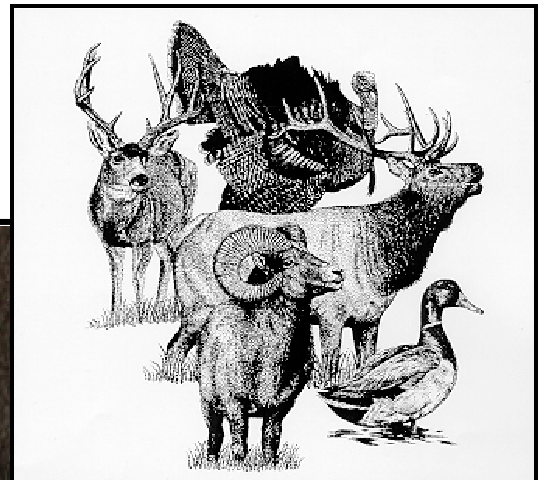
STATE OF WASHINGTON

2014 Game Status and Trend Report



Washington Department of FISH and WILDLIFE

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2014 GAME STATUS AND TREND REPORT

July 1, 2013 – June 30, 2014

Washington Department of Fish and Wildlife
600 Capitol Way North
Olympia, WA 98501-1091

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This Program Receives Federal Aid in Wildlife Restoration, Project W-96-R, Statewide Wildlife Management.

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TABLE OF CONTENTS

Deer

DEER STATUS AND TREND REPORT: REGION 1

PMU 11 – GMU 101
PMU 13 – GMUs 105, 108, 111, 113, 117, 121

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Population objectives and guidelines

In northeastern Washington white-tailed deer (*Odocoileus virginianus*) are the most abundant deer species. Mule deer (*O. hemionus*) are locally common, especially in the higher elevations and throughout Ferry County, but their overall numbers are lower compared to white-tailed deer on a district scale.

The white-tailed deer harvest management objective is to provide antlered and antlerless hunting opportunity for all hunting methods whenever feasible. The buck escapement goal is to maintain a ratio of at least 15 bucks per 100 does in the post-hunting season population (WDFW 2008). In addition, population goals from WDFW's White-tailed Deer Management Plan (WDFW 2010) for the Selkirk Zone are to 1.) increase deer counted per mile in the late summer surveys to fall within the range of 9 to 11 deer counted per survey mile, and 2.) increase the white-tailed deer harvest success rate and the white-tailed deer buck success rate in data collected at check stations and through hunter reporting to more closely reflect the 2003 to 2007 average rates. The stated strategy to achieve this population increase has been to reduce the amount of antlerless hunting opportunity, while still attempting to maintain some opportunity for all user groups.

Management goals for mule deer are to provide conservative hunting opportunity, maintain a range of 15 to 19 bucks per 100 does in the post-hunting season population, and allow population levels to increase by managing antlerless hunting opportunity (WDFW 2008).

Hunting seasons and harvest trends

In 2011, the Fish and Wildlife Commission changed the white-tailed buck hunting season structure in GMUs 117 and 121 from "any buck" to a "4-point minimum" antler restriction. Antlerless hunting opportunity was also reduced over the previous two years. Figure 1 depicts the trend in total estimated deer harvested by general season hunters within District One from 2008 through 2013. The overall deer harvest in District One steadily declined from 2008 through 2011, and then gradually began to increase in 2012 and 2013. Figure 2 shows the trend in total deer hunters within District One. Here the decline in hunters follows the same pattern as the deer harvest for 2008-2011. Then in 2012 and 2013 there is a slight increase in the number of hunters. The number of days hunted per deer harvested ranged from 19 to 25 days between 2008 and 2013 (Figure 3). The peak in days hunted per harvested deer was in 2011 at 25 days.

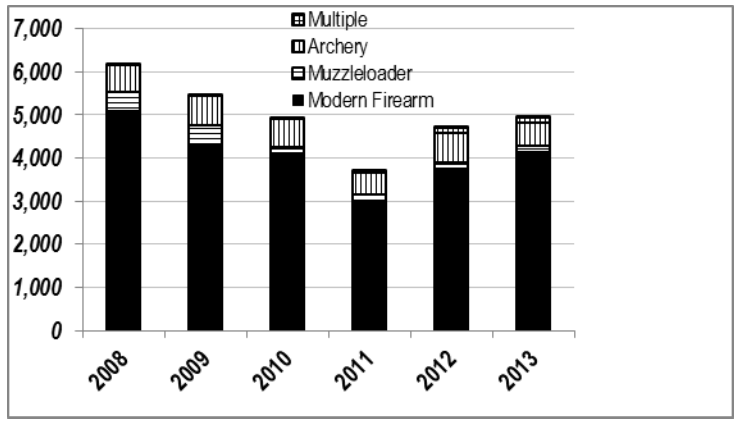

Figure 1. Trend in total general deer harvest in District One (GMUs 101-121) 2008 - 2013.

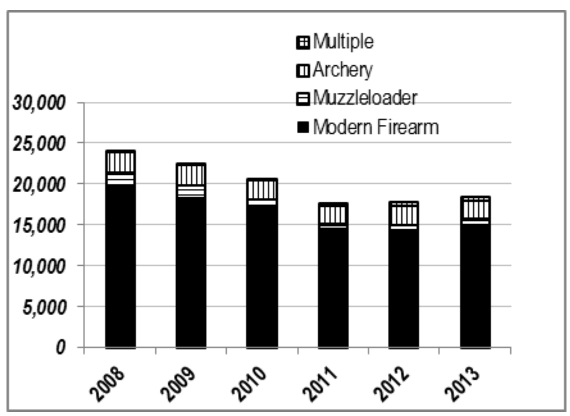

Figure 2. Trend in total deer hunters in District One (GMUs 101-121) 2008 – 2013.

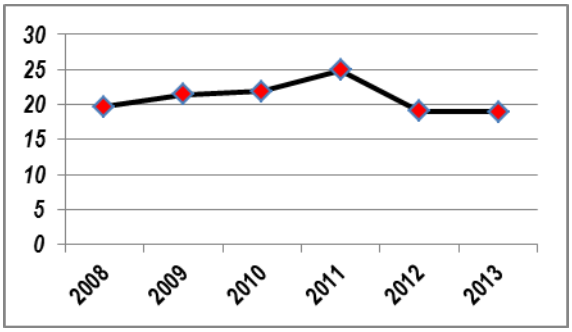

Figure 3. Six-year trend in days hunted per deer harvested within District One (GMUs 101-121), 2008-2013.

In the 2013 hunting season there was a reported harvest of 776 antlerless white-tailed deer along with 2910 antlered white-tail bucks taken within District One (Table 1). Beginning in the 2010 season, Youth, Senior, and Hunters with Disability (Y/S/D) were allowed to only take antlerless white-tails (or legal bucks) for 4 days including the second week-end of the Early Modern Firearm Deer Season (October dates only) within GMUs 101-121. There were only 25 antlerless white-tailed deer permits allocated for modern firearm deer hunters within GMUs 101-121 in 2013 not including special permits for master hunters. This was a tremendous decrease from previous seasons. Overall the proportion of antlerless white-tails taken per 100 antlered white-tailed deer for GMUs 101-121 was 27 in 2013 (Table 1).

Since 1997 mule deer bucks legal for harvest have been limited to a 3-point minimum. District wide (GMUs 101-121) in 2013, the mule deer buck harvest for general season and special permits combined was 347 (Table 2). Most of these were taken by modern firearm in GMU 101.

Table 2. Mule deer buck harvest trend from hunter reports by user group within District One (GMUs 101-121) , 2008-2013. (Arc = Archery ;MZL = Muzzleloader ; MF = Modern Firearm hunter harvest).

Year	Arc	MZL	MF	Total	# 4 pt.+	%4pt+
2008	20	35	297	352	191	54%
2009	15	25	351	391	247	63%
2010	27	15	357	399	220	55%
2011	16	20	204	240	124	52%
2012	28	26	256	310	178	57%
2013	20	26	301	347	223	64%

Age, antler, and sex ratio data are collected from harvested deer for monitoring harvest and developing season recommendations. One way that the ratio of mature white-tail bucks in the harvest is monitored is by taking tooth samples from adult deer for age analysis. Excluding yearling white-tail bucks, the proportion of adult bucks over 4 years of age that were sampled at hunter check stations in 2011 increased from previous years (Figure 4). After 2011 that proportion declined substantially.

White-tail buck antler data are also collected from hunter check stations and mandatory harvest reports. This includes tallies of bucks that have 5 or more points on the high side of their antlers. Hunter check stations and mandatory harvest reports in 2013 yielded 20% and 16% respectively of white-tail bucks with 5 points or higher in GMUs 101-124 (Table 3). Within GMUs 101-121 (excluding GMU 124) the mandatory harvest reports yielded 23% of the white-tail bucks having 5 or more antler points in 2013 (Figure 5).

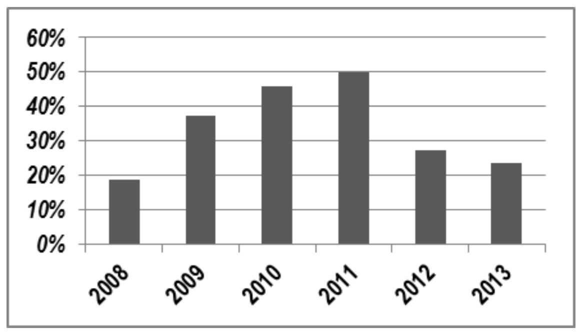

Figure 4. Percentage of adult white-tailed bucks 4 years and older from hunter check stations, 2008-2013.

The proportion of white-tail yearling bucks brought to hunter check stations ranged from 19% to 48% for 2008-2013 (Table 3). The mean age of adult white-tail bucks (yearlings excluded) checked in 2013 was 2.9 years (n = 76) which decreased from 3.5 years in 2012 (n = 66). The younger average age for 2013 was due to a high abundance of 2 year old bucks that came through the hunter check stations.

