows when no perches are available. On the west slope of the Cascade Range in Oregon, regeneration harvests initiate an early successional stage that can support small-mammal populations likely to be preyed upon by great gray owls for the first decade or so after harvest (Goggans and Platt 1992).

Juxtaposition of foraging habitat and nesting habitat is important. Although great gray owls have been observed foraging up to 3.2 kilometers (2 miles) from the nest (Bull and Henjum 1990), it is reasonable to suppose that breeding success decreases as this distance increases. Within the southern portions of the Oregon Western Cascades physiographic province and Oregon Klamath

physiographic province, the distance from nest trees to nearest openings were noted to be 518 feet (ISMS 2003) on average. In the Oregon Western Cascades physiographic province, ISMS (2003) data that was analyzed showed that the mean cluster of opening sizes within 518 feet of nest sites was 12.35 acres in size or larger.

H. Elevation use

Our review of agency databases (NRIS 2016, GeoBOB 2016) indicates that within the NWFP area the great gray owl has been known to nest from 1,200 feet up to 5,875 feet in elevation. Approximately 90% of the known great gray owl sites in the NWFP area are within the 2,000-5,500 foot elevation band in the Oregon Klamath and Oregon Eastern and Western Cascades Provinces. Despite version 3.0 of the great gray owl survey protocol (Quintana-Coyer et al. 2004) requiring pre-disturbance surveys up to 6,000 feet in elevation, only 7 sites have been located above 5,500 feet in the past 20 years. In addition, although that same protocol dictates pre-disturbance surveys conducted down to 500 feet, only 2 nests have been found below 2,000 feet during the same time period. However, survey efforts at both lower and higher elevations have been limited, as there have been few habitat-disturbing activities that trigger surveys at elevations below 2,000 or above 5,500 feet.

SURVEY TRIGGERS AND REQUIREMENTS

The objective of this survey protocol is to reduce the inadvertent loss of undiscovered sites (pairs or resident singles) by searching specified potential habitats prior to making decisions about habitat-disturbing activities. This survey protocol is designed to provide survey methods for pre-disturbance surveys in compliance with the record of decision and standards and guidelines for amendments to the survey and manage, protection buffer, and other mitigation measures standards and guidelines (USDA and USDI 2001). It is intended to provide a method of determining presence and inferred absence of great gray owl pairs or resident singles within proposed project areas, with a reasonable level of assurance, and to document known sites discovered during surveys.

A. Trigger criteria

Surveys for great gray owl are triggered if the proposed activity meets all three of the following criteria:

1. is within the range of the great gray owl;
2. is within or (*for noise-generating activities*) nearby³ nesting habitat, and
3. is a habitat-disturbing activity (see USDA and USDI 2001; S&G 22).

If all three triggers are met, then surveys are required. Six visits within one calendar year should be conducted between March 15 and July 15.

If one or more of the triggers are not met, then surveys are not required. Further information is provided below to help determine if each criterion is met.

The proposed activity is within the range of the great gray owl

In the NWFP area, the Washington Olympic Peninsula and Washington Western Lowlands physiographic provinces have never been included within the potential range of the great gray owl. In addition, pre-disturbance surveys have not been required within the California Klamath and California Cascades physiographic provinces, as great gray owls have been observed in those areas but have not been confirmed to be breeding there. There has been no new information within these four physiographic provinces to warrant a change in status.

Pre-disturbance surveys have been required in the remaining NWFP physiographic provinces: Washington Western Cascades, Washington Eastern Cascades, Oregon Coast Range, Oregon Willamette Valley, Oregon Western Cascades, Oregon Eastern Cascades, and Oregon Klamath.

Based on an assessment of information collected over the past 15 years, pre-disturbance surveys will no longer be required in the Washington Western Cascades, Washington Eastern Cascades, and most of the Oregon Coast Range physiographic provinces. Habitat modeling, range maps, and expert opinion (Seattle Audubon Society 2014, WDFW 1997, Washington Nature Mapping

³ This distance varies based on the activity. For blasting, the activity may be up to a mile away from nesting habitat and cause a disturbance. For other noise generating activities, in general, the distance is considered to be ≤ 330 feet. See text on page 19 for additional details.

Northwest Forest Plan Area

Physiographic Provinces

1. Washington Olympic Peninsula
2. Washington Western Lowlands
3. Washington Western Cascades
4. Washington Eastern Cascades
5. Oregon Western Cascades
6. Oregon Eastern Cascades
7. Oregon Coast Range
8. Oregon Willamette Valley
9. Oregon Klamath
10. California Klamath
11. California Coast Range
12. California Cascades

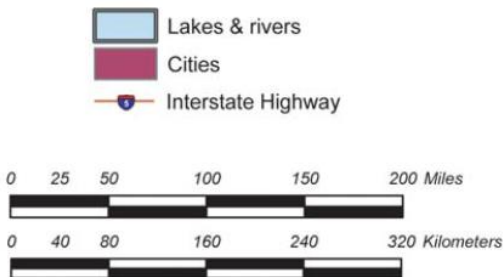


Figure 4. Terrestrial physiographic provinces identified for the Northwest Forest Plan (from Moeur et al. 2005)

Program 2011) have not included any lands within these physiographic provinces as suitable or within the range for great gray owls, except for two small areas within the Oregon Coast Range (Institute of Natural Resources 2011, Thiemann and Fuller 2015). Agency and state records (ORBIC 2013, GeoBOB 2016, NRIS 2016) contain no great gray owl known sites within any of these physiographic provinces, despite great gray owl surveys having been conducted in some of the physiographic provinces, as well as northern spotted owl (*Strix occidentalis caurina*) surveys and general field work. In addition, eBird (2016), a citizen-science interactive database created by the Cornell Lab of Ornithology and the National Audubon Society, contains no observations of great gray owls within these physiographic provinces, despite hundreds of observations of great gray owls included in this database for other parts of the species' range in Oregon and Washington.

Washington Eastern Cascades

This area contains two National Forests, Okanogan-Wenatchee and the eastern half of the Gifford Pinchot. The Gifford Pinchot National Forest conducted surveys of their best quality habitat on the east side of their forest in the late 1990's (Wainwright 2016). No great gray owl sites were discovered. The Okanogan-Wenatchee National Forest has conducted surveys for great gray owls since the 1997 requirement for pre-disturbance surveys under the survey and manage standards and guidelines. Approximately 275,000 acres have been surveyed in the NWFP area of the forest since then, with no great gray owl known sites detected (Kuk 2016).

Washington Western Cascades

Two National Forests are included in this physiographic province: Mt. Baker-Snoqualmie and the western half of the Gifford Pinchot. Numerous northern spotted owls surveys were conducted throughout this province in the 1990's (NRIS 2016) but no detections of great gray owl were recorded during those efforts. Using Version 3.0 of the great gray owl survey protocol (Quintana-Coyer 2004), Plumage (2016) determined that there was no suitable nesting habitat present on the Mt. Baker-Snoqualmie National Forest. For the Gifford Pinchot National Forest, agency biologists consider presence of great gray owls to be unlikely (Wainwright 2016), although no great gray owl-specific surveys have been conducted on the forest in this province, as no activities that trigger the pre-disturbance survey requirement have occurred, either due to the habitat criteria not being met or the activity not being considered habitat-disturbing.

