CANDIDATE ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

SCIENTIFIC NAME: Centrocercus urophasianus

COMMON NAME: Greater Sage Grouse (Columbia Basin Distinct Population Segment)

LEAD REGION: Region 1

INFORMATION CURRENT AS OF: January 2003

STATUS/ACTION (Check all that apply):
___ New candidate
_X_ Continuing candidate
__ Non-petitioned
_X_ Petitioned - Date petition received: June 21, 1999
_X_ 90-day positive - FR date: August 24, 2000
_X_ 12-month warranted but precluded - FR date: May 7, 2001
_ Is the petition requesting a reclassification of a listed species?
__ Listing priority change
Former LP: ___
New LP: ___
Latest date species first became a Candidate: May 7, 2001
___ Candidate removal: Former LP: ___ (Check only one reason)
___ A - Taxon more abundant or widespread than previously believed or not subject to a degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.
___ F - Range is no longer a U.S. territory.
___ I - Insufficient information on biological vulnerability and threats to support listing.
___ M - Taxon mistakenly included in past notice of review.
___ N - Taxon may not meet the Act's definition of "species."
___ X - Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Order Galliformes; Family Phasianidae (chicken-like, ground-dwelling birds).

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Oregon and Washington; and British Columbia, Canada

CURRENT STATES/COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE: Washington; Douglas, Grant, Kittitas, Yakima, and Benton Counties

LEAD REGION CONTACT (Name, phone number): Barb Behan, (503) 231-6210.

LEAD FIELD OFFICE CONTACT (Office, name, phone number): Chris Warren, Upper Columbia Fish and Wildlife Office, Spokane, Washington, (509) 891-6839.
BIOLOGICAL INFORMATION:

Taxonony

In July, 2000, the American Ornithologists' Union (AOU) recognized sage grouse (Centrocercus urophasianus) by the common name of greater sage grouse. In addition, the AOU recognized sage grouse inhabiting southwestern Colorado and extreme southeastern Utah as a congeneric species (C. minimus), referred to as Gunnison sage grouse (AOU 2000). We follow this nomenclature for the species' common names for the purposes of this assessment. Currently, the AOU also recognizes two subspecies of greater sage grouse (AOU 1957). The western subspecies (C. u. phaios) was first described in 1946 (Aldrich 1946). Compared to the eastern subspecies (C. u. urophasianus), the western subspecies has reduced white markings and darker grayish-brown feathering, resulting in a more dusky overall appearance. Disagreement as to the validity of the current subspecies designations for greater sage grouse exists. Based on recent communications with recognized experts, some disagreement as to the validity of these designations exists (Braun 1992 and Aldrich 1992, both in Drut 1994; Banks 1992, 2000, 2002). With regard to current taxonomic standards and information generated over the last few decades, these subspecies designations may be inappropriate (Johnsgard 1983; Schroeder et al. 1999a; Benedict et al. 2001).
When informed taxonomic opinion is not unanimous, the U.S. Fish and Wildlife Service (Service or we) must evaluate the available information and come to our own adequately documented conclusions for species' listing actions undertaken pursuant to section 4 of the Act. The Service has conducted a detailed analysis of available information and has determined that the subspecies designations for greater sage grouse are inappropriate given current taxonomic standards (68 FR 6503).

In May of 1999, we received a petition requesting that the Washington population of the western subspecies of greater sage grouse be listed as threatened or endangered under the Endangered Species Act of 1973, as amended (Act). The petitioners made this request based upon threats to the population and its isolation from the remainder of the taxon, and they provided biological and ecological support for the petitioned action. We considered this request appropriate because, while we do not base listing decisions on political subdivisions other than international boundaries, we must consider for listing under the Act any population of vertebrate taxa (species or subspecies) if it may be recognized as a distinct population segment (DPS) (61 FR 4722). The criteria under which we recognize DPS are based upon the population's physical, physiological, ecological, behavioral, morphological, or genetic separation from the remainder of the taxon (discreteness), and its importance to the taxon to which it belongs (significance). Therefore, the following assessment addresses the population segment of greater sage grouse that occurs in Washington as it relates to the remainder of the taxon.

Description and Natural History

We condensed the following information regarding the description and natural history of greater sage grouse from the following sources: Aldrich 1963; Dalke et al. 1963; Johnsgard 1973; Connelly et al. 1988; Fischer et al. 1993; Drut 1994; Washington Department of Fish and Wildlife (WDFW) 1995; Western Sage and Columbian Sharp-tailed Grouse Workshop (WSCSGW) 1996 and 1998; Schroeder et al. 1999.

Grouse are gallinaceous (chicken-like, ground-dwelling) birds, and greater sage grouse are the largest North American grouse species. Males and females have dark grayish-brown body

plumage with many small gray and white speckles, fleshy yellow combs over the eyes, long pointed tails, and dark-green toes. Males also have blackish chin and throat feathers, specialized erectile feathers at the back of the head and neck, and white feathers around the neck and upper belly. During breeding displays, males also exhibit patches of bare, olive-green skin on their breasts.

Greater sage grouse depend on shrub steppe habitats throughout their life cycle, and are particularly tied to several species of sagebrush (Artemesia spp.). Adult greater sage grouse rely on sagebrush throughout much of the year to provide roosting cover and food, and depend almost exclusively on sagebrush for food during the winter. A wide variety of forbs (broad-leaved herbaceous plants) are also used by greater sage grouse during the spring and summer periods. Greater sage grouse hens require sufficient forb abundance for their pre-laying and nesting periods, and an assortment of forb and insect species form important nutritional components for chicks during the early stages of development. Greater sage grouse may disperse up to 160 kilometers (km) (100 miles (mi)) between seasonal use areas, however, average movements are generally less than 35 km (21 mi).

During the spring breeding season, male greater sage grouse gather together and perform courtship displays on relatively open areas called leks. Leks are often surrounded by more dense shrub steppe cover where males and females may disperse to roost or escape predators during the breeding season. Males defend individual territories within leks and perform elaborate displays with their specialized plumage and vocalizations to attract females for mating. Relatively few dominant males account for the majority of breeding on a given lek.

Females typically select nest sites under sagebrush cover, although other vegetation is sometimes used. The simple nests consist of scrapes on the ground, which are sometimes lined with feathers and vegetation. Clutch sizes range from 6 to 13 eggs, and females may renest with loss of their first clutch. Nest success ranges from 10 to 63 percent and is relatively low compared to other prairie grouse species. Chicks begin to fly at 2 to 3 weeks of age and broods remain together for up to 12 weeks. Shrub canopy and the cover provided by grasses and forbs act to conceal nesting hens and their broods.

The annual mortality rate for greater sage grouse is roughly 50 to 55 percent, which is relatively low compared to other prairie grouse species. Most juvenile mortality occurs during nesting and the chicks' flightless stage and is due primarily to predation or severe weather conditions. Up to 50 percent of all greater sage grouse mortality is caused by predation, from both avian (e.g., hawks, eagles, and ravens) and ground (e.g., coyotes (Canis latrans), badgers (Taxidea taxus), and ground squirrels (Citellus spp.) predators.

Distribution and Abundance

Historically, greater sage grouse occurred in 12 states and 3 Canadian provinces (Schroeder et al. 1999). Their range extended from southeastern Alberta and southwestern Saskatchewan, Canada, south to northwestern Colorado, west to eastern California, Oregon, and Washington, and north to southern British Columbia, Canada. Range-wide, the distribution of greater sage grouse has declined in a number of areas. Currently, greater sage grouse occur in 11 states and 2 Canadian provinces; they have been extirpated from Nebraska and British Columbia (after Braun

1998). There have also been considerable declines in the abundance of greater sage grouse from historic levels (Hornaday 1916; Crawford and Lutz 1985; Drut 1994; WDFW 1995; Coggins and Crawford 1996; Braun 1998; Schroeder et al. 1999). Rough estimates, based on the historic distribution of greater sage grouse (WDFW 2000) and contemporary density projections (Johnsgard 1973; Drut et al. 1994a; WDFW 1995; M. Schroeder, WDFW, pers. comm., 1999), indicate that the abundance of greater sage grouse range wide has likely declined by over 67 percent from historic levels.

