RECOMMENDATIONS FOR GREATER SAGE-GROUSE HABITAT CLASSIFICATION UNDER OREGON DEPARTMENT OF FISH AND WILDLIFE's FISH AND WILDILIFE HABITAT MITIGATION POLICY (OAR 635-415-0000)

Wildlife Division
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PURPOSE

The purpose of this document is to provide policy direction, consistent recommendations and supporting rationale to guide Oregon Department of Fish and Wildlife (Department) habitat mitigation recommendations associated with impacts to greater sage-grouse (*Centrocercus urophasianus*) habitat from energy development, its associated infrastructure, or other industrial/commercial development.

This document establishes the standards for which greater sage-grouse (sage-grouse) habitat should be considered under the Fish and Wildlife Habitat Mitigation Policy (OAR 635-415-0000) (Mitigation Policy). These recommendations utilize and are consistent with habitat categories directed under the Mitigation Policy.

The goal of these recommendations is to avoid, minimize, or mitigate for impacts on sage-grouse habitats from energy development, its associated infrastructure or other industrial/commercial developments. The objective of these recommendations is to protect essential habitats to meet habitat and population objectives in the cooperatively developed Greater Sage-Grouse Conservation Assessment and Strategy for Oregon: A Plan to Maintain and Enhance Populations and Habitat (Sage-Grouse Plan; OAR 635-140-0005 & -0010; Hagen 2005).

Organization of Document

First, this document provides a summary of Department habitat mitigation recommendations for energy development, its associated infrastructure or other industrial/commercial developments on sage-grouse habitats in Oregon. Second, assumptions and rationale are explained to support these recommendations, in order to tier this document to the Sage-Grouse Plan. Finally, this document provides additional background information on the status and ecology of sage-grouse, why they are sensitive to changes in their habitat, followed by a literature review and case studies to support the Department's assertion that energy development and transmission has the potential to negatively affect sage-grouse populations in Oregon.

Habitat categories.—The Department recognizes the different setback distances recommended for various developments occurring in Category 1 habitats is counterintuitive. The rationale for establishing these setbacks is that each of these developments has a different level of disturbance on Category 1 habitat. A wind farm or geo-thermal grid will likely have a much larger impact than a single MET tower. Therefore the Department's assessment of biological risk is less for MET towers and allows for them to be sited closer to lek sites than developments with larger disturbance factors.

DEPARTMENT RECOMMENDATIONS

1) In an effort to protect breeding habitat, establish habitat protection areas of no development around (3-mile radius) occupied leks and designate all sagebrush (*Artemisia* spp.) habitats, wet meadows and native grassland areas within that radius as Category 1 habitat under the Mitigation Policy. The mitigation goal for Category 1 habitat is no loss of either habitat quantity or quality.

2) Any sagebrush habitat identified as winter habitat, designate as Category 2 habitat, and avoid development within 0.5 mile of these areas. The mitigation goal for Category 2 habitat if impacts are unavoidable, is no net loss of either habitat quantity or quality and to provide a net benefit of habitat quantity or quality.

3) Any sagebrush habitat identified as brood rearing habitat, designate as Category 2 habitat, and avoid development within 0.5 mile of these areas.

4) Transmission lines should be placed in existing right-of-ways to aggregate this disturbance; if not possible then transmission lines should be sited ≥2 miles from occupied leks, and ≥0.5 miles from wintering areas, and brood rearing habitats.

5) Meteorological (MET) towers should be constructed >2 miles from occupied leks.

6) Unimproved roads should be constructed ≥0.5 miles from occupied leks. Paved (or improved gravel) larger volume roads should be ≥1 mile from occupied leks.

7) Ground level structures (e.g., transfer stations, pipelines, buried power lines) should not be sited within 0.5 miles of the nearest occupied lek.

8) Timing restrictions: construction and maintenance activity associated with any development should be avoided from 1 March to 30 June time frame in sage-grouse habitat. If avoidance is not possible then activity should be restricted from 1 hour after sunset to 2 hrs after sunrise.