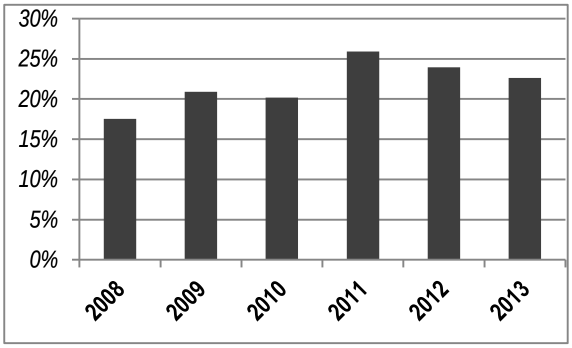

Figure 5. Percentage of white-tail bucks 5 point or higher from hunter harvest reports within GMUs 101-121.

Table 1. Total hunter harvest reports of antlered and antlerless white-tailed deer by Game Management Unit within District One in 2013.

		Antlerless					*Antlerless per 100*
PMU	***GMU***	**Archery**	**Permit**	**Y/S/D***	**Total****	**Antlered**	***Antlered***
11	*101*	44	13	113	170	407	***42***
13	*105*	7	1	29	37	233	***16***
	108	9	4	39	52	266	***20***
	111	0	0	42	42	337	***12***
	113	0	4	25	29	320	***9***
	117	40	11	141	192	574	***33***
	121	46	8	200	254	773	***33***
Total:		**146**	**41**	**589**	**776**	**2910**	***27***

* Y/S/D = Youth/Senior/Hunter with Disability
** Totals include Multi-method permits.

Table 3. White-tail yearling buck and 5+ antler point harvest trends from hunter check stations and mandatory hunter harvest reports for GMUs 101-124.

	Deer Hunter Check Stations		Harvest Reports
Year	**%Yearling**	**%5pt.+**	**%5pt.+**
2008	37%	13%	15%
2009	21%	30%	16%
2010	48%	14%	16%
2011	30%	30%	18%
2012	27%	22%	17%
2013	19%	20%	16%

Surveys

A reliable estimate of the deer population size has been out of reach due to staff and funding limitations. As a result, management decisions are often made with indices or surrogates of population size. One of these indices used within District One is the annual late summer (prior to the modern firearm season) deer composition survey. This survey is accomplished by counting all deer observed along 20 standardized transects set up on rural, secondary county roads that are widely distributed throughout District One. Each transect is 15 miles long and there is at least one transect in each GMU. The standardized routes have been surveyed consistently since 2011. In addition there are 6 "traditional" survey transects of varying length that have been surveyed consistently every year since 2003.

Within the Selkirk Zone (GMUs 105-121) the proportion of white-tail bucks to does observed in the summer of 2013 increased from 2012, going from 21 to 31 bucks per 100 does (Table 4). Meanwhile the fawn to doe ratio observed in 2013 was 48 per 100 does, a decrease from 57 fawns per 100 does observed in 2012. Important to note, however, is the wide variance in buck/doe/fawn ratios amongst all survey years with overlapping confidence intervals (Skalski et al. 2005).

Table 5 summarizes the numbers of white-tailed deer tallied on late summer surveys from the 6 traditional road transects surveyed with consistent effort from 2008 through 2013. The average number of white-tailed deer observed per transect mile had steadily declined from a high of 11.0 in 2007 to a low of 5.0 in 2011. In 2012 the observed density rose to 6.9 deer per mile, which was the first increase since 2006. This density remains substantially below the goal of 9 to 11 deer counted per survey mile (WDFW 2010).

Population status and trend analysis

The total deer harvest in 2013 increased from 2012 on account of approximately 8% more antlered bucks taken (Figure 1). Last year was the second increase in the deer harvest for GMUs 101-121 as a whole since 2006, the peak year. Total deer hunter numbers also increased slightly, up about 3% from 2012 to 2013 with a slight gain in modern firearm hunters.

In the late 1990s, there was unprecedented low representation of mature white-tail bucks in the harvest. This concern was addressed by maintaining conservative late buck seasons that did not extend beyond the middle of the rut. After 1999 there was consistent improvement in the percentage of older bucks based on monitoring antlers. Improvement in the general trend toward more bucks 4 years or older was also supported by cementum analysis of deer teeth (Figures 4 and 5). We are currently at a level that has reasonably good representation of mature bucks in the white-tail population. Now, better than 1 in 5 white-tail bucks harvested is 5 point or higher.

The total antlerless white-tailed deer harvest increased dramatically from 2001-2008. The proportion of antlerless white-tails taken per 100 antlered bucks went from 36:100 in 2002 to 59:100 in 2008. After two severe winters beginning in 2007 the opportunity for hunting antlerless white-tails was incrementally reduced. As a result, the overall ratio of antlerless to antlered white-tails in the harvest declined to 25 per 100 in both 2010 and 2011. In 2012, this ratio increased to 37 antlerless per 100 antlered white-tails in the harvest. In 2013, the ratio fell back to 27. The largest proportion of antlerless deer harvested occurred within GMU 101 while the lowest proportions were within GMUs 105, 108, 111, and 113 (Table 1).

Disease and Predators

WDFW continues to test deer opportunistically for Chronic Wasting Disease (CWD) and many deer from northeastern Washington have been included in the statewide sample. To date no deer from Washington State have tested positive for CWD.

Cougar populations in northeastern Washington were exceptionally high in the middle to late 1990s. Cougars are a prominent predator of deer in northeastern Washington, but the impact on deer populations has not been well quantified. Black bears and coyotes are also abundant within the Colville District. Gray wolves have recently established new packs within Washington including the northeastern part of the state where there is a prey base of elk and moose as well as deer.

Habitat condition and trend

Both survey and harvest data indicate a recent increase in the white-tailed deer population within the Colville District. Since the last severe winter of 2008-2009 the Colville District has had only mild or moderate winters. Consequently, winter deer kill has probably been negligible since 2009.

More insidious than occasional bad winters in northeastern Washington is the on-going conversion of farm and forest lands into rural-residential developments along with the loss of alfalfa and cereal grain production on established agricultural ground. Between 1985 and 2008 production of cereal grains and alfalfa hay within Stevens and Pend Oreille

Counties declined approximately 45% (Source: National Agricultural Statistics Service, USDA). This change in agricultural production in combination with occasional severe winters and prolonged summer droughts has probably led to a reduction in white-tailed deer abundance but not their overall distribution.

Wildlife damage

Deer foraging in alfalfa, nuisance deer in urban areas and damage to automobiles by highway collisions are the primary economic losses reported. Antlerless permits and either-sex hunting opportunity by youth, senior, and hunters with disabilities are part of the management strategy to stabilize deer populations and control excessive damage. While deer continue to be a problem for farmers, the population and the damage complaints are presently at a reasonably tolerable level. Deer damage prevention permits are issued by the WDFW in certain urban situations and to farmers with a history of chronic damage. On farms, these permits usually allow licensed hunters to take antlerless deer outside of general hunting seasons. This small-scale program has proven popular and effective, especially in providing landowner satisfaction. In urban areas kill permits have been issued to the local police department with the meat donated to local food banks.

Management conclusions

The total deer harvest in District One increased in 2013, which was the second season with an increase since 2006. Meanwhile the number of days hunted per deer harvested stayed the same in 2013 as 2012 at 19 days. The low proportion of antlerless white-tails harvested in several GMUs should help increase escapement of female deer for continuing growth in the white-tail population back to previous levels. The proportion of mature, age 4 or older, white-tail bucks in the harvest appears to be maintaining a reasonably high level at 24%. Maintaining adequate hunter field checks (check stations) along with analyses of harvest reports will be necessary to continue monitoring the age structure and antler classes of the deer population.

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Table 4. White-tailed deer late summer composition surveys within GMUs 105-121, the Selkirk Zone, 2008-2013.

	August		90%	September		90%
Year	Sample Size	Bucks per 100 Does	Confidence Interval	Sample Size	Fawns per 100 Does	Confidence Interval
2008	574	23	+/- 9	884	48	+/- 10
2009	451	29	+/- 11	542	54	+/- 16
2010	1522	24	+/- 5	1533	48	+/- 7
2011	765	28	+/- 9	1098	54	+/- 15
2012	878	21	+/- 6	465	57	+/- 25
2013	981	31	+/- 8	653	48	+/- 15

Table 5. Trend in late summer classification surveys of white-tailed deer as collected from 6 secondary road survey transects run consistently within GMUs 105-121, the Selkirk Zone, 2008-2013.

Transect Name and GMU:	Length, miles (total = 73.1)	2008	2009	2010	2011	2012	2013
Flat Creek – 105	17.5	143	122	117	35	16	45
Douglas – 108	11	179	131	103	92	80	79
Deep Creek – 108 / 111	19.8	61	78	51	23	21	49
Clayton – 117	7.2	61	48	38	38	82	50
Dunn Mountain – 121	5.3	106	42	103	117	205	112
Daisy / Maud – 121	12.3	75	50	50	59	93	59
Total White-tailed Deer Counted		625	471	462	364	497	394
Mean Number per Transect Mile		*8.5*	*6.4*	*6.3*	*5.0*	*6.8*	*5.4*

DEER STATUS AND TREND REPORT: REGION 1

PMU 14 – GMUs 127, 130, 133
PMU 15 – GMUs 136, 139, 142

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CARRIE LOWE, Wildlife Biologist

Population objectives and guidelines

Management objectives for white-tailed deer (*Odocoileus virginianus*) populations in the Palouse Zone are to maintain the population at current levels and to retain the current general season hunting structures (WDFW 2010). Increase in the population would be acceptable as long as agricultural damage does not become a problem (WDFW 2010). The white-tailed deer populations in Population Management Units (PMUs) 14 and 15 are currently at acceptable levels.

