Fall Population Structure of Sage-grouse in Colorado and Oregon

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Frontispiece: George Keister (left) of ODFW and Dr. Clait Braun of Grouse Inc. examine a greater sage-grouse wing.

Fall Population Structure of Sage-grouse in Colorado and Oregon

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ABSTRACT We studied the population structure of sage-grouse (*Centrocercus* spp.) based on collection and analysis of 67,679 wings from hunter-harvested birds in 10 areas in Colorado and 12 areas in Oregon during 1973–1998 and 1993–2013, respectively. The harvest age structure for greater sage-grouse (*C. urophasianus*) varied from 42 to 63% juveniles in Colorado and 27 to 58% in Oregon. Approximately 59% of the Gunnison sage-grouse (*C. minimus*) harvest was juvenile. The overall adult male:female sex ratio was 28:72 for greater sage-grouse in Colorado, 41:59 (this includes an unknown proportion of yearlings) for greater sage-grouse in Oregon, and 34:66 for Gunnison sage-grouse in Colorado. Proportions of females increased in all fall populations from juvenile to yearling to adult age classes. Estimated breeding success was similar for greater sage-grouse in Colorado (47%) and Oregon (49%), but Gunnison sage-grouse appeared to have higher (60%) breeding success. The average number of juveniles in the harvest per breeding-age female varied from 1.2 to 2.4. There was high annual variation within and among areas. Composite estimated annual survival varied from 46 to 48% for adult males and 56 to 59% for adult females.

KEY WORDS age and sex composition, *Centrocercus minimus, C. urophasianus*, chicks per hen, Colorado, harvest, nest success, Oregon, sage-grouse, survival, turnover
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Sage-grouse (*Centrocercus* spp.) are charismatic large grouse of the sagebrush (*Artemisia* spp.) steppe in western North America (Schroeder et al. 1999). They historically occurred in at least 16 states and 3 provinces of Canada. Greater sage-grouse (*C. urophasianus*) are currently considered an endangered species in Canada but are hunted in 8 states (as of 2014). The distribution of sage-grouse has markedly declined from their apparent historical distribution (Schroeder et al. 2004) as have apparent numbers (Braun 1998). The reasons for the declines are related to degradation, loss, and fragmentation of sagebrush-dominated habitats (Braun 1987, Connelly and Braun 1997, Braun 1998). This has led to concern about their status and both species have been repeatedly petitioned for listing under the Endangered Species Act (Knick and Connelly 2011). The U.S. Fish and Wildlife Service has filed a ruling to list Gunnison sage-grouse (*C. minimus*) as threatened (USDI 2014) and the greater sage-grouse is presently listed as warranted but precluded because of higher priorities (USDI 2010).

Data on the structure of sage-grouse populations are not readily available as individuals may occur seasonally in widely-spaced sex-specific flocks in winter (Beck 1977) and also in summer and fall. All individuals cannot be counted, even on leks where males congregate in spring, because all locations of active leks are not known, not all males attend leks, and hen presence on leks is not simultaneous (Beck and Braun 1980). Our objectives were to (1) describe

the fall structure of sage-grouse populations, and (2) test hypotheses that the fall structure of sage-grouse populations does not differ among populations of greater sage-grouse within a State, between states, and between greater and Gunnison sage-grouse. This analysis is based on examination and classification of the age and sex of over 67,000 individual sage-grouse harvested in Colorado and Oregon over the periods, 1973–1998, and 1993–2013, respectively. These data have not been examined or published across the range of sage-grouse and are important in understanding the population dynamics of both species. Some harvest data are present in unpublished reports of State wildlife agencies.

METHODS

We collected sage-grouse wings from hunters in Colorado at check stations on highways and roads leading from hunting areas as well as from voluntary wing collection stations placed along access roads (Hoffman and Braun 1975). A wing was clipped from each sage-grouse examined at check stations, the gonads were checked (primarily juveniles) when possible to ascertain sex, and the wings were labeled, and stored cold or frozen until analysis. Hunters in Oregon were requested to return one wing of each sage-grouse harvested in mail-in envelopes that were sent to, or dropped off at a central location for frozen storage.

Wings were thawed prior to analysis and were grouped into young of the year (juveniles), yearlings (young from the previous year), and adults following standardized procedures (Beck et al. 1975, Braun and Schroeder 2015). Sex of juveniles was ascertained based on measurements of primaries (from birds for which gonads were examined at check stations) and appearance of primaries, secondaries, wing coverts, and tertial feathers as described by Braun and Schroeder (2015). The adult category included some yearlings that had progressed enough in the molt, that characteristic yearling feathers (Braun and Schroeder 2015) were no longer present. Breeding success was estimated based on old (prior year) primaries retained at time of harvest. The primary molt of successful hens starts later than for hens losing their clutch during egg laying and or incubation based on recapture data in Colorado (Braun 1984). Annual turnover was estimated based on either the proportion of yearlings (Colorado) or juveniles (Oregon) compared to the proportion of adults (including yearlings) of each sex in the fall harvest. This assumes a population is stable. A population can be stable, increasing, or decreasing and the proportion of yearlings and or juveniles is a measure of overwinter survival (yearlings) or first summer survival to September (juveniles). We present raw data and averages by specific harvest area (Colorado) and by Management Unit (Oregon).

STUDY AREAS

Colorado

Sage-grouse were historically widely distributed in Colorado (Rogers 1964, Schroeder et al. 2004). Their distribution in the state has been greatly reduced (Braun 1995, Schroeder et al. 2004) (Fig. 1). Small Game Management Units historically followed the distribution of sage-grouse in Colorado and were first numbered in 1968, which continued through 1973; they were renumbered continuing through 1986. Numbering of all Big and Small Game Management units in Colorado was standardized in 1987. The distribution of sage-grouse in Colorado is within range-wide sage-grouse management zones II and VII (Stiver et al. 2006). Colorado shares sage-grouse populations with Utah and Wyoming. Sage-grouse in Colorado occur in three Environmental Protection Agency Level III ecoregions: Colorado Plateau, Southern Rockies, and

Wyoming Basin.

North Park - This area is within Jackson County and includes portions of Game Management Units 6, 7, 16, 17, 161, and 171. This area was formerly Small Game Management Unit 4 (1968–1973) and 12 (1974–1986). The area used by greater sage-grouse in North Park is at elevations of 2315–2745 m within a broad basin with numerous streams flowing to the north. Wet meadows and seasonally irrigated hay meadows are abundant. The area is rolling with numerous low and several higher ridges. There are no agricultural crops other than native hay as the growing season is short. Timing of sage-grouse breeding activities can be delayed in some years following severe winters.

Middle Park - This area includes portions of Game Management Units 18, 27, 28, 37, 171, and 181 in Grand and Summit counties. This area was formerly Small Game Unit 11 (1968–1973) and 28 (1974–1986). Middle Park is an open basin at ~2100–2300 m surrounded mostly by higher mountains. It has numerous streams flowing from the south and north, and then west. There is no agriculture other than native hay, and wet meadows are common. The length of the growing season is similar to that in North Park and greater sage-grouse breeding seasons can be late depending upon winter severity.

Eagle - This area includes portions of Game Management Units 25, 35, and 36 in Eagle (north of the Eagle River) and extreme northeastern Garfield counties. This area was formerly part of Small Game Management Units 9 and 10 (1968–1973) and Small Game Management Unit 54 (1974–1986). The Eagle area ranges from mid elevation (< 2000 m) sagebrush meadows to areas sloping sharply to the Eagle and Colorado rivers. Greater sage-grouse use the available sagebrush areas that are disjunct within a larger mosaic of pinyon-juniper (*Pinus-Juniperus*) shrubs and trees. Agriculture is limited to small hay meadows. Overall, the area is narrow, linear, and highly dissected by non-sagebrush habitat.

Yampa - This area includes parts of Game Management Units 15, 26, 131, and 231 in southern Routt County. This area was formerly Small Game Management Units 9 and 10 (1968–1973) and parts of Units 26 and 54 (1974–1986). The Yampa area supports greater sage-grouse from mid elevation (~ 2000 m) rolling sagebrush hills to irrigated hay meadows. Overall, the area is dissected by non-sagebrush habitat and hay meadows with more open areas near Yampa.

Piceance Basin - This area is primarily in Rio Blanco County and northern Garfield County in Game Management Unit 22 (1974 to present). It was formerly Small Game Management Unit 8 (1968–1973). This area is highly dissected by drainages and narrow ridges at elevations ranging from 1830 to 2285 m. Wider stream bottoms have been developed for hay production including some non-native species (primarily alfalfa). The population of greater sage-grouse is disjunct and occurs primarily along ridgetops dominated by sagebrush. The growing season is longer and warmer than in higher elevation areas, but little of the area is suitable for agriculture. Development for the extraction of oil, gas, and soda is common throughout the area.

Blue Mountain - This area includes part of Game Management Unit 10 (1987 to present) in far western Moffat County east of the Utah State Line and north of U.S. Highway 40 and west

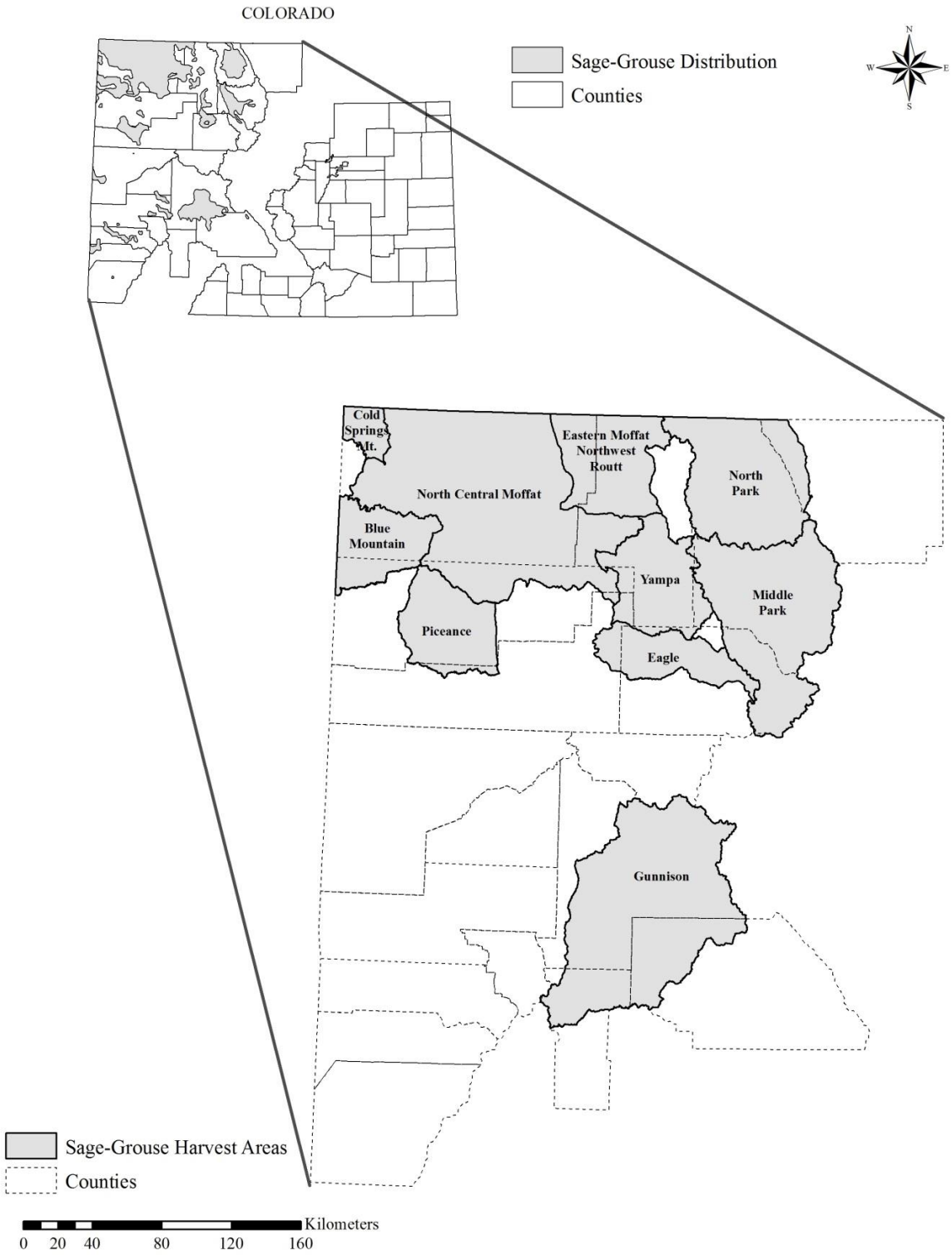

Figure 1. Sage-grouse harvest areas, county boundaries, and current distribution of sage-grouse in Colorado.

of Moffat County Road 16 north to the Yampa River. This was formerly part of Small Game Management Unit 7 (1968–1973) and parts of Units 18 and 20 (1974–1986). Blue Mountain is a higher elevation (~ 2785 m) area with rolling topography and intermittent springs and wet meadows. Greater sage-grouse breeding activity is later than in low elevations to the east and south.

Cold Springs Mountain - This area is in Game Management Unit 201 (1987 to present). It was formerly in Small Game Management Unit 18 (1974–1986) and in Unit 7 from 1968 to 1973. It is in the northwest corner of Moffat County bordered by Utah on the west, Wyoming on the north, Moffat County Road 10 on the east, and Colorado Highway 318 on the south. Cold Springs Mountain is a higher elevation (up to 2785 m) area with rolling topography and an abundance of intermittent springs and wet meadows. Greater sage-grouse breeding activity is later than in low elevations to the east and south. There is no agriculture including production of hay, except on one ranch, in the Unit.

Eastern Moffat County and Northwestern Routt County - This area includes Game Management Units 4, 5, 214, and 441 (1987 to present) and formerly Small Game Management Unit 5 (1968–1973) and Unit 14 (1974–1986) and is primarily east of Colorado Highway 13, north of U.S. Highway 40, and east and northeast of Craig. The topography of this area varies from rolling wheat fields at an elevation slightly over 1525 m along the west side near Craig to elevations of about 2875 m south of the Little Snake River which flows to the west and the Elkhead River that flows south to the Yampa River. Higher precipitation occurs to the northeast. Greater sage-grouse breeding is later at the higher elevations. Most suitable areas at low elevations have been developed for hay or wheat production, particularly along the Little Snake River. Overall, agricultural development is minimal.

Northcentral Moffat County - This large area includes Game Management Units 2, 3, 11, 12, 13, 211, and 301 and is west, northwest, southwest, and southeast of Craig. It formerly included all or parts of Small Game Management Units 6, 7, 8, 9, and 10 (1968–1973) and 16, 18, 20, and 26 (1974–1986). The Northcentral Moffat County area is diverse with extensive areas of small grain production as well as coal mining and oil and gas development. Most of the area supporting greater sage-grouse is at an elevation of 1525 to 1830 m and has a longer growing season. The remaining sagebrush habitats are highly fragmented and used by domestic livestock including both sheep and cattle. Hay production occurs along the Yampa River and other streams.

Gunnison Basin - This was the area supporting most Gunnison sage-grouse. It lies primarily in Gunnison and Saguache counties and marginally south into Hinsdale County west of the Continental Divide within Game Management Units 54, 55, 66, 67, and 551.This area was formerly Small Game Management Unit 20 (1968–1973) and then 66 (1974–1986). The Gunnison area is a large open basin dissected by streams that flow from the north, south, and east to form the west-flowing Gunnison River. The topography is irregular and slopes uphill to the north, east, and south. It lies at an elevation ranging from 2315 to 2745 m with cold winters and a short growing season. Agriculture, other than production of mostly native hay, is not common.

Oregon

Hunting of greater sage-grouse in Oregon is permitted in 12 of 21 state-defined wildlife management units in which sage-grouse are known to occur (Fig. 2). Habitat within each of the units is highly variable ranging from high elevation conifer forests to low elevation arid landscapes dominated by Wyoming big sagebrush (*A. tridentata wyomingensis*). The distribution of sage-grouse in Oregon is within range-wide sage-grouse management zones IV and V (Stiver et al. 2006). Oregon shares sage-grouse populations with California, Idaho, and Nevada. Sage-grouse in Oregon occur in the following four Environmental Protection Agency Level III ecoregions: Blue Mountains, Snake River Plain, Central Basin and Range, and Eastern Cascade Slopes and Foothills. Cattle ranching is the primary agricultural activity in all of the hunted management units.

Sumpter (Management Unit 51) - The Sumpter Wildlife Management Unit (51) occurs mostly within Baker and a small part of northern Malheur counties. The western portion is forested and within the Wallowa-Whitman National Forest of the Blue Mountains of Oregon. Much of this unit is drained by the Burnt River, a tributary of the Snake River. Most of the sage-grouse habitat is below 1000 m in elevation. Most (55%) of the land is in private ownership.

Lookout Mountain (Management Unit 64) - The Lookout Mountain Wildlife Management Unit (64) occurs entirely within Baker County. It is bordered on east by the Snake River and on the west by Interstate 84. Most of the unit is low to mid elevation sagebrush habitat with the highest point being Lookout Mountain at 3,048 m. Ranching was the primary agricultural activity, but hay production in lower elevation areas is also significant. This unit contains the smallest portion of public land (38%) of any Oregon unit open to sage-grouse hunting.

Beulah (Management Unit 65) - Most of the Beulah Wildlife Management Unit (65) is in the north part of Malheur County, but also includes the extreme northeast part of Harney, southwest extreme of Baker, and eastern part of Grant counties. The Baker and Grant county portions are primarily conifer forests and non-habitat for sage-grouse. This is a large unit with the Snake River forming the eastern border and the Malheur River forming the southern border. The eastern portion is characterized by higher human density and intensive row crop agriculture, but the principal agricultural activity throughout the unit is cattle ranching. The unit contains large contiguous expanses of sagebrush-steppe bisected by riparian areas and associated meadows which are often used for hay production. Most of the sage-grouse habitat is below 1000 m in elevation, but some buttes approach 2000 m. The Beulah unit consists of 57% public lands.

Malheur River (Management Unit 66) - The Malheur River Wildlife Management Unit (66) includes most of northeast Harney County, but also portions of Grant and Malheur counties. The Grant County portion is primarily conifer forest in the Malheur National Forest with little habitat for sage-grouse. The Malheur River, a tributary of the Snake River, drains most of the unit. The western portion includes the Malheur Basin with large portions dedicated to pivot irrigation and hay production. In modern history, western juniper (*Juniperus occidentalis*) has expanded into much of the large contiguous expanses of sagebrush-steppe, particularly at higher elevations. The unit is about 69% public lands.

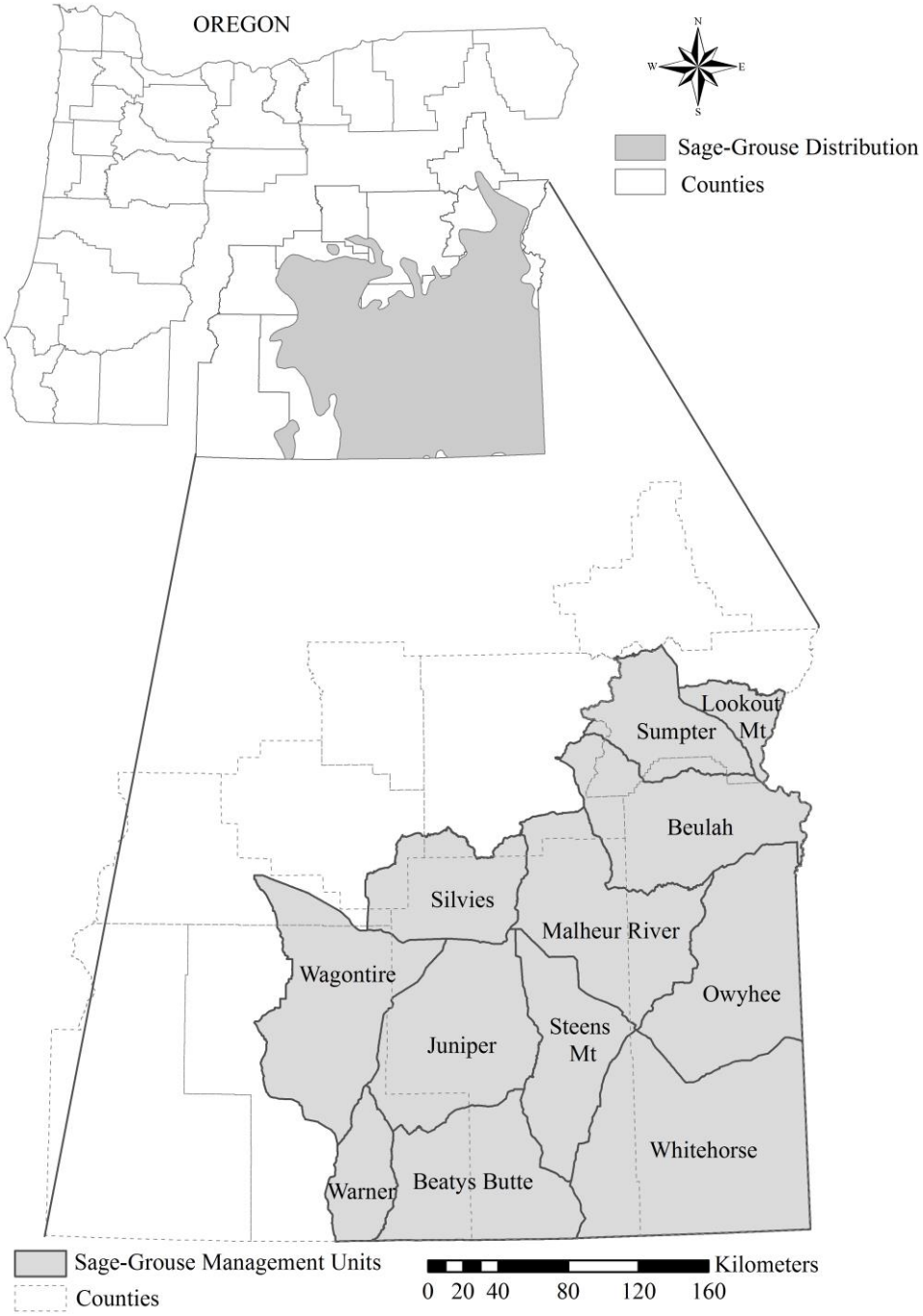

Figure 2. Sage-grouse management units, county boundaries, and current distribution of greater sage-grouse in Oregon.