The historic distribution of greater sage grouse populations within the Columbia Basin (i.e., the northwestern portion of the species' range, see Significance below) extended from northern Oregon throughout eastern Washington and into extreme south-central British Columbia. Except for Wallowa County, greater sage grouse were distributed throughout the sagebrush-dominated habitats of northern Oregon until the early 1900s (Gabrielson and Jewett 1940). By 1920, greater sage grouse populations had decreased and the birds were considered scarce within this region (Gabrielson and Jewett 1940; Drut 1994). Presently, Malheur, Harney, and Lake counties harbor the bulk of greater sage grouse in Oregon (roughly 24,000 to 58,000 birds), with the balance of Oregon's greater sage grouse population (roughly 3,000 to 8,000 birds) split among Baker, Crook, Deschutes, Grant, Klamath, Union, and Wheeler counties (after Willis et al. 1993). Currently, all (or very nearly all) of the greater sage grouse in Oregon occur outside of the Columbia Basin (WDFW 2000).

Historically, greater sage grouse in Washington ranged from Oroville in the north, west along the Cascade foothills, east to the Spokane River, and south to the Oregon border (Yocom 1956). Historic references indicate there were large numbers of greater sage grouse in Washington (Sveum 1995; WDFW 1995), and annual State harvests averaged roughly 1,800 birds from 1951 to 1973. Harvest rates declined from 1974 (n = 900) to 1987 (n = 18), and Washington closed the hunting season in 1988 (WDFW 1995). Currently, greater sage grouse occupy two relatively small areas within the Columbia Basin in central Washington, which represent approximately 10 percent of the species' historic state distribution. The northern subpopulation occurs primarily on private and state-owned lands in Douglas County (roughly 400 birds); the southern subpopulation occurs at the Yakima Training Center (YTC), administered by the U.S. Department of the Army (Army), in Kittitas and Yakima counties (roughly 300 birds).

Rough estimates, based on the historic distribution of greater sage grouse within the Columbia Basin (WDFW 2000) and contemporary density projections (Johnsgard 1973; Drut et al. 1994a; WDFW 1995; M. Schroeder, WDFW, pers. comm., 1999), indicate that there may have been between roughly 100 thousand and one million birds within this ecosystem historically. Given current estimates, the abundance of greater sage grouse within the Columbia Basin has declined by over 97 percent from historic levels.

Distinct Population Segment Review

Under the Act, we must consider for listing any species, subspecies, or, for vertebrates, any distinct population segment (DPS) of these taxa if there is sufficient information to indicate that such action may be warranted. To implement the measures prescribed by the Act and its Congressional guidance, we (along with the National Marine Fisheries Service) developed policy that addresses the recognition of DPSs for potential listing actions (61 FR 4722). The

policy allows for more refined application of the Act that better reflects the biological needs of the taxon being considered and avoids the inclusion of entities that do not require its protective measures.

Under our DPS policy, we use two elements to assess whether a population segment under consideration for listing may be recognized as a DPS. The elements are: (1) the population segment's discreteness from the remainder of the taxon; and (2) the population segment's significance to the taxon to which it belongs. If we determine that a population segment being considered for listing represents a DPS, then the level of threat to the population segment is evaluated based on the five listing factors established by the Act to determine if listing it as either threatened or endangered is warranted.

Below, we assess the population segment of greater sage grouse that remains within the Columbia Basin under our DPS policy.

Discreteness

A population segment of a vertebrate species may be considered discrete if it satisfies either one of the following two conditions: (1) it is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, or behavioral factors - quantitative measures of genetic or morphological discontinuity may also provide evidence of this separation; and (2) it is delimited by international governmental boundaries within which differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms exist that are significant with regard to conservation of the taxon. We did not address the international boundary criterion in this assessment because greater sage grouse within the Columbia Basin have been extirpated from British Columbia.

The two subpopulations of greater sage grouse that remain in central Washington are separated by approximately 55 km (34 mi). While this distance is well within the species' maximum estimated dispersal distance, a number of recent telemetry studies have never documented their intermixing (M. Schroeder, pers. comm., 1999; M. Pounds, YTC, pers. comm., 1999). However, until recently, the two subpopulations were considered relatively continuous and may now represent isolated components of a single metapopulation (WDFW 1995; Schroeder et al. 2000). In addition, sporadic sightings outside current concentrations indicate there may be some minimal interaction and, possibly, genetic interchange between them (WDFW 1995).

The next closest population of greater sage grouse is located over 185 km (115 mi) to the south, in central Oregon. Historically, there was a greater level of continuity and interaction between the population segments of greater sage grouse occupying these two regions (Drut 1994). However, bottlenecks in the distribution of greater sage grouse may have existed historically across central Oregon. In this area, greater sage grouse range is confined to relatively narrow corridors of lower elevation, shrub steppe habitats that transect higher elevation, forested habitats. In addition, the shrub steppe habitats and land forms found in central Oregon may further restrict greater sage grouse distribution within this region (see Significance, below).

It is currently unclear to what extent the restrictions of shrub steppe habitats in central Oregon may have acted to isolate the Columbia Basin population segment of greater sage grouse historically. Nevertheless, with regard to greater sage grouse seasonal movements, dispersal

behavior, and recent census information (M. Schroeder, pers. comm., 1999; M. Pounds, pers. comm., 1999; B. Ferry, Oregon Department of Fish and Wildlife, pers. comm., 2001), the population segment remaining in Washington is now considered physically discrete from the population segment in central and southern Oregon (WDFW 1995, WSGWG 1998, Schroeder et al. 2000). It is likely that the population segments within these two regions have been physically discrete since at least the early-1900s (Gabrielson and Jewett 1940; Crawford and Lutz 1985; Drut 1994).

Based on the above information, we found that the population segment of greater sage grouse that occurs within the Columbia Basin of central Washington is discrete from the remainder of the taxon.

Significance

Our DPS policy provides several examples of the types of information that may demonstrate the significance of a population segment to the remainder of its taxon, including, but not limited to: (1) persistence of the population segment in an ecological setting unusual or unique for the taxon; (2) evidence that the population segment differs markedly from other population segments in its genetic characteristics; (3) evidence that loss of the population segment would result in a significant gap in the range of the taxon; and (4) evidence that the discrete population segment represents the only surviving natural occurrence of the taxon that may be more abundant elsewhere as an introduced population outside its historic range. We assessed the following significance factors as they relate to the discrete population segment of greater sage grouse that remains within the Columbia Basin.

Persistence in an unusual or unique ecological setting:

The broad shrub steppe biome historically occupied by greater sage grouse across their range consists of a number of variable habitat types that grade from one to the next, and which may be considerably different between the regions occupied by the species (Miller and Eddleman 2000). The different habitats historically and currently occupied by greater sage grouse are a reflection of the different geologic, climatic, and edaphic (soil) conditions and disturbance regimes influencing the various regions within the shrub steppe biome (Miller and Eddleman 2000). Necessarily, greater sage grouse have adapted to the mosaic of shrub steppe habitat types found throughout their historic distribution (Schroeder et al. 1999).

With regard to the historic range of greater sage grouse in Washington and Oregon, several studies have defined and mapped landscape-level ecosystem components of the northwestern United States (Franklin and Dyrness 1988; Quigley et al. 1997), while others have focused on the management and conservation of natural resources within these regional ecosystems (Wisdom et al. 1998; Miller and Eddleman 2000). Although there are a number of differences between these studies and their stated objectives, the ecosystem mapping units that result are surprisingly consistent (Quigley et al. 1997). Use of this biogeographic information is important in determining if the population segment of greater sage grouse that remains within the Columbia Basin occupies an unusual or unique ecological setting. In addition, it is important for delineating the bounds of any potential DPS in the region, as required by our DPS policy.

Five of the ecosystems in Washington and Oregon that have been identified by the above studies

provide essential habitat requirements for greater sage grouse. For the purposes of this assessment, we refer to the ecosystems historically occupied by greater sage grouse in these two states as the Columbia Basin, High Lava Plains, Northern Great Basin, Owyhee Uplands, and Modoc Plateau (after Quigley et al. 1997). The Columbia Basin occurs in Washington and northern Oregon, while the other four ecosystems occur in central and southern Oregon. These ecosystems are interspersed to varying degrees with forested habitats of the Southern and Eastern Cascades ecosystems to the west, Okanogan Highlands to the north, and the Bitterroot and Blue Mountains to the east; and steppe (grassland) habitats of the Palouse Prairie to the east.