The mule deer (*O. hemionus*) populations in PMUs 14 and 15 are also currently within acceptable levels. The mule deer management plan is not complete at this time, but interim management objectives are to maintain the population within landowner tolerance, and to provide as much recreational use of the resource for hunting and aesthetic appreciation as possible. Further objectives are to meet the Game Management Plan (WDFW 2008) guidelines for buck escapement (20 to 24 bucks per 100 does post-hunt) and to maintain healthy fawn to doe ratios while minimizing agricultural damage from deer.

Hunting Seasons

Game Management Units (GMUs) 127 through 142 make up deer PMUs 14 and 15. PMU 14 contains a mixture of forest, shrub-steppe, and agricultural habitats, along with some areas of high urbanization. PMU 15 is relatively open shrub-steppe and agricultural habitat. Both PMUs contain populations of white-tailed deer and mule deer, with more white-tailed deer harvested annually in PMU 14 and more mule deer harvested annually in PMU 15.

A 3-point minimum regulation on antlered white-tailed and mule deer applies to all hunts, with an antlerless harvest option available to archery, muzzleloader, senior, youth, and disabled hunters. WDFW offered a nine-day early modern firearm season in mid-October for both mule and white-tailed deer. The modern firearm general late white-tailed deer season was removed in 2006 and replaced with the Palouse Special Permit Hunt, a permit-only late white-tailed buck hunt in November. A total of 750 permits were offered for the block hunt, which allowed permitees to hunt within any of the six GMUs. In addition, second deer tags (antlerless only) were offered in all six GMUs.

Archers were offered both early and late general hunting seasons. The early archery deer hunt occurs in September and the late season runs from November 25 to December 15. Muzzleloaders were offered both early and late general admission seasons as well. Muzzleloader early season runs from late September into early October. The late season runs from November 25 to December 8.

Harvest trends

Total deer harvest during the general seasons historically has been higher in PMU 15; however, harvest in recent years is effectively equal between the two PMUs (Table 1). Mule deer comprise a greater portion (58%) of the harvest in PMU 15, while white-tailed deer comprise a greater portion (60%) of the harvest in PMU 14.

Across both PMUs there was a pronounced reduction in general season harvest during 2006. Compared to the average for the previous 5-years, PMUs 14 and 15 had 15.6% and 30.3% reductions, respectively. The reduction in harvest in 2006 was due in part to the replacement of the general late white-tailed deer modern firearm season with a special permit hunt. General season harvest rebounded quickly, reaching pre- 2006 levels in both PMUs by 2008, but then declined to the low end of the range from 2009 – 2011. In 2012 there was a dramatic increase in general season harvest, exceeding previous highs in both PMUs. In 2013 general season harvest returned to average for PMU 14 and has continued to increase for PMU 15. These bumper years are likely due to mild winters and sufficient spring precipitation for forage production.

Overall hunter participation hit a high in 2004, declined through 2008, and has showed a positive trend since 2008 in both PMUs (Fig. 1). Decline in modern firearm hunter numbers is the main driver behind the negative trend between 2004 and 2008 in both PMUs (Fig. 2). In 2004 there were 4,953 and 5,477 modern firearm hunters in PMUs 14 and 15, respectively. By 2008 this dropped to 3,516 and 3,773 modern firearm hunters in PMUs 14 and 15 respectively, a decline in both PMUs of approximately 30%. Since 2008 modern firearm hunter numbers have shown a positive trend in PMU 15, but have remained low in PMU 14. The main drivers in the positive trends of overall hunter numbers are increases in archery hunters in PMU 14 (Fig. 3) and increases in muzzleloader numbers in both PMUs (Fig. 4).

Hunter success rates in PMU 14 and 15 average 30% and 35%, respectively, over the past thirteen years. There is no observable trend over this time period, reflective of the complex combination of variables (e.g., deer availability, hunting conditions, access, vacation, etc.) that affect hunter success each year (Fig. 5). There was a sharp decline in hunter success in 2006 in both PMUs, most likely related to the replacement of the general late white-tailed deer modern firearm season with a permit only hunt. Both PMUs showed a modest rebound in hunter success in 2007 followed by a sharp increase in 2008, likely due to heavy snowfall. Success dropped back to a more typical level in both PMUs in 2009 and remained there until 2012 when it spiked again, likely tied to early snow resulting in improved hunting conditions. Success has remained high (>40%) in PMU 15 in 2013, while in PMU 14 it has declined some, but remains higher than average.

Catch per unit effort (measured as kills per day) has averaged 0.07 and 0.10 for PMU 14 and 15, respectively, over the past thirteen years (Fig. 6). Catch per unit effort hit a high in 2008 in both PMUs and re-corrected down following the high, but overall shows a stable to slightly increasing trend.

Results for the Palouse special hunt show higher success rates (56% average) than in the general season modern firearm hunt (Table 2), though in 2010 success was not substantially higher. The percentage of 4+ and 5+ bucks in the Palouse hunt harvest has averaged 88% and 37%, respectively, compared to the general season harvest where 4+ and 5+ bucks have averaged 77% and 25%, respectively.

Surveys

Available resources, land ownership, and deer behavior all combine to limit WDFW’s ability to conduct surveys over the entire District (GMUs 124-142) and during all seasons. Pre-hunt ratios come from ground surveys conducted during August (for buck to doe ratio) and September (for fawn to doe ratio). They provide an estimate of fawn production for the year and buck recruitment pre-hunt. Post-hunt ratios come from helicopter surveys conducted during late November, December, or January. Post-hunt surveys reflect the effects of harvest on these herds, predominantly the antlered portion of the herds. However, due to the nocturnal behavior of bucks that is intensified by hunting, the post-hunt buck to doe ratio is probably a conservative measure of true composition. The hunt in pre-hunt and post-hunt refers to the modern firearm season only.

The pre-hunt mule deer buck to doe ratios have remained relatively stable over the past 12 years (Fig. 7) averaging 0.37. The pre-hunt mule deer fawn to doe ratios show a slight negative trend (Fig. 8); however the 90% Confidence Intervals (CI) indicate that there is no significant difference in these ratios across time. Pre-hunt ratios for white-tailed deer show a similar slight negative trend over the past 12 years (Fig. 9 & 10). Again, the 90% CI indicate that there is no significant difference in these ratios across time.

These negative trends in ratios may indicate a decline in the number of bucks and fawns, or an increase in the number of does, or the trend may just be a product of survey effort. Without population estimates it is difficult to determine which is occurring. However, the increase in number of surveys in recent years (via increased staff time and use of volunteers), the stability of ratios during this time, and the increased precision of these estimates, all indicate that the negative trends are likely due to lower sample sizes in early years which resulted in biased estimates.

All post-season composition data (Table 3) was collected via helicopter or fixed-wing flights. The number of flights is limited to available funds and surveyable terrain, which results in incomplete coverage of the district. In 2013 white-tailed deer were not counted during mule deer aerial surveys due to time/funding constraints. White-tailed post-season buck to doe ratios for previous years appear to be well above management goals (20-24 bucks per 100 does). Fawn to doe ratios also appear to be satisfactory. However, all of the post-season data is based on relatively small samples from surveys conducted in more open GMUs (133-142) with high visibility, were focused on mule deer populations, and were not conducted in the forested GMUs of 124 and 127 which are the core white-tailed deer areas for District 2.

Post-season mule deer fawn ratios were low in 2007 and 2008; however flights and coverage were limited in both years. Since 2009 more intensive flights have been conducted in mule deer winter concentration areas and fawn numbers appear good to high. Post-season mule deer buck to 100 doe ratios have been very stable the past eight years (averaging 23 bucks to 100 does) regardless of survey intensity. If we limit the analysis to adult bucks, the average pre-hunt buck to doe ratio for the past five years is 7:100, indicating that the current mule deer harvest is sustained by recruitment of yearling bucks (Fig. 7).

Habitat and Disease

Mass conversion of natural habitats to agriculture occurred in past decades, but represent minor changes today in PMUs 14 and 15. Gains have been made in deer habitat with enrollment of agricultural acres into the Conservation Reserve Program (CRP). However, with current wheat, lentil, and hay prices, several landowners have chosen not to re-enroll in CRP after their contracts expired. Current outlook for the Farm Bill is for a reduction in CRP acreage which will negatively impact deer in this district. Additionally, emergency haying and grazing of CRP acreage occurs often in response to a severe drought or similar natural disaster. Though these are temporary measures and do not remove the acreage from CRP it does reduce the quality of the land during a time of high stress, when wildlife may need it most.

Habitat loss due to development is of primary concern in this district, especially in GMU 124, 127, and 130, with the redistribution of Spokane's urban populations outward into rural settings. High-density development (>1house per acre) removes less habitat then low-density development (<1house per 10 acres), but tends to permanently displace the deer. While low-density development incorporates more habitat, direct disturbance is less, and more habitat is usable by deer post-construction. However, these deer tend to become damage/nuisance deer. Currently the district promotes high-density clustered development with larger open space areas, with the hope of maintaining larger connecting tracts of habitat.

Epizootic Hemorrhagic Disease (EHD) mortalities in white-tailed deer populations in PMUs 14 and 15 were high in 1998, 1999, 2003, and 2004, but have been almost nonexistent since. Drought conditions coincided with these large EHD outbreaks and likely exacerbated them. There are some indications that mule deer expanded back into areas that were occupied by white-tailed deer prior to the outbreak of EHD. This trend appears to be reversing as white-tailed deer populations recover.

Though Chronic Wasting Disease (CWD) has not been detected in Washington, it is a concern in District 2 due to its proximity with Idaho and Montana, which have several game farms. Lymph nodes were taken from hunter-killed and road-killed deer throughout the district from 2006-2011 to test for CWD. None of the samples were positive. Though no more field testing is planned, samples will be taken opportunistically from any deer exhibiting symptoms of CWD.