Owyhee (Management Unit 67) - The Owyhee Wildlife Management Unit (67) is entirely within Malheur County. The Owyhee River, a tributary of the Snake River, bisects the unit from south to north and Idaho forms the eastern border. Historically, this unit contained large expanses of sagebrush-steppe, but large areas were converted to crested wheatgrass (*Agropyron cristatum*) seedings in the 1960s as part of Bureau of Land Management's Vale Project. Sagebrush-steppe has also been lost from frequent lightning-caused wildfires. The relatively low elevation of this unit makes it highly vulnerable to invasive annual grasses. Juniper and conifers only exist on some of the highest points such as Mahogany Mountain (~1988 m). The BLM is the principal land manager with 82% of the area in the public domain.

Whitehorse (Management Unit 68) - The Whitehorse Wildlife Management Unit (68) encompasses the extreme southeast portion of Oregon and includes southern Malheur and southeast Harney counties. This is a large diverse unit and the Owyhee River and associated tributaries drain the northeast portion. The Trout Creek Mountains in the southwest part of the unit are generally below 2000 m and consist of large expanses of low (*A. arbuscula*) and mountain big (*A. t. vaseyana*) sagebrush with stands of aspen (*Populus tremuloides*). The Trout Creek Mountains have consistently had some of the highest densities of sage-grouse in Oregon. The north part of the unit experiences frequent lightning-caused wildfires, but the entire unit is susceptible. Fires of unprecedented scale in modern history impacted approximately 323,760 ha of this unit in 2012, including the Trout Creek Mountains. The unit is largely under the management of the BLM as 90% is public lands.

Steens Mountain (Management Unit 69) - The Steens Mountain Wildlife Management Unit (69) is in Harney County. The north part of the unit includes low elevations dominated by wet meadows and marsh and includes Malheur National Wildlife Refuge (NWR). The southern part of the unit is dominated by Steens Mountain. Steens Mountain is approximately 80 km in length and is a large fault-block mountain. The east side of the mountain drops precipitously by more than a 1000 m, but gradually slopes to the west. The western slopes are bisected by several large glacially-formed valleys. Encroachment by western juniper is an issue at lower elevations, but at higher elevations the juniper transitions to stands of aspen interspersed with meadows and mountain big sagebrush. Areas of low sage dominate some of the higher elevations or ridges with shallow soils. About 64% of the unit is in public ownership.

Beatys Butte (Management Unit 70) - The Beatys Butte Wildlife Management Unit (70) is in the southwest portion of Harney and southeast portion of Lake counties. Most of Hart Mountain National Antelope Refuge (NAR) occupies the northwest part of the unit. This area contains large contiguous expanses of low and big sagebrush with large areas of gentle topography. The western portion of the unit includes the Warner Wetlands and has some areas of western juniper encroachment. The Pueblo Mountains (~2659 m) are on the eastern border, while Hart Mountain (2347 m) is to the northwest and Beatys Butte (~2400 m) is near the middle of the unit. The Beatys Butte unit is 82% public lands.

Juniper (Management Unit 71) - The Juniper Wildlife Management Unit (71) lies mostly within Harney County but includes a portion of eastern Lake County. The southwest portion of the unit includes the Warner Basin and a portion of Hart Mountain NAR while the northeast part of the unit contains Harney Lake on Malheur NWR. Large contiguous expanses of intact

sagebrush-steppe with numerous playas dominate this arid unit. Lightning-caused wildfires are periodic and sometimes exceed 40,470 ha. There is little cultivated agriculture with most of the land use influenced by cattle ranching. The Juniper Unit is 89% public lands.

Silvies (Management Unit 72) - The Silvies Wildlife Management Unit (72) is primarily in Harney County but also includes portions of Lake, Deschutes, Crook, and Grant counties. Much of the unit is conifer forest in the Ochoco National Forest. The south and west portions are sagebrush-dominated landscapes, but western juniper distribution has expanded rapidly in this region. Cultivated agriculture occupies a small part of the unit. About 67% of the unit is in public ownership.

Wagontire (Management Unit 73) - The Wagontire Wildlife Management Unit (73) is primarily in Lake County but also includes portions of Harney and eastern Deschutes counties. This arid unit is dominated by large expanses of lower elevation Wyoming big sagebrush with numerous playas and two large closed basins (Summer Lake and Abert) in the south. Post-settlement encroachment of western juniper is compromising sage-grouse habitat quality in the western and northern areas of this unit. Cultivated agriculture is limited to a few irrigated pivots used for hay production. The unit is 85% public lands with the BLM being the principal land management agency.

Warner (Management Unit 74) - The Warner Wildlife Management Unit (74) is entirely within Lake County and is comparatively small. The western portion is bordered by U.S. Highway 395 at the base of Abert Rim and the Warner Mountains to the south. The Warner Mountains are dominated by conifer forest and are part of the Fremont National Forest. The western portion is higher in elevation (1800–2500 m) and receives more precipitation than the eastern area of the unit. The higher elevations with numerous wet meadows are attractive summer and late brood-rearing habitat. Western juniper encroachment is a serious threat to the sagebrush-steppe habitat and thousands of hectares of juniper have been cut in this unit in recent years. The unit is 70% public lands with the U.S. Forest Service and BLM the largest land managers.

HUNTING SEASON REGULATIONS

In general, the length of sage-grouse hunting seasons in Colorado was progressively lengthened from 3 days in 1974 to 16–34 days in the 1983–1994 period, depending upon the area (Table 1). Between 1994 and 1998 the seasons were generally reduced to 7–16 days in most areas, and in some cases closed (Eagle, Yampa, Piceance Basin, and Eastern Moffat and Northwestern Routt management units). Daily bag and possession limits were much more consistent throughout 1974–1998, varying from a bag limit of 1 to 3 and a possession limit of 2 to 9 (Table 2). The largest bag and possession limits (3 and 9 respectively) were in place in 1992–1994.

The sage-grouse season length in Oregon varied from 2 (1993–1994), to 5 (1995–2004), and to 9 days (2005–2013). The daily bag and season limits were 2 and 2, respectively. Permits specific to a particular Management Unit were required in all years and allocated based on the estimated fall population for each unit. Hunting was closed or permit numbers were reduced in several Management Units in some years because of West Nile virus or large wildfires.

RESULTS

Sex and age were ascertained for 48,599 greater sage-grouse and 7,547 Gunnison sage-grouse wings in Colorado and 11,533 greater sage-grouse wings in Oregon. Sex and age ratios in the harvest were calculated for each year and area for greater sage-grouse in Colorado (Appendix A1–A9), for greater sage-grouse in all Colorado hunting areas combined (Table 3), for Gunnison sage-grouse in Colorado (Table 4), for greater sage-grouse for each year and management area in Oregon (Appendix A10–A21), and for greater sage-grouse in management areas in Oregon combined (Table 5). The male:female sex ratio among juveniles varied from 41:59 to 52:48 for the 22 areas examined (Table 6). The harvest age structure for greater sage-grouse varied by year from 42 to 63% juveniles (Table 3) in Colorado (mean = 53.9%) and 27 to 58% (Table 5) in Oregon (mean = 48.0%); the Gunnison sage-grouse harvest that was juvenile ranged from 43 to 69% (Table 4) (mean = 59.5%).

The sex ratio changed with age as the male:female sex ratio for adult greater sage-grouse varied from 22:78 in Colorado to 41:59 (including an unknown proportion of yearlings) in Oregon (not counting the 2 areas with sample sizes < 100, Table 6), and 34:66 for Gunnison sage-grouse in Colorado (Table 6). The annual proportion of juveniles in the harvest for greater sage-grouse in Colorado (1974–1998) and Oregon (1993-2013) appeared to decline less than the proportion of juvenile Gunnison sage-grouse in Colorado (1977–1998) (Fig. 3).

Productivity was estimated for each year and area for greater sage-grouse in Colorado (Appendix B1–B9), for greater sage-grouse in all Colorado areas combined (Table 7), for Gunnison sage-grouse in Colorado (Table 8), for greater sage-grouse in Oregon (Appendix B10–B21), and for greater sage-grouse in all Oregon areas combined (Table 9). Estimated breeding success was similar for greater sage-grouse in Colorado (46.9%) and Oregon (48.8%), but was higher (60.0%) for Gunnison sage-grouse (Table 6). There was variability, 35.9–63.2%, in rates of breeding success among units (Table 6, not counting the 2 samples < 100). The average number of juveniles in the harvest per breeding-age female varied from 1.2 to 2.4 and the average number of juveniles per successful female varied from 2.2 to 4.8 (Table 6, excluding the samples <100). Generally, percent breeding success tracked the percent juveniles in the harvest (Table 6). Also notable was that breeding success of yearling females of both species in Colorado (Tables 8 and 9) was lower than for adult females. This comparison had no validity in Oregon (Table 9) as most unsuccessful females (both age classes) had completed replacement of primary flight feathers because of earlier timing of breeding.

Annual turnover of the sage-grouse populations in Colorado was based on the percent of yearlings in the fall harvest. This assumes the population was stable over time. Thus, the proportion of yearlings in the harvest should equal the proportion of adults that died. The survival estimate for greater sage-grouse in Colorado was 48.1% for males and 59.0% for females (Table 6). The survival estimate for Gunnison sage-grouse was 46.3% for males and 56.1% for females. A similar procedure was used for greater sage-grouse in Oregon, except that percent of juveniles was used because it was assumed many yearlings had completed their wing molt by time of harvest. The survival estimate in Oregon was 46.7% for males and 55.8% for females (Table 6). Gunnison sage-grouse generally were more productive (higher percent of juveniles in the harvest, higher estimated breeding success, more juveniles per hen) but had lower survival than greater sage-grouse.

Table 1. Sage-grouse hunting season length by year and area in Colorado, 1974–1998. Only years for which harvest data are available are shown.

Year	North Park	Middle Park	Eagle	Yampa	Piceance Basin	Blue Mountain	Cold Spring Mountain	E Moffat and NW Routt	N-central Moffat	Gunnison Basin
1974	3									
1975	9	3								
1976	9	3				3	3	3	3	
1977	16	7	7	7	7	7	7	7	7	3
1978	16	9	9	9[a]	9	9	9	9[a]	9	7
1979	16	9	9	9	9	16	16	9	16	9
1980	16	16	16	9	16	25	25	25	25	16
1981	23	16	16	16	16	16	16	16	16	16
1982	30	16	16	16	16	16	7	16	16	16
1983	30	16	16	16	16	16	16	16	16	16
1984	30	16	16	16	16	16	16	16	16	16
1985	23	16	16	16	16	16	16	16	16	16
1986	23	23	23	23	23	23	23	23	23	16
1987	23	23	23	23	23	23	23	23	23	16
1988	23	23	23	23	23	23	23	23	23	16
1989	30	30	30	30	30	30	30	30	30	30
1990	30	30	30	30	30	30	30	30	30	30
1991	30	30	30	30	30	30	30	30	30	30
1992	34	34	34	34	34	34	34	34	34	34
1993	33	33	33	33	33	33	33	33	33	33
1994	32	32	32	32	32	32	32	32	32	16
1995	17	17	Closed	17[b]	Closed	17	17	17	17	17
1996	22	22	Closed	22	Closed	22	22	22	22	16
1997	16	16	Closed	16	Closed	16	16	16	16	16
1998	16	16	Closed	Closed	Closed	7	7	Closed	7	16

[a] Season was only 7 days in Yampa area east of Colorado Highway 131 and in the Elk River drainage, and east of Colorado Highway 131 in the Eastern Moffat and Northwestern Routt area.
[b] Unit 26 was closed in the Yampa area in 1995.

Table 2. Sage-grouse hunting season bag and possession limits (in parentheses) by year and area in Colorado, 1974–1998. Only years for which harvest data are available are shown.

Year	North Park	Middle Park	Eagle	Yampa	Piceance Basin	Blue Mountain	Cold Spring Mountain	E Moffat and NW Routt	N-central Moffat	Gunnison Basin
1974	2 (4)									
1975	2 (4)	2 (2)								
1976	3 (6)	2 (4)				2 (4)	2 (4)	2 (4)	2 (4)	
1977	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	2 (2)
1978	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)
1979	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)
1980	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)
1981	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)
1982	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)
1983	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)
1984	3 (6)	2 (4)	2 (4)	2 (4)	2 (4)	2 (4)	1 (2)	2 (4)	2 (4)	2 (4)
1985	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)
1986	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	1 (2)	3 (6)	3 (6)	3 (6)
1987	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	1 (2)	3 (6)	3 (6)	3 (6)
1988	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	1 (2)	3 (6)	3 (6)	3 (6)
1989	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)
1990	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)
1991	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)	3 (6)
1992	3 (9)	3 (9)	3 (9)	3 (9)	3 (9)	3 (9)	3 (9)	3 (9)	3 (9)	3 (9)
1993	3 (9)	3 (9)	3 (9)	3 (9)	3 (9)	3 (9)	3 (9)	3 (9)	3 (9)	3 (9)
1994	3 (9)	3 (9)	3 (9)	3 (9)	3 (9)	3 (9)	3 (9)	3 (9)	3 (9)	1 (2)
1995	2 (4)	1 (2)	Closed	1 (2)	Closed	2 (4)	1 (2)	1 (2)	1 (2)	2 (4)
1996	2 (4)	1 (2)	Closed	1 (2)	Closed	2 (4)	1 (2)	1 (2)	1 (2)	2 (4)
1997	2 (4)	1 (2)	Closed	1 (2)	Closed	2 (4)	1 (2)	1 (2)	1 (2)	2 (4)
1998	2 (4)	2 (4)	Closed	Closed	Closed	2 (4)	2 (4)	Closed	2 (4)	2 (4)

Table 3. Age and gender composition of the greater sage-grouse harvest in Colorado, 1974–1998.

	Juveniles					Yearlings					Adults				
Year	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest
1974	171	179	350	48.9:51.1	50.1	49	89	138	35.5:64.5	19.8	45	165	210	21.4:78.6	30.1
1975	124	142	266	46.6:53.4	45.4	56	67	123	45.5:54.5	21.0	56	141	197	28.4:71.6	33.6
1976	341	415	756	45.1:54.9	55.9	96	159	255	37.6:62.4	18.8	76	266	342	22.2:77.8	25.3
1977	343	431	774	44.3:55.7	46.9	144	216	360	40.0:60.0	21.8	148	367	515	28.7:71.3	31.2
1978	1008	1060	2068	48.7:51.3	63.5	154	265	419	36.8:63.2	12.9	224	546	770	29.1:70.9	23.6
1979	1113	1247	2360	47.2:52.8	54.9	523	662	1185	44.1:55.9	27.6	242	511	753	32.1:67.9	17.5
1980	871	1070	1941	44.9:55.1	53.6	265	444	709	37.4:62.6	19.6	351	618	969	36.2:63.8	26.8
1981	709	883	1592	44.5:55.5	50.3	222	441	663	33.5:66.5	20.9	248	664	912	27.2:72.8	28.8
1982	569	647	1216	46.8:53.2	58.0	128	222	350	36.6:63.4	16.7	140	391	531	26.4:73.6	25.3
1983	874	983	1857	47.1:52.9	57.6	254	399	653	38.9:61.1	20.2	168	547	715	23.5:76.5	22.2
1984	542	608	1150	47.1:52.9	56.9	155	280	435	35.6:64.4	21.5	106	331	437	24.3:75.7	21.6
1985	633	737	1370	46.2:53.8	60.0	146	293	439	33.3:66.7	19.2	123	353	476	25.8:74.2	20.8
1986	720	828	1548	46.5:53.5	60.0	185	352	537	34.5:65.5	20.8	132	362	494	26.7:73.3	19.2
1987	793	929	1722	46.1:53.9	57.8	222	414	636	34.9:65.1	21.4	158	461	619	25.5:74.5	20.8
1988	510	628	1138	44.8:55.2	49.4	220	346	566	38.9:61.1	24.6	182	417	599	30.4:69.6	26.0
1989	678	801	1479	45.8:54.2	50.8	265	342	607	43.7:56.3	20.9	293	531	824	35.6:64.4	28.3
1990	588	711	1299	45.3:54.7	46.0	224	416	640	35.0:65.0	22.7	270	614	884	30.5:69.5	31.3
1991	365	505	870	42.0:58.0	46.3	124	227	351	35.3:64.7	18.7	174	484	658	26.4:73.6	35.0
1992	236	331	567	41.6:58.4	42.3	130	176	306	42.5:57.5	22.8	101	368	469	21.5:78.5	34.9
1993	273	308	581	47.0:53.0	53.1	43	99	142	30.3:69.7	13.0	87	285	372	23.4:76.6	34.0
1994	207	267	474	43.7:56.3	53.0	63	95	158	39.9:60.1	17.7	52	210	262	19.8:80.2	29.3
1995	90	89	179	50.3:49.7	59.7	12	40	52	23.1:76.9	17.3	18	51	69	26.1:73.9	23.0
1996	127	166	293	43.3:56.7	56.8	29	60	89	32.6:67.4	17.2	34	100	134	25.4:74.6	26.0
1997	99	90	189	52.4:47.6	52.6	29	46	75	38.7:61.3	20.9	28	67	95	29.5:70.5	26.5
1998	77	90	167	46.1:53.9	45.6	24	64	88	27.3:72.7	24.0	27	84	111	24.3:75.7	30.3
Average	482	566	1048	46.0:54.0	53.9	150	249	399	37.6:62.4	20.5	139	357	497	28.0:72.0	25.6

Table 4. Age and gender composition of the Gunnison sage-grouse harvest, Gunnison Basin, Colorado, 1977–1998.

	Juveniles					Yearlings					Adults				
Year	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest
1977	67	75	142	47.2:52.8	60.4	18	35	53	34.0:66.0	22.6	15	25	40	37.5:62.5	17.0
1978	151	168	319	47.3:52.7	61.7	16	38	54	29.6:70.4	10.4	56	88	144	38.9:61.1	27.9
1979	216	219	435	49.7:50.3	62.9	63	66	129	48.8:51.2	18.6	41	87	128	32.0:68.0	18.5
1980	127	144	271	46.9:53.1	64.5	41	43	84	48.8:51.2	20.0	25	40	65	38.5:61.5	15.5
1981	56	33	89	62.9:37.1	42.6	43	34	77	55.8:44.2	36.8	19	24	43	44.2:55.8	20.6
1982	94	79	173	54.3:45.7	64.6	14	13	27	51.9:48.1	10.1	22	46	68	32.4:67.6	25.4
1983	205	231	436	47.0:53.0	64.5	55	81	136	40.4:59.6	20.1	33	71	104	31.7:68.3	15.4
1984	130	197	327	39.8:60.2	66.3	32	46	78	41.0:59.0	15.8	32	56	88	36.4:63.6	17.8
1985	137	107	244	56.1:43.9	62.9	24	45	69	34.8:65.2	17.8	38	37	75	50.7:49.3	19.3
1986	165	139	304	54.3:45.7	54.8	74	60	134	55.2:44.8	24.1	33	84	117	28.2:71.8	21.1
1987	159	184	343	46.4:53.6	69.0	28	47	75	37.3:62.7	15.1	33	46	79	41.8:58.2	15.9
1988	99	119	218	45.4:54.6	60.1	36	35	71	50.7:49.3	19.6	25	49	74	33.8:66.2	20.4
1989	126	133	259	48.6:51.4	50.0	57	70	127	44.9:55.1	24.5	37	95	132	28.0:72.0	25.5
1990	69	98	167	41.3:58.7	45.6	41	65	106	38.7:61.3	29.0	21	72	93	22.6:77.4	25.4
1991	75	107	182	41.2:58.8	58.9	14	25	39	35.9:64.1	12.6	29	59	88	33.0:67.0	28.5
1992	68	67	135	50.4:49.6	50.6	29	31	60	48.3:51.7	22.5	27	45	72	37.5:62.5	27.0
1993	63	80	143	44.1:55.9	69.4	8	15	23	34.8:65.2	11.2	13	27	40	32.5:67.5	19.4
1994	12	13	25	48.0:52.0	65.8	5	2	7	71.4:28.6	18.4	3	3	6	50.0:50.0	15.8
1995	40	40	80	50.0:50.0	54.4	16	16	32	50.0:50.0	21.8	9	26	35	25.7:74.3	23.8
1996	32	42	74	43.2:56.8	51.0	11	24	35	31.4:68.6	24.1	15	21	36	41.7:58.3	24.8
1997	33	38	71	46.5:53.5	53.8	9	17	26	34.6:65.4	19.7	12	23	35	34.3:65.7	26.5
1998	24	26	50	48.0:52.0	47.2	2	16	18	11.1:88.9	17.0	11	27	38	28.9:71.1	35.8
Average	98	106	204	48.0:52.0	59.5	29	37	66	43.9:56.1	19.2	25	48	73	34.2:65.8	21.3

Table 5. Age and gender composition of the greater sage-grouse harvest in Oregon, 1993–2013.