The population segment of greater sage grouse that remains in Washington occurs entirely within the Columbia Basin and is the only representation of the taxon within this ecosystem. The population segment of greater sage grouse in central and southern Oregon shows nearly continuous occupation across the High Lava Plains, Northern Great Basin, and Owyhee Uplands. There is also a disjunct subpopulation in the vicinity of Gerber Reservoir in extreme south-central Oregon (Modoc Plateau). These birds likely have a closer affinity to the greater sage grouse population in northern California (WDFW 2000), and they are not considered further for the purposes of this assessment. Currently, there is insufficient information available to assess the other ecosystems throughout the remainder of the species' historic range in North America.

A number of significant differences are found between the Columbia Basin and the balance of historic greater sage grouse range in central and southern Oregon (Table 1). In general, the Columbia Basin is lower in elevation, contains deeper soils of varying origin, and has been influenced by different geological processes. These structural differences, combined with regional climatic conditions, significantly influence the broad plant associations found within each ecosystem (Daubenmire 1988; Franklin and Dyrness 1988). Historically, transitional steppe habitats were much more prevalent within the Columbia Basin than within the ecosystems of central and southern Oregon. In contrast, juniper (Juniperus spp.) woodlands and salt-desert shrub habitats were much more common in central and southern Oregon. Finally, there are significant differences in the type and distribution of sagebrush taxa among the ecosystems historically occupied by greater sage grouse in the northwestern extent of their historic range.

There are a number of broad habitat associations in common between the Columbia Basin and the ecosystems of central and southern Oregon (Daubenmire 1988; Franklin and Dyrness 1988). However, even within these common habitat associations, notable differences exist. In general, the composition of forb species differs considerably between the Columbia Basin and the ecosystems in central and southern Oregon (Daubenmire 1988; Franklin and Dyrness 1988). Even when the same forb species may be present, the two regions typically support different subspecies and/or varieties of these taxa (Hitchcock and Cronquist 1973).

The differences noted above between the Columbia Basin and the ecosystems of central and southern Oregon affect the essential habitat requirements of greater sage grouse within these different regions, as described below.

Greater sage grouse are sagebrush "obligates" and depend on sagebrush to a great degree to provide essential food and cover requirements, especially during winter (Drut 1994; Barnett and Crawford 1994; WDFW 1995; Schroeder et al. 1999). Greater sage grouse display preferential

Table 1. Differences in ecosystem elements between regions occupied by the extant population segments of greater sage grouse in Washington and Oregon (after Winward 1980; Daubenmire 1988; Franklin and Dyrness 1988; McNab and Avers 1994; Dobler et al. 1996; Quigley et al. 1997; Miller and Eddleman 2000).

Ecosystem Elements--Geologic, Edaphic, and Transitional Habitats

Population Segment	Elevations	Soils	Channeled Scablands	Internally-drained Playas	Steppe	Juniper Woodland	Salt-desert Shrub
Columbia Basin	< 3,000' ft	Deep/Loamy Glacial/ Eolian	Prominent (north)	Rare/Absent	Abundant (east)	Rare/Absent	Rare/Absent
Central / Southern Oregon	> 3,500 ft	Thin/Rocky Volcanic/ Alluvial	Rare/Absent	Prominent (NGB, OU)[1]	Rare/Absent	Abundant (HLP) Present (NGB, OU)	Abundant (NGB, OU)

Ecosystem Elements--Sagebrush (Artemesia) Taxa[2]

Population Segment	Basin ssp	Wyoming ssp	Mountain ssp	Low	Three-Tip	Stiff	Early	Silver	Black
Columbia Basin	Dominant	Rare/ Absent	Rare/ Absent	Rare/ Absent	Abundant (north)	Abundant	Rare/ Absent	Rare/ Absent	Rare/ Absent
Central / Southern Oregon	Rare/ Absent	Dominant	Abundant	Abundant	Present (OU)	Present	Present (HLP)	Present (NGB, OU)	Present (NGB, OU)

[1] Element primarily applies to the ecosystems noted: HLP - High Lava Plains; NGB - Northern Great Basin; OU - Owyhee Uplands.
[2] Big Sagebrush (A. tridentata) Subspecies (ssp): Basin - A.t. tridentata, Wyoming - A.t. wyomingensis, Mountain - A.t. vaseyana; Low - A. arbuscula; Three-tip - A. tripartita; Stiff - A. rigida; Early - A. longiloba; Silver - A. cana; Black - A. nova.

use of different taxa of sagebrush as winter food (Remington and Braun 1985; Welch et al. 1991) and, in some areas, low sagebrush may be preferred over big sagebrush (Schroeder et al. 1999). In addition, greater sage grouse display preference for the different subspecies of big sagebrush as food, showing the highest preference for mountain big sagebrush, followed by Wyoming big sagebrush, then basin big sagebrush (Welch et al. 1991). The different growth forms of sagebrush taxa (Winward 1980, 1981; Meyer 1992) also provide different cover conditions for greater sage grouse, and their winter movements are associated with locating appropriate sites (WDFW 1995; Schroeder et al. 1999). The sagebrush taxa that are available as winter food and cover for greater

sage grouse differ between the Columbia Basin and the ecosystems of central and southern Oregon (Table 1).

During the breeding season, adult greater sage grouse undergo a nutritional deficit and lose weight (WDFW 1995; Schroeder et al. 1999). During this period and continuing into summer, forbs and insects become increasingly important as food items for greater sage grouse. Greater sage grouse hens require sufficient forb abundance for their pre-laying and nesting periods, and an assortment of forb and insect species form important nutritional components for chicks during the early stages of their development (Gregg et al. 1993; Barnett and Crawford 1994; Drut et al. 1994b; Hanf et al. 1994). Preferential use of food resources by greater sage grouse is believed to be associated with the foods' nutritive values, the dietary needs of the birds, and, ultimately, the birds' reproductive fitness and survival (Remington and Braun 1985; Johnson and Boyce 1990; Barnett and Crawford 1994; Drut et al. 1994a,1994b; Hanf et al. 1994; WDFW 1995; Schroeder et al. 1999). Many of the native forb species and varieties that differ between the Columbia Basin and the ecosystems of central and southern Oregon (Hitchcock and Cronquist 1973; Franklin and Dyrness 1988) form important food items for greater sage grouse from spring through summer, including those within the genera Agoseris, Astragalus, Crepis, Aster, Erigeron, Eriogonum, and Lomatium (Sveum 1995; Miller and Eddleman 2000).

From spring through fall, sagebrush canopies provide vertical cover for greater sage grouse, while grasses and forbs provide horizontal cover. This variety of cover is very important for concealing nesting hens and their broods from potential avian and ground predators, as well as providing protection from inclement weather. Greater sage grouse in central and southern Oregon use different sagebrush habitat associations (e.g., mountain big sagebrush, low sagebrush) throughout the spring and summer periods (Gregg et al. 1993; Barnett and Crawford 1994; Drut et al. 1994a; Hanf et al. 1994). The sagebrush habitat associations preferentially selected by greater sage grouse in central and southern Oregon are not available to the population segment within the Columbia Basin (Table 1).

Juniper woodlands and salt-desert shrub communities are notable primarily for their potential to exclude greater sage grouse and the management implications that result. As juniper becomes more abundant and areas become increasingly closed woodlands, use by greater sage grouse is precluded. The exclusion of fire from juniper woodlands allow these communities to expand. Active invasion of sagebrush habitat associations by juniper woodlands has occurred over the last 130 years (Miller and Eddleman 2000). Likewise, salt-desert shrub habitats are not typically used by greater sage grouse. Intense grazing pressure and other local activities that can affect the hydrology of an area (e.g., irrigation, mining, impoundments) may alter the composition and distribution of salt-desert shrub communities. The historic, present, and predicted future occurrence of juniper woodlands and salt-desert shrub communities differ between the Columbia Basin and the ecosystems of central and southern Oregon (Table 1; Keane et al. 1996).

Based on the above information, we concluded that the Columbia Basin represents a unique ecological setting due to its geologic, climatic, edaphic, and plant community components. In addition, the unique elements of the Columbia Basin ecosystem affect the essential habitat requirements of greater sage grouse. Necessarily, the population segment of greater sage grouse occupying the

Columbia Basin must differentially exploit the resources that are available, as compared to the population segment within the ecosystems of central and southern Oregon. The different habitat use patterns of greater sage grouse within the Columbia Basin have bearing on their food and cover preferences, distribution, movements, reproductive fitness, and, ultimately, their survival. The unique elements of the Columbia Basin also hold different management implications for greater sage grouse within this ecosystem (see THREATS below).