Management Conclusions

Mule Deer

Currently we are meeting the Game Management Plan guidelines for mule deer buck escapement (20 to 24 bucks per 100 does post-hunt). However, the low adult mule deer buck to doe ratios indicate that our harvest is being sustained primarily by recruitment of yearlings (i.e., we are harvesting almost all of our old age classes). With accommodating weather and productive habitats these populations produce a sustained harvest. Reductions in productivity for one or more years, however, could result in pronounced declines in harvest and hunter success. Discussions on long-term management of mule deer and development of a Mule Deer Management Plan will address these and similar issues. Short-term recommendations are to continue monitoring buck escapement and to propose restrictions in hunting opportunity if declines in populations are observed.

White-tailed Deer

We have met the Game Management Plan guidelines for post-season buck ratios for white-tailed deer over the past three years (WDFW 2008). However, post-season surveys have been more focused in mule deer habitat (i.e., open terrain) than in white-tailed deer habitat and thus may not accurately reflect their status across the entire district. Attempts at post-season surveys in the more forested GMUs (124,127, & 133) have routinely produced low counts and low buck to doe ratios. Rather than actual buck numbers, this more likely reflects the poor visibility and nearly nocturnal activity patterns of bucks once hunting season opens. To address these problems there is an on-going WDFW research project in NE WA, investigating survey techniques for white-tailed deer in forested habitats. Those GMUs near the Spokane urban center continue to receive high hunting pressure and will need to be closely watched to avoid over- or under-harvest. So far we have not experienced excessive urban deer problems in Spokane. However, the public perceives high numbers of vehicle collisions with white-tailed deer as a problem in parts of GMUs 124 and 127. Additionally, crop damage is reported annually in some portions of all GMUs. Intensive recreational harvest, with a wide range of seasons and antlerless opportunities, has helped mitigate some of the damage claims and perceived urban population issues. We will continue to offer 2nd tag antlerless hunts by permit in all GMUs, as well as general white-tailed deer antlerless seasons for archery, muzzleloader, youth, senior, and disabled hunters in units near the urban area of Spokane and in rural units experience widespread damage issues.

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Table 1. Summary of general season harvest in PMU 14 and 15 (special permit harvest NOT included).

	PMU 14			PMU 15		
Year	Antlered	Antlerless	Total	Antlered	Antlerless	Total
2001	1194	294	1488	1544	357	1901
2002	1391	253	1644	1639	344	1983
2003	1386	380	1766	1444	501	1945
2004	1492	387	1880	1371	468	1839
2005	1547	337	1884	1500	421	1921
2006	1102	361	1463	1080	257	1337
2007	1246	361	1607	1290	277	1567
2008	1433	441	1874	1565	333	1898
2009	1158	412	1570	1362	364	1726
2010	1241	414	1655	1436	335	1771
2011	1133	494	1627	1301	284	1585
2012	1480	550	2030	1761	293	2054
2013	1313	473	1786	1914	292	2206
Average	**1317**	**397**	**1713**	**1477**	**348**	**1826**

Table 2. Palouse special permit hunt results

	2006	2007	2008	2009	2010	2011	2012	2013	Average
Num. of Hunters*	342	395	342	411	459	380	355	386	384
Hunter Success**	57%	42%	59%	57%	36%	58%	67%	67%	56%
Percent 4+ bucks**	85%	88%	89%	85%	91%	89%	89%	90%	88%
Percent 5+ bucks**	29%	37%	37%	35%	50%	33%	36%	34%	37%

* Number of tag holders that hunted in one of the Palouse GMUs (127 – 142).

** Calculations based on kills that occurred during the constraints of the permit hunt.

Table 3. Post-hunt ratios from flights only.

Species	Year	(Buck:Doe:Fawn) Post-hunt	Total Count	# GMUs
Mule Deer	2006	25:100:70	3050	5
	2007	22:100:59	444	1
	2008	22:100:52	684	2
	2009	22:100:71	2470	4
	2010	20:100:79	2526	3
	2011	24:100:79	3088	4
	2012	23:100:86	2089	2
	2013	25:100:87	3250	2
White-tailed Deer	2006	9:100:63	260	5
	2007	10:100:44	237	1
	2008	36:100:48	46	2
	2009	31:100:64	214	4
	2010	30:100:62	589	3
	2011	25:100:83	248	3
	2012	29:100:84	124	2
	2013	*	*	*

* White-tailed deer were not counted during mule deer aerial surveys this year due to time constraints.

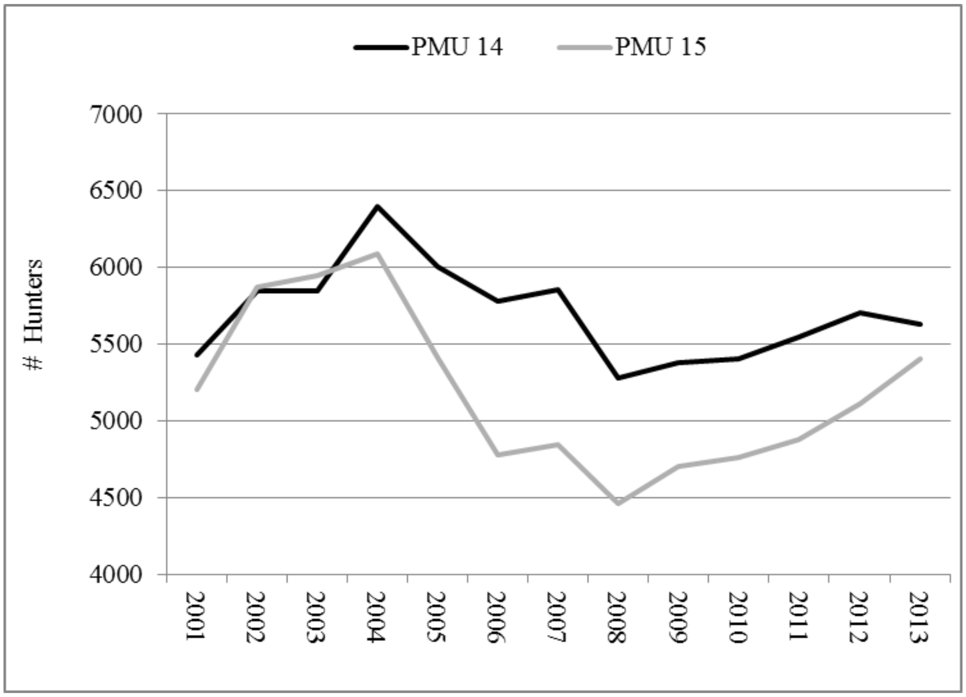

Figure 1. Trend in hunter numbers all weapon types in PMUs 14 & 15.

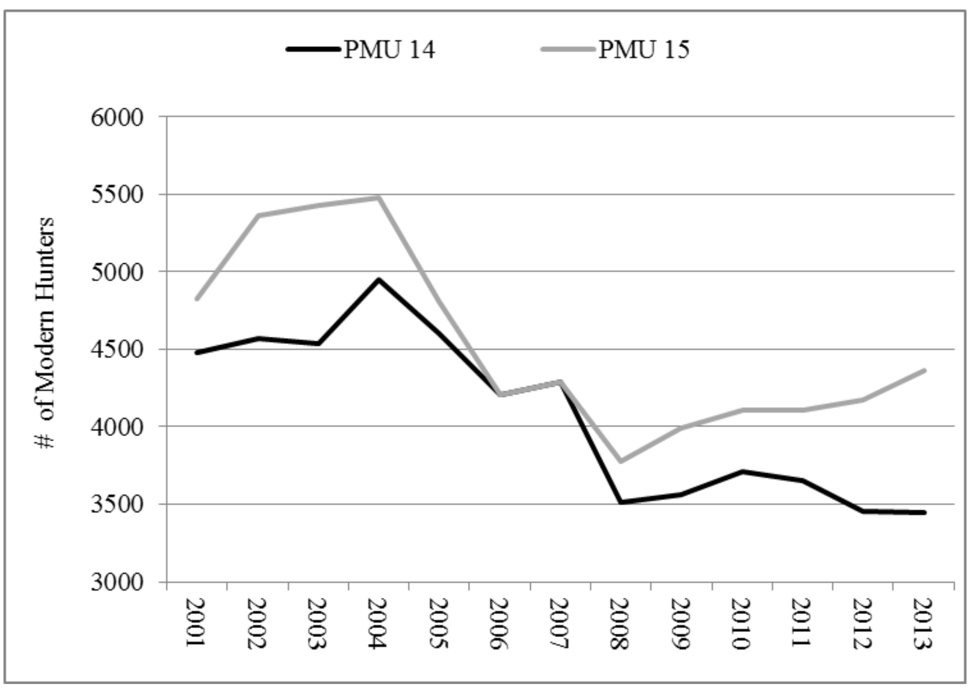

Figure 2. Trend in modern firearm hunters in PMUs 14 & 15

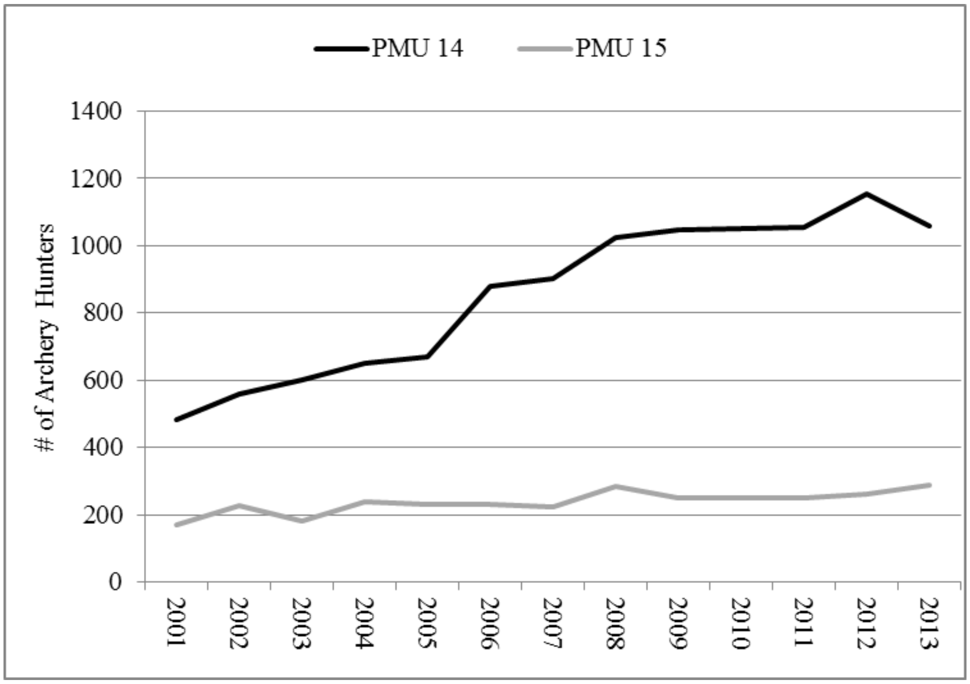

Figure 3. Trend in archery hunters in PMUs 14 & 15.