Year	Juveniles					Yearlings					Adults				
	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest
1993	103	99	202	51.0:49.0	47.4	5	14	19	26.3:73.7	4.5	80	125	205	39.0:61.0	48.1
1994	145	168	313	46.3:53.7	42.7	6	45	51	11.8:88.2	7.0	116	253	369	31.4:68.6	50.3
1995	68	93	161	42.2:57.8	35.5	1	20	21	4.8:95.2	4.6	86	185	271	31.7:68.3	59.8
1996	105	148	253	41.5:58.5	51.3	1	23	24	4.2:95.8	4.9	68	148	216	31.5:68.5	43.8
1997	147	169	316	46.5:53.5	53.9	7	37	44	15.9:84.1	7.5	88	138	226	38.9:61.1	38.6
1998	110	119	229	48.0:52.0	49.1	1	17	18	5.6:94.4	3.9	86	133	219	39.3:60.7	47.0
1999	173	201	374	46.3:53.7	55.7	5	31	36	13.9:86.1	5.4	108	153	261	41.4:58.6	38.9
2000	120	139	259	46.3:53.7	44.3	11	38	49	22.4:77.6	8.4	131	145	276	47.5:52.5	47.3
2001	181	179	360	50.3:49.7	54.0	5	45	50	10.0:90.0	7.5	113	144	257	44.0:56.0	38.5
2002	192	181	373	51.5:48.5	57.6	4	39	43	9.3:90.7	6.6	106	126	232	45.7:54.3	35.8
2003	145	171	316	45.9:54.1	48.3	4	30	34	11.8:88.2	5.2	142	162	304	46.7:53.3	46.5
2004	178	222	400	44.5:55.5	51.5	4	43	47	8.5:91.5	6.1	130	199	329	39.5:60.5	42.4
2005	171	201	372	46.0:54.0	44.9	2	38	40	5.0:95.0	4.8	189	227	416	45.4:54.6	50.2
2006	147	169	316	46.5:53.5	47.4	9	20	29	31.0:69.0	4.3	157	165	322	48.8:51.2	48.3
2007	58	74	132	43.9:56.1	27.4	3	28	31	9.7:90.3	6.4	121	198	319	37.9:62.1	66.2
2008	117	124	241	48.5:51.5	54.4	0	17	17	0.0:100.0	3.8	56	129	185	30.3:69.7	41.8
2009	131	148	279	47.0:53.0	56.7	0	24	24	0.0:100.0	4.9	92	97	189	48.7:51.3	38.4
2010	96	125	221	43.4:56.6	47.7	1	22	23	4.3:95.7	5.0	79	140	219	36.1:63.9	47.3
2011	78	102	180	43.3:56.7	42.7	2	20	22	9.1:90.9	5.2	105	115	220	47.7:52.3	52.1
2012	39	56	95	41.1:58.9	29.2	14	33	47	29.8:70.2	14.5	89	94	183	48.6:51.4	56.3
2013	74	73	147	50.3:49.7	57.9	2	16	18	11.1:88.9	7.1	32	57	89	36.0:64.0	35.0
Average	123	141	264	46.5:53.5	48.0	4	29	33	12.7:87.3	6.0	104	149	253	41.0:59.0	46.0

Table 6. Summary of sample size, sex ratio, breeding success, and survival for greater and Gunnison sage-grouse in Colorado and Oregon.

Species and area	Wings (*n*)	Male:female sex ratio			Survival (%)[a]		Female success (%)	Juveniles		
		Juveniles	Yearlings	Adults	Male	Female		In harvest (%)	Per female	Per successful female
Greater sage-grouse in Colorado	48599	46:54	38:62	28:72	48.1	59.0	46.9	53.9	1.7	3.7
North Park	13424	47:53	35:65	25:75	46.9	58.4	49.1	50.7	1.5	3.0
Middle Park	1903	50:50	39:61	26:74	41.4	57.7	55.9	52.6	1.6	2.9
Eagle	694	50:50	40:60	33:67	46.5	58.2	63.2	59.3	2.3	3.6
Yampa	920	50:50	46:54	36:64	42.1	54.4	47.9	43.2	1.2	2.6
Piceance Basin	817	47:53	43:57	30:70	41.3	54.8	57.1	57.6	2.1	3.7
Blue Mountain	5408	47:53	41:59	29:71	40.4	53.2	45.0	58.3	2.2	4.8
Cold Spring Mountain	2520	45:55	35:65	21:79	47.1	63.0	53.9	59.4	1.8	3.4
E Moffat and NW Routt counties	3539	48:52	33:67	25:75	42.6	53.5	39.6	53.5	1.6	4.1
Northcentral Moffat County	19374	44:56	39:61	31:69	53.3	62.1	44.2	54.6	1.8	4.1
Gunnison sage-grouse in Colorado	7547	48:52	44:56	34:66	46.3	56.1	60.0	59.5	2.4	4.0
Greater sage-grouse in Oregon	11533	47:53	12:88	41:59	46.7	55.8	48.8	48.0	1.5	3.0
Sumpter, Hunt Unit 51	47	41:59	0:100	43:57	63.2	64.3	33.3	36.2	0.9	2.8
Lookout Mountain, Hunt Unit 64	92	51:49	0:100	60:40	64.0	59.5	20.0	38.0	1.4	7.0
Beulah, Hunt Unit 65	990	52:48	4:96	36:64	40.0	58.4	39.6	49.4	1.5	3.7
Malheur River, Hunt Unit 66	780	45:55	16:84	41:59	45.8	53.8	43.1	49.5	1.6	3.6
Owyhee, Hunt Unit 67	693	51:49	7:93	40:60	50.7	63.1	35.9	42.3	1.2	3.3
Whitehorse, Hunt Unit 68	2721	47:53	7:93	41:59	43.3	53.2	48.5	51.0	1.7	3.4
Steens Mountain, Hunt Unit 69	1193	47:53	17:83	52:48	61.4	59.4	50.5	39.6	1.3	2.5
Beatys Butte, Hunt Unit 70	1999	46:54	19:81	43:57	48.5	54.7	54.8	48.0	1.5	2.8
Juniper, Hunt Unit 71	868	44:56	9:91	36:64	49.7	59.7	54.2	44.1	1.2	2.2
Silvies, Hunt Unit 72	202	43:57	10:90	26:74	35.3	56.0	49.3	51.0	1.4	2.8
Wagontire, Hunt Unit 73	546	46:54	19:81	31:69	40.8	58.2	53.0	48.4	1.3	2.5
Warner, Hunt Unit 74	1402	44:56	6:94	37:63	38.9	51.3	53.3	53.5	1.7	3.2

[a] Survival for greater sage-grouse in Oregon was estimated using annual turnover of juveniles and survival for sage-grouse in Colorado was estimated using annual turnover of yearlings.

Table 7. Greater sage-grouse productivity data, Colorado, 1974–1998.

Year	Estimated annual reproductive success						Juveniles		
	Adult		Yearling		All females		In harvest (%)	Per hen	Per successful hen
	%	*n*	%	*n*	%	*n*			
1974	64.8	165	46.1	89	58.3	254	50.1	1.4	2.4
1975	56.0	141	38.8	67	50.5	208	45.4	1.3	2.5
1976	54.9	266	34.0	159	47.1	425	55.9	1.8	3.8
1977	51.5	367	25.9	216	42.0	583	46.9	1.3	3.2
1978	65.2	546	46.4	265	59.1	811	63.5	2.5	4.3
1979	62.6	511	47.7	662	54.2	1173	54.9	2.0	3.7
1980	50.3	618	34.0	444	43.5	1062	53.6	1.8	4.2
1981	41.4	665	28.2	440	36.1	1105	50.3	1.4	4.0
1982	53.5	391	31.5	222	45.5	613	58.0	2.0	4.4
1983	62.7	547	45.3	408	55.3	955	57.6	2.0	3.5
1984	67.2	326	50.5	285	59.4	611	56.9	1.9	3.2
1985	62.0	353	41.3	293	52.6	646	60.0	2.1	4.0
1986	57.5	362	40.9	352	49.3	714	60.0	2.2	4.4
1987	50.9	462	36.1	413	43.9	875	57.8	2.0	4.5
1988	50.2	416	30.3	347	41.2	763	49.4	1.5	3.6
1989	48.0	531	29.2	342	40.7	873	50.8	1.7	4.2
1990	44.8	614	19.2	416	34.5	1030	46.0	1.3	3.7
1991	49.8	484	32.2	227	44.2	711	46.3	1.2	2.8
1992	40.5	368	23.3	176	34.9	544	42.3	1.0	3.0
1993	66.7	285	43.4	99	60.7	384	53.1	1.5	2.5
1994	61.0	210	38.9	95	54.1	305	53.0	1.6	2.9
1995	66.7	51	57.5	40	62.6	91	59.7	2.0	3.1
1996	64.0	100	36.7	60	53.8	160	56.8	1.8	3.4
1997	56.7	67	48.9	47	53.5	114	52.6	1.7	3.1
1998	50.6	85	23.4	64	38.9	149	45.6	1.1	2.9
Totals	54.2	8931	36.4	6228	46.9	15159	53.9	1.7	3.7

Table 8. Gunnison sage-grouse productivity data, Gunnison Basin, Colorado, 1977–1998.

Year	Estimated annual reproductive success						Juveniles		
	Adult		Yearling		All females		In harvest (%)	Per hen	Per successful hen
	%	*n*	%	*n*	%	*n*			
1977	92.0	25	68.6	35	78.3	60	60.4	2.4	3.0
1978	76.1	88	60.5	38	71.4	126	61.7	2.5	3.5
1979	67.8	87	72.7	66	69.9	153	62.9	2.8	4.1
1980	67.5	40	69.8	43	68.7	83	64.5	3.3	4.8
1981	50.0	24	29.4	34	37.9	58	42.6	1.5	4.0
1982	65.2	46	46.2	13	61.0	59	64.6	2.9	4.8
1983	74.6	71	49.4	81	61.2	152	64.5	2.9	4.7
1984	69.6	56	69.6	46	69.6	102	66.3	3.2	4.6
1985	62.2	37	73.3	45	68.3	82	62.9	3.0	4.4
1986	66.7	84	51.7	60	60.4	144	54.8	2.1	3.5
1987	71.7	46	40.4	47	55.9	93	69.0	3.7	6.6
1988	77.6	49	62.9	35	71.4	84	60.1	2.6	3.6
1989	58.9	95	38.6	70	50.3	165	50.0	1.6	3.1
1990	48.6	72	15.4	65	32.8	137	45.6	1.2	3.7
1991	66.1	59	36.0	25	57.1	84	58.9	2.2	3.8
1992	55.6	45	25.8	31	43.4	76	50.6	1.8	4.1
1993	81.5	27	66.7	15	76.2	42	69.4	3.4	4.5
1994	100.0	3	0.0	2	60.0	5	65.8	5.0	8.3
1995	65.4	26	87.5	16	73.8	42	54.4	1.9	2.6
1996	61.9	21	45.8	24	53.3	45	51.0	1.6	3.1
1997	65.2	23	58.8	17	62.5	40	53.8	1.8	2.8
1998	66.7	27	31.3	16	53.5	43	47.2	1.2	2.2
Totals	66.9	1051	51.2	824	60.0	1875	59.5	2.4	4.0

Table 9. Greater sage-grouse productivity data, Oregon, 1993–2013. Successful yearling females were more likely to be detected because those that were unsuccessful had likely completed replacement of all primaries from the previous year.

Year	Estimated annual reproductive success						Juveniles		
	Adult		Yearling		All females		In harvest (%)	Per hen	Per successful hen
	%	*n*	%	*n*	%	*n*			
1993	55.2	125	100.0	14	59.7	139	47.4	1.5	2.4
1994	40.3	253	37.8	45	39.9	298	42.7	1.1	2.6
1995	35.7	185	30.0	20	35.1	205	35.5	0.8	2.2
1996	51.4	148	47.8	23	50.9	171	51.3	1.5	2.9
1997	54.3	138	81.1	37	60.0	175	53.9	1.8	3.0
1998	45.1	133	100.0	17	51.3	150	49.1	1.5	3.0
1999	66.0	153	100.0	31	71.7	184	55.7	2.0	2.8
2000	42.1	145	55.3	38	44.8	183	44.3	1.4	3.2
2001	42.0	144	64.4	45	47.3	189	54.0	1.9	4.0
2002	57.1	126	100.0	39	67.3	165	57.6	2.3	3.4
2003	52.5	162	63.3	30	54.2	192	48.3	1.6	3.0
2004	42.7	199	100.0	43	52.9	242	51.5	1.7	3.1
2005	45.4	227	100.0	38	53.2	265	44.9	1.4	2.6
2006	49.1	165	55.0	20	49.7	185	47.4	1.7	3.4
2007	32.3	198	53.6	28	35.0	226	27.4	0.6	1.7
2008	47.3	129	76.5	17	50.7	146	54.4	1.7	3.3
2009	44.3	97	66.7	24	48.8	121	56.7	2.3	4.7
2010	35.0	140	50.0	22	37.0	162	47.7	1.4	3.7
2011	40.0	115	60.0	20	43.0	135	42.7	1.3	3.1
2012	31.9	94	15.2	33	27.6	127	29.2	0.7	2.7
2013	45.6	57	56.3	16	47.9	73	57.9	2.0	4.2
Totals	45.2	3133	67.8	600	48.8	3733	47.6	1.5	3.0

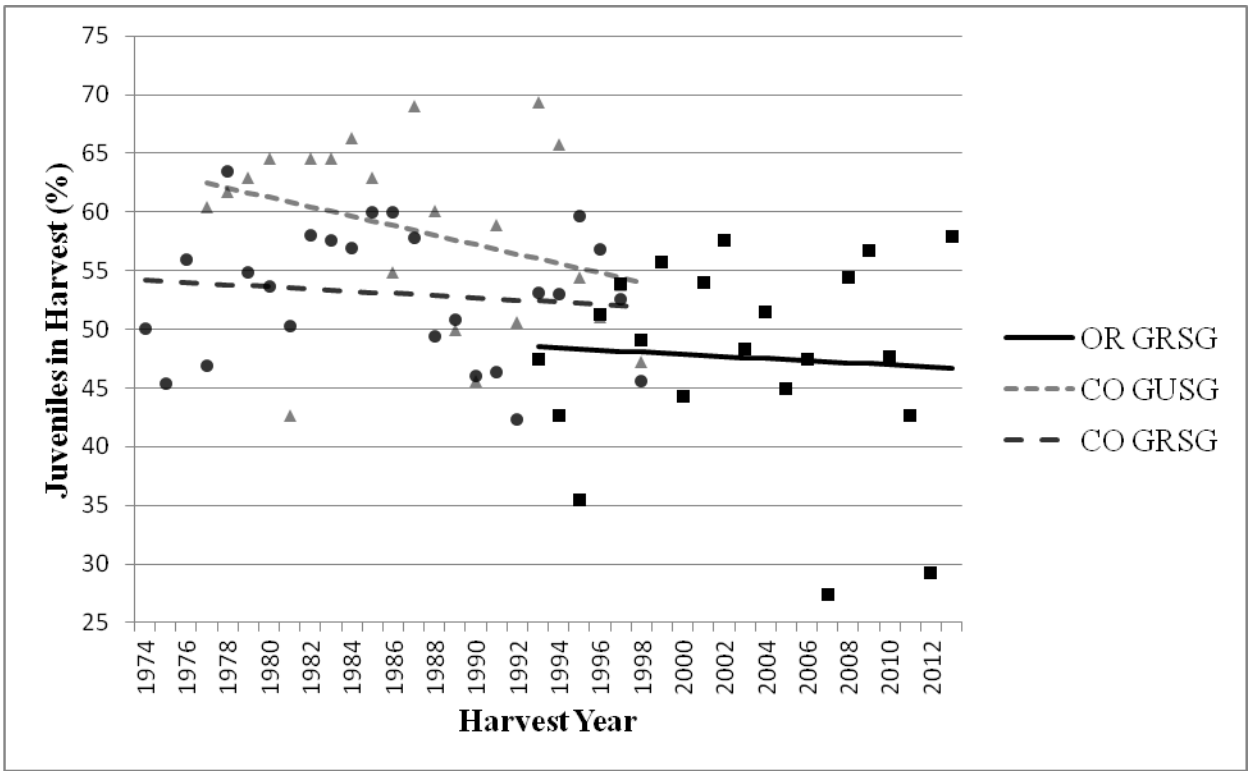

Figure 3. Trends (%) in juvenile sage-grouse as a proportion of harvest for Colorado (1974–1998) and Oregon (1993–2013) (OR GRSG = Oregon greater sage-grouse [squares], CO GUSG = Colorado Gunnison sage-grouse [triangles], CO GRSG = Colorado greater sage-grouse [circles]).

DISCUSSION

The structure of sage-grouse populations has been of interest for many years starting with the work of Patterson (1952). Wings from hunter-harvested sage-grouse were collected in Montana (Eng 1955) and Colorado starting in the 1950s (Rogers 1964) and later in other states (even though understanding the usefulness of wing analysis was rudimentary) (Dalke et al. 1963). Collection and classification of wings (Beck et al. 1975) were not standardized until the early 1970s in Colorado (Braun 1984) when sage-grouse wing collection was instituted in all areas open to sage-grouse hunting. This effort led other states (such as Idaho [Autenrieth 1981]) to follow standard procedures promoted by the Western States Sage Grouse Committee (Autenrieth et al. 1982; reviewed by Connelly and Schroeder 2007). This led to the first compilations of sage-grouse harvest data based on large samples (e.g., Braun 1984).

Several concerns arose from these data sets (Braun 1984) including the high percentage of females in the adult and yearling segments of the harvested sample and the apparent increase in females in the harvest from the juvenile (young of the year = 52%), to yearling (64%), to adult (72%) segments of the fall population. Sex ratios of juveniles in the harvest were approximately 1:1 (10-year average from 1974 to 1983 = 48:52, *n* = 4060 juveniles). This led Braun (1984:153) to indicate that survival favored females in all age classes. He also used progression of the molt

of primary flight feathers to estimate nest success of adult and yearling females (page 154) and reported a difference between yearlings (10-year average = 51%) and adults (10-year average = 68%). Braun's (1984) assumption of even sex ratios at hatch is consistent with the findings of Atamian and Sedinger (2010) and Guttery et al. (2013). Recent research indicates differences in juvenile to adult ratios and juveniles per hen may be related to moisture as Blomberg et al. (2014a) documented that clutch size was larger in years with more moisture (generally at higher elevations). These authors suggest that resource availability affects clutch size. A companion paper (Blomberg et al. 2014b) found that postfledging survival of juveniles was higher during cooler and wetter growing seasons compared to hot and dry growing seasons. Thus, those sites in Colorado with adequate sample sizes such as in the higher elevation areas of the Gunnison Basin (59%), Blue Mountain (58%), and Cold Spring Mountain (60%) would be expected to have higher proportions of juveniles in the harvest than in the lower elevation area of northcentral Moffat County (55%). This did not hold for the high elevation area of North Park (51% juveniles in the harvest).

Knowledge of the structure of sage-grouse populations is thus important for understanding the dynamics of changes over time. Most previous projections dating to Patterson's (1952) work have focused on male attendance at leks (Emmons and Braun 1984), even though the proportion of males in the population that attend leks is poorly understood. Females congregate in sex-specific flocks in winter and Beck's (1977) work in North Park, Colorado indicated there were 2 hens per male in winter flocks. Our work has supported that finding using harvest data. All populations studied had about 62–70% adult and yearling females in the adult and yearling segment of the fall harvest. These findings are not surprising as the mating system of sage-grouse is one where a few males do most of the breeding (Wiley 1973, 1978). Thus, even sex ratios are neither necessary nor desirable. The shift from an expected sex ratio of 50:50 at hatch to a ratio favoring females starts at a young age, probably because of the need for large amounts of high protein foods to meet the growth demands of the larger juvenile males (Swenson 1986). This shift continues as adult males especially have low annual survival (37% vs. adult females = 59%) (Zablan et al. 2003), possibly because of higher rates of predation during the breeding season (Connelly et al. 2000, Hagen 2011). Thus, based on the above discussion of the data, we were unable to detect differences using the available techniques to indicate that the fall structure of sage-grouse populations based on harvest differed among populations of greater sage-grouse within a State, between states, and between greater and Gunnison sage-grouse.

Estimates of breeding success of sage-grouse have primarily been based on studies of radio-marked hens (Schroeder 1997, Hagen et al. 2007). Ours is the first to derive breeding success (which includes nesting effort, nesting success, and chick survival to the hunting season) estimates from examination of hunter-harvested sage-grouse. This provides a less expensive way to estimate this important parameter even if it is not precise. More recently, Hagen and Loughin (2008) devised a method to estimate variance in sample sizes needed to provide estimates of productivity based on sage-grouse wing collections from hunters.

Estimated annual turnover (mortality) based on examination of wings varied slightly among areas (and years depending upon sample sizes) and was lower than rates for adult males

(63%), but similar for adult females (41%) published for banded and recovered sage-grouse in North Park, Colorado based on 6,000+ bandings over the period 1973–1990 and recovered in 1973–1993 (Zablan et al. 2003). These data suggest that estimating annual turnover of adult males and females from hunter-harvested sage-grouse has merit in both Colorado and Oregon.

Differential vulnerability to hunting is unknown for sage-grouse but juveniles may be more vulnerable than older age classes (Caudill et al. 2014). Anecdotal comments from hunters suggest there is selection for smaller birds (females and young). However, this is not supported by return of bands from marked sage-grouse of all age classes in Moffat County (unpubl. data) or of birds banded in spring as yearlings and adults in North Park. The data from North Park (Zablan et al. 2003) indicate that adult males had the highest harvest rates. This can be understood as males are larger (Beck and Braun 1978) and appear to flush later than females or juveniles.

MANAGEMENT IMPLICATIONS

The data on population composition of sage-grouse provided in this report span a 40-year period from small to large populations in a variety of habitats from high mountain valleys, which have substantial wet meadows, to low elevations that approach semi-deserts, all within a matrix of live sagebrush and mostly native herbaceous plants. Thus, data can be compared for the 1973–1998 period with that from 1993–2013. Of importance is the overlap from 1993 through 1998 between Colorado and Oregon. Data from small populations (Eagle = 695 wings [1977–1998], Piceance = 817 wings [1977–1994], and Yampa = 920 wings [1977–1998]) in Colorado have value as none of these populations is now hunted and none is likely to be hunted again. The same is true for some Harvest Management Units in Oregon. Even in situations where harvest is continuing, the long-term trend is declining samples of hunter-harvested wings. Consequently, it is unlikely that this quantity of data will ever be replicated.

These small populations have characteristics similar to the larger populations, but with larger variances in parameter estimates. Both species of sage-grouse are candidates for threatened or endangered listing and it is certain that at least one species will be subject to development of a recovery plan in the near future. Thus, it is important to know the characteristics of the populations prior to cessation of hunting and possible ESA listing.