Oregon Coast Range

Numerous northern spotted owls surveys were conducted throughout this province in the 1990's (NRIS 2016, GeoBOB 2016) but no detections of great gray owl were recorded during those efforts. Few activities triggering the pre-disturbance survey requirement have occurred within the physiographic province, for the same reasons listed under the Gifford Pinchot National Forest, above. McGraw (2016) noted in his review of GeoBOB data that approximately 52 survey polygons covering seven survey areas and a total of approximately 1,140 acres were surveyed for great gray owls within the Oregon Coast Range physiographic province on the Medford and Roseburg BLM Districts. From those surveys, approximately a dozen or so observations of great gray owls were made in Douglas County, all within 15 miles of the eastern edge of the Oregon Coast Range physiographic province (GeoBOB

2016). In addition, modeling work shows a small area of potential habitat in a different part of this physiographic province, near the border of the Oregon Willamette Valley physiographic province, in Lane County, just northwest of Eugene, Oregon (Institute of Natural Resources 2011; see figure 5).

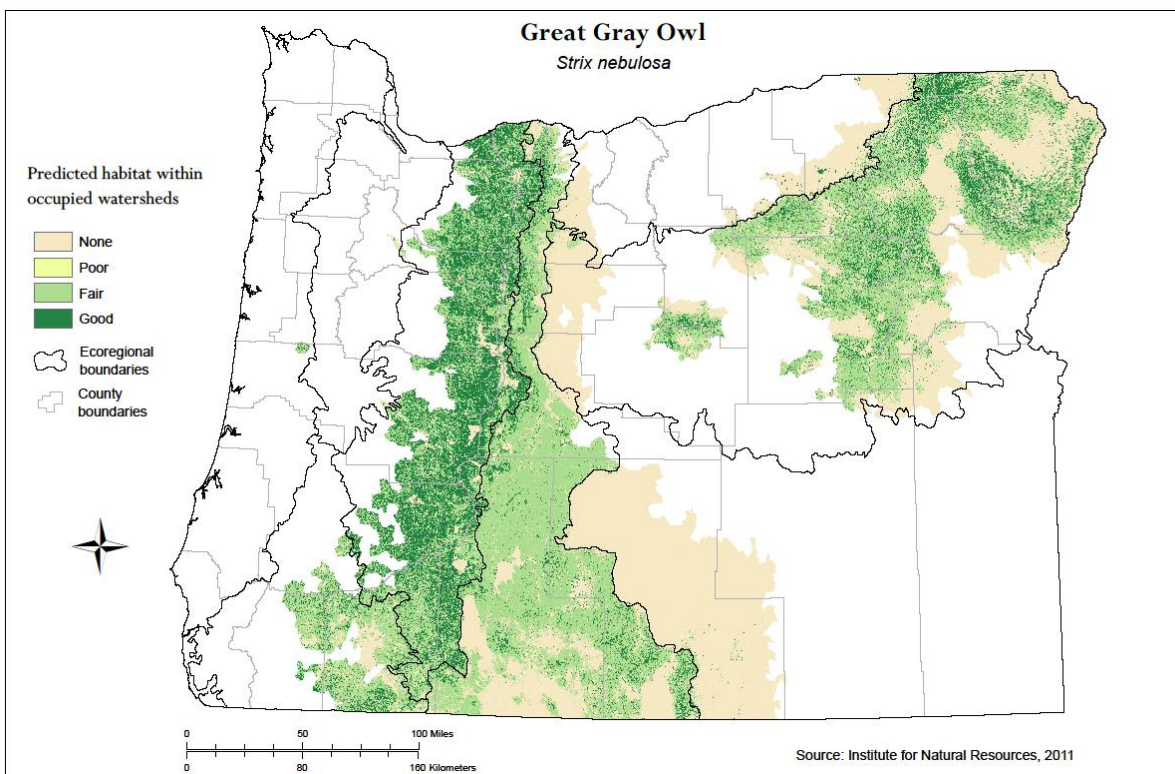


Figure 5. Predicted great gray owl habitat in Oregon, modeled by the Institute for Natural Resources (2001).

Oregon Willamette Valley

Few great gray owl specific surveys have been conducted within this physiographic province, and there are low amounts of federal land, mostly located along the edges of the physiographic province boundary. Modeling work does show a small area of potential habitat in this physiographic province, near Silver Falls State Park in Marion County (Institute of Natural Resources 2011). Although there are no known sites within this province, there are a number of observations, noted both in eBird (2016) and by Thiemann and Fuller (2015; see figure 3). Given the small amount of NWFP lands and low number of surveys conducted in the physiographic province, as well as the number of observations recorded, pre-disturbance surveys will still be required within the Oregon Willamette Valley physiographic Province.

Continuing to require surveys within the Western Washington Cascades, Eastern Washington Cascades, and most of the Oregon Coast Range physiographic provinces, where there are no known sites and no predicted habitat, is not needed in order to provide a reasonable assurance of species persistence. Should additional documentation be needed or future questions about the potential for known sites within these physiographic provinces arise, strategic surveys, targeting the questions or needed documentation could be initiated.

Pre-disturbance surveys for the great gray owl within the NWFP area are therefore only required in the Oregon Willamette Valley, Oregon Western Cascades, Oregon Eastern Cascades, Oregon Klamath, and a small portion of the Oregon Coast Range physiographic provinces. For the Oregon Coast Range physiographic province, pre-disturbance surveys will be limited to an area that includes the mapped predicted habitat (Institute for Natural Resources 2001) and the general areas where great gray owl observations were noted by the BLM (GeoBOB 2016), including the areas depicted by Thiemann and Fuller (see figure 3). This area is defined as NWFP lands in Douglas and Lane Counties within 25 miles west of the eastern edge of the Oregon Coast Range physiographic province.

The proposed activity is within or (for noise-generating activities) nearby nesting habitat

Nesting habitat includes stands meeting all four of the following criteria:

1. mature or old-growth conifer stands;
2. with >50 percent canopy cover;
3. within 660 feet of a natural, grassy opening ≥ 10 acres, and
4. containing potential nest trees, generally: a) broken-top snags (≥ 16 inch dbh), b) trees containing pre-existing stick nests from hawks, ravens, or squirrels, or c) mistletoe brooms.

This description of nest trees is significantly different than the previous version of the great gray owl survey protocol (Quintana-Coyer et al. 2004), being clearer about the types of trees used by great gray owls, as well as reducing the tree size to reflect information collected since the last version, based on our review of nest trees within the NWFP area. For the four physiographic provinces where surveys are required, the requirement that the stand to be impacted contains specific tree species has also been dropped, as tree species does not appear to be an important determinant as to whether a stand is nesting habitat or not; structure (broken top snags, pre-existing nests, or mistletoe brooms) appears to be the key component.