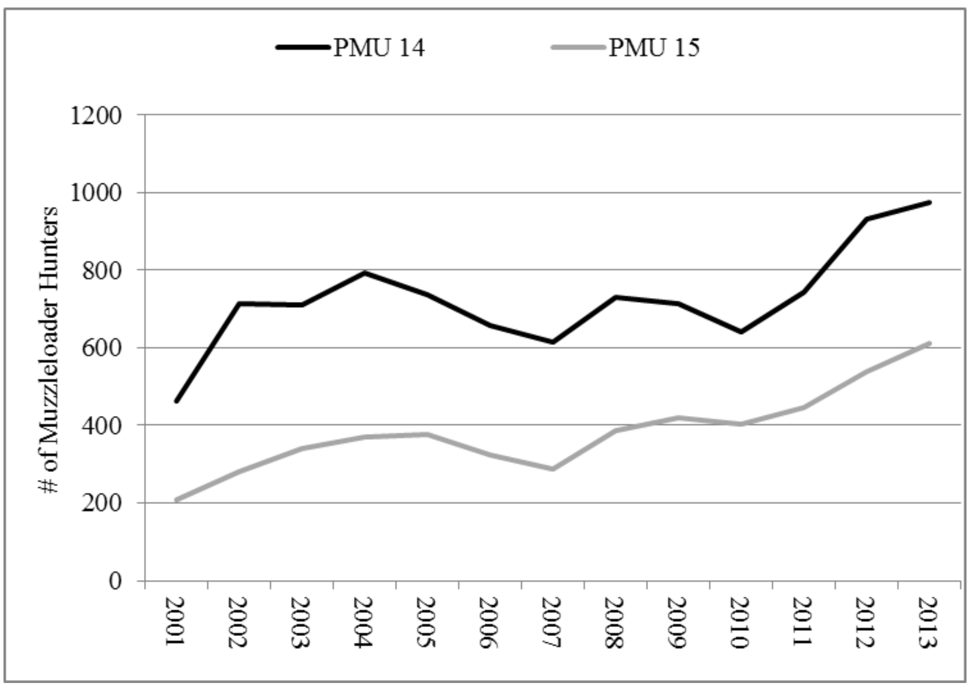

Figure 4. Trend in muzzleloader hunters in PMUs 14 & 15.

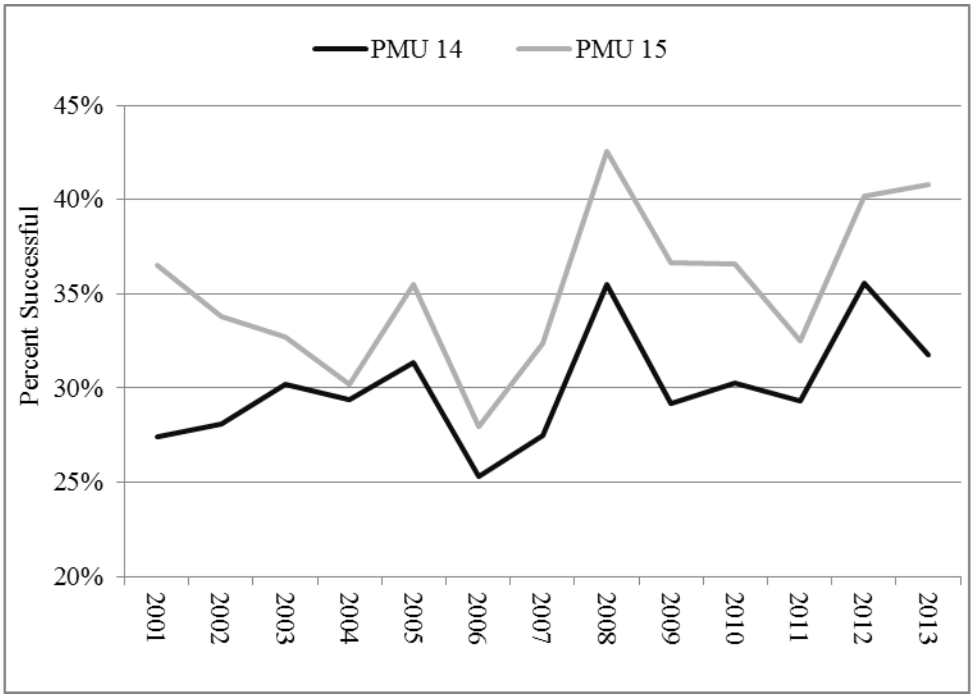

Figure 5. Hunter success rates in PMUs 14 & 15.

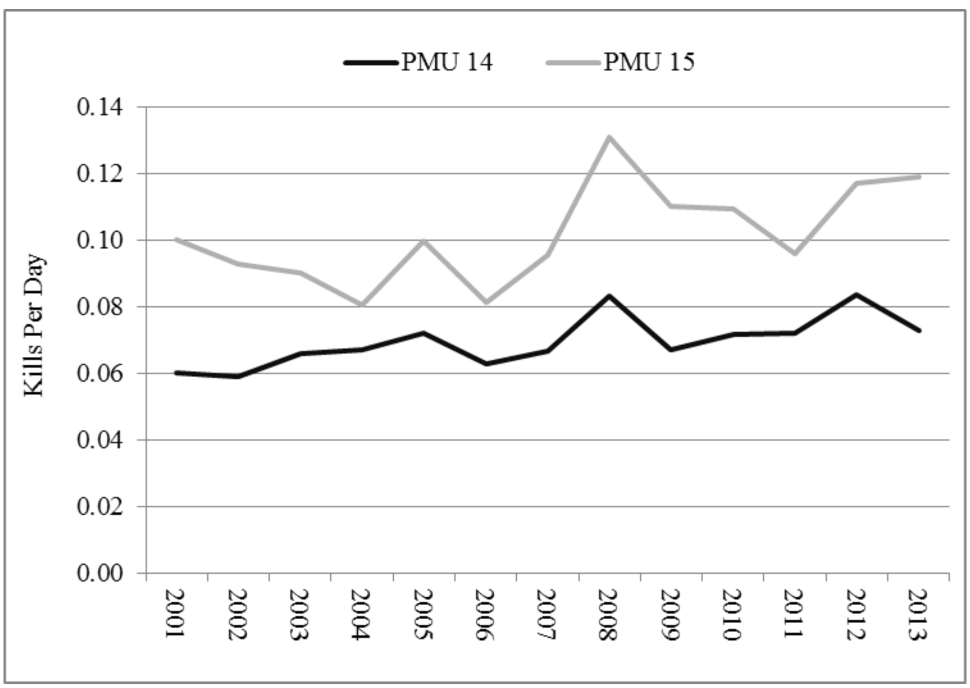

Figure 6. Catch per unit effort, measured as kills per day, in PMUs 14 & 15.

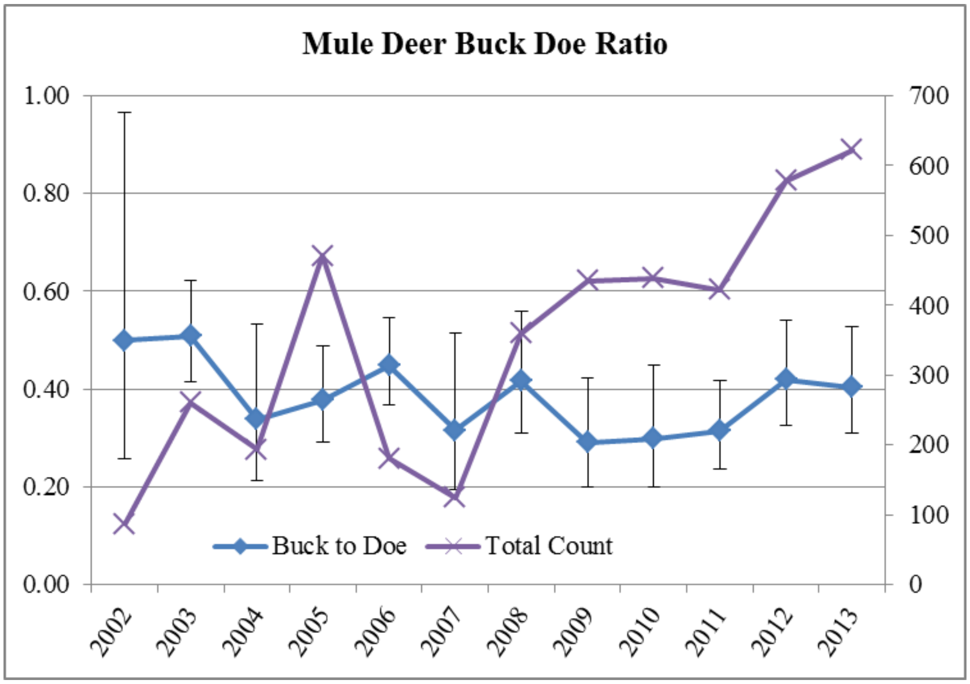

Figure 7. Pre-hunt mule deer buck to doe ratios and total count (bucks, does, & fawns).