The Gunnison sage-grouse population studied had the highest proportion of young in the fall harvest, the highest young per hen ratio, and was among those with the highest estimated breeding success. Despite these attributes, it still had estimated annual turnover that was quite similar (but somewhat higher) to other populations (Oregon; and especially North Park, Colorado which has similar habitat associations) that had adequate samples of wing receipts. Of interest is the similarity of most parameters measured including age and sex ratios with females comprising larger segments of fall populations in all older age classes. Clearly, the data indicate the mating system of sage-grouse which focuses on large, showy males and nondescript females is negative for male survival. It is also clear that all populations studied did not differ over time periods or geographical regions in their core attributes.

The data represented long periods from two states and indicates the need for population

monitoring over time as recommended by Nichols and Williams (2006). Unfortunately, the opportunity to collect large samples may not exist but we show that even small samples collected over time can provide reasonable estimates of the structure of the fall population of sage-grouse.

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Appendix A1. Age and gender composition of the greater sage-grouse harvest, North Park, Colorado, 1974–1998.

	Juveniles					Yearlings					Adults				
Year	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest
1974	171	179	350	48.9:51.1	50.1	49	89	138	35.5:64.5	19.8	45	165	210	21.4:78.6	30.1
1975	101	111	212	47.6:52.4	42.0	52	59	111	46.8:53.2	22.0	55	127	182	30.2:69.8	36.0
1976	104	106	210	49.5:50.5	42.3	46	71	117	39.3:60.7	23.5	49	121	170	28.8:71.2	34.2
1977	136	154	290	46.9:53.1	45.9	47	76	123	38.2:61.8	19.5	48	171	219	21.9:78.1	34.7
1978	184	201	385	47.8:52.2	53.2	62	81	143	43.4:56.6	19.8	67	129	196	34.2:65.8	27.1
1979	306	318	624	49.0:51.0	57.7	102	154	256	39.8:60.2	23.7	72	129	201	35.8:64.2	18.6
1980	207	254	461	44.9:55.1	49.1	80	170	250	32.0:68.0	26.6	70	158	228	30.7:69.3	24.3
1981	234	255	489	47.9:52.1	47.4	78	151	229	34.1:65.9	22.2	87	227	314	27.7:72.3	30.4
1982	197	196	393	50.1:49.9	50.6	53	80	133	39.8:60.2	17.1	81	170	251	32.3:67.7	32.3
1983	295	352	647	45.6:54.4	57.4	90	155	245	36.7:63.3	21.7	53	183	236	22.5:77.5	20.9
1984	236	251	487	48.5:51.5	57.0	68	132	200	34.0:66.0	23.4	37	131	168	22.0:78.0	19.6
1985	163	190	353	46.2:53.8	53.6	47	112	159	29.6:70.4	24.2	33	113	146	22.6:77.4	22.2
1986	168	236	404	41.6:58.4	61.8	27	93	120	22.5:77.5	18.3	25	105	130	19.2:80.8	19.9
1987	153	216	369	41.5:58.5	54.2	54	114	168	32.1:67.9	24.7	29	115	144	20.1:79.9	21.1
1988	80	101	181	44.2:55.8	42.9	52	81	133	39.1:60.9	31.5	18	90	108	16.7:83.3	25.6
1989	89	98	187	47.6:52.4	46.1	25	92	117	21.4:78.6	28.8	17	85	102	16.7:83.3	25.1
1990	69	66	135	51.1:48.9	38.7	21	59	80	26.3:73.8	22.9	25	109	134	18.7:81.3	38.4
1991	47	64	111	42.3:57.7	43.0	18	28	46	39.1:60.9	17.8	18	83	101	17.8:82.2	39.1
1992	37	35	72	51.4:48.6	36.7	26	20	46	56.5:43.5	23.5	15	63	78	19.2:80.8	39.8
1993	53	53	106	50.0:50.0	45.1	6	20	26	23.1:76.9	11.1	25	78	103	24.3:75.7	43.8
1994	65	68	133	48.9:51.1	56.1	15	16	31	48.4:51.6	13.1	15	58	73	20.5:79.5	30.8
1995	10	13	23	43.5:56.5	36.5	4	15	19	21.1:78.9	30.2	10	11	21	47.6:52.4	33.3
1996	38	32	70	54.3:45.7	54.7	5	15	20	25.0:75.0	15.6	7	31	38	18.4:81.6	29.7
1997	31	41	72	43.1:56.9	51.4	12	18	30	40.0:60.0	21.4	10	28	38	26.3:73.7	27.1
1998	22	26	48	45.8:54.2	37.2	4	34	38	10.5:89.5	29.5	9	34	43	20.9:79.1	33.3
Average	128	145	272	46.9:53.1	50.7	42	77	119	35.3:64.7	22.2	37	109	145	25.3:74.7	27.0

Appendix A2. Age and gender composition of the greater sage-grouse harvest, Middle Park, Colorado, 1975–1998.

	Juveniles					Yearlings					Adults				
Year	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest
1975	23	31	54	42.6:57.4	66.7	4	8	12	33.3:66.7	14.8	1	14	15	6.7:93.3	18.5
1976	34	35	69	49.3:50.7	63.9	9	14	23	39.1:60.9	21.3	2	14	16	12.5:87.5	14.8
1977	49	40	89	55.1:44.9	57.1	11	20	31	35.5:64.5	19.9	9	27	36	25.0:75.0	23.1
1978	52	37	89	58.4:41.6	45.9	24	27	51	47.1:52.9	26.3	16	38	54	29.6:70.4	27.8
1979	41	43	84	48.8:51.2	50.0	20	21	41	48.8:51.2	24.4	13	30	43	30.2:69.8	25.6
1980	22	27	49	44.9:55.1	51.6	7	17	24	29.2:70.8	25.3	7	15	22	31.8:68.2	23.2
1981	5	4	9	55.6:44.4	22.0	11	9	20	55.0:45.0	48.8	3	9	12	25.0:75.0	29.3
1982	23	24	47	48.9:51.1	75.8	1	4	5	20.0:80.0	8.1	1	9	10	10.0:90.0	16.1
1983	28	37	65	43.1:56.9	51.6	10	18	28	35.7:64.3	22.2	12	21	33	36.4:63.6	26.2
1984	31	30	61	50.8:49.2	56.0	10	15	25	40.0:60.0	22.9	10	13	23	43.5:56.5	21.1
1985	13	11	24	54.2:45.8	38.7	6	14	20	30.0:70.0	32.3	4	14	18	22.2:77.8	29.0
1986	29	36	65	44.6:55.4	58.6	4	16	20	20.0:80.0	18.0	3	23	26	11.5:88.5	23.4
1987	26	49	75	34.7:65.3	66.4	6	10	16	37.5:62.5	14.2	4	18	22	18.2:81.8	19.5
1988	29	21	50	58.0:42.0	54.3	11	10	21	52.4:47.6	22.8	5	16	21	23.8:76.2	22.8
1989	14	12	26	53.8:46.2	38.2	10	7	17	58.8:41.2	25.0	10	15	25	40.0:60.0	36.8
1990	14	13	27	51.9:48.1	38.6	14	9	23	60.9:39.1	32.9	10	10	20	50.0:50.0	28.6
1991	19	16	35	54.3:45.7	47.9	9	7	16	56.3:43.8	21.9	4	18	22	18.2:81.8	30.1
1992	16	18	34	47.1:52.9	45.3	7	7	14	50.0:50.0	18.7	6	21	27	22.2:77.8	36.0
1993	12	17	29	41.4:58.6	54.7	1	12	13	7.7:92.3	24.5	1	10	11	9.1:90.9	20.8
1994	1	1	2	50.0:50.0	100.0	0	0	0		0.0	0	0	0		0.0
1995	2	2	4	50.0:50.0	30.8	2	1	3	66.7:33.3	23.1	2	4	6	33.3:66.7	46.2
1996	7	6	13	53.8:46.2	68.4	0	3	3	0.0:100.0	15.8	1	2	3	33.3:66.7	15.8
1997	2	1	3	66.7:33.3	30.0	0	3	3	0.0:100.0	30.0	1	3	4	25.0:75.0	40.0
1998	0	0	0		0.0	0	1	1	0.0:100.0	50.0	0	1	1	0.0:100.0	50.0
Average	21	21	42	50.0:50.0	52.5	7	11	18	38.9:61.1	22.5	5	14	20	26.3:73.7	25.0

Appendix A3. Age and gender composition of the greater sage-grouse harvest, Eagle, Colorado, 1977–1998.

	Juveniles					Yearlings					Adults				
Year	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest
1977	7	16	23	30.4:69.6	65.7	0	8	8	0.0:100.0	22.9	0	4	4	0.0:100.0	11.4
1978	27	20	47	57.4:42.6	59.5	5	3	8	62.5:37.5	10.1	5	19	24	20.8:79.2	30.4
1979	19	17	36	52.8:47.2	48.6	15	6	21	71.4:28.6	28.4	9	8	17	52.9:47.1	23.0
1980	22	25	47	46.8:53.2	69.1	0	7	7	0.0:100.0	10.3	4	10	14	28.6:71.4	20.6
1981	5	5	10	50.0:50.0	76.9	1	1	2	50.0:50.0	15.4	0	1	1	0.0:100.0	7.7
1982	8	6	14	57.1:42.9	100.0	0	0	0		0.0	0	0	0		0.0
1983	26	25	51	51.0:49.0	56.7	8	16	24	33.3:66.7	26.7	3	12	15	20.0:80.0	16.7
1984	8	3	11	72.7:27.3	42.3	4	6	10	40.0:60.0	38.5	2	3	5	40.0:60.0	19.2
1985	13	7	20	65.0:35.0	58.8	0	2	2	0.0:100.0	5.9	5	7	12	41.7:58.3	35.3
1986	11	16	27	40.7:59.3	69.2	0	4	4	0.0:100.0	10.3	0	8	8	0.0:100.0	20.5
1987	18	17	35	51.4:48.6	55.6	6	10	16	37.5:62.5	25.4	4	8	12	33.3:66.7	19.0
1988	8	12	20	40.0:60.0	54.1	1	5	6	16.7:83.3	16.2	4	7	11	36.4:63.6	29.7
1989	4	2	6	66.7:33.3	75.0	0	1	1	0.0:100.0	12.5	0	1	1	0.0:100.0	12.5
1990	9	7	16	56.3:43.8	61.5	1	0	1	100.0:0.0	3.8	1	8	9	11.1:88.9	34.6
1991	11	17	28	39.3:60.7	63.6	7	5	12	58.3:41.7	27.3	2	2	4	50.0:50.0	9.1
1992	3	7	10	30.0:70.0	45.5	5	1	6	83.3:16.7	27.3	3	3	6	50.0:50.0	27.3
1993	0	1	1	0.0:100.0	25.0	0	0	0		0.0	1	2	3	33.3:66.7	75.0
1994	3	1	4	75.0:25.0	36.4	1	0	1	100.0:0.0	9.1	4	2	6	66.7:33.3	54.5
1995	0	0	0			0	0	0			0	0	0		
1996	0	0	0			0	0	0			0	0	0		
1997	0	1	1	0.0:100.0	50.0	0	1	1	0.0:100.0	50.0	0	0	0		0.0
1998	2	2	4	50.0:50.0	80.0	0	0	0		0.0	0	1	1	0.0:100.0	20.0
Average	9	9	19	50.0:50.0	59.4	2	3	6	40.0:60.0	18.8	2	5	7	33.3:66.7	21.9

Appendix A4. Age and gender composition of the greater sage-grouse harvest, Yampa, Colorado, 1977–1998.

	Juveniles					Yearlings					Adults				
Year	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest
1977	30	28	58	51.7:48.3	58.6	9	16	25	36.0:64.0	25.3	5	11	16	31.3:68.8	16.2
1978	28	28	56	50.0:50.0	45.5	5	14	19	26.3:73.7	15.4	16	32	48	33.3:66.7	39.0
1979	20	31	51	39.2:60.8	37.0	23	28	51	45.1:54.9	37.0	17	19	36	47.2:52.8	26.1
1980	31	30	61	50.8:49.2	42.4	21	19	40	52.5:47.5	27.8	16	27	43	37.2:62.8	29.9
1981	7	10	17	41.2:58.8	21.3	17	26	43	39.5:60.5	53.8	3	17	20	15.0:85.0	25.0
1982	8	11	19	42.1:57.9	57.6	5	4	9	55.6:44.4	27.3	0	5	5	0.0:100.0	15.2
1983	16	8	24	66.7:33.3	57.1	4	7	11	36.4:63.6	26.2	1	6	7	14.3:85.7	16.7
1984	7	7	14	50.0:50.0	51.9	5	3	8	62.5:37.5	29.6	2	3	5	40.0:60.0	18.5
1985	2	6	8	25.0:75.0	34.8	2	3	5	40.0:60.0	21.7	3	7	10	30.0:70.0	43.5
1986	4	3	7	57.1:42.9	63.6	0	2	2	0.0:100.0	18.2	0	2	2	0.0:100.0	18.2
1987	3	1	4	75.0:25.0	33.3	2	4	6	33.3:66.7	50.0	0	2	2	0.0:100.0	16.7
1988	3	2	5	60.0:40.0	16.7	11	2	13	84.6:15.4	43.3	8	4	12	66.7:33.3	40.0
1989	7	9	16	43.8:56.3	43.2	10	3	13	76.9:23.1	35.1	6	2	8	75.0:25.0	21.6
1990	2	6	8	25.0:75.0	47.1	1	2	3	33.3:66.7	17.6	2	4	6	33.3:66.7	35.3
1991	7	6	13	53.8:46.2	48.1	1	5	6	16.7:83.3	22.2	3	5	8	37.5:62.5	29.6
1992	1	2	3	33.3:66.7	25.0	5	0	5	100.0:0.0	41.7	1	3	4	25.0:75.0	33.3
1993	12	11	23	52.2:47.8	54.8	0	2	2	0.0:100.0	4.8	3	14	17	17.6:82.4	40.5
1994	1	1	2	50.0:50.0	18.2	3	1	4	75.0:25.0	36.4	4	1	5	80.0:20.0	45.5
1995	1	3	4	25.0:75.0	50.0	0	0	0		0.0	0	4	4	0.0:100.0	50.0
1996	1	1	2	50.0:50.0	100.0	0	0	0		0.0	0	0	0		0.0
1997	0	0	0			0	0	0			0	0	0		
1998	2	0	2	100.0:0.0	100.0	0	0	0		0.0	0	0	0		0.0
Average	9	9	18	50.0:50.0	42.9	6	6	12	45.5:54.5	28.6	4	8	12	36.4:63.6	28.6

Appendix A5. Age and gender composition of the greater sage-grouse harvest, Piceance Basin, Colorado, 1977–1994.

	Juveniles					Yearlings					Adults				
Year	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest
1977	13	19	32	40.6:59.4	49.2	6	9	15	40.0:60.0	23.1	3	15	18	16.7:83.3	27.7
1978	33	42	75	44.0:56.0	65.8	4	12	16	25.0:75.0	14.0	6	17	23	26.1:73.9	20.2
1979	23	16	39	59.0:41.0	54.9	10	4	14	71.4:28.6	19.7	8	10	18	44.4:55.6	25.4
1980	22	31	53	41.5:58.5	67.9	8	6	14	57.1:42.9	17.9	5	6	11	45.5:54.5	14.1
1981	9	11	20	45.0:55.0	83.3	1	1	2	50.0:50.0	8.3	0	2	2	0.0:100.0	8.3
1982	24	17	41	58.5:41.5	69.5	2	6	8	25.0:75.0	13.6	1	9	10	10.0:90.0	16.9
1983	17	15	32	53.1:46.9	62.7	5	9	14	35.7:64.3	27.5	1	4	5	20.0:80.0	9.8
1984	15	11	26	57.7:42.3	61.9	1	5	6	16.7:83.3	14.3	3	7	10	30.0:70.0	23.8
1985	12	13	25	48.0:52.0	69.4	2	2	4	50.0:50.0	11.1	1	6	7	14.3:85.7	19.4
1986	9	16	25	36.0:64.0	37.9	10	12	22	45.5:54.5	33.3	8	11	19	42.1:57.9	28.8
1987	17	17	34	50.0:50.0	63.0	3	10	13	23.1:76.9	24.1	3	4	7	42.9:57.1	13.0
1988	8	7	15	53.3:46.7	55.6	2	5	7	28.6:71.4	25.9	0	5	5	0.0:100.0	18.5
1989	7	11	18	38.9:61.1	36.7	12	8	20	60.0:40.0	40.8	6	5	11	54.5:45.5	22.4
1990	5	4	9	55.6:44.4	37.5	4	2	6	66.7:33.3	25.0	6	3	9	66.7:33.3	37.5
1991	0	1	1	0.0:100.0	14.3	1	1	2	50.0:50.0	28.6	1	3	4	25.0:75.0	57.1
1992	3	6	9	33.3:66.7	47.4	1	5	6	16.7:83.3	31.6	0	4	4	0.0:100.0	21.1
1993	6	2	8	75.0:25.0	57.1	1	1	2	50.0:50.0	14.3	0	4	4	0.0:100.0	28.6
1994	9	3	12	75.0:25.0	70.6	1	0	1	100.0:0.0	5.9	0	4	4	0.0:100.0	23.5
Average	13	13	26	47.4:52.6	56.5	4	5	10	42.9:57.1	21.7	3	7	10	30.0:70.0	21.7

Appendix A6. Age and gender composition of the greater sage-grouse harvest, Blue Mountain, Colorado, 1976–1998.

	Juveniles					Yearlings					Adults				
Year	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest
1976	32	37	69	46.4:53.6	61.6	7	10	17	41.2:58.8	15.2	4	22	26	15.4:84.6	23.2
1977	26	38	64	40.6:59.4	60.4	10	7	17	58.8:41.2	16.0	11	14	25	44.0:56.0	23.6
1978	166	164	330	50.3:49.7	62.1	28	68	96	29.2:70.8	18.1	31	74	105	29.5:70.5	19.8
1979	97	107	204	47.5:52.5	45.0	76	74	150	50.7:49.3	33.1	29	70	99	29.3:70.7	21.9
1980	102	136	238	42.9:57.1	68.8	11	31	42	26.2:73.8	12.1	13	53	66	19.7:80.3	19.1
1981	27	40	67	40.3:59.7	54.9	13	19	32	40.6:59.4	26.2	11	12	23	47.8:52.2	18.9
1982	58	100	158	36.7:63.3	70.5	23	21	44	52.3:47.7	19.6	4	18	22	18.2:81.8	9.8
1983	41	50	91	45.1:54.9	63.2	6	17	23	26.1:73.9	16.0	4	26	30	13.3:86.7	20.8
1984	78	81	159	49.1:50.9	63.1	28	28	56	50.0:50.0	22.2	9	28	37	24.3:75.7	14.7
1985	125	98	223	56.1:43.9	67.4	25	36	61	41.0:59.0	18.4	18	29	47	38.3:61.7	14.2
1986	116	115	231	50.2:49.8	59.5	41	50	91	45.1:54.9	23.5	17	49	66	25.8:74.2	17.0
1987	150	151	301	49.8:50.2	66.3	35	41	76	46.1:53.9	16.7	21	56	77	27.3:72.7	17.0
1988	69	79	148	46.6:53.4	50.0	32	48	80	40.0:60.0	27.0	32	36	68	47.1:52.9	23.0
1989	74	75	149	49.7:50.3	41.3	51	58	109	46.8:53.2	30.2	42	61	103	40.8:59.2	28.5
1990	70	89	159	44.0:56.0	55.4	27	38	65	41.5:58.5	22.6	10	53	63	15.9:84.1	22.0
1991	40	81	121	33.1:66.9	54.0	15	35	50	30.0:70.0	22.3	15	38	53	28.3:71.7	23.7
1992	32	41	73	43.8:56.2	45.9	16	23	39	41.0:59.0	24.5	14	33	47	29.8:70.2	29.6
1993	43	60	103	41.7:58.3	65.2	3	11	14	21.4:78.6	8.9	8	33	41	19.5:80.5	25.9
1994	17	38	55	30.9:69.1	48.7	11	22	33	33.3:66.7	29.2	7	18	25	28.0:72.0	22.1
1995	41	29	70	58.6:41.4	74.5	1	13	14	7.1:92.9	14.9	1	9	10	10.0:90.0	10.6
1996	39	43	82	47.6:52.4	56.6	11	16	27	40.7:59.3	18.6	10	26	36	27.8:72.2	24.8
1997	20	14	34	58.8:41.2	50.0	9	9	18	50.0:50.0	26.5	8	8	16	50.0:50.0	23.5
1998	10	10	20	50.0:50.0	50.0	1	6	7	14.3:85.7	17.5	6	7	13	46.2:53.8	32.5
Average	64	73	137	46.7:53.3	58.3	21	30	50	41.2:58.8	21.3	14	34	48	29.2:70.8	20.4

Appendix A7. Age and gender composition of the greater sage-grouse harvest, Cold Spring Mountain, Colorado, 1976–1998. Wings were not identifiable to specific hunting area in 1978 and 1979.