Surveying areas with nesting habitat adjacent to natural openings <10 acres is not required, nor is surveying areas with nesting habitat adjacent to human-created openings, or openings with significant brush or regenerated trees impeding great gray owl foraging opportunities. While there may potentially be known sites in these types of situations, the foraging habitat within these areas is either considered temporary (human-created openings) or of poorer quality (natural openings <10 acres; significant brush or regenerated trees), and surveys to these areas are not necessary to provide a reasonable assurance of species persistence. While pre-disturbance surveys are not required in these areas, known sites discovered incidentally will be managed in accordance with the current direction for this species (see page 32 for current site management direction).

The proposed activity is a habitat-disturbing activity

The record of decision and standards and guidelines for amendments to the survey and manage, protection buffer, and other mitigation measures standards and guidelines (USDA and USDI 2001: S&G 22) states:

Habitat-disturbing activities are defined as those disturbances likely to have a significant negative impact on the species' habitat, its life cycle, microclimate, or life support requirements. The evaluation of the scale, scope, and intensity of the anticipated negative impact of the project on habitat or life requirements should include an assessment of the type, timing, and intensity of the disturbing activity.

1. *Activities that are generally habitat-disturbing*

The following activities are generally expected to result in significant negative impacts on the habitat, life cycle, microclimate, life support systems, or persistence of great gray owls at the site. These include activities that significantly modify the structure of the nesting habitat by falling potential nest trees or by falling other trees and reducing canopy cover in the nesting habitat to <50 percent. Examples include:

- a. timber harvest;
 - i. regeneration harvest
 - ii. commercial thinning, if removing potential nest trees or taking the canopy cover below 50 percent
- b. road construction/reconstruction;
- c. logging landings, and
- d. guy line or tail hold trees.⁴

Activities that do not significantly modify nesting habitat may be considered a habitat-disturbing activity by harassing owls, if the activity occurs during the breeding season (March 15-July 15), thereby affecting the owl's life cycle. Certain activities that do not significantly modify nesting habitat can trigger pre-disturbance surveys if they produce noise above ambient levels within 330 feet of nesting habitat or within 1 mile of nesting habitat for blasting. These distances and types of activities that trigger surveys reflect the expert opinions from the version 3.0 protocol authors (Quintana-Coyer et al. 2004) and are also based on work with northern spotted owls. Noise alone can trigger surveys when the noise is repetitive or continuous and occurs during the breeding season. Burning, when smoke persistently goes into the canopy of the nesting habitat during the breeding season, may also be considered a habitat-disturbing activity. Burning conducted outside the breeding season could also be considered a habitat-disturbing activity if nest trees could be ignited or canopy cover of the nesting habitat could be reduced below 50%.

2. *Activities that are generally not habitat-disturbing*

Expert opinion from version 3.0 protocol authors (Quintana-Coyer et al. 2004) suggested that the following activities, either conducted within nesting habitat or within 330 feet of it, are generally not expected to result in significant negative impacts on habitat, life cycle, microclimate, life support systems or persistence of great gray owls because of short duration or low intensity. The project may result in reduced reproductive output for a breeding year at the disturbed site, but is not expected to affect species persistence at the site. Examples of such activities are:

- a. tree planting with hand tools;
- b. snag creation with inoculation;

⁴ In situations where few potential nest trees might be affected by the proposed action, a visual examination of the impacted trees to locate nests may suffice, and additional survey efforts are not needed.

- c. manual fireline construction (without chainsaws);
- d. hand removal or biological control (using insects/animals) of noxious weeds;
- e. occasional (one to four) low-level (<500 feet) aircraft flights within a 24-hour period;
- f. smoke from prescribed fire outside the breeding season, and
- g. manual trail construction/reconstruction.

Routine maintenance of improvements and existing structures is not considered a habitat-disturbing activity. Examples of routine maintenance include road maintenance, clearing encroaching vegetation, managing existing seed orchards, and falling hazard trees (USDA and USDI 2001: S&G 22).

3. *Pre-disturbance survey exemptions*

There are survey (and site management) exemptions that have been identified through a settlement agreement associated with survey and manage litigation. These exemptions (Pechman 2006) are still valid and include:

- a. thinning projects in stands younger than 80 years old;
- b. replacing culverts on roads that are in use and part of the road system, and removing culverts if the road is temporary or to be decommissioned;
- c. riparian and stream improvement projects where the riparian work is riparian planting, obtaining material for placing in-stream, and road or trail decommissioning; and where the stream improvement work is the placement [of] large wood, channel and floodplain reconstruction, or removal of channel diversions; and
- d. the portions of projects involving hazardous fuel treatments where prescribed fire is applied. Any portion of a hazardous fuel treatment project involving commercial logging will remain subject to the survey and management requirements except for thinning of stands younger than 80 years old.

B. One year of surveys required

Version 3.0 of the great gray owl survey protocol required a two-year survey effort with six visits conducted each year. The origin for the rationale requiring two years of surveys is unclear, but Friesen (2013) suggests it is likely that the 1995 great gray owl survey protocol was patterned after the northern spotted owl protocol, which requires a two-year effort. Thrailkill (2016) also suggests that the two-year effort may have been in response to the cyclic nature of great gray owl prey species, which may result in inconsistent breeding by great gray owls among years. This could result in variability in annual detectability.

It is important to recognize that the northern spotted owl is listed as a threatened species under the Endangered Species Act of 1973. As such, intense efforts are needed to ensure that the northern spotted owl is not harmed by federal project actions, or that incidental take of owls is assessed in order to assure project actions do not result in jeopardy to the continued existence of the species. As a survey and manage species, the goal of pre-disturbance surveys and known site management of the great gray owl is to provide a reasonable assurance of species persistence within the range of the northern spotted owl. Meeting this standard does not require the same

level of survey effort or assurance of site protection as for species listed under the Endangered Species Act.

In a study done in Yosemite National Park and adjacent National Forest lands in the central Sierra Nevada mountains, researchers estimated probability of great gray owl detection ($P[d]$) for various combinations of broadcast surveys and meadow searches (Keane et al. 2011). A $P[d]$ value can range from 0 (simplistically, 0 percent likelihood of detection) to 1 (simplistically 100 percent likelihood of detection) for a particular methodology. Their estimates indicated that an overall $P[d]$ would be 0.95 (a 95 percent likelihood of documenting a great gray owl) for a one broadcast and one meadows search combination, 0.98 for a two broadcast survey and one meadows search combination, and 0.99 for a three broadcast survey and meadow search combination. These numbers are very high estimates for wildlife surveys, with a high probability of detection for just one calling visit and visual search. The results of this study indicate that an extensive calling effort (such as in version 3.0 of the great gray owl survey protocol, of two years of surveys, six visits each year) is not necessary to provide a high degree of likelihood of presence or inferred absence.