Markedly different genetic characteristics:

To date, most genetic research on greater sage grouse has concentrated on clarifying issues surrounding the taxonomic separation of Gunnison sage grouse in Colorado. Results of this research show Gunnison sage grouse to have a dissimilar genetic profile and less genetic diversity than greater sage grouse populations in Colorado (Quinn et al. 1997; Oyler-McCance et al. 1999). This information, along with behavioral and morphological information, supports the new species designation for these birds (AOU 2000). The genetic and other information concerning Gunnison sage grouse demonstrates that the genus may differentiate significantly within a relatively small geographic region. In addition, this information is important for helping to determine the extent of genetic differentiation between population segments of greater sage grouse, and whether such differentiation may be significant to the remainder of the taxon.

Additional studies to investigate the range-wide genetic profiles of greater sage grouse are ongoing (Quinn et al. 1997; Benedict and Quinn 1998; Benedict et al. 2001). Range-wide investigations include samples from Colorado, Utah, Nevada, California, Oregon, and Washington. Sample sizes are minimal for portions of the range, and the results are preliminary and have been used primarily to guide further investigation (S. Oyler-McCance, University of Denver, pers. comm., 1999; T. Quinn, University of Denver, pers. comm., 1999; Benedict et al 2001; Oyler-McCance et al 2001).

The range-wide investigations into the genetic profiles of greater sage grouse have identified a number of rare and unique haplotypes (from mitochondrial DNA). In addition, haplotype frequencies and the level of genetic diversity vary among the local populations sampled (Quinn et al. 1997; Benedict and Quinn 1998; Benedict et al. 2001). So far, there are several notable results from this range-wide work (Benedict et al. 2001). First, the populations sampled from the Mono Basin area in California and Nevada stands out for having an unusually high proportion of novel haplotypes, sharing only a single haplotype (represented by just one individual) with the rest of the range. This population represents the extreme southwestern extent of historic greater sage grouse range. Second, there is no genetic differentiation apparent between the delineated eastern and western subspecies. Third, the population segment that remains within the Columbia Basin stands out for having very low genetic diversity, with just three haplotypes represented among the two subpopulations. Thirteen individuals sampled from the northern subpopulation (n = 18) and all of the individuals sampled from the southern subpopulation (n = 18) represent a single, widespread haplotype that is shared with most of the other sampled locales. The remaining five individuals from the northern subpopulation are represented by a novel (n = 3) or rare (n = 2) haplotype (Benedict et

al. 2001).

The comparatively low genetic diversity of the population segment of greater sage grouse that remains within the Columbia Basin is consistent with a recent and severe bottleneck in its effective population size (i.e., the number of individuals contributing to reproduction), reduced or no gene flow to this population segment from other regions, or both (Benedict et al. 2001; Oyler-McCance et al. in litt. 2001). The results from the range-wide work on the regional genetic profiles of greater sage grouse are suggestive and demonstrate a marked difference between the population segment of greater sage grouse within the Columbia Basin and the population segment in central and southern Oregon. However, these results do not necessarily indicate that genetic differentiation of this population segment is significant to the remainder of the taxon. To what extent the forces of isolation, adaptive change, genetic drift, and/or inbreeding may have influenced the regional genetic profiles of greater sage grouse, including those that remain within the Columbia Basin, merits further investigation (Benedict et al. 2001; Oyler-McCance et al. in litt. 2001).

Significant gap in the range of the taxon.

Greater sage grouse within the Columbia Basin represent the extreme northwestern extent of the species' historic range. The Columbia Basin historically encompassed roughly 7 percent of the entire range of the taxon. Currently, greater sage grouse occupy approximately 5 percent of their historic distribution within this ecosystem.

A number of studies address the characteristics of peripheral and/or isolated populations and their potential influences on, and importance to, the remainder of the taxon. Peripheral and isolated populations may experience increased directional selection due to marginal or varied habitats or species compositions at range peripheries, exhibit adaptations specific to these differing selective pressures, demonstrate genetic consequences of reduced gene flow dependent on varying levels of isolation, and/or have different responses to anthropogenic influences (Levin 1970; MacArthur 1972; Morain 1984; Lacy 1987; Hengeveld 1990; Saunders et al. 1991; Hoffmann and Blows 1994; Furlow and Armijo-Prewitt 1995; Garcia-Ramos and Kirkpatrick 1997).

Recent discussions addressed the attributes of isolated and peripheral populations and their potential importance to conservation efforts. Some investigations would emphasize genetic distinctiveness (Lesica and Allendorf 1995; Waples 1998), while others suggest a spectrum of influences may demonstrate the value of discrete populations (Pennock and Dimmick 1997; Ruggiero et al. 1999). The purposes of the Act are to conserve species "...of esthetic, ecological, educational, historical, recreational, and scientific value...." As addressed above, the DPS policy reflects this broader objective and does not limit the concept of significance strictly to genetic distinctiveness.

The available information regarding the historic distribution and potential isolation of greater sage grouse within the Columbia Basin demonstrates that this population segment is likely experiencing increased directional selection due to marginal and varied habitats at

the taxon's range periphery, exhibiting genetic consequences of reduced gene flow from other population segments, and is responding (and will continue to respond) to the different anthropogenic influences in the region.

Based on the above information, we conclude that loss of the population segment of greater sage grouse that remains within the Columbia Basin would represent a significant gap in the historic range of the taxon (i.e., the loss of a conspicuous peripheral and potentially isolated extension of historic range, and representation of the taxon within a unique ecological setting).

Conclusion

To summarize, we found that the discrete population segment of greater sage grouse that remains in Washington is significant to the remainder of the taxon, and thus represents a distinct population segment. The significance of this population segment is primarily due to its persistence in the unique ecological setting of the Columbia Basin. In addition, the available genetic and morphological information on greater sage grouse, while inconclusive, indicates that this population segment may be differentiating from the remainder of the taxon, and its extirpation could preclude further scientific inquiry into these characteristics. Finally, information concerning the historic and current distribution of greater sage grouse indicates that the loss of the Columbia Basin population segment would represent a significant gap in the historic range of the taxon.

As required by our DPS policy, we determined that the bounds of this DPS are conterminous with the historic distribution of western sage grouse within the Columbia Basin ecosystem (Figure 1).

THREATS:

A. The present or threatened destruction, modification, or curtailment of its habitat or range.

A number of influences have been implicated in the decline of greater sage grouse distribution and abundance throughout the species' range (Crawford and Lutz 1985; Blus et al. 1989; Braun et al. 1994; Drut 1994; WDFW 1995; Fischer et al. 1996; Connelly and Braun 1997; Schroeder et al. 1999). Of primary concern are impacts to native shrub steppe habitats, which include conversion for agriculture, urban and mineral resources developments, construction of utility and transportation corridors, and habitat degradation through overgrazing, brush control, altered fire frequencies, and exotic species invasions. Other potential influences that may be associated with greater sage grouse population declines include predation, excessive hunting, disease and parasitism, chemical applications for pest control, weather cycles, and recreational activities. As a result of these combined influences, greater sage grouse distribution and abundance have continued to decline over the past decade, and a number of populations may now be at risk of extinction throughout the species' range (WSCSGW 1996 and 1998). Currently, greater sage grouse populations may be considered secure in five States, including Montana, Wyoming, Idaho, Nevada, and Oregon (Connelly and Braun 1997).

Native Americans began grazing horses in the Columbia Basin in the mid-1700s and, by the mid-1800s, European settlers had established extensive cattle and horse grazing operations throughout the shrub steppe habitats used by greater sage grouse (Daubenmire 1988; WDFW 1995; Livingston 1998). By the late 1800s, sheep production became increasingly important and large flocks were grazed along with other previously established livestock herds. Concurrent with significant declines in native shrub steppe habitats (see below), contemporary grazing levels are much reduced from historic levels. However, large livestock operations continue within the shrub steppe habitats of the Columbia Basin to the present. From 1986 to 1993, roughly 500,000 cattle were being supported in nine central Washington counties that historically harbored greater sage grouse (WDFW 1995).