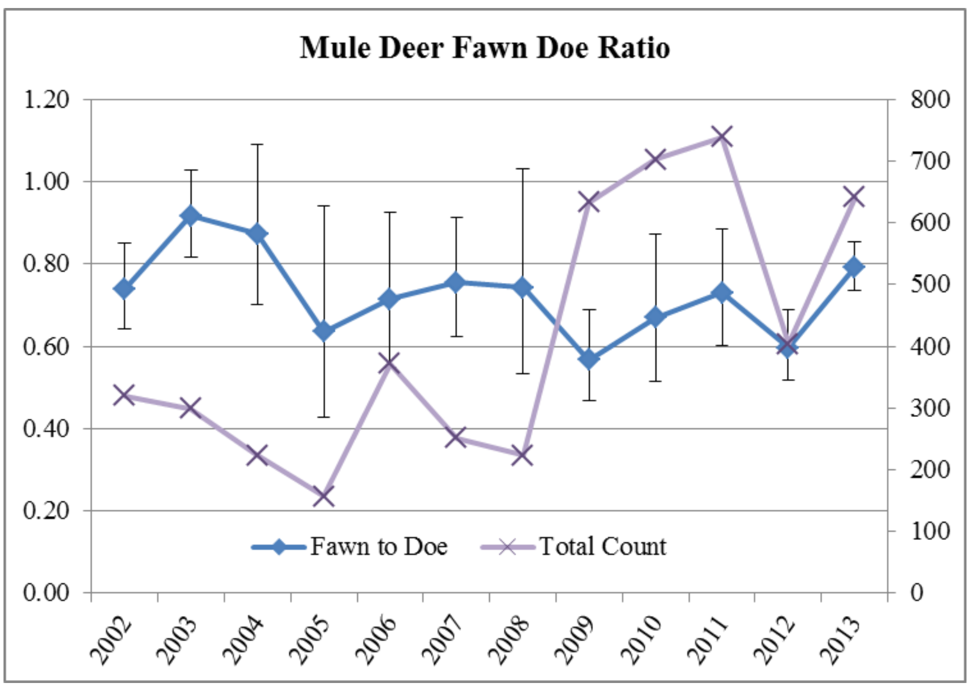

Figure 8. Pre-hunt mule deer fawn to doe ratios and total count (bucks, does, & fawns).

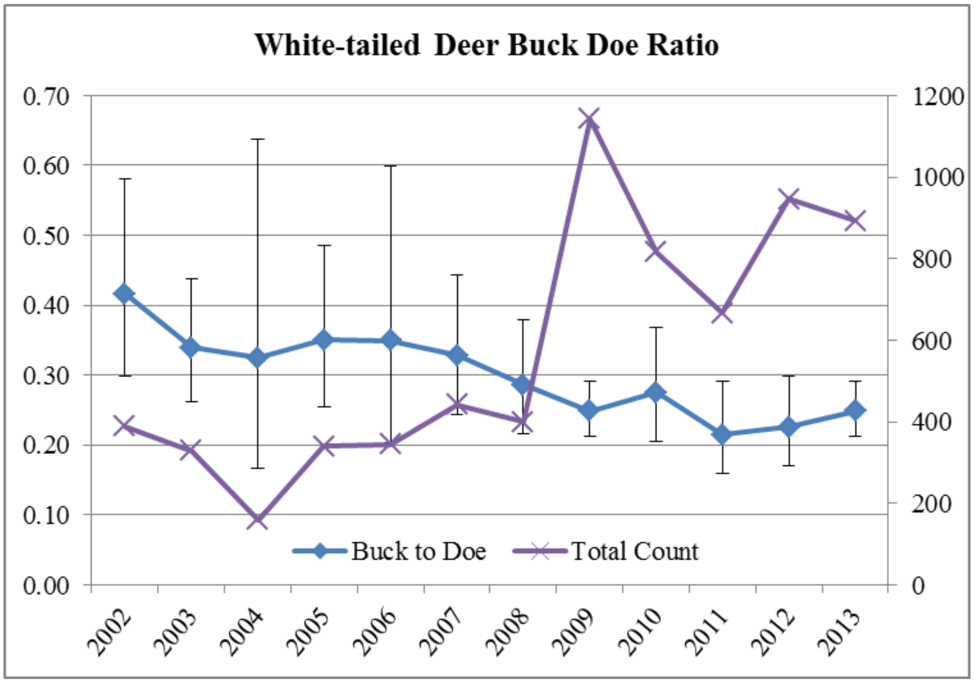

Figure 9. Pre-hunt white-tailed deer buck to doe ratios and total count (bucks, does, & fawns).

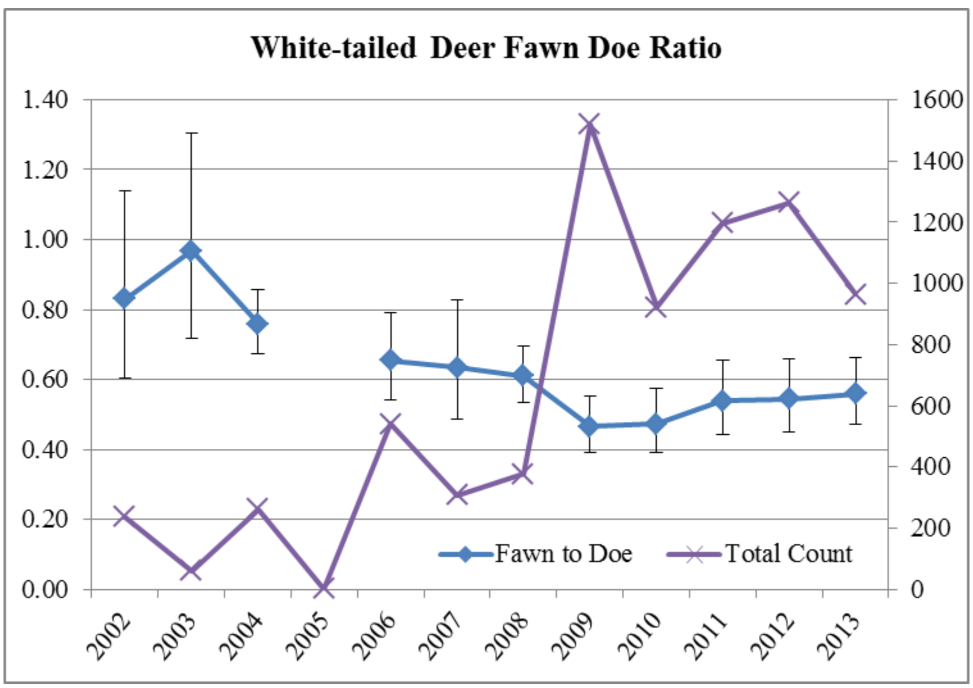

Figure 10. Pre-hunt white-tailed deer fawn to doe ratios and total count (bucks, does, & fawns). In 2005 September surveys in white-tailed deer areas were not conducted.

DEER STATUS AND TREND REPORT: REGION 1

PMU 16 - GMUS 145, 149, 154, 178, 181
PMU 17 - GMUS 162, 163, 166, 169, 172, 175, 186

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MARK VEKASY, Assistant District Wildlife Biologist

Population Objectives and Guidelines

The goal set by the Washington Department of Fish and Wildlife (WDFW) for the management of deer populations in Washington is to maintain numbers within habitat limitations. Landowner tolerance, a sustainable harvest, and non-consumptive deer opportunities are considered within the land base framework (WDFW 2008). The Blue Mountains District (Region 1, District 3) is located in southeast Washington and includes Game Management Units (GMUs) 145 – 186, subdivided into two Population Management Units (PMU); PMU 16 (GMUs 145, 149, 154, 178, and 181), and PMU 17 (GMUs 157, 162, 163, 166, 169, 172, 186). Our deer management goals are to maintain both white-tailed deer (*Odocoileus virginianus*) and mule deer (*O. hemionus*) numbers at levels compatible with available habitat, landowner tolerance, and provide as much recreational use of the resource for hunting and aesthetic appreciation as possible. Further objectives are to meet the Game Management Plan (WDFW 2008) guidelines for buck escapement (post-hunt) by PMU, which are 15-19 bucks per 100 does in PMU 16, and 20 to 24 bucks per 100 does in PMU 17, while maintaining healthy fawn to doe ratios and minimizing agricultural damage from deer. In addition, the population goal from WDFW's white-tailed deer management plan (WDFW 2010) for the Palouse Zone and Blue Mountains Zone is to maintain the population at its current level or allow a slight increase as long as agricultural damage does not become a problem. The stated strategy to achieve this goal is to recommend hunting season structures and opportunity that will maintain white-tailed deer at their current numbers and distribution, while still attempting to maintain some opportunity for all user groups.

Based on limited aerial surveys, ground counts, and harvest estimates, the mule deer population in the Blue Mountains has remained relatively stable along the breaks of the Snake River. Mule deer populations in the mountains may still be depressed, but appear stable, and GMUs 175 and 181 have recently reversed long-term declines in harvest metrics. White-tailed deer populations have recovered from epizootic hemorrhagic disease (EHD) outbreaks and past high antlerless harvest in the western Blue Mountain foothills.