9) If development is unavoidable in these habitats studies need to be conducted to quantify the level of impact on sage-grouse

Assumptions/Rationale

Habitat protection areas – Sage-grouse are a landscape species occupying annual ranges of several hundred square miles but selecting smaller seasonal ranges 10-20 square miles to meet specific life history needs (Connelly et al. 2000). In non-migratory populations (moving <6 miles between seasonal habitats), as appears to be the case with several of Oregon's populations, protecting areas in the immediate vicinity of leks from development can provide adequate habitat for breeding, nesting and early brood-rearing and sometimes winter range.

Habitat quality changes annually as it relates to weather patterns and the occurrence of wildfire. Because of this annual variation in quality and recovery time of some vegetation communities to fire, habitat protection areas provide a conservation focus for highly variable and sometimes unpredictable ecological conditions for sage-grouse.

Based on radio telemetry data (*n* = 493) from Oregon 80% and 50% of nests were within 3 and 1.65 miles of the nearest lek, respectively. These distances are slightly shorter than elsewhere in the range (Connelly et al. 2000), but indicate that habitat protection areas (buffers) of 0.25 to 0.5 miles are insufficient to protect lekking and nesting habitats, as they have lead to avoidance of otherwise suitable habitat and to population declines in parts of Wyoming and Montana (Holloran 2005, Walker et al. 2007, Doherty et. al. 2008). The 5 mile lek habitat protection area (buffer) for wind energy designated in the Sage-Grouse Plan was based on the recommendations of Manville (2004) in the absence of information on these potential impacts.

Lek activity – ODFW's rationale for defining lek activity is to provide some flexibility in the siting of energy developments. These definitions (see Glossary on pg.11 for more detail) are based solely on long term trend data (between 10 and 40 years) from 22 Oregon leks that experienced a period of no activity (range 2 to 11 years) and eventually rebounded, and 19 other leks that have been unoccupied or at least have not had any activity in recent years (range 5 to 18 years). On average, a lek may have 4.1 years (SD = 2.6 years) of inactivity and rebound, most of the sample rebounded in a period of 7 years or less. Thus, leks may have no birds present for up to 7 years, but are defined as **occupied**. On average, leks remain unoccupied after 8.9 years (SD = 3.2 years) of annual inactivity. Thus, leks with no birds counted for 8 or more years are defined as **unoccupied**. These definitions are based primarily on annual lek activity. Just as important is the surrounding habitat type and its current condition. Further refinement of habitat mitigation categories should be considered for unoccupied, and pending, and unknown leks that examines the condition and type of habitat present.

Mitigation categorization – Category 1 habitat designation for breeding habitat around occupied leks: Generally sagebrush habitat and mesic (e.g., wet meadows, seeps, springs) sites within 3 miles of a lek is suitable for breeding and brood-rearing (Connelly et al. 2000). While both lek habitat and nesting habitat can be reclaimed, the biological dynamic that occurs between female nest site selection and their movement patterns that drive males to establish a lek in these areas of female use (Bradbury et al. 1989), has yet to be restored by human actions. Given the uncertainty and risk involved in trying to mitigate for the loss (i.e., reclaim/restore) of these habitats and biological dynamics, protection of these areas is paramount.

Category 2 habitat designation for winter habitats: Generally winter habitat is comprised of low elevation flats in stands of Wyoming big sagebrush (*Artemisia tridentata wyomingensis*) or basin big sagebrush (*A. t. tridentata*), or stands of low sagebrush (*A. t. arbuscula*) along windswept ridges (Beck 1977, Hupp and Braun 1989, Hagen 2005). Winter habitat has not been adequately inventoried in Oregon, thus its distribution and abundance is largely unknown. Because of the essential nature of winter habitat (sage-grouse feed exclusively on sagebrush during winter), and temporally its availability is limited, "no net loss" is paramount if protection is not possible.