There is some evidence that the shrub steppe habitats of the Columbia Basin evolved in the absence of substantial grazing pressure from large native herbivores since the latest period of glaciation, roughly 12,000 years before present (Mack and Thompson 1982; Daubenmire 1988). Excessive grazing pressure can have significant impacts on the shrub steppe ecosystems found throughout the historic range of greater sage grouse (Fleischner 1994), and these impacts may be exacerbated in the Columbia Basin. In this region, excessive grazing removes current herbaceous growth and residual cover of native grasses and forbs, and can increase the canopy cover and density of sagebrush and invasive species (Daubenmire 1988; WDFW 1995; Livingston 1998). These impacts may be especially critical to greater sage grouse populations during the spring nesting and brood rearing periods, and may negatively affect their reproductive potential (Crawford 1997; Connelly and Braun 1997; Schroeder et al. 1999).

The latest available estimate (1993) of the number of cattle supported in Douglas County, which also supports the northern subpopulation of the Columbia Basin DPS, is roughly 20,000 (WDFW 1995). It is currently unclear if this level of livestock use in the county may have negative affects on greater sage grouse or their habitats. Prior to 1992, livestock grazing pressure was intense throughout the area of Kittitas and Yakima Counties that now comprises the YTC, which supports the southern subpopulation of the Columbia Basin DPS. In 1992, grazing intensity was reduced at the YTC within the greater sage grouse protection areas identified by the Army. In 1995, cattle grazing was eliminated throughout the installation (Livingston 1998). Twice annually during spring and fall, flocks of sheep are trailed-through the YTC over a period of several weeks (M. Pounds, pers. comm., 1999). It is unknown to what degree current livestock use levels may be impacting greater sage grouse or their habitat at the YTC. However, impacts from past livestock grazing are still evident throughout the installation (Livingston 1998).

During the first half of the 1900s, large portions of the shrub steppe habitats on deeper soils within the Columbia Basin were converted for dryland crop production (Daubenmire 1988; Franklin and Dyrness 1988; WDFW 1995). During the mid-1900s, a number of hydro-electric dams were developed on the Columbia and Snake Rivers in Washington and Oregon. The reservoirs formed by these projects impacted native shrub steppe habitats adjacent to the rivers and led to further conversion of large expanses of upland shrub steppe habitats in the Columbia Basin for irrigated agriculture (WDFW 1995; Franklin and Dyrness 1988). It has been estimated that approximately 60 percent of the original shrub steppe habitat in Washington has been converted, primarily for

agricultural uses (Dobler 1994). While at much reduced levels, shrub steppe habitats within the Columbia Basin continue to be converted for both dryland and irrigated crop production. In addition, the U.S. Bureau of Reclamation retains options for further development of the Columbia Basin Irrigation Project in central Washington (USDI 1998). Major portions of Washington's shrub steppe ecosystem are considered among the least protected areas in the state (Cassidy 1997).

Large areas of privately owned lands in Douglas County are currently withdrawn from crop production and planted to native and non-native cover under the federal Conservation Reserve Program (CRP), established in 1985 (USDA 1998). Lands under the CRP are very important to the northern subpopulation of the Columbia Basin DPS (M. Schroeder, pers. comm., 1999). These areas, some of which have been set aside since the late 1980s, can provide the essential grass and shrub cover requirements of greater sage grouse on lands previously used for agriculture. The juxtaposition of CRP lands with the remaining areas of native shrub steppe habitats and crop lands may further increase the value of these habitat patches for greater sage grouse (M. Schroeder, pers. comm., 1999). A number of CRP contracts in Washington have expired since 1995, and more are scheduled to expire through 2002. New contracts completed in 1998 for Douglas County have increased the acreage of CRP lands potentially available for use by greater sage grouse. However, contracts extend for just 10 years and new standards for CRP lands will be implemented that may require replanting of significant acreage under existing contracts (USDA 1998; M. Schroeder, pers. comm., 1999). Presently, it is unclear what effects these changes have had, or will have, on the northern subpopulation of the Columbia Basin DPS.

In 1991, the Army expanded the YTC along its northern boundary by approximately 24,000 ha (60,000 ac) to form its present configuration and size of approximately 130,000 ha (325,000 ac). One of the primary justifications for expansion of the installation was to reduce impacts to heavily used areas by allowing rotational training exercises and rehabilitation of impacted sites (U.S. Department of Defense (DOD) 1989). In 1994, the Army restationed mechanized and armored combat forces to Fort Lewis in western Washington (DOD 1994). This action was undertaken to accommodate brigade-level maneuver exercises and may result in an increase in overall training activity and associated impacts at the YTC. Large-scale training exercises at the YTC are scheduled to occur at 18 to 24 month intervals and may involve over 10,000 troops and 1,000 tracked and wheeled vehicles. Small-scale training exercises are also conducted annually at the YTC by other United States' (e.g., Washington National Guard) and allied military units (DOD 1989; Livingston 1998).

In the fall of 1995, the Army conducted its first large-scale training exercise at the YTC following the restationing action. Analysis of the impacts from this exercise indicated that over 9 percent of the sagebrush plants within the greater sage grouse protection areas experienced major structural damage. In addition, modeling exercises indicated that sagebrush cover would decline due to similar training scenarios if conducted on a biannual basis (Cadwell et al. 1996). Analyses of the potential impacts to other shrub steppe components that may be important to greater sage grouse at the YTC (e.g., grass, forb, and insect quality and abundance), or those associated with the smaller, ongoing training activities, are not currently available. However, it has been suggested that native vegetation on impacted sites with limited soil disturbance will recover following large-scale maneuver exercises (Cadwell et al. 1996).

In addition, the YTC conducts aggressive revegetation efforts for sagebrush and native grasses within the greater sage grouse protection areas (Livingston 1998) and has eliminated season-long grazing on the installation (DOD 1996). Evaluation of the quality or quantity of naturally recovered areas and the efficacy of revegetation efforts is currently not available.

Natural and human-caused fire is a significant threat to greater sage grouse throughout the Columbia Basin because, at increased frequencies, it can remove sagebrush from the vegetation assemblage (USDI 1994; WDFW 1995). Sagebrush is easily killed by fire (Daubenmire 1988) and, in the absence of a sufficient seed source, may not readily reinvade sites where it has been removed. Fire may be especially damaging at the YTC where military training activities provide multiple ignition sources, vegetative cover is relatively continuous, and invasive species such as cheatgrass (Bromus tectorum) and knapweed (Centauria spp) may provide fine fuels that can carry a fire. The Army considered fire management and control in its planning efforts for the restationing action (DOD 1996), and the YTC has since developed a detailed fire management plan (DOD 1998). However, the potential for relatively large range fires to occur at the YTC remains. In 1996, over 25,000 ha (60,000 ac) of shrub steppe habitat, much of it currently and potentially used by greater sage grouse, was burned as a result of training activities. A fire of this magnitude within the identified greater sage grouse protection areas would jeopardize the subspecies' persistence at the installation (Livingston 1998).

B. Over-utilization for commercial, recreational, scientific, or educational purposes.

Recent scientific investigations in Washington have resulted in some mortality of greater sage grouse. However, the level of mortality incurred is not likely to significantly influence the viability of the Columbia Basin DPS (M. Schroeder, pers. comm., 1999; M. Pounds, pers. comm., 1999).

The northern subpopulation of the Columbia Basin DPS occurs primarily on private lands and is not subject to extensive viewing by the general public or other recreational activities (M. Schroeder, pers. comm., 1999). The YTC closely manages recreation and sage grouse viewing by the general public using the installation, and these activities are not believed to be significant to the well-being of the southern subpopulation of the Columbia Basin DPS (M. Pounds, pers. comm., 1999).

The Columbia Basin DPS has not been subject to hunting since 1987 (WDFW 1995).

C. Disease or predation.

Greater sage grouse are subject to a number of mortality factors related to disease and predation (WDFW 1995). However, there are apparently no documented severe episodes of disease or predation that have played a significant role in the population declines and range reduction of greater sage grouse. Episodes of disease or altered predation patterns may play an important role in the dynamics of small and isolated populations, and increase the risk of their extirpation (see threat factor 'E', below).