	Juveniles					Yearlings					Adults				
Year	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest
1976	18	20	38	47.4:52.6	73.1	2	2	4	50.0:50.0	7.7	0	10	10	0.0:100.0	19.2
1977	18	43	61	29.5:70.5	59.8	6	12	18	33.3:66.7	17.6	3	20	23	13.0:87.0	22.5
1978	0	0	0			0	0	0			0	0	0		
1979	0	0	0			0	0	0			0	0	0		
1980	25	22	47	53.2:46.8	60.3	2	4	6	33.3:66.7	7.7	4	21	25	16.0:84.0	32.1
1981	75	81	156	48.1:51.9	61.7	8	28	36	22.2:77.8	14.2	19	42	61	31.1:68.9	24.1
1982	25	26	51	49.0:51.0	64.6	5	8	13	38.5:61.5	16.5	2	13	15	13.3:86.7	19.0
1983	97	79	176	55.1:44.9	68.0	15	24	39	38.5:61.5	15.1	3	41	44	6.8:93.2	17.0
1984	4	14	18	22.2:77.8	39.1	3	8	11	27.3:72.7	23.9	4	13	17	23.5:76.5	37.0
1985	50	73	123	40.7:59.3	62.1	12	22	34	35.3:64.7	17.2	3	38	41	7.3:92.7	20.7
1986	39	31	70	55.7:44.3	61.4	8	12	20	40.0:60.0	17.5	2	22	24	8.3:91.7	21.1
1987	15	20	35	42.9:57.1	49.3	9	12	21	42.9:57.1	29.6	4	11	15	26.7:73.3	21.1
1988	23	23	46	50.0:50.0	54.1	6	13	19	31.6:68.4	22.4	6	14	20	30.0:70.0	23.5
1989	46	52	98	46.9:53.1	51.3	12	24	36	33.3:66.7	18.8	24	33	57	42.1:57.9	29.8
1990	42	63	105	40.0:60.0	52.5	11	24	35	31.4:68.6	17.5	8	52	60	13.3:86.7	30.0
1991	56	74	130	43.1:56.9	68.1	1	13	14	7.1:92.9	7.3	8	39	47	17.0:83.0	24.6
1992	27	57	84	32.1:67.9	51.9	13	23	36	36.1:63.9	22.2	10	32	42	23.8:76.2	25.9
1993	40	51	91	44.0:56.0	62.3	6	17	23	26.1:73.9	15.8	6	26	32	18.8:81.3	21.9
1994	22	25	47	46.8:53.2	72.3	4	8	12	33.3:66.7	18.5	2	4	6	33.3:66.7	9.2
1995	6	9	15	40.0:60.0	60.0	0	3	3	0.0:100.0	12.0	1	6	7	14.3:85.7	28.0
1996	14	20	34	41.2:58.8	63.0	5	3	8	62.5:37.5	14.8	5	7	12	41.7:58.3	22.2
1997	21	15	36	58.3:41.7	65.5	1	6	7	14.3:85.7	12.7	2	10	12	16.7:83.3	21.8
1998	17	26	43	39.5:60.5	45.7	9	13	22	40.9:59.1	23.4	7	22	29	24.1:75.9	30.9
Average	32	39	65	45.1:54.9	59.6	7	13	18	35.0:65.0	16.5	6	23	26	20.7:79.3	23.9

Appendix A8. Age and gender composition of the greater sage-grouse harvest, Eastern Moffat and Northwestern Routt counties, Colorado, 1976–1998. The season was closed in 1998 but some wings were received. There were no wings received in 1995.

	Juveniles					Yearlings					Adults				
Year	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest
1976	10	15	25	40.0:60.0	46.3	11	7	18	61.1:38.9	33.3	3	8	11	27.3:72.7	20.4
1977	14	22	36	38.9:61.1	39.6	4	14	18	22.2:77.8	19.8	13	24	37	35.1:64.9	40.7
1978	99	108	207	47.8:52.2	77.8	8	17	25	32.0:68.0	9.4	10	24	34	29.4:70.6	12.8
1979	112	103	215	52.1:47.9	57.5	27	84	111	24.3:75.7	29.7	3	45	48	6.3:93.8	12.8
1980	69	81	150	46.0:54.0	50.8	18	48	66	27.3:72.7	22.4	26	53	79	32.9:67.1	26.8
1981	83	107	190	43.7:56.3	42.7	43	85	128	33.6:66.4	28.8	28	99	127	22.0:78.0	28.5
1982	52	35	87	59.8:40.2	46.3	14	36	50	28.0:72.0	26.6	17	34	51	33.3:66.7	27.1
1983	42	54	96	43.8:56.3	47.5	21	23	44	47.7:52.3	21.8	18	44	62	29.0:71.0	30.7
1984	15	21	36	41.7:58.3	62.1	1	9	10	10.0:90.0	17.2	4	8	12	33.3:66.7	20.7
1985	34	50	84	40.5:59.5	65.1	6	22	28	21.4:78.6	21.7	3	14	17	17.6:82.4	13.2
1986	52	58	110	47.3:52.7	70.1	15	14	29	51.7:48.3	18.5	5	13	18	27.8:72.2	11.5
1987	53	44	97	54.6:45.4	65.1	6	22	28	21.4:78.6	18.8	4	20	24	16.7:83.3	16.1
1988	36	40	76	47.4:52.6	50.7	12	24	36	33.3:66.7	24.0	8	30	38	21.1:78.9	25.3
1989	79	68	147	53.7:46.3	59.8	19	30	49	38.8:61.2	19.9	4	46	50	8.0:92.0	20.3
1990	82	81	163	50.3:49.7	49.8	40	49	89	44.9:55.1	27.2	26	49	75	34.7:65.3	22.9
1991	28	33	61	45.9:54.1	42.1	15	24	39	38.5:61.5	26.9	14	31	45	31.1:68.9	31.0
1992	12	15	27	44.4:55.6	34.2	9	9	18	50.0:50.0	22.8	7	27	34	20.6:79.4	43.0
1993	11	13	24	45.8:54.2	32.4	3	7	10	30.0:70.0	13.5	8	32	40	20.0:80.0	54.1
1994	20	24	44	45.5:54.5	62.0	1	13	14	7.1:92.9	19.7	1	12	13	7.7:92.3	18.3
1995	0	0	0			0	0	0			0	0	0		
1996	5	6	11	45.5:54.5	47.8	0	5	5	0.0:100.0	21.7	1	6	7	14.3:85.7	30.4
1997	2	0	2	100.0:0.0	100.0	0	0	0		0.0	0	0	0		0.0
1998	0	2	2	0.0:100.0	14.3	0	4	4	0.0:100.0	28.6	0	8	8	0.0:100.0	57.1
Average	40	43	82	48.2:51.8	53.2	12	24	36	33.3:66.7	23.4	9	27	36	25.0:75.0	23.4

Appendix A9. Age and gender composition of the greater sage-grouse harvest, Northcentral Moffat County, Colorado, 1976–1998.

	Juveniles					Yearlings					Adults				
Year	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest
1976	143	202	345	41.4:58.6	65.1	21	55	76	27.6:72.4	14.3	18	91	109	16.5:83.5	20.6
1977	50	71	121	41.3:58.7	33.3	51	54	105	48.6:51.4	28.9	56	81	137	40.9:59.1	37.7
1978	419	460	879	47.7:52.3	71.7	18	43	61	29.5:70.5	5.0	73	213	286	25.5:74.5	23.3
1979	495	612	1107	44.7:55.3	57.1	250	291	541	46.2:53.8	27.9	91	200	291	31.3:68.7	15.0
1980	371	464	835	44.4:55.6	53.0	118	142	260	45.4:54.6	16.5	206	275	481	42.8:57.2	30.5
1981	264	370	634	41.6:58.4	54.8	50	121	171	29.2:70.8	14.8	97	255	352	27.6:72.4	30.4
1982	174	232	406	42.9:57.1	61.4	25	63	88	28.4:71.6	13.3	34	133	167	20.4:79.6	25.3
1983	312	363	675	46.2:53.8	57.1	95	130	225	42.2:57.8	19.0	73	210	283	25.8:74.2	23.9
1984	148	190	338	43.8:56.2	55.7	35	74	109	32.1:67.9	18.0	35	125	160	21.9:78.1	26.4
1985	221	289	510	43.3:56.7	62.7	46	80	126	36.5:63.5	15.5	53	125	178	29.8:70.2	21.9
1986	292	317	609	47.9:52.1	58.6	80	149	229	34.9:65.1	22.0	72	129	201	35.8:64.2	19.3
1987	358	414	772	46.4:53.6	55.9	101	191	292	34.6:65.4	21.2	89	227	316	28.2:71.8	22.9
1988	254	343	597	42.5:57.5	51.3	93	158	251	37.1:62.9	21.6	101	215	316	32.0:68.0	27.1
1989	358	474	832	43.0:57.0	53.9	126	119	245	51.4:48.6	15.9	184	283	467	39.4:60.6	30.2
1990	295	382	677	43.6:56.4	44.5	105	233	338	31.1:68.9	22.2	182	326	508	35.8:64.2	33.4
1991	157	213	370	42.4:57.6	40.7	57	109	166	34.3:65.7	18.2	109	265	374	29.1:70.9	41.1
1992	105	150	255	41.2:58.8	41.3	48	88	136	35.3:64.7	22.0	45	182	227	19.8:80.2	36.7
1993	96	100	196	49.0:51.0	53.1	23	29	52	44.2:55.8	14.1	35	86	121	28.9:71.1	32.8
1994	69	106	175	39.4:60.6	47.7	27	35	62	43.5:56.5	16.9	19	111	130	14.6:85.4	35.4
1995	30	33	63	47.6:52.4	64.9	5	8	13	38.5:61.5	13.4	4	17	21	19.0:81.0	21.6
1996	23	58	81	28.4:71.6	55.9	8	18	26	30.8:69.2	17.9	10	28	38	26.3:73.7	26.2
1997	23	18	41	56.1:43.9	50.0	7	9	16	43.8:56.3	19.5	7	18	25	28.0:72.0	30.5
1998	24	24	48	50.0:50.0	60.0	10	6	16	62.5:37.5	20.0	5	11	16	31.3:68.8	20.0
Average	204	256	459	44.3:55.7	54.5	61	96	157	38.9:61.1	18.6	69	157	226	30.8:69.2	26.8

Appendix A10. Age and gender composition of the greater sage-grouse harvest, Sumpter, Hunt Unit 51, Oregon, 1993–2013.

	Juveniles					Yearlings					Adults				
Year	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest
1993	3	2	5	60.0:40.0	83.3	0	0	0		0.0	0	1	1	0.0:100.0	16.7
1994	1	4	5	20.0:80.0	50.0	0	1	1	0.0:100.0	10.0	0	4	4	0.0:100.0	40.0
1995	0	0	0		0.0	0	0	0		0.0	2	1	3	66.7:33.3	100.0
1996	0	2	2	0.0:100.0	33.3	0	0	0		0.0	3	1	4	75.0:25.0	66.7
1997	1	0	1	100.0:0.0	25.0	0	0	0		0.0	2	1	3	66.7:33.3	75.0
1998	0	0	0			0	0	0			0	0	0		
1999	0	0	0		0.0	0	0	0		0.0	1	1	2	50.0:50.0	100.0
2000	0	1	1	0.0:100.0	33.3	0	1	1	0.0:100.0	33.3	0	1	1	0.0:100.0	33.3
2001	0	0	0		0.0	0	0	0		0.0	0	2	2	0.0:100.0	100.0
2002	0	0	0			0	0	0			0	0	0		
2003	0	0	0		0.0	0	0	0		0.0	2	2	4	50.0:50.0	100.0
2004	1	0	1	100.0:0.0	100.0	0	0	0		0.0	0	0	0		0.0
2005	1	1	2	50.0:50.0	100.0	0	0	0		0.0	0	0	0		0.0
2006	0	0	0			0	0	0			0	0	0		
2007	0	0	0			0	0	0			0	0	0		
2008	0	0	0		0.0	0	0	0		0.0	0	2	2	0.0:100.0	100.0
2009	0	0	0		0.0	0	0	0		0.0	2	0	2	100.0:0.0	100.0
2010	0	0	0			0	0	0			0	0	0		
2011	0	0	0			0	0	0			0	0	0		
2012	0	0	0			0	0	0			0	0	0		
2013	0	0	0			0	0	0			0	0	0		
Average	0	1	1	41.2:58.8	36.2	0	0	0	0.0:100.0	4.3	1	1	1	42.9:57.1	59.6

Appendix A11. Age and gender composition of the greater sage-grouse harvest, Lookout Mountain, Hunt Unit 64, Oregon, 1993–2013.

	Juveniles					Yearlings					Adults				
Year	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest
1993	2	3	5	40.0:60.0	62.5	0	0	0		0.0	1	2	3	33.3:66.7	37.5
1994	0	1	1	0.0:100.0	25.0	0	0	0		0.0	1	2	3	33.3:66.7	75.0
1995	3	1	4	75.0:25.0	50.0	0	2	2	0.0:100.0	25.0	1	1	2	50.0:50.0	25.0
1996	0	3	3	0.0:100.0	100.0	0	0	0		0.0	0	0	0		0.0
1997	0	0	0		0.0	0	0	0		0.0	3	0	3	100.0:0.0	100.0
1998	0	0	0		0.0	0	0	0		0.0	4	0	4	100.0:0.0	100.0
1999	3	0	3	100.0:0.0	25.0	0	0	0		0.0	5	4	9	55.6:44.4	75.0
2000	0	0	0		0.0	0	0	0		0.0	2	0	2	100.0:0.0	100.0
2001	1	2	3	33.3:66.7	60.0	0	0	0		0.0	1	1	2	50.0:50.0	40.0
2002	1	1	2	50.0:50.0	66.7	0	0	0		0.0	1	0	1	100.0:0.0	33.3
2003	3	3	6	50.0:50.0	66.7	0	1	1	0.0:100.0	11.1	0	2	2	0.0:100.0	22.2
2004	0	0	0		0.0	0	0	0		0.0	2	1	3	66.7:33.3	100.0
2005	2	2	4	50.0:50.0	50.0	0	0	0		0.0	2	2	4	50.0:50.0	50.0
2006	2	1	3	66.7:33.3	33.3	0	0	0		0.0	5	1	6	83.3:16.7	66.7
2007	0	0	0		0.0	0	0	0		0.0	3	1	4	75.0:25.0	100.0
2008	0	0	0		0.0	0	0	0		0.0	0	2	2	0.0:100.0	100.0
2009	0	0	0			0	0	0			0	0	0		
2010	0	0	0			0	0	0			0	0	0		
2011	0	0	0		0.0	0	0	0		0.0	0	1	1	0.0:100.0	100.0
2012	1	0	1	100.0:0.0	25.0	0	1	1	0.0:100.0	25.0	1	1	2	50.0:50.0	50.0
2013	0	0	0			0	0	0			0	0	0		
Average	1	1	2	51.4:48.6	38.0	0	0	0	0.0:100.0	4.3	2	1	3	60.4:39.6	60.0

Appendix A12. Age and gender composition of the greater sage-grouse harvest, Beulah, Hunt Unit 65, Oregon, 1993–2013.

	Juveniles					Yearlings					Adults				
Year	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest
1993	6	1	7	85.7:14.3	38.9	0	1	1	0.0:100.0	5.6	3	7	10	30.0:70.0	55.6
1994	21	6	27	77.8:22.2	52.9	0	4	4	0.0:100.0	7.8	7	13	20	35.0:65.0	39.2
1995	3	6	9	33.3:66.7	31.0	0	1	1	0.0:100.0	3.4	11	8	19	57.9:42.1	65.5
1996	9	5	14	64.3:35.7	50.0	0	1	1	0.0:100.0	3.6	5	8	13	38.5:61.5	46.4
1997	14	17	31	45.2:54.8	45.6	1	5	6	16.7:83.3	8.8	10	21	31	32.3:67.7	45.6
1998	17	8	25	68.0:32.0	47.2	0	2	2	0.0:100.0	3.8	10	16	26	38.5:61.5	49.1
1999	13	21	34	38.2:61.8	47.9	0	3	3	0.0:100.0	4.2	19	15	34	55.9:44.1	47.9
2000	19	12	31	61.3:38.7	47.0	0	1	1	0.0:100.0	1.5	15	19	34	44.1:55.9	51.5
2001	14	15	29	48.3:51.7	55.8	0	3	3	0.0:100.0	5.8	5	15	20	25.0:75.0	38.5
2002	18	11	29	62.1:37.9	49.2	0	2	2	0.0:100.0	3.4	8	20	28	28.6:71.4	47.5
2003	12	11	23	52.2:47.8	39.7	0	4	4	0.0:100.0	6.9	15	16	31	48.4:51.6	53.4
2004	17	21	38	44.7:55.3	62.3	0	3	3	0.0:100.0	4.9	1	19	20	5.0:95.0	32.8
2005	19	28	47	40.4:59.6	51.1	0	2	2	0.0:100.0	2.2	18	25	43	41.9:58.1	46.7
2006	19	19	38	50.0:50.0	63.3	0	0	0		0.0	5	17	22	22.7:77.3	36.7
2007	4	2	6	66.7:33.3	25.0	0	1	1	0.0:100.0	4.2	3	14	17	17.6:82.4	70.8
2008	6	8	14	42.9:57.1	60.9	0	1	1	0.0:100.0	4.3	0	8	8	0.0:100.0	34.8
2009	18	15	33	54.5:45.5	57.9	0	0	0		0.0	8	16	24	33.3:66.7	42.1
2010	11	17	28	39.3:60.7	49.1	0	4	4	0.0:100.0	7.0	8	17	25	32.0:68.0	43.9
2011	2	8	10	20.0:80.0	37.0	1	2	3	33.3:66.7	11.1	8	6	14	57.1:42.9	51.9
2012	7	5	12	58.3:41.7	38.7	0	4	4	0.0:100.0	12.9	6	9	15	40.0:60.0	48.4
2013	3	1	4	75.0:25:0	80.0	0	0	0		0	1	0	1	100.0:0.0	20.0
Average	12	11	23	51.5:48.5	49.4	0	2	2	0.0:100.0	4.3	8	14	22	36.5:63.5	46.0

Appendix A13. Age and gender composition of the greater sage-grouse harvest, Malheur River, Hunt Unit 66, Oregon, 1993–2013.

	Juveniles					Yearlings					Adults				
Year	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest
1993	9	14	23	39.1:60.9	71.9	0	1	1	0.0:100.0	3.1	2	6	8	25.0:75.0	25.0
1994	17	23	40	42.5:57.5	46.0	3	3	6	50.0:50.0	6.9	13	28	41	31.7:68.3	47.1
1995	5	9	14	35.7:64.3	50.0	0	2	2	0.0:100.0	7.1	6	6	12	50.0:50.0	42.9
1996	7	13	20	35.0:65.0	60.6	0	1	1	0.0:100.0	3.0	2	10	12	16.7:83.3	36.4
1997	2	10	12	16.7:83.3	52.2	0	1	1	0.0:100.0	4.3	5	5	10	50.0:50.0	43.5
1998	5	7	12	41.7:58.3	36.4	0	3	3	0.0:100.0	9.1	8	10	18	44.4:55.6	54.5
1999	13	16	29	44.8:55.2	56.9	0	3	3	0.0:100.0	5.9	7	12	19	36.8:63.2	37.3
2000	8	12	20	40.0:60.0	41.7	1	3	4	25.0:75.0	8.3	10	14	24	41.7:58.3	50.0
2001	13	16	29	44.8:55.2	45.3	2	7	9	22.2:77.8	14.1	17	9	26	65.4:34.6	40.6
2002	16	10	26	61.5:38.5	56.5	0	3	3	0.0:100.0	6.5	6	11	17	35.3:64.7	37.0
2003	10	19	29	34.5:65.5	54.7	1	4	5	20.0:80.0	9.4	5	14	19	26.3:73.7	35.8
2004	14	20	34	41.2:58.8	59.6	1	1	2	50.0:50.0	3.5	8	13	21	38.1:61.9	36.8
2005	17	10	27	63.0:37.0	37.0	0	3	3	0.0:100.0	4.1	24	19	43	55.8:44.2	58.9
2006	13	5	18	72.2:27.8	46.2	0	2	2	0.0:100.0	5.1	7	12	19	36.8:63.2	48.7
2007	2	5	7	28.6:71.4	31.8	1	4	5	20.0:80.0	22.7	4	6	10	40.0:60.0	45.5
2008	7	10	17	41.2:58.8	50.0	0	2	2	0.0:100.0	5.9	6	9	15	40.0:60.0	44.1
2009	5	2	7	71.4:28.6	43.8	0	2	2	0.0:100.0	12.5	3	4	7	42.9:57.1	43.8
2010	9	11	20	45.0:55.0	66.7	0	1	1	0.0:100.0	3.3	2	7	9	22.2:77.8	30.0
2011	0	0	0		0.0	0	0	0		0.0	0	5	5	0.0:100.0	100.0
2012	1	0	1	100.0:0.0	33.3	0	0	0		0.0	2	0	2	100.0:0.0	66.7
2013	0	1	1	0.0:100.0	33.3	0	1	1	0.0:100.0	33.3	0	1	1	0.0:100.0	33.3
Average	8	10	18	44.8.0:55.2	49.5	0	2	3	16.1:83.9	7.2	7	10	17	40.5:59.5	43.3

Appendix A14. Age and gender composition of the greater sage-grouse harvest, Owyhee, Hunt Unit 67, Oregon, 1993–2013.