Category 2 habitat designation for brood-rearing habitats: Generally brood-rearing habitat is comprised of a mosaic of upland vegetation intermixed with wetland sites (e.g., playas, seeps, springs, riparian areas) where broods seek succulent vegetation and invertebrates. These areas can be >3 miles from lek sites. Wetland sites in the High Desert or Basin and Range Ecoregion are an essential and limited habitat, and "no net loss" is paramount if protection is not possible. Although agricultural lands (i.e., alfalfa, hay fields) can provide habitat in late summer these non-native habitats would not be considered Category 2 under these standards.

Monitoring for project effects – Generally before-after control impact (BACI) designs are appropriate for measuring the impacts of energy developments. Briefly, these will require paired (at a minimum) sites to be monitored pre- and post-construction. Variables to be measured to understand population response could include: lek counts (male and female attendance), pellet transects, or radio marked birds. In the case of radiotelemetry, grouse response will need to be identified based on the hypothesized project impacts, but may be as simple as habitat use (avoidance) or more detailed examination of life-history attributes (e.g., nest initiation, nest success, chick survival, adult survival, recruitment). Similarly point counts or nesting studies of sagebrush obligate passerines may be considered as well to examine avoidance or demographic responses.

Adaptive management – These recommended standards should be considered interim, until field studies of wind energy or other developments provide evidence as to their empirical impacts on habitat selection and life-history of sage-grouse and other sagebrush obligates. Additionally, as tools develop to accurately inventory and map seasonal habitats or identify core areas the recommended standards may adapt to new information.

BACKGROUND

Population status – Sage-grouse populations range-wide have declined since the 1960s. The declines have been substantial enough that the US Fish and Wildlife Service has initiated two status reviews for sage-grouse as a result of numerous petitions to protect the species under the federal Endangered Species Act.

The Sage-Grouse Plan was developed to maintain sustainable populations in Oregon, so Federal regulations would not be warranted. Furthermore, the Sage-Grouse Plan established a "no net loss" objective for sage-grouse habitat conservation.

Establishing habitat protection areas (buffers) associated with essential breeding areas and mitigation is consistent with this objective. However under the proposed 3-mile habitat protection area, approximately 20% of the nesting females may be compromised using this standard. These mitigation recommendations also provide benefits for a suite of other sagebrush obligate species (Hagen 2005, Rowland et al. 2005).

Population monitoring – Monitoring efforts for sage-grouse began in 1941 and have intensified since about 1980 with a resultant increase in sample sizes. In addition, since approximately 1996, the Department has been following population monitoring protocols so data quality is consistent and comparable across the state.

Lek counts. Counts are based on the number of sage-grouse (primarily males) attending designated leks ("trend leks") each spring. Each trend lek or lek complex is counted at least 3 times at 7-10 day intervals during the breeding season. This survey provides a measure of population trend over time and serves as the basis for making annual population estimates.

Lek searches. Since the early 1990's, the Department has worked cooperatively with BLM to conduct systematic helicopter searches of all potentially suitable habitats for occupied sage-grouse leks. As a result, many (>150) previously unknown leks have been discovered.

Population Trends. Trend is measured by the change in the average number of males per active lek, the number of active leks, and the annual rate of change (percent change) in total numbers of males counted on leks between consecutive years.

Oregon's Sage-Grouse Conservation Goals – In August 2005, the Oregon Fish and Wildlife Commission adopted into rule the Sage-Grouse Plan. Plan development was lead by the Department, but was collaboratively agreed upon and written by the Oregon Sage-Grouse and Sagebrush Habitat Conservation Team (Sage Grouse Team). Specifically, the Commission adopted the population and habitat objectives into rule (OAR 635-140-0005 & -0010), and directed staff to implement these policies as described in the Plan.