An analysis of great gray owl survey data from the past 15 years (Haney 2014, Stone 2014) indicates that for the BLM and Forest Service within the NWFP area, a very high percentage (≥ 81 percent; ≥ 83 out of 103) of the known sites assessed were documented as known sites in the first year of surveys. In addition, version 4.0 of the great gray owl survey protocol includes a resident single as a known site where version 3.0 included only great gray owl pairs as known sites. Expanding the definition of known site to include resident singles captures those sites where persistent use by great gray owls is documented, such that the site may be currently, or in the near future, occupied by a pair. The inclusion of resident singles in the definition of known sites helps address the detectability variation mentioned by Thrailkill (2016) above.

These reasons support a reduction in survey effort in the NWFP area to six visits in one year, while still providing a reasonable assurance of species persistence.

C. Survey longevity

Longevity of the pre-disturbance survey results was not established in previous great gray owl survey protocols. Due to a reduction in the number of years that surveys would be conducted, and because these owls may use alternate nest sites over time, a survey longevity requirement is now established.

At the survey polygon scale, surveys which result in the identification of a known site are valid for 10 years. Known site designation affords protection to habitat, as current management recommendations (Williams 2012) require the management of 30 acres around the site, with a 0.25 mile radius protection zone established. Great gray owls tend to continue to nest in or near habitat where they have previously nested as long as the habitat characteristics remain suitable for such use (e.g., nest sites continue to be available). Great gray owls have been documented to survive 10 or more years in the wild (Bull and Duncan 1993), thus, it is reasonable to assume that great gray owls will continue to occupy known sites for at least 10 years.

Surveys to polygons where no known sites were located are valid for five years. Great gray owls do not reproduce every year and some areas of great gray owl nesting habitat may be unoccupied for years due to prey availability or after the death of a resident pair. For this reason, it is necessary to re-survey inferred unoccupied areas of great gray owl nesting habitat at least every five years prior to project decisions that involve habitat-disturbing activities.

If a National Environmental Policy Act (NEPA) decision or decision document has not been signed within five or 10 years from the date of completion of the surveys for the project, and the desire is to still move forward with a project decision, the surveys to the specific polygons where the surveys have expired should be redone. If a NEPA decision document has been signed, but the project has not yet been implemented within five or 10 years from the date of completion of the surveys for the project, surveys are not required to be redone.

SURVEY METHODS

The protocol guidelines are a step-by-step process. The entire methodology section should be read before initiating any phase of the survey. This protocol requires six visits during the breeding season (March 15-July 15) within the same calendar year. The approach presented is a presence/inferred-absence survey technique.

A. Survey period

Survey Season

To ensure that surveys adequately cover the potential nesting period, a total of six complete visits, each separated by at least seven days, are required between March 15 and July 15 within the same calendar year to fulfill protocol requirements.

- Between March 15 – May 15 (approximate incubation and brooding periods), three complete visits should occur.
- Between May 16 – July 15 (approximate late nestling and fledging periods), three complete visits should occur.

Hungry owlets can be quite vocal at and after fledging, and many are found at this time. Concentrating the most survey effort into this period, however, would result in missing nest attempts that result in failure prior to this stage. However, visits may need to occur towards the second half of the breeding season if road conditions limit access to the survey area due to snow or blowdown from winter and spring storms. Deviations from the survey season dates may be valid, but should be documented with supporting rationale.

Survey Timing

In general, surveys should be conducted at night sometime between one hour before sunset and one hour after sunrise. If, however, safety dictates the need for surveys to be conducted outside of nighttime hours, surveyors are strongly encouraged to focus surveys between 1) sunrise and up to four hours after sunrise or 2) between four hours before sunset to sunset, to avoid mid-day surveys, where response likelihood significantly decreases.

B. Pre-survey planning

Project and survey area map

Prepare a map that includes:

1. boundaries of the project area including project units;
2. natural openings ≥ 10 acres, and
3. great gray owl nesting, roosting, and foraging habitat within the project area.

Mapping the habitat to survey

There are two types of activities that trigger the need for surveys. These two situations result in two different ways to delineate the area to survey. In both cases the intent of the surveys is to

determine if there is a known site within the nesting habitat that would be impacted by the activity.

1. *Habitat-disturbing activities that significantly modify the structure of the nesting habitat*
 - a. Draw a polygon around the nesting habitat where the habitat-disturbing activity will occur.
 - b. Draw a 0.25 mile radius from the edges of that polygon.
 - c. All nesting, roosting, and foraging habitat within the resulting polygon is the area to survey. See figure 6 below.
 - d. Large areas should be divided into smaller survey areas to ensure that a visit can be completed in seven days.

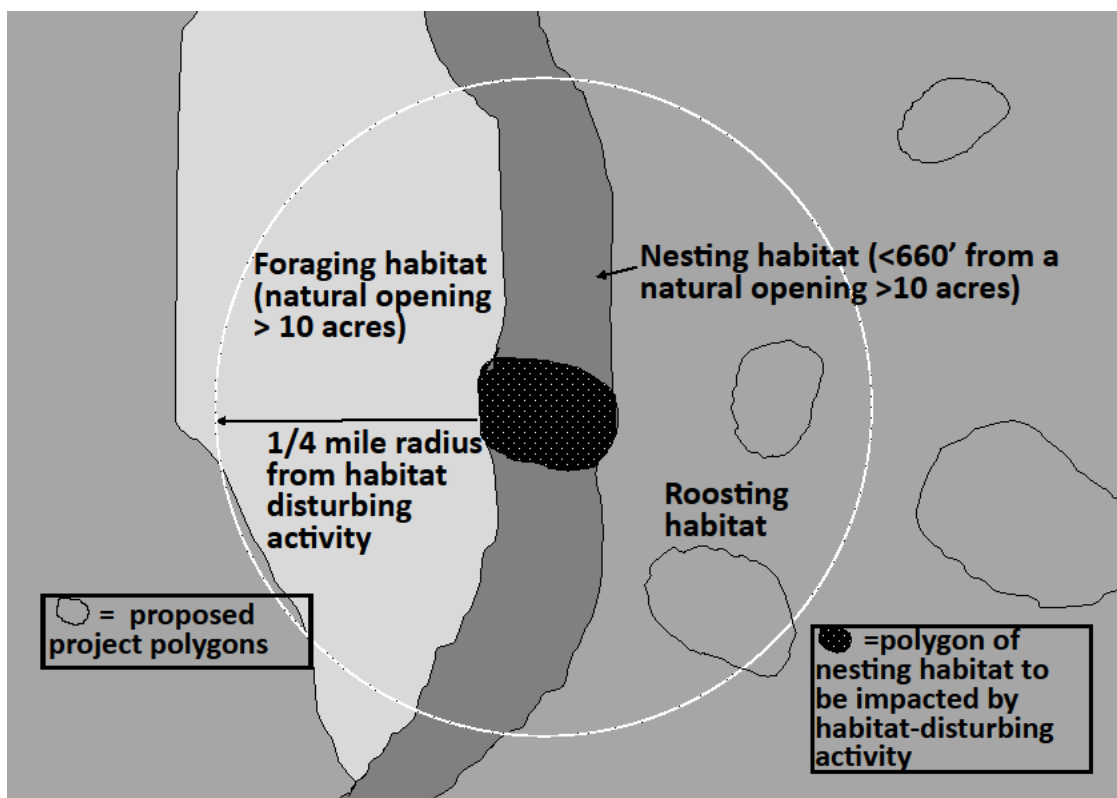


Figure 6. Determining the area to survey around a habitat-disturbing activity that modifies nesting habitat structure. All of the nesting, roosting, and foraging habitat within the 1/4 mile radius of the impacted polygon would require surveys.