D. Inadequacy of existing regulatory mechanisms.

Revegetation standards under the CRP promote the improvement of habitat conditions for the northern subpopulation of the Columbia Basin DPS, and the CRP restricts livestock grazing on contract lands except under extraordinary circumstances. However, these measures are not specifically promulgated for the protection of greater sage grouse, and there are few other mechanisms that regulate grazing practices or the conversion of native habitats on privately owned lands.

We are currently assisting with development of a county-wide Habitat Conservation Plan (HCP) for private lands in central Washington (Foster Creek Conservation District, Douglas County). When completed, the HCP will include measures to protect the northern subpopulation of the Columbia Basin DPS. However, the Act does not provide regulatory protections for unlisted species during development of HCPs (USDI 1996).

Some illegal or accidental shooting of greater sage grouse may occur in Washington in association with hunting seasons for other upland game species. However, the state hunting moratorium and hunting regulations implemented by the Army at the YTC appear to be sufficient to control this form of mortality, and it is not likely to significantly influence the viability of the Columbia Basin DPS (M. Schroeder, pers. comm., 1999; M. Pounds, pers. comm., 1999).

The Army implements a number of regulations at the YTC to promote environmental protection of the installation's natural resources. However, various impacts to the habitats important to greater sage grouse occur, and are primarily the result of training-related fire and direct damage to vegetation communities from training maneuvers (see threat factor 'A', above).

E. Other natural or human-caused factors affecting its continued existence.

The fragmented, isolated nature of the Columbia Basin DPS is a concern for conservation of the taxon within the Columbia Basin ecosystem. A preliminary viability analysis conducted by the WSGWG (1998) indicates that neither subpopulation is likely viable over the long term (approximately 100 years). In addition to the relatively large-scale impacts on native shrub steppe habitats (above), other naturally occurring impacts and human influences of lesser magnitude may pose threats to the Columbia Basin's isolated subpopulations. Potential risks include direct impacts to individuals from inclement weather conditions, altered predator demographics or behavior, agricultural practices (e.g., cultivation, harvest, etc.), vehicle collisions, pest control measures, scientific investigations, and military training (e.g., smoke obscurant and live-fire exercises, etc.). Impacts may also result from indirect disturbance of the subpopulations caused by agricultural and grazing activities, transportation corridors, recreation, and military training events (over-flights, troop movements, etc.). Small, isolated populations may also be at greater risk to the effects of inbreeding (Benedict et al. 2001; Oyler-McCance et al. in litt. 2001). Although it is unlikely that any one of these factors have played

a significant role in the population declines and range reductions of greater sage grouse, these combined influences may now play an important role in the dynamics of the relatively small and isolated subpopulations that make up the Columbia Basin DPS.

FOR RESUBMITTED PETITIONS:

a. Is listing still warranted? Yes

b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? Yes

c. Is a proposal to list the species as threatened or endangered in preparation? No

d. If the answer to c. above is no, provide an explanation of why the action is still precluded: Since publication of the 2002 CNOR, the publication of a proposed rule to list this species has been precluded by other higher priority listing actions, and based on work scheduled we expect that will remain the case for the remainder of Fiscal Year 2004. Almost the entire national listing budget has been consumed by work on various listing actions taken to comply with court orders and court-approved settlement agreements, emergency listing, and essential litigation-related, administrative, and program management functions. We will continue to monitor the status of the Columbia Basin DPS of greater sage grouse as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures.

LAND OWNERSHIP:

The northern subpopulation of the Columbia Basin DPS occurs primarily on private and State-owned lands in Douglas County; the southern subpopulation occurs almost entirely on Federal lands, administered by the Army, in Kittitas and Yakima Counties.

PRELISTING:

In 1992, we entered into a voluntary Conservation Agreement with the Army and the WDFW for greater sage grouse occurring at the YTC. The Conservation Agreement expired April 30, 2000. Efforts to update and implement a revised Conservation Agreement for greater sage grouse throughout Washington are ongoing.

The Service is currently assisting with development of a county-wide Habitat Conservation Plan (HCP) for private lands in central Washington (Foster Creek Conservation District, Douglas County). When completed, the HCP will likely include measures to protect the northern subpopulation of the Columbia Basin DPS.

REFERENCES:

Personal Communications

Ferry, Brian, Upland Bird Biologist, Oregon Department of Fish and Wildlife, Prineville, Oregon.

Oyler-McCance, Sara, Genetics Research, Department of Biological Sciences, University of Denver, Denver, Colorado.

Pounds, Margaret, Wildlife Biologist, Directorate of Environment and Natural Resources, Yakima Training Center, Yakima, Washington.

Quinn, Thomas, Genetics Research, Department of Biological Sciences, University of Denver, Denver, Colorado.

Schroeder, Michael, Upland Bird Research, Wildlife Management Program, Washington Department of Fish and Wildlife, Bridgeport, Washington.

Literature Citations

Aldrich, J.W. 1946. New Subspecies of Birds from Western North America. Proc. Biol. Soc. Washington. 59:129-136.

_____. 1963. Geographic Orientation of American Tetraonidae. J. Wildl. Manage. 27:529-545.

_____. 1992. July 15, 1992, personal correspondence in Drut 1994, p 34.

AOU. 1957. American Ornithologists' Union Check-list of North American Birds. The Lord Baltimore Press, Inc., Baltimore, Maryland. p. 139.

_____. 2000. Forty-second Supplement to the American Ornithologists' Union Check-list of North American Birds. Auk. 117:847-858.

Barnett, J.K. and J.A. Crawford. 1994. Pre-laying Nutrition of Sage Grouse Hens in Oregon. J. Range Manage. 47:114-118.

Benedict, N.G. and T.W. Quinn. 1998. A Molecular Characterization of Sage Grouse Throughout Their Range in Oregon and Nevada. Trans. Western Sage and Columbian Sharp-tailed Grouse Workshop, Billings, Montana, July 13-18.

Benedict, N.G., S.J. Oyler-McCance, S.E. Taylor, C.E. Braun, and T.W. Quinn. 2001. Evaluation of the Eastern (Centrocercus

urophasianus urophasianus) and Western (Centrocercus urophasianus phaios) Subspecies of Sage Grouse Using Mitochondrial Control-Region Sequence Data. Authors' draft submitted for publication - on file.

Blus, L.J., C.S. Staley, C.J. Henny, G.W. Pendleton, T.H. Craig, and D.K. Halford. 1989. Effects of Organophosphorus Insecticides on Sage Grouse in Southeastern Idaho. J. Wildl. Manage. 53:1139-1146.

Braun, C.E., K.M. Giesen, R.W. Hoffman, T.E. Remington, and W.D. Snyder. 1994. Upland Bird Management Analysis Guide, 1994-1998. Div. Rep. No. 19, Colorado Division of Wildlife, Denver, Colorado. pp 1-29.

Braun, C.E. 1998. Sage Grouse Declines in Western North America: What are the Problems? Proc. West. Assoc. State Fish and Wildl. Agencies. 78:139-156.

Cadwell, L.L., W.R. Reid, M.A. Simmons, and J.J. Nugent. 1996. An Analysis of Sage Grouse Habitat Change at the Yakima Training Center After the Cascade Sage Training Exercise. Report prepared for the U.S. Dept. of the Army by the Pacific Northwest National Laboratory, Richland, Washington. 37 pp.

Cassidy, K.M. 1997. Land Cover of Washington State: Description and Management. Vol. 1 in Washington GAP Analysis Project Final Report, K.M. Cassidy, C.E. Grue, M.R. Smith, and K.M. Dvornich, eds. Washington Coop. Fish and Wildl. Res. Unit., Univ. of Washington, Seattle, Washington. 260 pp.

Coggins, K. and J. A. Crawford. 1996. Population Status and Habitat Use of Sage Grouse in Oregon. Trans. Western Sage and Columbian Sharp-tailed Grouse Workshop, Gillette, Wyoming, July 15-18.

Connelly, J.W., H.W. Browers, and R.J. Gates. 1988. Seasonal Movements of Sage Grouse in Southeastern Idaho. J. Wildl. Mange. 52:116-122.

Connelly, J.W. and C.E. Braun. 1997. A Review of Long-Term Changes in Sage Grouse Populations in Western North America - authors' draft on file.

Crawford, J.A. and R.S. Lutz. 1985. Sage Grouse Population Trends in Oregon, 1941-1983. Murrelet. 66:69-74.