	Juveniles					Yearlings					Adults				
Year	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest
1993	1	3	4	25.0:75.0	25.0	0	0	0		0.0	0	12	12	0.0:100.0	75.0
1994	7	5	12	58.3:41.7	40.0	0	0	0		0.0	2	16	18	11.1:88.9	60.0
1995	1	5	6	16.7:83.3	37.5	0	1	1	0.0:100.0	6.3	3	6	9	33.3:66.7	56.3
1996	8	12	20	40.0:60.0	62.5	0	3	3	0.0:100.0	9.4	2	7	9	22.2:77.8	28.1
1997	3	4	7	42.9:57.1	36.8	0	0	0		0.0	5	7	12	41.7:58.3	63.2
1998	4	2	6	66.7:33.3	18.8	0	1	1	0.0:100.0	3.1	14	11	25	56.0:44.0	78.1
1999	12	11	23	52.2:47.8	47.9	0	3	3	0.0:100.0	6.3	9	13	22	40.9:59.1	45.8
2000	15	13	28	53.6:46.4	53.8	0	2	2	0.0:100.0	3.8	12	10	22	54.5:45.5	42.3
2001	24	21	45	53.3:46.7	66.2	1	3	4	25.0:75.0	5.9	7	12	19	36.8:63.2	27.9
2002	6	13	19	31.6:68.4	47.5	0	3	3	0.0:100.0	7.5	6	12	18	33.3:66.7	45.0
2003	6	4	10	60.0:40.0	25.6	0	2	2	0.0:100.0	5.1	12	15	27	44.4:55.6	69.2
2004	13	15	28	46.4:53.6	52.8	0	1	1	0.0:100.0	1.9	8	16	24	33.3:66.7	45.3
2005	10	8	18	55.6:44.4	32.1	0	3	3	0.0:100.0	5.4	14	21	35	40.0:60.0	62.5
2006	5	5	10	50.0:50.0	22.2	0	1	1	0.0:100.0	2.2	21	13	34	61.8:38.2	75.6
2007	4	1	5	80.0:20.0	20.8	1	1	2	50.0:50.0	8.3	5	12	17	29.4:70.6	70.8
2008	5	3	8	62.5:37.5	50.0	0	0	0		0.0	2	6	8	25.0:75.0	50.0
2009	9	3	12	75.0:25.0	54.5	0	0	0		0.0	1	9	10	10.0:90.0	45.5
2010	4	2	6	66.7:33.3	37.5	0	1	1	0.0:100.0	6.3	6	3	9	66.7:33.3	56.3
2011	1	1	2	50.0:50.0	13.3	0	0	0		0.0	7	6	13	53.8:46.2	86.7
2012	7	11	18	38.9:61.1	43.9	0	2	2	0.0:100.0	4.9	10	11	21	47.6:52.4	51.2
2013	3	3	6	50.0:50.0	46.2	0	0	0		0	4	3	7	57.1:42.9	53.8
Average	7	7	14	50.5:49.5	42.3	0	1	1	6.9:93.1	4.2	7	11	18	40.4:59.6	53.5

Appendix A15. Age and gender composition of the greater sage-grouse harvest, Whitehorse, Hunt Unit 68, Oregon, 1993–2013. The season was closed in 2012.

	Juveniles					Yearlings					Adults				
Year	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest
1993	27	30	57	47.4:52.6	44.9	0	3	3	0.0:100.0	2.4	29	38	67	43.3:56.7	52.8
1994	38	53	91	41.8:58.2	54.5	0	8	8	0.0:100.0	4.8	23	45	68	33.8:66.2	40.7
1995	25	33	58	43.1:56.9	48.7	1	7	8	12.5:87.5	6.7	13	40	53	24.5:75.5	44.5
1996	32	37	69	46.4:53.6	51.1	0	8	8	0.0:100.0	5.9	18	40	58	31.0:69.0	43.0
1997	39	36	75	52.0:48.0	58.1	1	15	16	6.3:93.8	12.4	16	22	38	42.1:57.9	29.5
1998	23	32	55	41.8:58.2	56.7	0	2	2	0.0:100.0	2.1	14	26	40	35.0:65.0	41.2
1999	43	46	89	48.3:51.7	64.5	0	6	6	0.0:100.0	4.3	14	29	43	32.6:67.4	31.2
2000	18	31	49	36.7:63.3	35.8	7	15	22	31.8:68.2	16.1	34	32	66	51.5:48.5	48.2
2001	44	39	83	53.0:47.0	55.3	0	9	9	0.0:100.0	6.0	25	33	58	43.1:56.9	38.7
2002	58	42	100	58.0:42.0	63.3	1	11	12	8.3:91.7	7.6	22	24	46	47.8:52.2	29.1
2003	37	37	74	50.0:50.0	51.4	0	6	6	0.0:100.0	4.2	34	30	64	53.1:46.9	44.4
2004	52	61	113	46.0:54.0	52.8	0	11	11	0.0:100.0	5.1	44	46	90	48.9:51.1	42.1
2005	47	52	99	47.5:52.5	44.4	0	14	14	0.0:100.0	6.3	43	67	110	39.1:60.9	49.3
2006	42	44	86	48.8:51.2	48.0	1	7	8	12.5:87.5	4.5	49	36	85	57.6:42.4	47.5
2007	12	9	21	57.1:42.9	18.8	0	3	3	0.0:100.0	2.7	36	52	88	40.9:59.1	78.6
2008	27	38	65	41.5:58.5	63.7	0	3	3	0.0:100.0	2.9	7	27	34	20.6:79.4	33.3
2009	28	35	63	44.4:55.6	56.8	0	5	5	0.0:100.0	4.5	25	18	43	58.1:41.9	38.7
2010	28	41	69	40.6:59.4	52.7	0	7	7	0.0:100.0	5.3	14	41	55	25.5:74.5	42.0
2011	24	37	61	39.3:60.7	48.0	0	10	10	0.0:100.0	7.9	22	34	56	39.3:60.7	44.1
2012	0	0	0			0	0	0			0	0	0		
2013	7	3	10	70.0:30.0	47.6	0	1	1	0.0:100.0	4.8	5	5	10	50.0:50.0	47.6
Average	33	37	69	46.9:53.1	51.0	1	8	8	6.8:93.2	6.0	24	34	59	41.6:58.4	43.1

Appendix A16. Age and gender composition of the greater sage-grouse harvest, Steens Mountain, Hunt Unit 69, Oregon, 1993–2013.

	Juveniles					Yearlings					Adults				
Year	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest
1993	13	11	24	54.2:45.8	29.3	4	4	8	50.0:50.0	9.8	23	27	50	46.0:54.0	61.0
1994	28	23	51	54.9:45.1	45.5	0	5	5	0.0:100.0	4.5	17	39	56	30.4:69.6	50.0
1995	7	8	15	46.7:53.3	23.4	0	2	2	0.0:100.0	3.1	24	23	47	51.1:48.9	73.4
1996	9	20	29	31.0:69.0	42.0	1	4	5	20.0:80.0	7.2	14	21	35	40.0:60.0	50.7
1997	16	18	34	47.1:52.9	51.5	4	3	7	57.1:42.9	10.6	12	13	25	48.0:52.0	37.9
1998	6	5	11	54.5:45.5	24.4	1	1	2	50.0:50.0	4.4	14	18	32	43.8:56.3	71.1
1999	12	12	24	50.0:50.0	50.0	1	3	4	25.0:75.0	8.3	6	14	20	30.0:70.0	41.7
2000	11	11	22	50.0:50.0	57.9	0	3	3	0.0:100.0	7.9	8	5	13	61.5:38.5	34.2
2001	12	10	22	54.5:45.5	52.4	1	2	3	33.3:66.7	7.1	11	6	17	64.7:35.3	40.5
2002	17	13	30	56.7:43.3	43.5	1	12	13	7.7:92.3	18.8	14	12	26	53.8:46.2	37.7
2003	11	19	30	36.7:63.3	53.6	1	3	4	25.0:75.0	7.1	12	10	22	54.5:45.5	39.3
2004	9	16	25	36.0:64.0	31.6	1	5	6	16.7:83.3	7.6	21	27	48	43.8:56.3	60.8
2005	14	22	36	38.9:61.1	50.7	0	1	1	0.0:100.0	1.4	25	9	34	73.5:26.5	47.9
2006	10	18	28	35.7:64.3	41.2	3	1	4	75.0:25.0	5.9	22	14	36	61.1:38.9	52.9
2007	6	14	20	30.0:70.0	26.0	1	5	6	16.7:83.3	7.8	24	27	51	47.1:52.9	66.2
2008	13	4	17	76.5:23.5	56.7	0	1	1	0.0:100.0	3.3	7	5	12	58.3:41.7	40.0
2009	3	12	15	20.0:80.0	46.9	0	1	1	0.0:100.0	3.1	13	3	16	81.3:18.8	50.0
2010	5	1	6	83.3:16.7	17.6	0	2	2	0.0:100.0	5.9	19	7	26	73.1:26.9	76.5
2011	5	3	8	62.5:37.5	25.8	0	0	0		0.0	15	8	23	65.2:34.8	74.2
2012	6	6	12	50.0:50.0	25.0	2	1	3	66.7:33.3	6.3	23	10	33	69.7:30.3	68.8
2013	7	7	14	50.0:50.0	43.8	0	4	4	0.0:100.0	12.5	5	9	14	35.7:64.3	43.8
Average	10	12	23	46.5:53.5	39.6	1	3	4	17.0:83.0	7.0	16	15	30	51.7:48.3	53.3

Appendix A17. Age and gender composition of the greater sage-grouse harvest, Beatys Butte, Hunt Unit 70, Oregon, 1993–2013.

	Juveniles					Yearlings					Adults				
Year	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest
1993	23	23	46	50.0:50.0	59.7	1	2	3	33.3:66.7	3.9	13	15	28	46.4:53.6	36.4
1994	13	21	34	38.2:61.8	30.1	2	14	16	12.5:87.5	14.2	26	37	63	41.3:58.7	55.8
1995	14	18	32	43.8:56.3	31.7	0	1	1	0.0:100.0	1.0	16	52	68	23.5:76.5	67.3
1996	14	16	30	46.7:53.3	43.5	0	3	3	0.0:100.0	4.3	11	25	36	30.6:69.4	52.2
1997	42	32	74	56.8:43.2	56.1	1	9	10	10.0:90.0	7.6	18	30	48	37.5:62.5	36.4
1998	22	27	49	44.9:55.1	67.1	0	2	2	0.0:100.0	2.7	6	16	22	27.3:72.7	30.1
1999	28	37	65	43.1:56.9	55.1	3	4	7	42.9:57.1	5.9	21	25	46	45.7:54.3	39.0
2000	16	25	41	39.0:61.0	43.2	2	9	11	18.2:81.8	11.6	18	25	43	41.9:58.1	45.3
2001	18	20	38	47.4:52.6	45.2	1	3	4	25.0:75.0	4.8	23	19	42	54.8:45.2	50.0
2002	29	26	55	52.7:47.3	58.5	0	2	2	0.0:100.0	2.1	21	16	37	56.8:43.2	39.4
2003	27	30	57	47.4:52.6	52.8	0	3	3	0.0:100.0	2.8	31	17	48	64.6:35.4	44.4
2004	32	38	70	45.7:54.3	52.2	0	9	9	0.0:100.0	6.7	17	38	55	30.9:69.1	41.0
2005	27	29	56	48.2:51.8	44.1	0	8	8	0.0:100.0	6.3	37	26	63	58.7:41.3	49.6
2006	21	33	54	38.9:61.1	51.9	3	5	8	37.5:62.5	7.7	19	23	42	45.2:54.8	40.4
2007	6	10	16	37.5:62.5	21.9	0	6	6	0.0:100.0	8.2	20	31	51	39.2:60.8	69.9
2008	18	21	39	46.2:53.8	60.0	0	2	2	0.0:100.0	3.1	8	16	24	33.3:66.7	36.9
2009	31	27	58	53.4:46.6	58.0	0	9	9	0.0:100.0	9.0	14	19	33	42.4:57.6	33.0
2010	12	13	25	48.0:52.0	45.5	0	1	1	0.0:100.0	1.8	8	21	29	27.6:72.4	52.7
2011	24	27	51	47.1:52.9	51.5	0	3	3	0.0:100.0	3.0	30	15	45	66.7:33.3	45.5
2012	3	12	15	20.0:80.0	17.6	12	12	24	50.0:50.0	28.2	20	26	46	43.5:56.5	54.1
2013	23	31	54	42.6:57.4	58.1	2	5	7	28.6:71.4	7.5	14	18	32	43.8:56.2	34.4
Average	21	25	46	46.2:53.8	48.0	1	5	7	19.4:80.6	7.0	19	24	43	43.4:56.6	45.1

Appendix A18. Age and gender composition of the greater sage-grouse harvest, Juniper, Hunt Unit 71, Oregon, 1993–2013.

	Juveniles					Yearlings					Adults				
Year	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest
1993	9	6	15	60.0:40.0	53.6	0	0	0		0.0	7	6	13	53.8:46.2	46.4
1994	2	8	10	20.0:80.0	18.5	1	6	7	14.3:85.7	13.0	6	31	37	16.2:83.8	68.5
1995	3	4	7	42.9:57.1	23.3	0	0	0		0.0	5	18	23	21.7:78.3	76.7
1996	10	12	22	45.5:54.5	47.8	0	3	3	0.0:100.0	6.5	4	17	21	19.0:81.0	45.7
1997	12	20	32	37.5:62.5	61.5	0	1	1	0.0:100.0	1.9	7	12	19	36.8:63.2	36.5
1998	5	9	14	35.7:64.3	50.0	0	0	0		0.0	3	11	14	21.4:78.6	50.0
1999	16	14	30	53.3:46.7	47.6	0	2	2	0.0:100.0	3.2	12	19	31	38.7:61.3	49.2
2000	13	11	24	54.2:45.8	47.1	1	0	1	100.0:0.0	2.0	13	13	26	50.0:50.0	51.0
2001	14	22	36	38.9:61.1	59.0	0	2	2	0.0:100.0	3.3	6	17	23	26.1:73.9	37.7
2002	14	22	36	38.9:61.1	60.0	1	3	4	25.0:75.0	6.7	11	9	20	55.0:45.0	33.3
2003	7	13	20	35.0:65.0	39.2	0	2	2	0.0:100.0	3.9	10	19	29	34.5:65.5	56.9
2004	11	11	22	50.0:50.0	48.9	0	1	1	0.0:100.0	2.2	10	12	22	45.5:54.5	48.9
2005	10	13	23	43.5:56.5	39.0	0	3	3	0.0:100.0	5.1	13	20	33	39.4:60.6	55.9
2006	5	11	16	31.3:68.8	32.0	0	0	0		0.0	14	20	34	41.2:58.8	68.0
2007	0	4	4	0.0:100.0	13.8	0	1	1	0.0:100.0	3.4	8	16	24	33.3:66.7	82.8
2008	13	7	20	65.0:35.0	51.3	0	0	0		0.0	6	13	19	31.6:68.4	48.7
2009	10	12	22	45.5:54.5	56.4	0	1	1	0.0:100.0	2.6	6	10	16	37.5:62.5	41.0
2010	4	9	13	30.8:69.2	44.8	0	2	2	0.0:100.0	6.9	8	6	14	57.1:42.9	48.3
2011	8	4	12	66.7:33.3	48.0	0	0	0		0.0	6	7	13	46.2:53.8	52.0
2012	0	1	1	0.0:100.0	4.8	0	3	3	0.0:100.0	14.3	8	9	17	47.1:52.9	81.0
2013	2	2	4	50.0:50.0	50	0	2	2	0.0:100.0	25	0	2	2	0.0:100.0	25
Average	8	10	18	43.9:56.1	44.1	0	2	2	8.6:91.4	4.0	8	14	21	36.2:63.8	51.8

Appendix A19. Age and gender composition of the greater sage-grouse harvest, Silvies, Hunt Unit 72, Oregon, 1993–2013.

	Juveniles					Yearlings					Adults				
Year	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest
1993	8	4	12	66.7:33.3	85.7	0	1	1	0.0:100.0	7.1	0	1	1	0.0:100.0	7.1
1994	3	6	9	33.3:66.7	47.4	0	1	1	0.0:100.0	5.3	0	9	9	0.0:100.0	47.4
1995	3	0	3	100.0:0.0	75.0	0	0	0		0.0	0	1	1	0.0:100.0	25.0
1996	0	4	4	0.0:100.0	50.0	0	0	0		0.0	0	4	4	0.0:100.0	50.0
1997	0	7	7	0.0:100.0	63.6	0	0	0		0.0	0	4	4	0.0:100.0	36.4
1998	0	3	3	0.0:100.0	27.3	0	0	0		0.0	0	8	8	0.0:100.0	72.7
1999	9	2	11	81.8:18.2	91.7	0	0	0		0.0	0	1	1	0.0:100.0	8.3
2000	0	1	1	0.0:100.0	20.0	0	0	0		0.0	4	0	4	100.0:0.0	80.0
2001	2	1	3	66.7:33.3	33.3	0	1	1	0.0:100.0	11.1	2	3	5	40.0:60.0	55.6
2002	3	5	8	37.5:62.5	80.0	0	1	1	0.0:100.0	10.0	0	1	1	0.0:100.0	10.0
2003	2	1	3	66.7:33.3	25.0	0	0	0		0.0	1	8	9	11.1:88.9	75.0
2004	0	0	0			0	0	0			0	0	0		
2005	0	3	3	0.0:100.0	37.5	1	0	1	100.0:0.0	12.5	2	2	4	50.0:50.0	50.0
2006	2	6	8	25.0:75.0	61.5	0	1	1	0.0:100.0	7.7	1	3	4	25.0:75.0	30.8
2007	4	4	8	50.0:50.0	50.0	0	1	1	0.0:100.0	6.3	3	4	7	42.9:57.1	43.8
2008	2	1	3	66.7:33.3	21.4	0	0	0		0.0	4	7	11	36.4:63.6	78.6
2009	1	3	4	25.0:75.0	36.4	0	1	1	0.0:100.0	9.1	3	3	6	50.0:50.0	54.5
2010	0	2	2	0.0:100.0	25.0	0	0	0		0.0	1	5	6	16.7:83.3	75.0
2011	0	3	3	0.0:100.0	50.0	0	0	0		0.0	2	1	3	66.7:33.3	50.0
2012	2	1	3	66.7:33.3	75.0	0	1	1	0.0:100.0	25.0	0	0	0		0.0
2013	3	2	5	60.0:40.0	71.4	0	1	1	0.0:100.0	14.3	0	1	1	0.0:100.0	14.3
Average	2	3	5	42.7:57.3	51.0	0	0	0	10.0:90.0	5.0	1	3	4	25.8:74.2	44.1

Appendix A20. Age and gender composition of the greater sage-grouse harvest, Wagontire, Hunt Unit 73, Oregon, 1993–2013.

	Juveniles					Yearlings					Adults				
Year	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest
1993	0	0	0		0.0	0	0	0		0.0	1	4	5	20.0:80.0	100.0
1994	6	4	10	60.0:40.0	35.7	0	1	1	0.0:100.0	3.6	7	10	17	41.2:58.8	60.7
1995	1	3	4	25.0:75.0	23.5	0	2	2	0.0:100.0	11.8	2	9	11	18.2:81.8	64.7
1996	5	11	16	31.3:68.8	64.0	0	0	0		0.0	1	8	9	11.1:88.9	36.0
1997	8	7	15	53.3:46.7	53.6	0	1	1	0.0:100.0	3.6	3	9	12	25.0:75.0	42.9
1998	12	14	26	46.2:53.8	57.8	0	2	2	0.0:100.0	4.4	7	10	17	41.2:58.8	37.8
1999	4	3	7	57.1:42.9	33.3	0	1	1	0.0:100.0	4.8	5	8	13	38.5:61.5	61.9
2000	10	10	20	50.0:50.0	41.7	0	3	3	0.0:100.0	6.3	9	16	25	36.0:64.0	52.1
2001	14	18	32	43.8:56.3	60.4	0	5	5	0.0:100.0	9.4	7	9	16	43.8:56.3	30.2
2002	3	13	16	18.8:81.3	55.2	1	1	2	50.0:50.0	6.9	3	8	11	27.3:72.7	37.9
2003	4	6	10	40.0:60.0	34.5	1	2	3	33.3:66.7	10.3	6	10	16	37.5:62.5	55.2
2004	6	5	11	54.5:45.5	55.0	1	1	2	50.0:50.0	10.0	1	6	7	14.3:85.7	35.0
2005	6	8	14	42.9:57.1	60.9	1	2	3	33.3:66.7	13.0	1	5	6	16.7:83.3	26.1
2006	10	4	14	71.4:28.6	53.8	2	1	3	66.7:33.3	11.5	4	5	9	44.4:55.6	34.6
2007	5	7	12	41.7:58.3	40.0	0	0	0		0.0	4	14	18	22.2:77.8	60.0
2008	2	2	4	50.0:50.0	25.0	0	0	0		0.0	6	6	12	50.0:50.0	75.0
2009	7	10	17	41.2:58.8	73.9	0	0	0		0.0	2	4	6	33.3:66.7	26.1
2010	3	4	7	42.9:57.1	35.0	0	0	0		0.0	2	11	13	15.4:84.6	65.0
2011	5	4	9	55.6:44.4	56.3	0	2	2	0.0:100.0	12.5	1	4	5	20.0:80.0	31.3
2012	4	4	8	50.0:50.0	32.0	0	1	1	0.0:100.0	4.0	6	10	16	37.5:62.5	64.0
2013	7	5	12	58.3:41.7	63.2	0	0	0		0	0	7	7	0.0:100.0	36.8
Average	6	7	13	46.2:53.8	48.4	0	1	1	19.4:80.6	5.7	4	8	12	31.1:68.9	46.0

Appendix A21. Age and gender composition of the greater sage-grouse harvest, Warner, Hunt Unit 74, Oregon, 1993–2013.