Hunting seasons

PMU 16 contains primarily agricultural habitat with a mixture of Conservation Reserve Program (CRP) grasslands, large expanses of grasslands/canyonlands, small amounts of shrub-steppe, and forested riparian areas along numerous rivers and creeks, although GMU 154 includes forested habitat in north-facing draws and upper elevations of the Blue Mountains foothills. PMU 17 contains a mix of foothill agricultural lands, forested draws, high elevation forestlands, and riparian areas, although GMU 163 is primarily agricultural lands. Both PMUs contain populations of white-tailed deer and mule deer, with more mule deer harvested annually in PMU 16 and slightly more white-tailed deer harvested annually in PMU 17; however if hunters wish to target an individual species, hunts should be planned on a GMU basis, with mule deer the dominant harvest in most units, but white-tailed buck harvest predominates in GMUs 154 and 162, with significant numbers of white-tails also harvested in GUMs 145, 149, 178, and 181. A 3-point minimum regulation on antlered deer applies to all hunts, with an antlerless harvest option available to archery, muzzleloader, senior, youth, and disabled hunters. WDFW offered a nine-day general early modern firearm season in mid-October for both mule and white-tailed deer. Archers are offered both early and late general hunting seasons in selected GMUs. The early archery deer hunt occurs in September and the late season runs in late November to early December. Muzzleloaders are offered both early and late general admission seasons in selected GMUs, as well. Muzzleloader early season runs from late September into early October. The late season is in late November through early December. Permit hunt opportunities for quality deer, buck, and second deer (antlerless only) are offered in multiple GMUs, along with special permits for youth, seniors, and disabled hunters.

Harvest trends

The accuracy of harvest data has improved since implementation of mandatory hunter reporting in 2001. For the 10-year period from 2003-2012, District 3 combined general and permit season buck harvest averaged 2,041 bucks/year, and ranged from 1,789 to 2,419. In 2013, hunters harvested 2,769 bucks (Table 1), 36% above the 10-year mean and the largest harvest in at least the last 17 years. In 2013, the mule deer buck harvest averaged 60% four-point or better, well above both the 54% in 2012 and the 10-year mean of 53%. White-tailed deer harvest averaged 26% five-point or better, slightly above both the 22% in 2012 and the 10-year mean of 22%. General season hunter success was 31.4%, spread across all GMUs and all user groups (Table 2). This was the highest success in at least the last 13 years, and success was higher than the 10-year mean of 25.4%.

Table 1: Blue Mountains deer harvest summary (2003 – 2013).

	All Deer			Mule Deer		White-tailed Deer	
Year	Antlered	Antlerless	Total	% ≥ 4 point*	Does:100 Bucks Harvested	% ≥ 5 point*	Does:100 Bucks Harvested
2003	2,255	1,496	3,751	49%	60	18%	76
2004	2,015	1,303	3,318	49%	48	21%	88
2005	1,927	927	2,854	53%	31	20%	69
2006	1,931	713	2,644	56%	18	20%	62
2007	1,789	583	2,372	51%	14	22%	57
2008	2,033	574	2,607	53%	15	23%	48
2009	1,974	504	2,478	54%	9	26%	53
2010	2,104	553	2,657	59%	9	22%	56
2011	1,963	491	2,454	55%	9	24%	51
2012	2,419	566	2,985	54%	9	22%	44
10-yr mean	2,041	771	2,812	53%	22	22%	60
2013	2,769	518	3,287	60%	10	25%	35

Note: % ≥ 4 point calculated from harvest under 3-point minimum regulation.

Table 2: 2013 General season hunter success and effort for each GMU within the Blue Mountains district.

		GMU												
Weapon	Data	145	149	154	162	163	166	169	172	175	178	181	186	Totals
All Weapon	Reported Kill	412	874	347	409	131	126	37	71	55	229	228	36	2,955
	Success	48.7%	42.8%	29.2%	22.3%	26.4%	18.5%	15.1%	24.9%	10.3%	36.9%	41.8%	33.3%	31.4%
	Days/GMU	2,399	6,429	4,770	6,888	1,672	2,744	1,065	1,143	2,422	2,147	1,980	324	33,983
	# Hunters	844	2,040	1,187	1,832	497	682	245	285	534	620	546	108	9,420
	Harvest/ day	0.172	0.136	0.073	0.060	0.078	0.046	0.035	0.062	0.023	0.107	0.115	0.111	0.087
Archery	Reported Kill	9	50	53	16	17	19	1	3	4	30	6	0	208
	Success	16.4%	37.6%	23.6%	9.2%	13.1%	19.6%	4.0%	15.0%	3.5%	28.8%	17.1%	0.0%	18.6%
	Days/GMU	263	683	1,289	1,026	645	554	151	138	770	614	182	27	6,342
	# Hunters	55	133	225	173	130	97	25	20	113	104	35	6	1,116
	Harvest/ day	0.034	0.073	0.041	0.016	0.026	0.034	0.007	0.022	0.005	0.049	0.033	0.000	0.033
Modern	Reported Kill	362	691	285	386	111	102	35	56	43	197	168	34	2,460
	Success	49.9%	44.0%	30.6%	23.8%	31.0%	17.8%	16.1%	26.4%	11.5%	38.7%	44.9%	35.1%	32.5%
	Days/GMU	1912	4,425	3,270	5,676	988	2,124	906	745	1,456	1,496	1,179	285	24,426
	# Hunters	725	1,570	931	1,619	358	572	217	212	374	509	374	97	7,558
	Harvest/ day	0.189	0.156	0.087	0.068	0.112	0.048	0.039	0.075	0.030	0.132	0.142	0.119	0.101
Multi Weapon	Reported Kill	11	24	9	7	3	5	1	1	1	2	7	1	72
	Success	73.3%	41.4%	29.0%	20.6%	33.3%	38.0%	33.3%	10.0%	7.7%	28.6%	70.0%	25.0%	34.8%
	Days/GMU	58	329	211	171	39	66	8	51	73	37	28	10	1,081
	# Hunters	15	58	31	34	9	13	3	10	13	7	10	4	207
	Harvest/ day	0.190	0.073	0.048	0.045	0.077	0.076	0.125	0.020	0.014	0.054	0.250	0.100	0.067
Muzzle loader	Reported Kill	30	109						11	7		47	1	208
	Success	61.2%	39.0%						25.6%	20.6%		37.0%	100%	39.0%
	Days/GMU	166	992			No Hunt			209	123	No Hunt	591	2	2,083
	# Hunters	49	279						43	34		127	1	533
	Harvest/ day	0.181	0.110						0.053	0.057		0.080	0.500	0.100

Deer population levels are most sensitive to doe survival and fawn recruitment and survival. Antlerless harvest is one of the best management tools to regulate deer numbers within population objectives. High antlerless permit numbers during the late 90s-early 2000s, coupled with unexpected disease outbreaks resulted in overharvest of does and subsequent population declines, especially in white-tailed deer which are more susceptible than mule deer to EHD outbreaks. Other factors likely contributed to mule deer declines, such as weather impacts on habitat, and other factors resulting in habitat loss or conversion. As a result, antlerless permit numbers have been more tightly controlled in an effort to increase deer populations. In 2013, 518 antlerless deer were harvested (Table 1), 211 with permits and 307 during the general season, lower than both the 2012 level (566) and the mean of 545 for the 6-year period from 2007-2012, during which time permit numbers were reduced and have remained relatively stable. For comparison, the mean antlerless harvest for the 6-year period from 2001-2006 was 1,122 deer. With recent increases in hunter success (Figure 2) and harvest per unit effort (HPUE, Figure 1) in most of the prairie GMUs (145, 149, 163, 178, 181), we were able to reinstate antlerless permit opportunity in GMUs 145 and 149 for the 2013 season. GMUs 162 and 163 also historically had high antlerless permit levels. GMU 163 has shown improvement in HPUE and success, and may warrant an increase in opportunity, while GMU 162 continues to be among GMUs with the lowest HPUE and success rates. GMU 178 was mistakenly dropped from the GMUs available to hunt for the Senior/Disabled/Youth general season, and probably accounts for most of the drop in antlerless harvest between 2012 and 2013.

Figure 2. Harvest success for District 3 GMUs.