Crawford, J.A. 1997. Importance of Herbaceous Vegetation to Female Sage Grouse During the Reproductive Period: A Synthesis of Research from Oregon - author's draft on file.

Dalke, P.D., D.B. Pyrah, D.C. Stanton, J.E. Crawford, and E. Schlatterer. 1963. Ecology, productivity, and management of sage

grouse in Idaho. J. Wildl. Manage. 27:811-841.

Daubenmire, R. 1988. Steppe vegetation of Washington. Washington State Univ. Coop. Ext. Bull. EB 1446. 131 pp.

Dobler, F.C. 1994. Shrub Steppe Ecosystem Studies: Phase One Completion Report. Prepared for the Wildl. Mgmt. Div., Washington Dept. of Fish and Wildlife - author's draft on file.

Dobler, F.C., J. Eby, C. Perry, S. Richardson, and M. Vander Haegen. 1996. Status of Washington's Shrub-Steppe Ecosystem: Extent, Ownership, and Wildlife / Vegetation Relationships. Washington Dept. of Fish and Wildlife Research Report. 39 pp.

Drut, M.S. 1994. Status of Sage Grouse with Emphasis on Populations in Oregon and Washington. Audubon Soc. of Portland, Oregon. 43 pp.

Drut, M.S., J.A. Crawford, and M.A. Gregg. 1994a. Brood Habitat Use by Sage Grouse in Oregon. Great Basin Nat. 54:170-176.

Drut, M.S., W.H. Pyle, and J.A. Crawford. 1994b. Technical Note: Diets and Food Selection of Sage Grouse Chicks in Oregon. J. Range Manage. 47:90-93.

Fischer, R.A., A.D. Apa, W.L. Wakkinen, K.P. Reese, and J.W. Connelly. 1993. Nesting-area Fidelity of Sage Grouse in Southeastern Idaho. Condor. 95:1038-1041.

Fischer, R.A., K.P. Reese, and J.W. Connelly. 1996. An Investigation on Fire Effects within Xeric Sage Grouse Brood Habitat. J. Range Manage. 49:194-198.

Fleischner, T.L. 1994. Ecological Costs of Livestock Grazing in Western North America. Cons. Biol. 8:629-644.

Franklin, J.F. and C.T. Dyrness. 1988. Natural Vegetation of Oregon and Washington. Oregon State University Press reprint of 1973 USDA, Forest Service, publication. 452 pp.

Furlow, F.B. and T. Armijo-Prewitt. 1995. Peripheral Populations and Range Collapse. Cons. Biol. 9:1345.

Gabrielson, I.N. and S.G. Jewett. 1940. Birds of Oregon. Oregon State Coll., Corvallis, Oregon. 650 pp.

Garcia-Ramos, G. and M. Kirkpatrick. 1997. Genetic Models of Adaptation and Gene Flow in Peripheral Populations. Evol. 5:21-28.

Gregg, M.A., J.A. Crawford, and M.S. Drut. 1993. Summer Habitat Use and Selection by Female Sage Grouse (Centrocercus urophasianus) in Oregon. Great Basin Nat. 53:293-298.

Hanf, J.M., P.A. Schmidt, and E.B. Groshens. 1994. Sage Grouse in the High Desert of Central Oregon: Results of a Study, 1988-1993. USDI Bureau of Land Management Report, Series P-SG-01. 57 pp.

Hengeveld, R. 1990. Dynamic Biogeography. Cambridge Univ. Press, New York, New York. pp 116-125 and 197-215.

Hitchcock, C.L. and A. Cronquist. 1973. Flora of the Pacific Northwest. University of Washington Press, Seattle, Washington. 730 pp.

Hoffman, A.A. and M.W. Blows. 1994. Species Borders: Ecological and Evolutionary Perspectives. Tree. 9:223-227.

Hornaday, W.T. 1916. Save the Sage Grouse From Extinction: A Demand from Civilization to the Western States. N.Y. Zool. Park Bull. 5:179-219.

Hupp, J.W. and C.E. Braun. 1991. Geographic Variation Among Sage Grouse in Colorado. Wilson Bull. 103:255-261.

Johnsgard, P.A. 1973. Grouse and Quails or North America. University of Nebraska Press, Lincoln. pp 155-174.

Johnson, G.D. and M.S. Boyce. 1990. Feeding Trials with Insects in the Diet of Sage Grouse Chicks. J. Wildl. Manage. 54:89-91.

Keane, R.E., D.G. Long, J.P. Menakis, W.J. Hann, and C.D. Bevins. 1996. Simulating Coarse-Scale Vegetation Dynamics Using the Columbia River Basin Succession Model - CRBSUM. Gen. Tech. Rep. INT-GTR-340. USDA, Forest Service, Intermountain Research Station, Ogden, Utah. 50 pp.

Lacy, R.C. 1987. Loss of Genetic Diversity from Managed Populations: Interacting Effects of Drift, Mutation, Immigration, Selection, and Population Subdivision. Cons. Biol. 1:143-158.

Levin, D.A. 1970. Developmental Instability and Evolution in Peripheral Isolates. Am. Nat. 104:343-353.

Lesica, P. and F.W. Allendorf. 1995. When are Peripheral Populations Valuable for Conservation? Cons. Biol. 9:753-760.

Livingston, M.F. 1998. Western Sage Grouse Management Plan (1 October 1998 to 30 September 2003). Report prepared for the Directorate of Environment and Natural Resources, Yakima Training Center. 76 pp.

MacArthur, R.H. 1972. Geographical Ecology: Patterns in the Distribution of Species. Harper and Row, Publishers, Inc. New York, New York. pp 142-153.

Mack, R.N. and J.N. Thompson. 1982. Evolution in Steppe with Few Large, Hooved Mammals. Amer. Nat. 119:757-773.

McNab, W.H., and P.E. Avers. 1994. Ecological Subregions of the United States: Section Descriptions. Report of the USDA Forest Service Ecosystem Management Division - on file.

Meyer, S.E. 1992. Germination and Establishment Ecology of Big Sagebrush: Implications for Community Restoration. In 1994 Proceedings - Ecology and Management Annual Rangelands. USDA Forest Service Gen. Tech. Rep. INT-GTR-313, pp 244-251.

Miller, R.F. and L.L. Eddleman. 2000. Spatial and Temporal Change of Sage Grouse Habitat in the Sagebrush Biome. Oregon State University Agricultural Experiment Station. Tech. Bull. 151. 35 pp.

Morain, S.A. 1984. Systematic and Regional Biogeography. Van Nostrand Reinhold Co., Inc. New York, New York. pp 42-65.

Oyler-McCance, S.J., N.W. Kahn, K.P. Burnham, C.E. Braun, and T.W. Quinn. 1999. A Population Genetic Comparison of Large and Small-Bodied Sage Grouse in Colorado Using Microsatellite and Mitochondrial DNA Markers - authors' draft on file.

Oyler-McCance, S.J., T.W. Quinn, N.G. Benedict, and S.E. Taylor. 2001. February 19, 2001, letter provided in response to Service status review request, Genetics Laboratory, University of Denver, Denver, Colorado - on file.

Pennock, D.S. and W.W. Dimmick. 1997. Critique of the Evolutionary Significant Unit as a Definition for "Distinct Population Segments" Under the U.S. Endangered Species Act. Cons. Biol. 11:611-619.

Quigley, T.M., S.J. Arbelbide, and J. Sylvia. 1997. An Assessment of Ecosystem Components in the Interior Columbia Basin and Portions of the Klamath and Great Basins: Vol. 1 Gen. Tech. Rep. PNW-GTR-405. Portland, OR.

Quinn, T.W., N.W. Kahn, J.R. Young, N.G. Benedict, S. Wood, D. Mata, and C.E. Braun. 1997. Probing the Evolutionary History of Sage Grouse Cetrocercus urophasianus Populations Using Mitochondrial DNA Sequence. Wildl. Biol. 3:291.

Remington, T.E. and C.E. Braun. 1985. Sage Grouse Food Selection in Winter, North Park, Colorado. J. Wildl. Manage. 49:1055-1061.

Ruggiero, L.F., M.K. Schwartz, K.B. Aubry, C.J. Krebs, A. Stanley, S.W. Buskirk. 1999. Chapter 5: Species Conservation and Natural Variation Among Populations. USDA For. Ser. Gen. Tech. Rep. RMRS-GTR-30. Rocky Mountain Research Station, Ogden, Utah.