The statewide population objective is to maintain or enhance sage-grouse numbers and distribution at the 2003 spring breeding population level, approximately 40,000 birds (Hagen 2005:32)." The statewide habitat objective is to maintain 70% of sagebrush steppe as sagebrush dominated (>10% sagebrush cover) landscapes and to allow for 30% of the landscape to occur in various stages of disturbance and transition. To achieve this objective, conservation guidelines were established to "…maintain (at a minimum) or enhance (optimum) the quality of current habitats (Hagen 2005:70)."

Conservation guidelines in the Sage-Grouse Plan for energy developments (including oil/gas, wind facilities, transmission lines) were based on a few studies, and Department's guidance for wind energy was drawn from the U.S. Fish and Wildlife Service's interim guidelines (Manville 2004). At the time, there was a paucity of data regarding effects of energy development on sage-grouse. Guidelines for placement of temporary meteorological towers (MET towers) were not included in the Sage-Grouse Plan.

CASE STUDIES AND LITERATURE TO SUPPORT RECOMMENDATIONS

General biology – Sage-grouse are a sagebrush obligate species, and alterations of sagebrush habitats are the primary cause of sage-grouse population declines. Sage-grouse are relatively long-lived (3-6 years), have lower productivity (7 eggs in a clutch and 1.6 chicks per female in fall populations; Hagen 2005) than most upland game birds, which generally have a 1-2 year lifespan and clutch sizes of >10 eggs. Sage-grouse exhibit strong fidelity to their seasonal ranges and especially to their breeding areas, which includes display sites (leks), nesting, and early-brood rearing habitats. The life-history pattern of sage-grouse yields populations with slow recovery rates after disturbance to their habitats.

Energy development – Currently there is a lack of specific information about the effects of wind energy development on sage-grouse ecology. Thus, studies from oil and natural gas exploration in areas of the intermountain West were used as a surrogate to establish habitat protection areas for wind developments in Oregon.

Generally, oil and gas developments within 2-4 miles leks and/or nesting areas had deleterious effects on populations (Lyon and Anderson 2003, Holloran 2005, Walker et al. 2007). Oil and gas fields may differ in the overall vertical structure and vehicle traffic relative to wind energy developments, but they are similar from the standpoint that roads and infrastructure fragment native habitat. They also differ in that oil and gas fields expand over time and well density may change over time, whereas wind energy developments are constrained by a set density of wind turbines that is established during the planning phase, and that density is realized quickly during construction of the facility. Thus, the rapid rate of a wind energy development may mean more rapid declines in sage-grouse populations.

Additionally, sage-grouse feed exclusively on sagebrush during winter months and this habitat is limited by its availability above the snow pack. Because sage-grouse are dependent on sagebrush for winter forage, loss of winter habitat can have severe impacts on survival and subsequent breeding population size (Swenson et al. 1987, Connelly et al. 2004). Recent work on coal-bed methane development indicates 3 well per 1.5 sections of land diminishes the use of otherwise suitable sage-grouse winter habitat by 10% and with 22 wells use is diminished by 47% (Doherty et al. 2008). The latter figure (22 wells / 988 acres) is likely similar to some of the densities observed for wind turbine placement.

Transmission lines – Perching on power poles and transmission structures increases a raptor or corvid's range of vision, allowing for greater speed and effectiveness in searching for and acquiring prey (Steenhof et al. 1993, Manville 2004). Increased abundance of raptors and corvids within occupied sage-grouse habitats may result in predation rates outside the range of natural variation (Coates 2007).

Transmission structures may also provide nesting sites for corvids and raptors in habitats with low vegetation and relatively flat terrain. Thus, raptors and corvids may preferentially seek out transmission structures in areas where natural perches and nesting sites are limited.

For example, within one year of construction of a 372.5 mi transmission line in southern Idaho and Oregon, raptors and common ravens (*Corvus corax)* began nesting on the support structures, and within 10 years of construction 133 pairs of raptors and ravens were nesting on the transmission structures (Steenhof et al. 1993). Alternatively, raptor observations have remained stable over a 5 year period post construction along a power line in Nevada, but common ravens have increased >200% (Atamian and Sedinger 2007).