2. *Activities that do not significantly modify nesting habitat but are considered a habitat-disturbing activity by harassing owls during the breeding season (March 15-July 15) thereby affecting the species' life cycle*
 - a. For these types of projects, determine where noise above ambient levels, smoke, or other related disturbance will likely occur within nesting habitat. For most projects involving tree-felling and other logging-related activity, assume that the noise will likely have impacts up to 330 feet from the project. For blasting or similar activities, assume the noise impacts can reach up to 1 mile from the activity.

- b. To determine the impacted nesting habitat, draw a 330 feet radius around the noise creating activity (for blasting or similar, draw a 1 mile radius), and identify where that boundary overlaps with nesting habitat.
- c. Draw a polygon outlining this area of overlap; this represents the nesting habitat where a significant negative impact due to noise from the proposed project could occur, and the area to survey.
- d. If the area to survey is small, containing few potential nest trees, a visual examination of the potential nest trees instead of conducting surveys may suffice in determining if there are any nests.

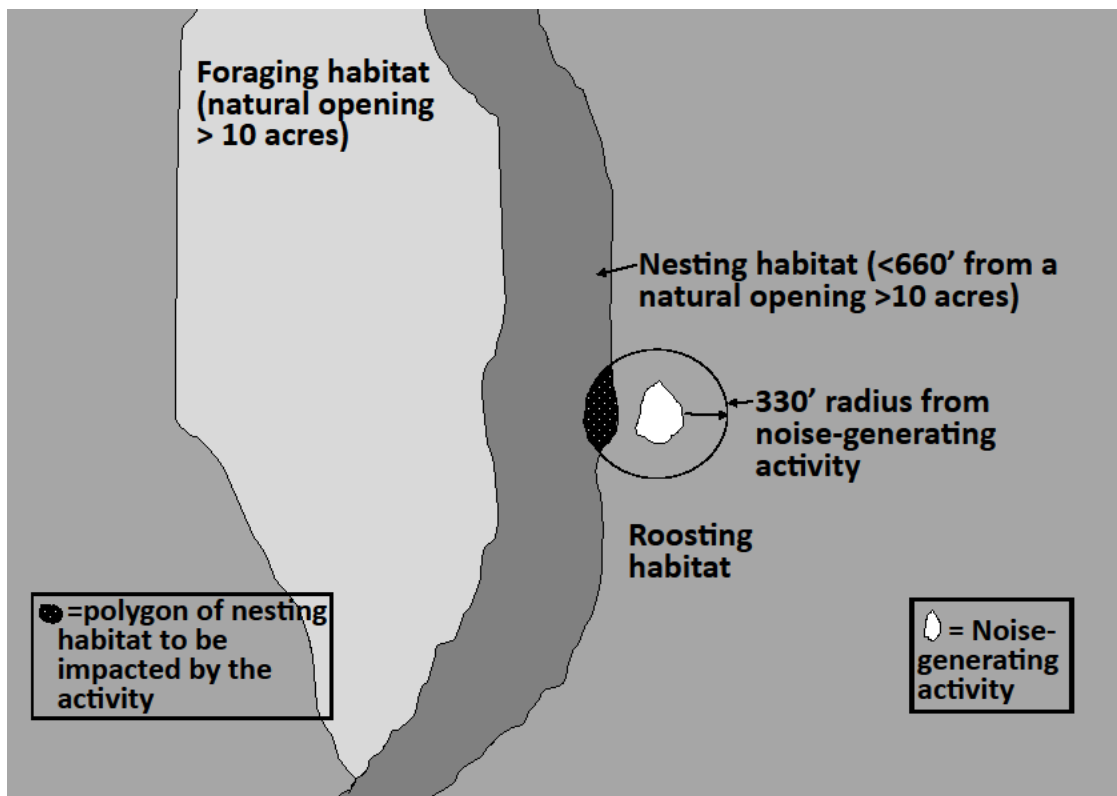


Figure 7. Determining the area to survey around a habitat-disturbing activity due to noise, smoke, or other disturbance. Only the nesting habitat potentially impacted would require surveys.

Establish survey routes and calling stations

Establish survey routes and calling stations to attain full coverage of the survey area. The intent is for the owls to hear the surveyor and for the surveyor to be able to hear responding owls. Along each survey route, space fixed calling stations at every 0.10-0.20 mile, depending upon topography. In general, the greater the variation in topography, the closer the spacing between transects and calling stations should be. The area covered at each station is deemed to be 0.10 mile in radius. Owls can hear the broadcast across greater distances, but they are less likely to respond and the observer is less likely to be able to hear such responses.

The following are options for establishing routes for great gray owl surveys.

1. **Roads:** Survey areas that have accessible roads for establishing calling stations should be surveyed at night.

2. *Trails:* In survey areas without roads, only establish nighttime calling stations where they can be traversed safely. Calling stations may be established on well-maintained trails where there is little danger to a caller equipped with only a flashlight or headlamp.
3. *Daytime surveys using roads and trails:* Survey areas that cannot be effectively or safely surveyed from the roads or trails at night should be surveyed during the daytime. Surveys should be conducted in the evening (up to four hours before sunset) or early-morning (up to four hours after dawn).
4. *Daytime surveys using continuous-calling walk-through:* An alternative survey method when roads and trails do not effectively cover the survey area is a continuous-calling walking transect that effectively covers the area. Surveys should be conducted in the evening (up to four hours before sunset) or early-morning (up to four hours after dawn).

The following guidelines should be followed when establishing calling stations along survey routes.

1. Consider the physical characteristics of the survey area when establishing calling stations. (i.e., sound travels in a straight line, but not around bends or over ridges).
2. Avoid establishing a calling station near noise sources, such as loud creeks and roads. If these areas cannot be avoided, increase the survey effort with more stations.
3. Establish stations at useful geographic features such as prominent ridge points, saddles, and openings in the vegetation to ensure complete coverage of the survey area; however, when selecting locations to call from, be sure to consider the proximity to habitat and whether surveys could reach the habitat from the calling station.
4. Utilize roads and trails as much as possible, to focus survey efforts at night, when the owls are much more likely to be responsive.

Mark each established station on an aerial photograph or topographic map (the minimum standard is 1:24,000), and assign route and station numbers. Mapping stations using a GPS (global positioning system) is strongly recommended. Flagging calling stations along roads and trails may also be helpful for surveyors to relocate stations in future survey visits.