	Juveniles					Yearlings					Adults				
Year	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest	Males (*n*)	Females (*n*)	Total (*n*)	Male:female sex ratio	% in harvest
1993	2	2	4	50.0:50.0	30.8	0	2	2	0.0:100.0	15.4	1	6	7	14.3:85.7	53.8
1994	9	14	23	39.1:60.9	39.7	0	2	2	0.0:100.0	3.4	14	19	33	42.4:57.6	56.9
1995	3	6	9	33.3:66.7	26.5	0	2	2	0.0:100.0	5.9	3	20	23	13.0:87.0	67.6
1996	11	13	24	45.8:54.2	61.5	0	0	0		0.0	8	7	15	53.3:46.7	38.5
1997	10	18	28	35.7:64.3	54.9	0	2	2	0.0:100.0	3.9	7	14	21	33.3:66.7	41.2
1998	16	12	28	57.1:42.9	62.2	0	4	4	0.0:100.0	8.9	6	7	13	46.2:53.8	28.9
1999	20	39	59	33.9:66.1	67.8	1	6	7	14.3:85.7	8.0	9	12	21	42.9:57.1	24.1
2000	10	12	22	45.5:54.5	56.4	0	1	1	0.0:100.0	2.6	6	10	16	37.5:62.5	41.0
2001	25	15	40	62.5:37.5	51.9	0	10	10	0.0:100.0	13.0	9	18	27	33.3:66.7	35.1
2002	27	25	52	51.9:48.1	65.0	0	1	1	0.0:100.0	1.3	14	13	27	51.9:48.1	33.8
2003	26	28	54	48.1:51.9	59.3	1	3	4	25.0:75.0	4.4	14	19	33	42.4:57.6	36.3
2004	23	35	58	39.7:60.3	53.2	1	11	12	8.3:91.7	11.0	18	21	39	46.2:53.8	35.8
2005	18	25	43	41.9:58.1	50.0	0	2	2	0.0:100.0	2.3	10	31	41	24.4:75.6	47.7
2006	18	23	41	43.9:56.1	55.4	0	2	2	0.0:100.0	2.7	10	21	31	32.3:67.7	41.9
2007	15	18	33	45.5:54.5	46.5	0	6	6	0.0:100.0	8.5	11	21	32	34.4:65.6	45.1
2008	24	30	54	44.4:55.6	54.0	0	8	8	0.0:100.0	8.0	10	28	38	26.3:73.7	38.0
2009	19	29	48	39.6:60.4	60.8	0	5	5	0.0:100.0	6.3	15	11	26	57.7:42.3	32.9
2010	20	25	45	44.4:55.6	54.2	1	4	5	20.0:80.0	6.0	11	22	33	33.3:66.7	39.8
2011	9	15	24	37.5:62.5	34.3	1	3	4	25.0:75.0	5.7	14	28	42	33.3:66.7	60.0
2012	8	16	24	33.3:66.7	38.1	0	8	8	0.0:100.0	12.7	13	18	31	41.9:58.1	49.2
2013	19	18	37	51.4:48.6	69.8	0	2	2	0.0:100.0	3.8	3	11	14	21.4:78.6	26.4
Average	16	20	36	44.3:55.7	53.5	0	4	4	5.6:94.4	6.3	10	17	27	36.6:63.4	40.2

Appendix B1. Greater sage-grouse productivity data, North Park, Colorado, 1974–1998.

Year	Estimated annual reproductive success						Juveniles		
	Adult		Yearling		All females		In harvest (%)	Per hen	Per successful hen
	%	*n*	%	*n*	%	*n*			
1974	64.8	165	46.1	89	58.3	254	50.1	1.4	2.4
1975	52.8	127	39.0	59	48.4	186	42.0	1.1	2.4
1976	52.9	121	26.8	71	43.2	192	42.3	1.1	2.5
1977	59.1	171	32.9	76	51.0	247	45.9	1.2	2.3
1978	59.7	129	38.3	81	51.4	210	53.2	1.8	3.6
1979	65.1	129	55.8	154	60.1	283	57.7	2.2	3.7
1980	55.7	158	30.6	170	42.7	328	49.1	1.4	3.3
1981	37.4	227	21.9	151	31.2	378	47.4	1.3	4.1
1982	58.8	170	37.5	80	52.0	250	50.6	1.6	3.0
1983	65.6	183	50.6	164	58.5	347	57.4	1.9	3.3
1984	74.6	126	53.3	137	63.5	263	57.0	1.9	2.9
1985	54.9	113	43.8	112	49.3	225	53.6	1.6	3.2
1986	61.0	105	47.3	93	54.5	198	61.8	2.0	3.7
1987	50.4	115	36.0	114	43.2	229	54.2	1.6	3.7
1988	61.1	90	38.3	81	50.3	171	42.9	1.1	2.1
1989	49.4	85	19.6	92	33.9	177	46.1	1.1	3.1
1990	45.9	109	32.2	59	41.1	168	38.7	0.8	2.0
1991	53.0	83	28.6	28	46.8	111	43.0	1.0	2.1
1992	33.3	63	35.0	20	33.7	83	36.7	0.9	2.6
1993	69.2	78	40.0	20	63.3	98	45.1	1.1	1.7
1994	62.1	58	43.8	16	58.1	74	56.1	1.8	3.1
1995	63.6	11	60.0	15	61.5	26	36.5	0.9	1.4
1996	67.7	31	40.0	15	58.7	46	54.7	1.5	2.6
1997	53.6	28	44.4	18	50.0	46	51.4	1.6	3.1
1998	47.1	34	17.6	34	32.4	68	37.2	0.7	2.2
Totals	56.6	2709	38.8	1949	49.1	4658	50.7	1.5	3.0

Appendix B2. Greater sage-grouse productivity data, Middle Park, Colorado, 1975–1998.

Year	Estimated annual reproductive success						Juveniles		
	Adult		Yearling		All females		In harvest (%)	Per hen	Per successful hen
	%	*n*	%	*n*	%	*n*			
1975	85.7	14	37.5	8	68.2	22	66.7	2.5	3.6
1976	64.3	14	64.3	14	64.3	28	63.9	2.5	3.8
1977	51.9	27	25.0	20	40.4	47	57.1	1.9	4.7
1978	68.4	38	44.4	27	58.5	65	45.9	1.4	2.3
1979	80.0	30	42.9	21	64.7	51	50.0	1.6	2.5
1980	53.3	15	70.6	17	62.5	32	51.6	1.5	2.5
1981	33.3	9	33.3	9	33.3	18	22.0	0.5	1.5
1982	77.8	9	25.0	4	61.5	13	75.8	3.6	5.9
1983	71.4	21	27.8	18	51.3	39	51.6	1.7	3.2
1984	92.3	13	40.0	15	64.3	28	56.0	2.2	3.4
1985	71.4	14	50.0	14	60.7	28	38.7	0.9	1.4
1986	65.2	23	37.5	16	53.8	39	58.6	1.7	3.1
1987	83.3	18	20.0	10	60.7	28	66.4	2.7	4.4
1988	75.0	16	50.0	10	65.4	26	54.3	1.9	2.9
1989	66.7	15	71.4	7	68.2	22	38.2	1.2	1.7
1990	60.0	10	33.3	9	47.4	19	38.6	1.4	3.0
1991	66.7	18	71.4	7	68.0	25	47.9	1.4	2.1
1992	23.8	21	28.6	7	25.0	28	45.3	1.2	4.9
1993	40.0	10	33.3	12	36.4	22	54.7	1.3	3.6
1994		0		0		0	100.0		
1995	75.0	4	100.0	1	80.0	5	30.8	0.8	1.0
1996	50.0	2	66.7	3	60.0	5	68.4	2.6	4.3
1997	100.0	3	33.3	3	66.7	6	30.0	0.5	0.7
1998	0.0	1	0.0	1	0.0	2	0.0	0.0	
Totals	65.5	345	42.7	253	55.9	598	52.6	1.6	2.9

Appendix B3. Greater sage-grouse productivity data, Eagle, Colorado, 1977–1998. Wings of only juveniles were reported in 1982 and no wings were received in 1995 and 1996.

Year	Estimated annual reproductive success						Juveniles		
	Adult		Yearling		All females		In harvest (%)	Per hen	Per successful hen
	%	*n*	%	*n*	%	*n*			
1977	50.0	4	50.0	8	50.0	12	65.7	1.9	3.8
1978	57.9	19	100.0	3	63.6	22	59.5	2.1	3.4
1979	62.5	8	83.3	6	71.4	14	48.6	2.6	3.6
1980	60.0	10	42.9	7	52.9	17	69.1	2.8	5.2
1981	100.0	1	0.0	1	50.0	2	76.9	5.0	10.0
1982		0		0		0	100.0		
1983	75.0	12	50.0	16	60.7	28	56.7	1.8	3.0
1984	100.0	3	83.3	6	88.9	9	42.3	1.2	1.4
1985	71.4	7	50.0	2	66.7	9	58.8	2.2	3.3
1986	50.0	8	50.0	4	50.0	12	69.2	2.3	4.5
1987	75.0	8	40.0	10	55.6	18	55.6	1.9	3.5
1988	83.3	6	33.3	6	58.3	12	54.1	1.7	2.9
1989	100.0	1	100.0	1	100.0	2	75.0	3.0	3.0
1990	75.0	8		0	75.0	8	61.5	2.0	2.7
1991	100.0	2	80.0	5	85.7	7	63.6	4.0	4.7
1992	33.3	3	0.0	1	25.0	4	45.5	2.5	10.0
1993	100.0	2		0	100.0	2	25.0	0.5	0.5
1994	100.0	2		0	100.0	2	36.4	2.0	2.0
1995		0		0		0	0.0		
1996		0		0		0	0.0		
1997		0	100.0	1	100.0	1	50.0	1.0	1.0
1998	100.0	1		0	100.0	1	80.0	4.0	4.0
Totals	68.6	105	55.8	77	63.2	182	59.3	2.3	3.6

Appendix B4. Greater sage-grouse productivity data, Yampa, Colorado, 1977–1998.

Year	Estimated annual reproductive success						Juveniles		
	Adult		Yearling		All females		In harvest (%)	Per hen	Per successful hen
	%	*n*	%	*n*	%	*n*			
1977	45.5	11	25.0	16	33.3	27	58.6	2.1	6.5
1978	50.0	32	50.0	14	50.0	46	45.5	1.2	2.4
1979	68.4	19	39.3	28	51.1	47	37.0	1.1	2.1
1980	48.1	27	52.6	19	50.0	46	42.4	1.3	2.7
1981	50.0	18	20.0	25	32.6	43	21.3	0.4	1.2
1982	60.0	5	25.0	4	44.4	9	57.6	2.1	4.8
1983	83.3	6	57.1	7	69.2	13	57.1	1.8	2.7
1984	100.0	3	33.3	3	66.7	6	51.9	2.3	3.5
1985	42.9	7	0.0	3	30.0	10	34.8	0.8	2.7
1986	100.0	2	0.0	2	50.0	4	63.6	1.8	3.5
1987	0.0	3	66.7	3	33.3	6	33.3	0.7	2.0
1988	75.0	4	50.0	2	66.7	6	16.7	0.8	1.2
1989	0.0	2	33.3	3	20.0	5	43.2	3.2	16.0
1990	50.0	4	50.0	2	50.0	6	47.1	1.3	2.7
1991	60.0	5	80.0	5	70.0	10	48.1	1.3	1.9
1992	66.7	3		0	66.7	3	25.0	1.0	1.5
1993	42.9	14	100.0	2	50.0	16	54.8	1.4	2.9
1994	100.0	1	0.0	1	50.0	2	18.2	1.0	2.0
1995	100.0	4		0	100.0	4	50.0	1.0	1.0
1996		0		0		0	100.0		
1997		0	100.0	1	100.0	1	0.0		
1998	100.0	1		0	100.0	1	100.0		
Totals	55.0	171	39.3	140	47.9	311	43.2	1.2	2.6

Appendix B5. Greater sage-grouse productivity data, Piceance Basin, Colorado, 1977–1994.

Year	Estimated annual reproductive success						Juveniles		
	Adult		Yearling		All females		In harvest (%)	Per hen	Per successful hen
	%	*n*	%	*n*	%	*n*			
1977	73.3	15	55.6	9	66.7	24	49.2	1.3	2.0
1978	76.5	17	50.0	12	65.5	29	65.8	2.6	3.9
1979	100.0	10	100.0	4	100.0	14	54.9	2.8	2.8
1980	66.7	6	33.3	6	50.0	12	67.9	4.4	8.8
1981	0.0	2	100.0	1	33.3	3	83.3	6.7	20.0
1982	66.7	9	50.0	6	60.0	15	69.5	2.7	4.6
1983	50.0	4	77.8	9	69.2	13	62.7	2.5	3.6
1984	71.4	7	60.0	5	66.7	12	61.9	2.2	3.2
1985	50.0	6	50.0	2	50.0	8	69.4	3.1	6.3
1986	45.5	11	41.7	12	43.5	23	37.9	1.1	2.5
1987	50.0	4	40.0	10	42.9	14	63.0	2.4	5.7
1988	60.0	5	80.0	5	70.0	10	55.6	1.5	2.1
1989	20.0	5	37.5	8	30.8	13	36.7	1.4	4.5
1990	33.3	3	0.0	2	20.0	5	37.5	1.8	9.0
1991	0.0	3	0.0	1	0.0	4	14.3	0.3	
1992	50.0	4	20.0	5	33.3	9	47.4	1.0	3.0
1993	75.0	4	0.0	1	60.0	5	57.1	1.6	2.7
1994	100.0	4		0	100.0	4	70.6	3.0	3.0
Totals	63.0	119	50.0	98	57.1	217	57.6	2.1	3.7

Appendix B6. Greater sage-grouse productivity data, Blue Mountain, Colorado, 1976–1998.

Year	Estimated annual reproductive success						Juveniles		
	Adult		Yearling		All females		In harvest (%)	Per hen	Per successful hen
	%	*n*	%	*n*	%	*n*			
1976	50.0	22	20.0	10	40.6	32	61.6	2.2	5.3
1977	35.7	14	28.6	7	33.3	21	60.4	3.0	9.2
1978	51.4	74	36.8	68	44.4	142	62.1	2.3	5.2
1979	54.3	70	36.5	74	45.1	144	45.0	1.4	3.1
1980	56.6	53	25.8	31	45.2	84	68.8	2.8	6.3
1981	41.7	12	52.6	19	48.4	31	54.9	2.2	4.5
1982	55.6	18	33.3	21	43.6	39	70.5	4.1	9.3
1983	69.2	26	29.4	17	53.5	43	63.2	2.1	4.0
1984	60.7	28	46.4	28	53.6	56	63.1	2.8	5.3
1985	86.2	29	41.7	36	61.5	65	67.4	3.4	5.6
1986	55.1	49	36.0	50	45.5	99	59.5	2.3	5.1
1987	48.2	56	41.5	41	45.4	97	66.3	3.1	6.8
1988	61.1	36	20.8	48	38.1	84	50.0	1.8	4.6
1989	49.2	61	29.3	58	39.5	119	41.3	1.3	3.2
1990	41.5	53	15.8	38	30.8	91	55.4	1.7	5.7
1991	55.3	38	31.4	35	43.8	73	54.0	1.7	3.8
1992	36.4	33	13.0	23	26.8	56	45.9	1.3	4.9
1993	75.8	33	54.5	11	70.5	44	65.2	2.3	3.3
1994	66.7	18	45.5	22	55.0	40	48.7	1.4	2.5
1995	77.8	9	46.2	13	59.1	22	74.5	3.2	5.4
1996	61.5	26	31.3	16	50.0	42	56.6	2.0	3.9
1997	50.0	8	55.6	9	52.9	17	50.0	2.0	3.8
1998	57.1	7	16.7	6	38.5	13	50.0	1.5	4.0
Totals	55.1	773	33.6	681	45.0	1454	58.3	2.2	4.8

Appendix B7. Greater sage-grouse productivity data, Cold Spring Mountain, Colorado, 1976–1998. Wings were not identifiable to specific hunting area in 1978–1979.

Year	Estimated annual reproductive success						Juveniles		
	Adult		Yearling		All females		In harvest (%)	Per hen	Per successful hen
	%	*n*	%	*n*	%	*n*			
1976	80.0	10	0.0	2	66.7	12	73.1	3.2	4.7
1977	80.0	20	25.0	12	59.4	32	59.8	1.9	3.2
1978		0		0		0	0.0		
1979		0		0		0	0.0		
1980	61.9	21	50.0	4	60.0	25	60.3	1.9	3.1
1981	47.6	42	21.4	28	37.1	70	61.7	2.2	6.0
1982	53.8	13	12.5	8	38.1	21	64.6	2.4	6.4
1983	73.2	41	54.2	24	66.2	65	68.0	2.7	4.1
1984	61.5	13	37.5	8	52.4	21	39.1	0.9	1.6
1985	63.2	38	31.8	22	51.7	60	62.1	2.1	4.0
1986	77.3	22	33.3	12	61.8	34	61.4	2.1	3.3
1987	63.6	11	33.3	12	47.8	23	49.3	1.5	3.2
1988	64.3	14	15.4	13	40.7	27	54.1	1.7	4.2
1989	60.6	33	20.8	24	43.9	57	51.3	1.7	3.9
1990	57.7	52	16.7	24	44.7	76	52.5	1.4	3.1
1991	59.0	39	53.8	13	57.7	52	68.1	2.5	4.3
1992	62.5	32	56.5	23	60.0	55	51.9	1.5	2.5
1993	88.5	26	70.6	17	81.4	43	62.3	2.1	2.6
1994	100.0	4	87.5	8	91.7	12	72.3	3.9	4.3
1995	83.3	6	33.3	3	66.7	9	60.0	1.7	2.5
1996	71.4	7	66.7	3	70.0	10	63.0	3.4	4.9
1997	60.0	10	33.3	6	50.0	16	65.5	2.3	4.5
1998	54.5	22	15.4	13	40.0	35	45.7	1.2	3.1
Totals	64.5	476	35.8	279	53.9	755	59.4	1.8	3.4

Appendix B8. Greater sage-grouse productivity data, Eastern Moffat and Northwestern Routt counties, Colorado, 1976–1998. Season closed in 1998 but some wings were received. No wings were received in 1995.

Year	Estimated annual reproductive success						Juveniles		
	Adult		Yearling		All females		In harvest (%)	Per hen	Per successful hen
	%	*n*	%	*n*	%	*n*			
1976	50.0	8	28.6	7	40.0	15	46.3	1.7	4.2
1977	58.3	24	28.6	14	47.4	38	39.6	0.9	2.0
1978	70.8	24	76.5	17	73.2	41	77.8	5.0	6.9
1979	48.9	45	35.7	84	40.3	129	57.5	1.7	4.1
1980	47.2	53	29.2	48	38.6	101	50.8	1.5	3.8
1981	31.3	99	18.8	85	25.5	184	42.7	1.0	4.0
1982	52.9	34	27.8	36	40.0	70	46.3	1.2	3.1
1983	59.1	44	34.8	23	50.7	67	47.5	1.4	2.8
1984	62.5	8	77.8	9	70.6	17	62.1	2.1	3.0
1985	64.3	14	31.8	22	44.4	36	65.1	2.3	5.3
1986	69.2	13	57.1	14	63.0	27	70.1	4.1	6.5
1987	55.0	20	27.3	22	40.5	42	65.1	2.3	5.7
1988	50.0	30	12.5	24	33.3	54	50.7	1.4	4.2
1989	50.0	46	16.7	30	36.8	76	59.8	1.9	5.3
1990	49.0	49	16.3	49	32.7	98	49.8	1.7	5.1
1991	38.7	31	33.3	24	36.4	55	42.1	1.1	3.0
1992	33.3	27	33.3	9	33.3	36	34.2	0.8	2.3
1993	53.1	32	0.0	7	43.6	39	32.4	0.6	1.4
1994	75.0	12	30.8	13	52.0	25	62.0	1.8	3.4
1995		0		0		0	0.0		
1996	66.7	6	20.0	5	45.5	11	47.8	1.0	2.2
1997		0		0		0	100.0		
1998	25.0	8	50.0	4	33.3	12	14.3	0.2	0.5
Totals	48.8	627	29.1	546	39.6	1173	53.5	1.6	4.1

Appendix B9. Greater sage-grouse productivity data, Northcentral Moffat County, Colorado, 1976–1998.

Year	Estimated annual reproductive success						Juveniles		
	Adult		Yearling		All females		In harvest (%)	Per hen	Per successful hen
	%	*n*	%	*n*	%	*n*			
1976	54.9	91	40.0	55	49.3	146	65.1	2.4	4.8
1977	25.9	81	7.4	54	18.5	135	33.3	0.9	4.8
1978	74.2	213	60.5	43	71.9	256	71.7	3.4	4.8
1979	62.0	200	49.5	291	54.6	491	57.1	2.3	4.1
1980	45.1	275	33.8	142	41.2	417	53.0	2.0	4.9
1981	47.5	255	41.3	121	45.5	376	54.8	1.7	3.7
1982	43.6	133	27.0	63	38.3	196	61.4	2.1	5.4
1983	56.2	210	40.0	130	50.0	340	57.1	2.0	4.0
1984	57.6	125	44.6	74	52.8	199	55.7	1.7	3.2
1985	62.4	125	42.5	80	54.6	205	62.7	2.5	4.6
1986	50.4	129	38.3	149	43.9	278	58.6	2.2	5.0
1987	48.0	227	36.1	191	42.6	418	55.9	1.8	4.3
1988	39.5	215	29.7	158	35.4	373	51.3	1.6	4.5
1989	45.2	283	37.8	119	43.0	402	53.9	2.1	4.8
1990	41.1	326	16.7	233	30.9	559	44.5	1.2	3.9
1991	46.8	265	23.9	109	40.1	374	40.7	1.0	2.5
1992	42.3	182	13.6	88	33.0	270	41.3	0.9	2.9
1993	65.1	86	37.9	29	58.3	115	53.1	1.7	2.9
1994	54.1	111	25.7	35	47.3	146	47.7	1.2	2.5
1995	47.1	17	75.0	8	56.0	25	64.9	2.5	4.5
1996	60.7	28	33.3	18	50.0	46	55.9	1.8	3.5
1997	55.6	18	55.6	9	55.6	27	50.0	1.5	2.7
1998	63.6	11	66.7	6	64.7	17	60.0	2.8	4.4
Totals	50.0	3606	34.7	2205	44.2	5811	54.6	1.8	4.1

Appendix B10. Greater sage-grouse productivity data, Sumpter, Hunt Unit 51, Oregon, 1993–2013.

Year	Estimated annual reproductive success						Juveniles		
	Adult		Yearling		All females		In harvest (%)	Per hen	Per successful hen
	%	*n*	%	*n*	%	*n*			
1993	100.0	1		0	100.0	1	83.3	5.0	5.0
1994	25.0	4	100.0	1	40.0	5	50.0	1.0	2.5
1995	100.0	1		0	100.0	1	0.0	0.0	0.0
1996	100.0	1		0	100.0	1	33.3	2.0	2.0
1997	0.0	1		0	0.0	1	25.0	1.0	
1998		0		0		0	0.0		
1999	100.0	1		0	100.0	1	0.0	0.0	0.0
2000	0.0	1	0.0	1	0.0	2	33.3	0.5	
2001	0.0	2		0	0.0	2	0.0	0.0	
2002		0		0		0	0.0		
2003	0.0	2		0	0.0	2	0.0	0.0	
2004		0		0		0	100.0		
2005		0		0		0	100.0		
2006		0		0		0	0.0		
2007		0		0		0	0.0		
2008	0.0	2		0	0.0	2	0.0	0.0	
2009		0		0		0	0.0		
2010		0		0		0	0.0		
2011		0		0		0	0.0		
2012		0		0		0	0.0		
2013		0		0		0	0.0		
Totals	31.3	16	50.0	2	33.3	18	50.0	0.9	2.8

Appendix B11. Greater sage-grouse productivity data, Lookout Mountain, Hunt Unit 64, Oregon, 1993–2013.