Case studies – Golden eagle (*Aquila chrysaetos*) predation of sage-grouse increased from 26% to 73% (of the total predation) after a transmission line was constructed within 220 yd of an occupied lek in northeastern Utah (Ellis 1984). The lek was extirpated, and Ellis (1984) concluded that the presence of the transmission line resulted in changes in sage-grouse dispersal patterns and fragmentation of the habitat. In Washington, 95% (19 of 20) leks documented ≤4.7 miles of 500 kV transmission are now unoccupied, while the unoccupied rate for leks >4.7 miles is 59% (22 of 37 leks; Washington Department of Fish and Wildlife 2008).

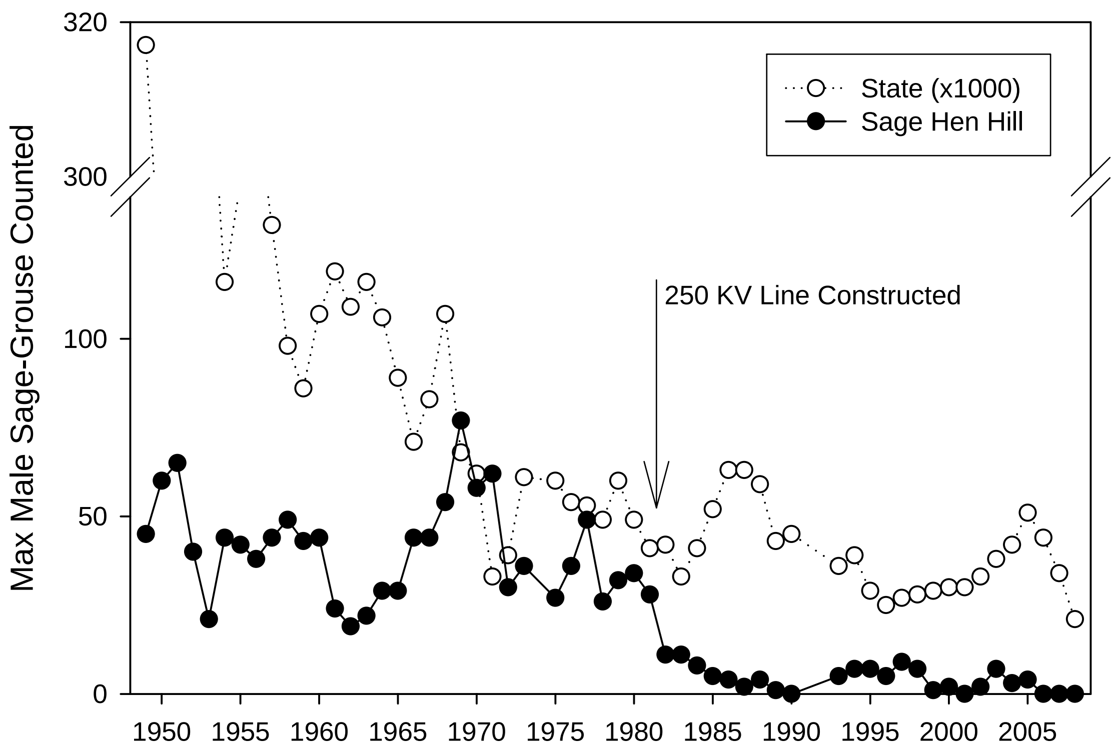
Leks within 0.25 miles of new power lines constructed for coalbed methane development in the Powder River Basin of Wyoming had significantly slower growth rates compared to leks further from these lines, which was presumed to be the result of increased raptor predation (Braun et al. 2002).

The presence of a power line may fragment sage-grouse habitats even if raptors are not present. Braun (1998) found that use of otherwise suitable habitat by sage-grouse near power lines increased as distance from the power line increased for up to 660 yd and based on unpublished data reported that the presence of power lines may limit sage-grouse use within 0.6 miles in otherwise suitable habitat. Similar avoidance behavior has been documented in closely related species such as greater (*Tympanuchus cupido*) and lesser prairie-chickens (*Tympanuchus pallidicinctus*), where habitats within 1 mile of power lines were avoided (Hagen et al. 2004, Pruett et al. *in press*).