C. Recommended equipment specifications

There are two equipment options available which adequately reproduce the calls of great gray owls: MP3 and compact disc players. Tape players are no longer an acceptable method of broadcast calling for great gray owls. Special attention should be paid to the speakers selected for this type of survey. Great gray owl calls are very low-pitched (~200 hertz). Speakers for use in great gray owl surveys must reproduce sound extending to at least this frequency. Reference the manufacturer's ratings for speaker frequency range in the selection of appropriate speaker models. Sound reproduction must also be of sufficient volume to carry a minimum of 0.1 mile in field settings without notable distortion. Field-testing of equipment is necessary to be certain these sound reproduction parameters are met.

D. Calling techniques and timing of use

Use a compact disc or MP3 recording for calling surveys, downloadable from the survey and manage website: <http://www.blm.gov/or/plans/surveyandmanage/protocols/owl.php> .

Recommended calls to use:

1. March 15-May 15 (early season), track 1-the early-season sequence, and
2. May 16-July 15 (late season), track 2-the late-season sequence.

There are also five other call tracks on the recording:

1. track 3 – male territorial call (early season/late season);
2. track 4 – female begging/contact call (early season/late season);
3. track 5 – juvenile begging call (late season);
4. track 6 – female with nest chatter (late season), and
5. track 7 – adult agitated call.

Tracks 3-5 can be used in conjunction with tracks 1 and 2, depending on the survey season. Early in the nesting season there may be better response to the male territorial call (track 3) than there would be after incubation. Female begging calls (who-oo call; track 4) can work well throughout the season (Godwin 2002). After owlets have fledged, it is likely that there would be better response to a juvenile begging call (Bull 1995; track 5).

The use of audio tracks 6 and 7 are to be used at the discretion of the surveyor, as the calls may agitate the owls, and should only be considered for use if standard survey tracks from the audio calls have been utilized without success. Track 6 is most likely to elicit a response during late nesting and early fledging (May 16 through July 15). Track 7 may elicit responses during all portions of the survey season.

Be aware of potential predators such as common ravens (*Corvus corax*), great horned owls (*Bubo virginianus*) and northern goshawks (*Accipiter gentilis*). Discontinue call playback when these species are detected.

E. Conducting surveys

Survey considerations

In planning and conducting surveys for great gray owls, it is important to keep in mind several characteristics of this species.

1. Great gray owls are not known to defend a large territory and consequently are not likely to answer from or travel a great distance in response to broadcast calls.
2. Both males and females have very soft vocalizations that are difficult to hear and, therefore, require extreme concentration and listening skills to detect.
3. Great gray owls are much less likely to approach the observer than are northern spotted owls.
4. The responsiveness of great gray owls depends on many factors, which may include:
 - a. *time of day*. Great gray owls are more likely to be detected at night, near sunrise, and after sunset. During the middle of the day they are relatively inactive and less likely to respond;
 - b. *temperature*. Air temperature will affect an owl's responsiveness. In hot weather, owls may be less likely to respond, and
 - c. *individual variation*. Owls vary greatly in their responsiveness to broadcast calls.

Survey procedures for a complete visit using calling stations

These procedures are the same whether surveying along roads or trails, night or day.

1. Stay at each calling station for at least a total of six minutes.
 - a. Listen silently for one minute before playing the audio call track (silently means focused time, not eating, moving around or gathering gear).
 - b. For the remaining five minutes mix broadcasted calls and silent listening.
2. If a response to the calls is detected, estimate the location of the response by taking a compass bearing and estimating the distance from the station to the response.
 - a. In order to get a better location, triangulation should be used, by taking compass bearings from two to three locations along the survey route. The compass bearings should be taken as soon as possible after a response.
 - b. The location and compass bearing(s) should be recorded on a map or aerial photograph and the field visit form. Attach a map to the field visit form, and include the compass bearing(s) and estimated distance from the station to the response.
 - c. Flag and GPS the response location to establish a start point for the follow-up survey.
 - d. Conduct a follow-up visit preferably within 48 hours of the response. If the initial response is during the day, conduct the follow-up visit immediately and continue surveys when done with the follow-up visit.
 - e. If a known site is discovered, areas within audible distance of the known site may be dropped on subsequent visits.
 - f. Continue to the next calling station beyond audible distance of the responding owl (two to three stations) and continue surveying the remaining stations.
3. Completion of all the calling stations and any needed follow-up visits are considered a complete visit. If there is no response from surveys at all of the calling stations, then that is considered a complete visit.

Survey procedures for a complete visit using daytime continuous-calling walk-through

1. Walk transects that effectively cover the survey polygon.
 - a. More than one transect may be needed depending upon the survey polygon size. Separate transects by 0.10-0.20 mile depending upon topography. The transects do not need to be linear (they can meander) but placement of the transects should ensure full coverage of the survey area.
 - b. Walk at a normal pace, playing calls appropriate to the season for about two minutes every 100-200 feet and then pausing to listen and visually search for one to three minutes.
 - c. Mark the survey route on a map or aerial photograph or document a pre-determined compass bearing for the surveyor to follow.
 - d. Flagging can help to define transects for future survey visits.
2. If a response is received, immediately attempt to locate the bird and determine status; conduct a follow-up visit.
 - a. Flag and GPS the best location from this visit (bird and/or nest location). Attach a map to the field visit form, and include the GPS locations.

- b. If a known site is discovered, areas within audible distance of the known site may be dropped on subsequent visits.
 - c. After completion of the follow-up visit, move out of audible distance and continue with walk-through.
3. Completion of all the walk-through transects and any needed follow-up visits are considered a complete visit. If there is no response during the walk-through transect survey, then that is considered a complete visit.

Follow-up visits

The goal of a follow-up visit is to visually confirm or infer the presence of a pair of great gray owls, and if possible, to locate a nest tree. Conduct surveys in the evening (up to four hours before sunset) or early-morning (up to four hours after dawn).

1. Starting from the station where a response was heard and using the compass bearing(s) obtained when a response was noted, begin a search by moving toward the approximate response location.
2. Do a systematic search, looking for:
 - a. live or dead trees with broken-tops or mistletoe brooms;
 - b. abandoned squirrel, northern goshawk, common raven, or red-tailed hawk stick nests;
 - c. movement in the canopy;
 - d. mobbing behavior by other birds, and
 - e. whitewash, feathers, or pellets around the base of possible nest or roost sites (Bull 1995). Whitewash and pellets are generally associated with roost sites and may be found near nest sites, but not actually under the nest, until a week before young leave the nest.
3. Keep the original location of the owl response in mind, and try to visually locate the bird. Great gray owls tend to fly away from intruders, so search for other visual clues as suggested above.
4. Calling may help to elicit responses from great gray owls, but they may not respond to calls during the day.
 - a. A technique that may be helpful is to broadcast the call softly and point the speaker downward when calling to avoid startling the owl as one walks in the direction of the original response.
 - b. Use the audio call track appropriate for the season of survey.
5. If a great gray owl is not located after two hours of effort, the follow-up visit is complete.
6. If an owl is located, allow up to two additional hours to establish pair status.
 - a. Use visual observation to help determine status. Document all behavior noted, for example agitated calls, continuous responses, movements, roosting, preening or other behavior (e.g., males often look toward the nest area).
 - b. Once visual contact is established, evaluate the situation before moving closer. Great gray owls may flush as surveyors approach. Causing the owl to fly may expose it to harassment or predation and should be avoided.
 - c. Do not call or stimulate owls any more than is necessary to determine status. Be cognizant of predators in the area. For example, calling may attract common ravens. Great gray owl chicks and fledglings are very susceptible to avian and mammalian predation.