Year	Estimated annual reproductive success						Juveniles		
	Adult		Yearling		All females		In harvest (%)	Per hen	Per successful hen
	%	*n*	%	*n*	%	*n*			
1993	0.0	2		0	0.0	2	62.5	2.5	
1994	0.0	2		0	0.0	2	25.0	0.5	
1995	0.0	1	50.0	2	33.3	3	50.0	1.3	4.0
1996		0		0		0	100.0		
1997		0		0		0	0.0		
1998		0		0		0	0.0		
1999	0.0	4		0	0.0	4	25.0	0.8	
2000		0		0		0	0.0		
2001	0.0	1		0	0.0	1	60.0	3.0	
2002		0		0		0	66.7		
2003	100.0	2	100.0	1	100.0	3	66.7	2.0	2.0
2004	0.0	1		0	0.0	1	0.0	0.0	
2005	0.0	2		0	0.0	2	50.0	2.0	
2006	0.0	1		0	0.0	1	33.3	3.0	
2007	0.0	1		0	0.0	1	0.0	0.0	
2008	50.0	2		0	50.0	2	0.0	0.0	0.0
2009		0		0		0	0.0		
2010		0		0		0	0.0		
2011	0.0	1		0	0.0	1	0.0	0.0	
2012	0.0	1	0.0	1	0.0	2	25.0	0.5	
2013		0		0		0	0.0		
Totals	14.3	21	50.0	4	20.0	25	40.0	1.4	7.0

Appendix B12. Greater sage-grouse productivity data, Beulah, Hunt Unit 65, Oregon, 1993–2013.

Year	Estimated annual reproductive success						Juveniles		
	Adult		Yearling		All females		In harvest (%)	Per hen	Per successful hen
	%	*n*	%	*n*	%	*n*			
1993	71.4	7	100.0	1	75.0	8	38.9	0.9	1.2
1994	30.8	13	50.0	4	35.3	17	52.9	1.6	4.5
1995	12.5	8	100.0	1	22.2	9	31.0	1.0	4.5
1996	25.0	8	0.0	1	22.2	9	50.0	1.6	7.0
1997	28.6	21	40.0	5	30.8	26	45.6	1.2	3.9
1998	50.0	16	100.0	2	55.6	18	47.2	1.4	2.5
1999	60.0	15	100.0	3	66.7	18	47.9	1.9	2.8
2000	31.6	19	100.0	1	35.0	20	47.0	1.6	4.4
2001	53.3	15	33.3	3	50.0	18	55.8	1.6	3.2
2002	60.0	20	100.0	2	63.6	22	49.2	1.3	2.1
2003	25.0	16	0.0	4	20.0	20	39.7	1.2	5.8
2004	31.6	19	100.0	3	40.9	22	62.3	1.7	4.2
2005	56.0	25	100.0	2	59.3	27	51.1	1.7	2.9
2006	23.5	17		0	23.5	17	63.3	2.2	9.5
2007	14.3	14	100.0	1	20.0	15	25.0	0.4	2.0
2008	37.5	8	100.0	1	44.4	9	60.9	1.6	3.5
2009	25.0	16		0	25.0	16	57.9	2.1	8.3
2010	47.1	17	0.0	4	38.1	21	49.1	1.3	3.5
2011	33.3	6	50.0	2	37.5	8	37.0	1.3	3.3
2012	11.1	9	0.0	4	7.7	13	38.7	0.9	12.0
2013		0		0		0	80.0	-	-
Totals	37.7	289	52.3	44	39.6	333	49.0	1.5	3.7

Appendix B13. Greater sage-grouse productivity data, Malheur River, Hunt Unit 66, Oregon, 1993–2013.

Year	Estimated annual reproductive success						Juveniles		
	Adult		Yearling		All females		In harvest (%)	Per hen	Per successful hen
	%	*n*	%	*n*	%	*n*			
1993	66.7	6	100.0	1	71.4	7	71.9	3.3	4.6
1994	42.9	28	33.3	3	41.9	31	46.0	1.3	3.1
1995	16.7	6	0.0	2	12.5	8	50.0	1.8	14.0
1996	20.0	10	100.0	1	27.3	11	60.6	1.8	6.7
1997	0.0	5	0.0	1	0.0	6	52.2	2.0	
1998	40.0	10	100.0	3	53.8	13	36.4	0.9	1.7
1999	50.0	12	100.0	3	60.0	15	56.9	1.9	3.2
2000	42.9	14	66.7	3	47.1	17	41.7	1.2	2.5
2001	44.4	9	42.9	7	43.8	16	45.3	1.8	4.1
2002	36.4	11	100.0	3	50.0	14	56.5	1.9	3.7
2003	35.7	14	25.0	4	33.3	18	54.7	1.6	4.8
2004	76.9	13	100.0	1	78.6	14	59.6	2.4	3.1
2005	42.1	19	100.0	3	50.0	22	37.0	1.2	2.5
2006	25.0	12	50.0	2	28.6	14	46.2	1.3	4.5
2007	16.7	6	50.0	4	30.0	10	31.8	0.7	2.3
2008	22.2	9	50.0	2	27.3	11	50.0	1.5	5.7
2009	25.0	4	50.0	2	33.3	6	43.8	1.2	3.5
2010	57.1	7	0.0	1	50.0	8	66.7	2.5	5.0
2011	20.0	5		0	20.0	5	0.0	0.0	0.0
2012		0		0		0	33.3		
2013	100	1	100	1	100	2	33.3	0.5	0.5
Totals	39.3	201	59.6	47	43.1	248	46.4	1.6	3.6

Appendix B14. Greater sage-grouse productivity data, Owyhee, Hunt Unit 67, Oregon, 1993–2013.

Year	Estimated annual reproductive success						Juveniles		
	Adult		Yearling		All females		In harvest (%)	Per hen	Per successful hen
	%	*n*	%	*n*	%	*n*			
1993	50.0	12		0	50.0	12	25.0	0.3	0.7
1994	18.8	16		0	18.8	16	40.0	0.8	4.0
1995	50.0	6	0.0	1	42.9	7	37.5	0.9	2.0
1996	42.9	7	66.7	3	50.0	10	62.5	2.0	4.0
1997	28.6	7		0	28.6	7	36.8	1.0	3.5
1998	36.4	11	100.0	1	41.7	12	18.8	0.5	1.2
1999	38.5	13	100.0	3	50.0	16	47.9	1.4	2.9
2000	20.0	10	0.0	2	16.7	12	53.8	2.3	14.0
2001	33.3	12	66.7	3	40.0	15	66.2	3.0	7.5
2002	66.7	12	100.0	3	73.3	15	47.5	1.3	1.7
2003	26.7	15	50.0	2	29.4	17	25.6	0.6	2.0
2004	37.5	16	100.0	1	41.2	17	52.8	1.6	4.0
2005	38.1	21	100.0	3	45.8	24	32.1	0.8	1.6
2006	23.1	13	100.0	1	28.6	14	22.2	0.7	2.5
2007	16.7	12	0.0	1	15.4	13	20.8	0.4	2.5
2008	16.7	6		0	16.7	6	50.0	1.3	8.0
2009	33.3	9		0	33.3	9	54.5	1.3	4.0
2010	0.0	3	0.0	1	0.0	4	37.5	1.5	
2011	0.0	6		0	0.0	6	13.3	0.3	
2012	36.4	11	0.0	2	30.8	13	43.9	1.4	4.5
2013	33	3	0	0	33.3	3	46.2	1.7	5
Totals	32.6	221	63.0	27	35.9	248	42.3	1.2	3.3

Appendix B15. Greater sage-grouse productivity data, Whitehorse, Hunt Unit 68, Oregon, 1993–2013. The Whitehorse Unit was closed to hunting in 2012.

Year	Estimated annual reproductive success						Juveniles		
	Adult		Yearling		All females		In harvest (%)	Per hen	Per successful hen
	%	*n*	%	*n*	%	*n*			
1993	42.1	38	100.0	3	46.3	41	44.9	1.4	3.0
1994	35.6	45	50.0	8	37.7	53	54.5	1.7	4.6
1995	50.0	40	42.9	7	48.9	47	48.7	1.2	2.5
1996	62.5	40	37.5	8	58.3	48	51.1	1.4	2.5
1997	54.5	22	86.7	15	67.6	37	58.1	2.0	3.0
1998	30.8	26	100.0	2	35.7	28	56.7	2.0	5.5
1999	75.9	29	100.0	6	80.0	35	64.5	2.5	3.2
2000	28.1	32	53.3	15	36.2	47	35.8	1.0	2.9
2001	34.4	32	77.8	9	43.9	41	55.3	2.0	4.5
2002	45.8	24	100.0	11	62.9	35	63.3	2.9	4.5
2003	60.0	30	83.3	6	63.9	36	51.4	2.1	3.2
2004	41.3	46	100.0	11	52.6	57	52.8	2.0	3.8
2005	46.3	67	100.0	14	55.6	81	44.4	1.2	2.2
2006	52.8	36	57.1	7	53.5	43	48.0	2.0	3.7
2007	21.2	52	33.3	3	21.8	55	18.8	0.4	1.8
2008	51.9	27	100.0	3	56.7	30	63.7	2.2	3.8
2009	38.9	18	60.0	5	43.5	23	56.8	2.7	6.3
2010	26.8	41	57.1	7	31.3	48	52.7	1.4	4.6
2011	29.4	34	70.0	10	38.6	44	48.0	1.4	3.6
2012		0		0		0			
2013	60	5	0	1	50.0	6	47.6	1.7	3.3
Totals	42.8	684	74.2	151	48.5	835	51.1	1.7	3.4

Appendix B16. Greater sage-grouse productivity data, Steens Mountain, Hunt Unit 69, Oregon, 1993–2013.

Year	Estimated annual reproductive success						Juveniles		
	Adult		Yearling		All females		In harvest (%)	Per hen	Per successful hen
	%	*n*	%	*n*	%	*n*			
1993	66.7	27	100.0	4	71.0	31	29.3	0.8	1.1
1994	33.3	39	20.0	5	31.8	44	45.5	1.2	3.6
1995	34.8	23	0.0	2	32.0	25	23.4	0.6	1.9
1996	33.3	21	100.0	4	44.0	25	42.0	1.2	2.6
1997	61.5	13	100.0	3	68.8	16	51.5	2.1	3.1
1998	44.4	18	100.0	1	47.4	19	24.4	0.6	1.2
1999	71.4	14	100.0	3	76.5	17	50.0	1.4	1.8
2000	20.0	5	66.7	3	37.5	8	57.9	2.8	7.3
2001	16.7	6	0.0	2	12.5	8	52.4	2.8	22.0
2002	50.0	12	100.0	12	75.0	24	43.5	1.3	1.7
2003	70.0	10	100.0	3	76.9	13	53.6	2.3	3.0
2004	29.6	27	100.0	5	40.6	32	31.6	0.8	1.9
2005	33.3	9	100.0	1	40.0	10	50.7	3.6	9.0
2006	57.1	14	0.0	1	53.3	15	41.2	1.9	3.5
2007	44.4	27	100.0	5	53.1	32	26.0	0.6	1.2
2008	80.0	5	100.0	1	83.3	6	56.7	2.8	3.4
2009	33.3	3	100.0	1	50.0	4	46.9	3.8	7.5
2010	57.1	7	100.0	2	66.7	9	17.6	0.7	1.0
2011	37.5	8		0	37.5	8	25.8	1.0	2.7
2012	20.0	10	0.0	1	18.2	11	25.0	1.1	6.0
2013	55.6	9	50.0	4	53.8	13	43.8	1.1	2.0
Totals	44.6	307	79.4	63	50.5	370	39.6	1.3	2.5

Appendix B17. Greater sage-grouse productivity data, Beatys Butte, Hunt Unit 70, Oregon, 1993–2013.

Year	Estimated annual reproductive success						Juveniles		
	Adult		Yearling		All females		In harvest (%)	Per hen	Per successful hen
	%	*n*	%	*n*	%	*n*			
1993	66.7	15	100.0	2	70.6	17	59.7	2.7	3.8
1994	59.5	37	35.7	14	52.9	51	30.1	0.7	1.3
1995	42.3	52	0.0	1	41.5	53	31.7	0.6	1.5
1996	44.0	25	0.0	3	39.3	28	43.5	1.1	2.7
1997	70.0	30	100.0	9	76.9	39	56.1	1.9	2.5
1998	50.0	16	100.0	2	55.6	18	67.1	2.7	4.9
1999	68.0	25	100.0	4	72.4	29	55.1	2.2	3.1
2000	64.0	25	44.4	9	58.8	34	43.2	1.2	2.1
2001	47.4	19	100.0	3	54.5	22	45.2	1.7	3.2
2002	68.8	16	100.0	2	72.2	18	58.5	3.1	4.2
2003	76.5	17	100.0	3	80.0	20	52.8	2.9	3.6
2004	47.4	38	100.0	9	57.4	47	52.2	1.5	2.6
2005	34.6	26	100.0	8	50.0	34	44.1	1.6	3.3
2006	52.2	23	60.0	5	53.6	28	51.9	1.9	3.6
2007	45.2	31	33.3	6	43.2	37	21.9	0.4	1.0
2008	56.3	16	100.0	2	61.1	18	60.0	2.2	3.5
2009	52.6	19	66.7	9	57.1	28	58.0	2.1	3.6
2010	42.9	21	100.0	1	45.5	22	45.5	1.1	2.5
2011	60.0	15	33.3	3	55.6	18	51.5	2.8	5.1
2012	46.2	26	41.7	12	44.7	38	17.6	0.4	0.9
2013	27.8	18	60	5	34.8	23	58.1	2.4	6.8
Totals	52.4	510	66.1	112	54.8	622	48.0	1.5	2.8

Appendix B18. Greater sage-grouse productivity data, Juniper, Hunt Unit 71, Oregon, 1993–2013.

Year	Estimated annual reproductive success						Juveniles		
	Adult		Yearling		All females		In harvest (%)	Per hen	Per successful hen
	%	*n*	%	*n*	%	*n*			
1993	33.3	6		0	33.3	6	53.6	2.5	7.5
1994	58.1	31	50.0	6	56.8	37	18.5	0.3	0.5
1995	11.1	18		0	11.1	18	23.3	0.4	3.5
1996	64.7	17	33.3	3	60.0	20	47.8	1.1	1.8
1997	75.0	12	100.0	1	76.9	13	61.5	2.5	3.2
1998	45.5	11		0	45.5	11	50.0	1.3	2.8
1999	68.4	19	100.0	2	71.4	21	47.6	1.4	2.0
2000	46.2	13		0	46.2	13	47.1	1.8	4.0
2001	29.4	17	100.0	2	36.8	19	59.0	1.9	5.1
2002	66.7	9	100.0	3	75.0	12	60.0	3.0	4.0
2003	73.7	19	50.0	2	71.4	21	39.2	1.0	1.3
2004	33.3	12	100.0	1	38.5	13	48.9	1.7	4.4
2005	65.0	20	100.0	3	69.6	23	39.0	1.0	1.4
2006	80.0	20		0	80.0	20	32.0	0.8	1.0
2007	31.3	16	0.0	1	29.4	17	13.8	0.2	0.8
2008	46.2	13		0	46.2	13	51.3	1.5	3.3
2009	80.0	10	100.0	1	81.8	11	56.4	2.0	2.4
2010	33.3	6	100.0	2	50.0	8	44.8	1.6	3.3
2011	42.9	7		0	42.9	7	48.0	1.7	4.0
2012	33.3	9	0.0	3	25.0	12	4.8	0.1	0.3
2013	0	2	100	2	50	4	50	1	2
Totals	52.6	287	68.7	32	54.2	319	44.1	1.2	2.2

Appendix B19. Greater sage-grouse productivity data, Silvies, Hunt Unit 72, Oregon, 1993–2013.

Year	Estimated annual reproductive success						Juveniles		
	Adult		Yearling		All females		In harvest (%)	Per hen	Per successful hen
	%	*n*	%	*n*	%	*n*			
1993	100.0	1	100.0	1	100.0	2	85.7	6.0	6.0
1994	22.2	9	0.0	1	20.0	10	47.4	0.9	4.5
1995	0.0	1		0	0.0	1	75.0	3.0	
1996	75.0	4		0	75.0	4	50.0	1.0	1.3
1997	75.0	4		0	75.0	4	63.6	1.8	2.3
1998	87.5	8		0	87.5	8	27.3	0.4	0.4
1999	100.0	1		0	100.0	1	91.7	11.0	11.0
2000		0		0		0	20.0		
2001	66.7	3	100.0	1	75.0	4	33.3	0.8	1.0
2002	100.0	1	100.0	1	100.0	2	80.0	4.0	4.0
2003	12.5	8		0	12.5	8	25.0	0.4	3.0
2004		0		0		0	0.0		
2005	100.0	2		0	100.0	2	37.5	1.5	1.5
2006	66.7	3	100.0	1	75.0	4	61.5	2.0	2.7
2007	0.0	4	100.0	1	20.0	5	50.0	1.6	8.0
2008	28.6	7		0	28.6	7	21.4	0.4	1.5
2009	33.3	3	0.0	1	25.0	4	36.4	1.0	4.0
2010	60.0	5		0	60.0	5	25.0	0.4	0.7
2011	0.0	1		0	0.0	1	50.0	3.0	
2012		0	0.0	1	0.0	1	75.0	3.0	
2013	100	1	0	1	50	2	71.4	2.5	5
Totals	48.5	66	55.6	9	49.3	75	51	1.4	2.8

Appendix B20. Greater sage-grouse productivity data, Wagontire, Hunt Unit 73, Oregon, 1993–2013.

Year	Estimated annual reproductive success						Juveniles		
	Adult		Yearling		All females		In harvest (%)	Per hen	Per successful hen
	%	*n*	%	*n*	%	*n*			
1993	50.0	4		0	50.0	4	0.0	0.0	0.0
1994	30.0	10	0.0	1	27.3	11	35.7	0.9	3.3
1995	33.3	9	0.0	2	27.3	11	23.5	0.4	1.3
1996	62.5	8		0	62.5	8	64.0	2.0	3.2
1997	44.4	9	100.0	1	50.0	10	53.6	1.5	3.0
1998	70.0	10	100.0	2	75.0	12	57.8	2.2	2.9
1999	87.5	8	100.0	1	88.9	9	33.3	0.8	0.9
2000	62.5	16	100.0	3	68.4	19	41.7	1.1	1.5
2001	44.4	9	60.0	5	50.0	14	60.4	2.3	4.6
2002	50.0	8	100.0	1	55.6	9	55.2	1.8	3.2
2003	10.0	10	100.0	2	25.0	12	34.5	0.8	3.3
2004	66.7	6	100.0	1	71.4	7	55.0	1.6	2.2
2005	80.0	5	100.0	2	85.7	7	60.9	2.0	2.3
2006	40.0	5	0.0	1	33.3	6	53.8	2.3	7.0
2007	42.9	14		0	42.9	14	40.0	0.9	2.0
2008	33.3	6		0	33.3	6	25.0	0.7	2.0
2009	50.0	4		0	50.0	4	73.9	4.3	8.5
2010	45.5	11		0	45.5	11	35.0	0.6	1.4
2011	75.0	4	100.0	2	83.3	6	56.3	1.5	1.8
2012	50.0	10	0.0	1	45.5	11	32.0	0.7	1.6
2013	57.1	7		0	57.1	7	63.2	1.7	3
Totals	50.3	173	72.0	25	53.0	198	48.4	1.3	2.5

Appendix B21. Greater sage-grouse productivity data, Warner, Hunt Unit 74, Oregon, 1993–2013.

Year	Estimated annual reproductive success						Juveniles		
	Adult		Yearling		All females		In harvest (%)	Per hen	Per successful hen
	%	*n*	%	*n*	%	*n*			
1993	66.7	6	100.0	2	75.0	8	30.8	0.5	0.7
1994	42.1	19	0.0	2	38.1	21	39.7	1.1	2.9
1995	25.0	20	50.0	2	27.3	22	26.5	0.4	1.5
1996	85.7	7		0	85.7	7	61.5	3.4	4.0
1997	71.4	14	50.0	2	68.8	16	54.9	1.8	2.5
1998	14.3	7	100.0	4	45.5	11	62.2	2.5	5.6
1999	83.3	12	100.0	6	88.9	18	67.8	3.3	3.7
2000	50.0	10	100.0	1	54.5	11	56.4	2.0	3.7
2001	66.7	18	70.0	10	67.9	28	51.9	1.4	2.1
2002	69.2	13	100.0	1	71.4	14	65.0	3.7	5.2
2003	84.2	19	66.7	3	81.8	22	59.3	2.5	3.0
2004	47.6	21	100.0	11	65.6	32	53.2	1.8	2.8
2005	35.5	31	100.0	2	39.4	33	50.0	1.3	3.3
2006	57.1	21	50.0	2	56.5	23	55.4	1.8	3.2
2007	52.4	21	50.0	6	51.9	27	46.5	1.2	2.4
2008	60.7	28	62.5	8	61.1	36	54.0	1.5	2.5
2009	54.5	11	80.0	5	62.5	16	60.8	3.0	4.8
2010	13.6	22	50.0	4	19.2	26	54.2	1.7	9.0
2011	53.6	28	33.3	3	51.6	31	34.3	0.8	1.5
2012	16.7	18	0.0	8	11.5	26	38.1	0.9	8.0
2013	54.5	11	50	2	53.8	13	69.8	2.9	5.3
Totals	50.4	357	65.5	84	53.3	441	53.5	1.7	3.2

Bureau of Land Management and Oregon Dept. of Fish and Wildlife biologists examine greater sage-grouse wings mailed in by hunters in 2004, Hines, Oregon.

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