In an Oregon example, the Sage Hen Hill Lek in Harney County was first counted in 1949 and had an average of 41 males counted until 1980 (see figure below). Between 1980 and 1982, a 250kV transmission line was constructed within 0.5 miles of the lek site. An average of 5 males has been counted at the lek since 1981 (28 males that year), with no males counted since 2006.

The cause of this decline or perhaps extirpation cannot be directly linked to the power line, but it is likely part of a cumulative effect from development in the area. Note, that statewide from 1980 to 1988 (the period when Sage Hen Hill lek declined) sage-grouse populations reached relatively high levels (see figure below).

Lek Counts at Sage Hen Hill 1949-2008



One set of mitigation recommendations has been to fit power pole structures with anti-perching or nesting devices. Recent data suggests, however, the effectiveness of these devices is marginal (Lammers and Collopy 2007). Thus, excluding power pole infrastructure within lekking and breeding habitats is paramount. The available literature suggests that significant affects occur between 0.5 – 4.7 miles from these disturbances. ODFW's best assessment is that transmission lines and power poles should be sited at least 2 miles from leks.

Biological Mechanisms in Sage Grouse Decline Associated with Development

As illustrated in the previous example, when sage-grouse are impacted by nearby land development, the breeding unit (lek-nesting complex) does not typically disappear all at once, but slowly disappears over time through attrition (Holloran 2005, Walker et al. 2007). Recent research from oil and gas developments in Wyoming further describes the ecological mechanisms involved in the sage-grouse decline.

As oil/gas development has progressed in parts of the West, research has documented that adult female sage-grouse remain in traditional nesting areas regardless of increasing levels of development (Fischer et al. 1993, Schroeder and Robb 2003). However, yearling females avoid development by nesting farther from main haul roads and other infrastructure. Additionally, yearling males avoid leks inside developed areas and are displaced to the periphery of gas fields. Recruitment of males to leks also declines the closer a lek is to the center of a development (Holloran et al. 2007).

Perhaps the most important finding from these studies is that sage-grouse declines are partially explained by lower annual survival of female sage-grouse, and those impacts have resulted in population-level declines. Strong site fidelity and reduced survival of adult sage-grouse combined with lek avoidance by yearling birds may explain the observed time lags of three to four years between development activities and lek loss (for more details see Holloran 2005, Kaiser 2006, Holloran et al. 2005, Walker et al. 2007).

Sage-grouse occupy seasonal habitats that maximize survival and reproductive success. As the studies above indicate, displacement to other sagebrush habitats yields lower survival and may reduce carrying capacity.

Habitat needs and protections

Breeding habitat (lekking, nesting habitat, and early brood-rearing) is critical to the life-history of sage-grouse (Johnson and Braun 1999, Walker 2008). Like many game birds, sage-grouse rear only 1 brood of young in a breeding season. Thus, any hindrance to breeding activities (i.e., habitat loss or other disturbance) may be deleterious to production and ultimately recruitment into the population (Lyon and Anderson 2003, Holloran 2005, Walker et al. 2007).

The concept of establishing "no disturbance" habitat protection areas (or buffers) around lek sites or other important habitats dates back more than 40 years, and has evolved over time as the body of scientific knowledge has grown. The first set of published guidelines for sage-grouse management recommended a 2-mile buffer (Braun et al. 1977), at the time it was thought most nesting occurred within that distance. Connelly et al. (2000) provided an updated set of guidelines, which included a considerable amount of data from radio-telemetry studies to make a recommendation of 2-3 mile buffer, but recognized that nesting habitats could be as far as 11 miles from leks.