- d. If predators are attracted, leave the area and try a follow-up visit at another time.
 - e. If the owl is located and there are no signs indicating pair status within two-hours, the follow-up visit is over.
7. The follow-up visit may take up to four hours: two hours searching for an owl and two hours trying to determine pair status once an owl has been located. Additional time may be used, as these time constraints are minimums.

Preliminary survey using historical information

In some cases, great gray owls may be located more efficiently by going directly to an historical observation location during the day. If it is possible to locate pairs or singles without doing station visits, time and effort may be saved. Use the knowledge of the area in deciding if this approach will be beneficial, and use the following five-step process as a guide. Additional calling stations may be required depending on the outcome of this type of survey technique.

1. Identify the known sites or historical observations in the survey area on a map or aerial photograph.
2. Visit the historical observations during the day. Use whatever techniques are appropriate to locate the pair or resident single (calling, nest searching).
3. If occupancy by a pair or resident single cannot be determined during a day visit, use night calling in the general area of the historical observation. Note that great gray owls may use alternate nest sites within their home territory.
4. If the owl cannot be located, then proceed with establishing survey routes.
5. If a pair is located, additional visits, as needed, are recommended to determine reproductive success.

F. General survey requirements

1. Complete a field visit form for all outings, regardless of whether an owl was detected or not. Enter visit data into the appropriate agency database.
2. Be outside your vehicle when conducting surveys.
3. Do not survey under inclement weather conditions, such as high winds (> 10 miles per hour) or moderate to heavy rain which would prevent surveyor from hearing a great gray owl response. Avoid surveys in hot weather (>90 degrees), as great gray owl responsiveness goes down as temperature increases.
4. Record observations of other avian predators (e.g., northern goshawk, great horned owl, common ravens) that are detected while surveying for great gray owls.

G. Baiting or mousing

There is no evidence for utilizing bait (e.g. mice, rats, etc.) to determine the occupancy or reproductive status of great gray owls. Great gray owls may accept such bait, but are less likely than northern spotted owls to transport them to a mate or young. This should not deter surveyors from attempting to feed bait items to great gray owls, as this practice can sometimes lead to the location of another adult, a nest or juveniles. However, negative results (i.e. refusal, unknown disposition, repeated consumption and/or caching) should not be interpreted as indicating the absence of a mate, nest or young.

H. Determining a known site

Known site status is determined by any of the following:

1. a male and female great gray owl are heard or observed in proximity (<0.10 mile) to each other on the same outing;
2. a female great gray owl is seen on a nest;
3. a young live or dead great gray owl is observed, and can be determined by the presence of an adult great gray owl or other means that it is a great gray owl young (e.g. yellow eyes, etc.), and
4. a great gray owl is detected on three of the six visits (resident single). In order to count towards establishment as a known site, each detection must be within 0.25 mile of one other response (total distance separating responses can be 0.5 mile), and of the same sex.

Once a known site is documented, no additional survey effort is required in the immediate area, and the area to be surveyed should be adjusted for the remaining visits to complete the survey so responses from this known site are not picked up again.

Additional follow-up visits to known sites are recommended, but not required, to identify any nest trees and to determine the nesting status of the owls, which can help in our understanding of the species' status within the NWFP area.

To pinpoint the location for management as a known site, use the nest tree for owls determined to be nesting, and use a daytime location over a nighttime location for non-nesting pairs and resident singles. (For instance, a daytime location in June would be used over a nighttime location in May). If responses are similar in nature (for instance, all nighttime responses), use the earliest response of the season as the point for known site management.

Known sites should be managed consistent with current management direction for the species. The conservation assessment for great gray owl (Williams 2012, p. 30) indicates known sites should be managed as follows:

a 30 acre management area is delineated for nests or paired owls [or resident singles], covering the best potential habitat for the species. Within these 30 acres, management treatments are limited to the protection or improvement of nesting habitat. In addition, a ¼ mile protection zone is created around each nest/pair. Within this protection zone, a 300 ft buffer is established around meadows and natural openings greater than [or equal to] 10 acres. Within these buffers, treatments are limited to protection or improvement of nesting habitat.

I. Other observations status

If after 6 complete visits, the results from the surveys did not establish a known site for a survey polygon, one of the following statuses should be noted:

1. *Status unknown* (single owl) is the response of a male or female great gray owl, which does not meet the pair or resident single requirements.
2. *Presence* is the detection of pellets or feathers that can be identified as being from a great gray owl.

3. *Inferred unoccupied habitat* is the lack of detections after six protocol survey visits, which should be viewed as a high likelihood, not a certainty, that the site is unoccupied.

DATA MANAGEMENT

To document and track information obtained through surveys and to make adjustments to the protocol where necessary, all field units should maintain hard copies of survey plans, field forms, maps and aerial photographs used during the surveys. The survey polygons, survey visits and observation data should be stored electronically in BLM's Geographic Biotics Observations database (GeoBOB) or the Forest Service's Natural Resources Information System wildlife database (NRIS Wildlife).

GeoBOB and NRIS Wildlife field forms can be downloaded from the Interagency Special Status/Sensitive Species Program website, on the Inventories page, under the Inventory and Monitoring Protocols bullet: <http://www.fs.fed.us/r6/sfpnw/isssp/inventories/monitoring.shtml>.

TRAINING AND QUALIFICATIONS

The protocol is designed for individuals who will be conducting great gray owl surveys on NWFP lands within the range of the northern spotted owl. Surveyors may include those currently employed as professional biologists, biological technicians, contractors or volunteers that are supervised by a biologist. Surveyors should:

1. be competent in establishing compass bearings, including triangulation;
2. be able to use GPS for marking nest tree locations, great gray owl observation points;
3. locate, describe and interpret visual signs of owl nesting, occupancy and behavior;
4. have normal hearing. Since great gray owls can be very difficult to hear, a standard hearing exam is recommended for personnel surveying for the great gray owl, and
5. possess birding skills, such as ability to visually identify all the owl species that occur in their area, know their calls, as well as potential predator species such as the northern goshawk, common ravens, red-tailed hawk, and species that may sound similar to a great gray owl such as blue grouse (*Dendragapus obscurus*) and great horned owls.