Saunders, D.A., R.J. Hobbs, and C.R. Margules. 1991. Biological Consequences of Ecosystem Fragmentation: A Review. Cons. Biol. 5:18-32.

Schroeder, M.A. 1997. Unusually High Reproductive Effort by Sage Grouse in a Fragmented Habitat in North-Central Washington. Condor. 99:933-941.

Schroeder, M.A., J.R. Young, and C.E. Braun. 1999. Sage Grouse (Centrocercus urophasianus). In The Birds of North America, No. 425, A. Poole and F. Gill, eds. The Birds of North America, Inc., Philadelphia, Pennsylvania.

Schroeder, M.A., D.W. Hays, M.F. Livingston, L.E. Stream, J.E. Jacobson, and D.J. Pierce. 2000. Changes in the Distribution and Abundance of Sage Grouse in Washington. Northwestern Naturalist. 81:104-112.

Sveum, C.M. 1995. Habitat Selection by Sage Grouse Hens During the Breeding Season in South-Central Washington. M.S. Thesis, Oregon State Univ., Corvallis, Oregon.

USDA. 1998. The Conservation Reserve Program: 16th Signup. January 29, 1998, report by the Farm Service Agency - report and addendums on file.

USDD. 1989. Yakima Firing Center Proposed Land Acquisition: Draft Supplemental Environmental Impact Statement. Dept. of the Army, I Corps and Ft. Lewis, Ft. Lewis, Washington.

_____. 1994. Stationing of Mechanized or Armored Combat Forces at Fort Lewis, Washington: Final Environmental Impact Statement. Dept. of the Army, I Corps and Ft. Lewis, Ft. Lewis, Washington.

_____. 1996. Draft Cultural and Natural Resources Management Plan: Yakima Training Center. Report prepared for the U.S. Dept. of the Army by CH2M Hill, Bellevue, Washington.

_____. 1998. Wildland Fire Management Plan. Report prepared by the Yakima Training Center, U.S. Dept. of the Army, Yakima, Washington. 75 pp.

USDI. 1994. Western Sage Grouse Conservation Agreement. Joint document of the U.S. Fish and Wildlife Service, U.S. Department of the Army, and Washington Department of Fish and Wildlife. 9 pp.

_____. 1996. Habitat Conservation Planning Handbook. Joint publication of the U.S. Fish and Wildlife Service and National Marine Fisheries Service - on file.

_____. 1998. Columbia Basin Scattered Tracts Resource Management Plan. U.S. Bureau of Reclamation, Ephrata, Washington.

U.S. Fish and Wildlife Service. 2003. Notice of 90-finding. Federal Register 68:6500-6504.

Waples, R.S. 1998. Evolutionarily Significant Units, Distinct Population Segments, and the Endangered Species Act: Reply to Pennock and Dimmick. Cons. Biol. 12:718-721.

WDFW. 1995. Washington State Management Plan for Sage Grouse. Wildl. Manage. Prog., Wash. Dept. of Fish and Wildl., Olympia, Washington. 101 pp.

WDFW. 2000. Changes in the Sage Grouse Range Throughout Western North America. February 18, 2000, draft map of current and historic sage grouse distribution, produced by the Washington Department of Fish and Wildlife - on file.

WDFW. 2001. Changes in the Distribution and Abundance of Greater Sage Grouse in Washington. Washington Department of Fish and Wildlife Job Progress Report, December 2001 - on file.

Welch, B.L., F.J. Wagstaff, and J.A. Roberson. 1991. Preference of Wintering Sage Grouse for Big Sagebrush. J. Range Manage. 44:462-465.

Willis, M.J., G.P. Keister, Jr., D.A. Immell, D.M. Jones, R.M. Powell, and K.R. Durbin. 1993. Sage Grouse in Oregon. Oregon Dept. of Fish and Wildl., Wildlife Research Rep. No. 15, Portland, Oregon. 54 pp.

Winward, A.H. 1980. Taxonomy and Ecology of Sagebrush in Oregon. Oregon State University Agricultural Experiment Station. Tech. Bull. 642. 15 pp.

Winward, A.H. 1981. Using Sagebrush Ecology in Wildland Management. In 1983 Proceedings of the First Utah Shrub Ecology Workshop, Ephraim, Utah, September 9-10, 1981. Publication of Utah State Univ., Logan, Utah, pp 15-19.

Wisdom, M.J., R.S. Holthausen, B.C. Wales, D.C. Lee, C.D. Hargis, V.A. Saab, W.J. Hann, T.D. Rich, M.M. Rowland, W.J. Murphy, and M.R. Eames. 1998. Source Habitats for Terrestrial Vertebrates of Focus in the Interior Columbia Basin: Broad-scale Trends and Management Implications. Gen. Tech. Rep. GTR-PNW-XXX. Portland, Oregon: USDA Forest Service, Pacific Northwest Research Station. December, 1998, Draft - on file.

WSCSGW. 1996. Transactions of the Western Sage and Columbian Sharp-tailed Grouse Workshop. July 15-18, Gillette, Wyoming.

_____. 1998. Transactions of the Western Sage and Columbian Sharp-tailed Grouse Workshop. July 13-15, Billings, Montana.

WSGWG. 1998. Minimum Viable Populations for Sage Grouse in Washington. Draft working document of the Western Sage Grouse Working Group - on file.

Yocom, C.N. 1956. The Sage Hen in Washington State. Auk. 73:540-550.

Young, J.R., J.W. Hupp, J.W. Bradbury, and C.E. Braun. 1994. Phenotypic Divergence of Secondary Sexual Traits Among Sage Grouse, Centrocercus urophasianus, Populations. Anim. Behav. 47:1353-1362.

LISTING PRIORITY (place * after number)

THREAT			
Magnitude	Immediacy	Taxonomy	Priority
High	Imminent	Monotypic genus	1
		Species	2
		Subspecies/population	3
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/population	6*
Moderate to Low	Imminent	Monotypic genus	7
		Species	8
		Subspecies/population	9
	Non-imminent	Monotypic genus	10
		Species	11
		Subspecies/population	12

Rationale for listing priority number:

Magnitude: The abundance of greater sage grouse within the Columbia Basin DPS declined by approximately 30 percent between 2000 and 2001 (WDFW 2001). Of even greater concern is the estimated reduction in size of the larger subpopulation in Douglas and Grant Counties, Washington, which accounted for the majority of the decline (dropping from 684 in 2000 to 395 in 2001, or approximately 42 percent). The current, overall population estimate of roughly 700 individuals is the lowest ever recorded for the Columbia Basin DPS, although it is just slightly lower than the previous lowest estimate recorded in 1994. Since 1970, the estimated population lows for the Columbia Basin DPS have occurred "regularly" over a 3- to 4-year period at mid-decade (e.g., >75->78, >85->87, and >93->96) (WDFW 2001). Should this cyclical pattern in population abundance hold, we may expect further significant declines in the Columbia Basin DPS over the next several years. As such, we conclude that the magnitude of threat to the Columbia Basin DPS remains high.

Imminence: Military training constitutes the primary threat to the southern subpopulation, while habitat conversion (primarily loss of CRP acreage) is the primary threat impacting the northern subpopulation. However, we conclude that threats related to military training are not imminent, based on the implementation of the Army's conservation measures and considerably less-than-planned training activities occurring in Yakima and Kittitas Counties. We likewise conclude that the threat to the northern subpopulation from habitat conversion is not imminent, because much of the CRP acreage that could have expired was re-signed and total CRP acreage increased in 1998 in Douglas County. As such, we conclude that threats to the Columbia Basin DPS remain non-imminent.

Therefore, the listing priority number for the Columbia Basin DPS of greater sage grouse is 6.

APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes to the candidate list, including listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all additions of species to the candidate list, removal of candidates, and listing priority changes.

Approve: Rowan Gould March 6, 2003
Acting Regional Director, Fish and Wildlife Service Date

Concur: Steve Williams April 5, 2004
Director, Fish and Wildlife Service Date

Do not concur: _____ _____
Director, Fish and Wildlife Service Date

Director's Remarks:
-
-

Date of annual review: January 2003

Conducted by: C. Warren

Changes from June 13, 2002, CNOR (check one) Yes_X_ No____

Approve: _____ _____
Regional Director Date

Comments:
-
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