More recently Colorado (Colorado Steering Committee 2008) and Wyoming (Governor's Executive Order 2008) adopted a 4-mile buffer to protect sage-grouse breeding habitat. These buffers were based on regional radio-telemetry data that indicated 80% of nesting occurred within 4 miles of leks. Thus, 20% of the nesting population in these regions may be compromised.

In Oregon, a 3-mile habitat protection radius around lek sites protects 80% of the nesting habitat used by female sage-grouse (data from 493 nest sites in Oregon). Any loss of nesting habitat (or any life history stage) can only be justified if viable populations still occur. Using average life-history attributes (e.g., nest success, chick survival, adult female survival) from across the range indicated that large and healthy populations can persist at 20% loss of the nesting population, although the carrying capacity will be reduced (Walker 2008). However, the risk of extirpation or extinction can increase with smaller populations as stochastic weather or disease events pose greater threats (Walker et al. 2007). Additionally, small and isolated populations may not be able to withstand any significant losses of nesting habitat and remain viable. Based on recent research on oil/gas developments in Wyoming and Montana, the 3-mile buffer appears to be a reasonable set-back distance that will minimize the impacts on sage-grouse (Walker et al. 2007, Doherty et al. 2008).

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GLOSSARY

Lek: an area where male sage-grouse display during the breeding season to attract females (also referred to as strutting-ground)

Lek complex: A collection of lek sites typically with small numbers of males which are associated with a larger lek site in the vicinity (≤ 1 mile). A count of a lek complex generally includes censusing all displaying males in a series of leks where no 2 lek sites are more than 1 mile apart.

Lek Status definitions:

Annual status: Lek status based on the following definitions of annual activity.

Active lek: A lek attended by ≥ 1 male sage-grouse during the breeding season. Acceptable documentation of grouse presence includes observation of birds using the site or recent signs of lek attendance (e.g. fresh droppings, feathers). New leks found during ground counts or surveys are given an annual status of active.

Inactive lek: A lek with sufficient data suggests that there was no male attendance throughout a breeding season. Absence of male grouse during a single visit is insufficient documentation to establish that a lek is inactive. This designation requires documentation of either: 1) an absence of birds on the lek during at least 2 ground surveys separated by at least 7 days. These surveys must be conducted under acceptable weather conditions (clear to partly cloudy and winds <15 kph) and in the absence of obvious disturbance or, 2) a ground check of the exact known lek site late in the strutting season that fails to find any sign (fresh droppings/feathers) of attendance. Data collected by aerial surveys alone may not be used to designate inactive status.

Unknown lek: Lek status has not been documented during the course of a breeding season. New leks found during aerial surveys in the current year are given an annual status of unknown unless they are confirmed on the ground or observed >1 time by air.

Conservation status: Based on its annual status, a lek is assigned to one of the following categories for conservation or mitigation actions:

Occupied lek: A regularly visited lek that has had ≥ 1 male counted in the last 7 years. Designate and protect surrounding area as Category 1 habitat (see Hagen 2005 for lek count protocols).

Occupied-pending- A lek not counted regularly in the last 7 years, but birds were present at last visit. Designate and protect surrounding area as Category 1 habitat. These leks should be resurveyed at a minimum of 2 additional years to confirm activity.

Unoccupied lek: A lek that has been counted annually and has had ZERO birds for 8 or more consecutive years. Mitigation category based on habitat type and condition.

Unoccupied-pending: A lek not counted regularly in a 7 year period, but birds were NOT present at last visit. Designate and protect surrounding area as Category 1 habitat. These leks should be resurveyed at a minimum of 2 additional years to confirm activity.

Historic lek: A lek that has been unoccupied prior to 1980 and remains so. Mitigation category based on habitat type and condition.

a. 1980 serves as the baseline for evaluating population objectives under ODFW’s Conservation Strategy, thus leks unoccupied prior to 1980 are not included in the baseline for population abundance and distribution

Productivity: An estimate of nest success and chick survival in a given year determined from the number of chicks observed per female. These data are obtained either from brood routes or wing-data obtained from hunter harvests.