Professional knowledge is involved in interpreting the owl survey, behavior and habitat use. The following qualifications are required for personnel involved in the identification and designation of great gray owl known sites:

1. a bachelor's degree in wildlife biology or similar field or qualifies as a GS-486-9, and
2. at least two years of field experience with surveying for northern spotted owls or other owl species

If available personnel do not meet the minimum requirements above, they must be supervised by someone who does. It is assumed that surveyors who work within the range of the northern spotted owl are familiar with the procedures for surveying for northern spotted owls and the calls of the various species of owls that occur within its range, and, therefore, should have no problems interpreting or training for this survey methodology. Biologists who are planning to train and supervise seasonal or volunteer personnel to conduct northern spotted owl surveys could train the crews in great gray owl surveys at the same time.

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GLOSSARY

Boreal

Northern; used to describe a region that has a northern temperate climate, with cold winters and warm summers.

Breeding season

This period encompassing egg-laying, incubation, brooding, nestling, and fledging periods. For the area covered by the NWFP, this is approximately March 1 through July 15. Actual dates of nesting vary with weather and elevation, and may vary from year to year at the same site. Great gray owls lay eggs one to three days apart and begin incubation with the laying of the first egg. Eggs hatch after about 28-29 days. Brooding occurs for two to three weeks and young leave the nest after approximately four weeks. They cannot fly well until nearly two weeks after leaving the nest.

Complete survey

The survey area has been surveyed to protocol standards, which is a minimum of six complete survey visits, each separated by at least seven days between visits, between March 15-July 15, within the same calendar year.

Complete visit

A complete visit includes the completion of all of the calling stations (or daytime continuous calling routes) and completion of all follow-up visits associated with responses received during calling station surveys.

Current pair

A great gray owl pair that has been verified within the last 10 years.

Field forms

Forms used to record data collected during pre-disturbance survey and follow-up visits.

Follow-up visit

A follow-up visit is performed during the daytime to visually confirm or infer the presence of a resident single or pair of great gray owls and to locate a nest tree.

Habitat-disturbing activity

Disturbances likely to have a significant negative impact on the species' habitat, its life cycle, microclimate, or life support requirements. The evaluation of the scale, scope, and intensity of the anticipated negative impact of the project on habitat or life requirements should include an assessment of the type, timing, and intensity of the disturbing activity. (USDA and USDI 2001: S&Gs 22).

Habitat for surveys

Habitat specific to the species being surveyed; generally described in survey protocols or management recommendations as the habitat where pre-disturbance surveys are required in order to provide a reasonable assurance of species persistence.

Historical pair

A pair of great gray owls that has not been verified within the last 10 years.

Inferred unoccupied

The lack of detections after one year of protocol survey should be viewed as a high likelihood, not a certainty, that the site is unoccupied. For project planning purposes, an area meeting this definition is unoccupied.

Late-successional forests

Forest stands consisting of trees, structural attributes, supporting biological communities, and processes associated with old-growth and/or mature forests (USDA, USDI 1994a). Forest seral stages that include mature and old-growth age classes (USDA, USDI 1994a). Age is not necessarily a defining characteristic but has been used as a proxy or indicator in some usages. Minimum ages are typically 80 to 130 years, more or less, depending on the site quality, species, rate of stand development, and other factors.

Line officer

In the BLM and Forest Service, the individual managers in the direct chain of command. For example, in the Forest Service, the chain runs from chief/deputy chiefs, to regional forester, to forest supervisors, to district rangers, and there is only one line officer at each office (although two line officers may share an office while administering different geographic areas). These line officers have the decision-making authority and responsibility assigned to their administrative level; other individuals at that unit advise and work for the line officer (USDA and USDI 2001).

Listening duration

Listening shall occur at each station for a minimum of six minutes: one minute of silent listening after arriving at the calling station followed by five minutes with intervals of broadcasted calls and silent listening.

Manage (as in manage known sites)

To maintain the habitat elements needed to provide for persistence of the species at the site. Manage may range from maintaining one or more habitat components such as down logs or canopy cover, up to complete exclusion from disturbance for many acres, and may permit loss of some individuals, area, or elements not affecting continued site occupancy (USDA and USDI 2001)

Mature forest

A subset of late-successional forests. Mature forests are characterized by the onset of slowed growth, crown expansion, heavier limbs, gaps, mortality in some larger trees, and appearance of more shade-tolerant species or additional crown layers. In Douglas-fir in the western Cascade Range, this stage typically begins between 80 and 130 years, depending on site conditions and stand history (USDA and USDI 2001).

Montane

Belonging to mountainous regions; growing or living in mountainous regions.

Mousing

The act of feeding domestic mice, rats, gerbils, or hamsters to adult male and female owls by a surveyor.

Old-growth forest – An ecosystem distinguished by old trees and related structural attributes. Old-growth encompasses the later stages of stand development that typically differ from earlier stages in a variety of characteristics which may include tree size, accumulations of large dead woody material, number of canopy layers, species, composition, and ecosystem function. More specific parameters applicable to various species are available in the USFS, Region 6, 1993 interim old-growth definitions (USDA FS 1993). The Northwest Forest Plan supplemental environmental impact statement and FEMAT describe old-growth forest as a forest stand usually at least 180 to 220 years old with moderate-to-high canopy closure; a multi-layered, multi-species canopy dominated by large overstory trees; high incidence of large trees, some with broken tops and other indications of old and decaying wood (decadence); numerous large snags; and heavy accumulations of wood, including large logs on the ground (USDA and USDI 2001).

Persistence (as in persistence objective for a species)

An abbreviated expression of the species management objectives for these standards and guidelines. Generally the persistence objective for vertebrates is based on the Forest Service viability provisions in the regulations implementing the National Forest Management Act (USDA and USDI 2001).

Persistence (as in persistence at a site)

Continued occupancy by a species at a known site (USDA and USDI 2001).

Pre-disturbance surveys

Surveys conducted prior to a habitat-disturbing activity, necessary to provide a reasonable assurance of species persistence for the species surveyed.

Presence

A visual observation of a great gray owl. The detection of pellets or feathers that can be identified as from great gray owl.

Site (as in occupied site)

The location where a specimen or population of the target species (taxonomic entity) was located, observed, or presumed to exist (occasionally used as a local option to pre-disturbance surveys for certain vertebrates) based on indicators described in survey protocols or management recommendations (USDA and USDI 2001).

Site (as used in manage known sites)

The occupied site plus any buffer needed to maintain the habitat parameters described in the management recommendations (USDA and USDI 2001).

Status unknown (single owl)

Status is unknown if the response of an owl does not meet the pair or resident single status definitions above.

Survey seasons

March 15 - May 15 (3 surveys) (early season - approximately the nesting/incubation period)

May 15 – July 15 (3 surveys) (late season - approximately the fledging period)

Surveys prior to habitat-disturbing activities

Surveys conducted to determine if the species is present at a site proposed for habitat-disturbing activities (USDA and USDI 2001).

Young

A live or dead great gray owlet.