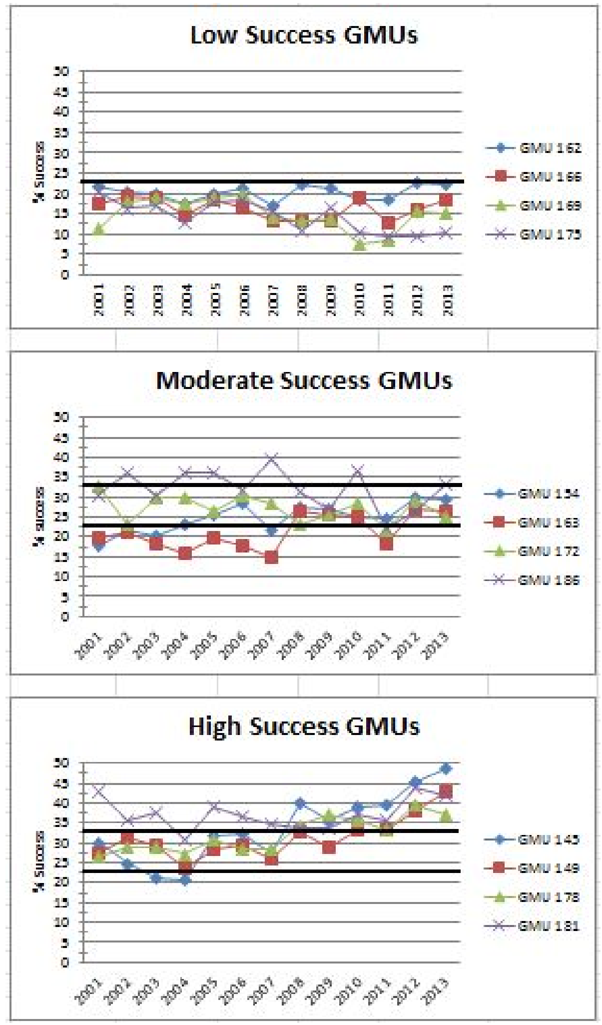
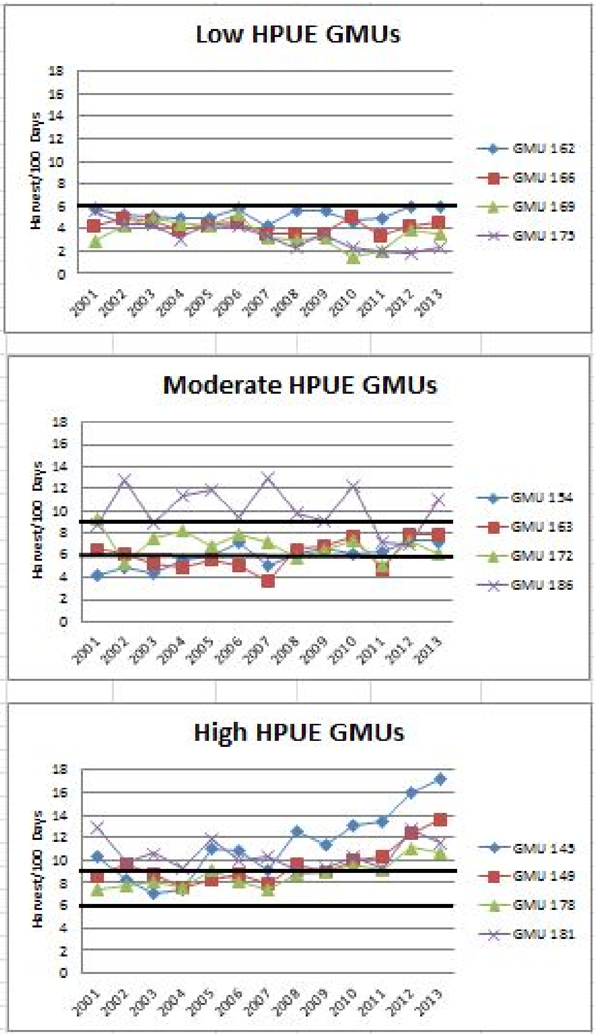


Figure 3. Harvest per 100 days for District 3 GMUs.



Three user groups have general seasons in the Blue Mountains: archery, muzzleloader, and modern firearm. The number of modern firearm hunters has gradually declined since 1996, from a high of 13,423 to a low of 6,914 in 2008 (Table 2). Numbers have since stabilized and 7,558 hunters participated in 2013. Modern firearm (MF) hunters harvested 2,460 deer in 2013; 2,264 bucks and 196 antlerless deer. General season MF hunter success was 32.5%. Higher harvest over the last 2 years has reversed long-term harvest declines. While much of the decrease in harvest numbers can be attributed to decreasing modern firearm hunter numbers, we need to be aware of other factors that may be affecting deer populations and harvest numbers, such as habitat loss (CRP, non-native plants, conversion) or changes (fire, fire suppression, logging), predation (coyote, cougar, wolf, bear), weather (drought, winter severity), and disease (EHD).

Muzzleloader (ML) hunter numbers increased dramatically with the introduction of a general muzzleloader season in 2000. The first year, only 117 ML hunters participated, but by 2004 that number increased to 734 hunters. ML hunters have declined since 2004, but appear to have stabilized recently at close to 500 hunters, with 533 participating in 2013. Muzzleloader hunters harvested 208 deer in 2013, 196 bucks and 12 antlerless. Antlerless harvest was impacted by the closure of the late white-tailed deer hunt in GMU 181, which was replaced by a permit hunt. Although there were ample permits, the hunt saw low participation and the late general season will be re-instated for 2014. Muzzleloaders enjoyed a success rate of 39.0% (Table 2), which was the highest success rate for any user group in the Blue Mountains.

Archery hunter numbers have been relatively stable since 2002, with 1,116 archers participating in 2013. Archers harvested 208 deer (110 bucks, 98 does), which was slightly below the 10-year mean of 218 deer. The archery success rate was the lowest for all user groups at 18.6% (Table 2).

Species composition of the general buck harvest in 2013 was comprised of 66% mule deer and 34% white-tailed deer, similar to previous years and slightly higher than the 10-year mean of 62% mule deer in the harvest. The total antlerless harvest consisted of 32.6% mule deer, higher than both last year and the 5-year mean of 24.2%. The antlerless deer harvest continues to focus on white-tailed deer, due to persisting low numbers of mule deer in many units, although we have been able to increase antlerless opportunity in GMUs 145 and 149, and continue to look for other GMUs to increase opportunity. A total of 395 any antlerless deer permits (increased from 309 in 2012) along with 225 permits for antlerless white-tailed deer (increased from 195 in 2012) were issued in 2013.

The 2013 permit-controlled and general season antlerless harvest totaled 518 antlerless deer (general season 307, permit season 211), comprised of 168 mule deer and 348 white-tailed deer. We have reduced antlerless hunting pressure on mule deer over the last few years due to presumed drought impacts on mule deer fawn recruitment, while slowly allowing increased hunting opportunity for antlerless white-tailed deer due to increasing white-tailed deer numbers since the EHD outbreak.

The antlered permit controlled hunt opportunities have been expanded in recent years, with modern firearm rut hunts available for mule deer in limited numbers and muzzleloader opportunities in the mountain GMUs prior to the modern firearm general season. The largest opportunity is still the late white-tailed deer hunts during November for modern firearm and muzzleloader hunters, which increased in 2011 from 210 to 230 permits and remained at 230 for 2013 (Table 3). For all permits, only 55% reported hunting with their permit with an overall success of 60%.

Table 3. 2013 late white-tailed deer harvest, modern firearm and muzzleloader combined and previous 10-year history.

Year	Permits	Bucks	Does	Total	Success Rate	%Harvest ≥ 5 pt.
2003	210	95	13	108	65%	17%
2004	210	69	16	85	52%	39%
2005	210	84	9	93	60%	37%
2006	210	84	8	92	74%	40%
2007	210	70	11	81	53%	48%
2008	210	86	18	104	65%	34%
2009	210	87	13	100	69%	37%
2010	210	77	3	80	59%	40%
2011	230	87	5	92	65%	37%
2012	230	87	0	87	64%	31%
2013	230	95	0	95	61%	44%

Surveys

Both aerial and ground surveys are used to determine pre- and post-hunt herd composition. We conducted pre-hunt surveys from the ground between August and September, and classified 1,050 mule deer during August, followed by 801 classified in September along most of the same routes. We classified 634 and 576 white-tailed deer during these same time periods and along the same routes. Using only the August survey data, we found 38 bucks:100 does and 37 fawns:100 does for mule deer, and 37 bucks:100 does and 33 fawns: 100 does for white-tailed deer. August surveys generally underestimate fawn:doe ratios, as many fawns are still difficult to detect at this time. September surveys resulted in 24 bucks:100 does and 50 fawns:100 does for mule deer, and 27 bucks:100 does and 53 fawns:100 does for white-tailed deer. August and September surveys both yielded a high percentage of bucks ≥2 years-old for mule deer (50-53%), with mixed results for white-tailed deer (38-58%).

Post-hunt surveys (aerial) in 2013 resulted in 7,567 mule deer classified (Table 4). Overall, the mule deer fawn: doe ratio was 50.1 fawns:100 does (90% CI +/-2.2), which was slightly higher than the estimate for last year (45.0 fawns:100 does, 90% CI+/-3.2) and similar to the 10-year mean of 48.0 fawns:100 does (90% CI +/-3.8).

The post-hunt mule deer buck:doe ratio was 27 bucks:100 does (90% CI +/-1.5) for the district, which is higher than the 10-year mean of 17 bucks:100 does (90% CI +/-2, Table 4). The 10-year mean of mule deer bucks ≥2 years of age is 36.5% of the post-hunt buck population. In 2013, 49.4% of the bucks were ≥2-years old.

Table 4. Post-hunt mule deer surveys 2002-2013, Blue Mountains, Washington.

	Bucks					Ratios (90% C.I.)	
Year	Adults	Yrlg	Doe	Fawn	Total	Fawn (CI)	Bucks (CI)
2002	77	158	1,651	581	2,465	35 (32, 38)	14 (13, 15)
2003	34	70	979	467	1,550	48 (43, 52)	11 (8, 13)
2004	85	112	1,440	719	2,363	50 (46, 54)	14 (13, 16)
2005	85	229	1,870	688	2,872	37 (34, 39)	17 (15, 18)
2006	80	147	1,350	645	2,231	48 (44, 51)	17 (14, 19)
2007	80	112	1,166	505	1,862	43 (40, 47)	16 (14, 19)
2008	113	132	1,444	697	2,386	48 (45, 52)	17 (15, 19)
2009	72	162	1,363	769	2,366	56 (52, 61)	17 (15, 19)
2010	80	290	2,232	1,088	3,704	49 (46, 52)	17 (15, 18)
2011	74	124	831	466	1,495	56 (51, 61)	24 (21, 27)
2012	181	179	1,719	773	2,852	45 (42, 48)	21 (19, 23)
2013	562	576	4,284	2,145	7,567	50 (48, 52)	27 (25, 28)

Unlike mule deer, white-tailed deer have not been the focus of District 3's post-hunt deer surveys and are harder to detect in forested and riparian habitats, which results in significantly fewer deer being classified. In 2013, 2,056 white-tailed deer were classified all during aerial surveys. The fawn:doe ratio for white-tailed deer was 50 fawns:100 does (90% CI +/-4.1). The buck ratio was 24 bucks:100 does (90% CI +/-4). This compares to 10-year means of 51 fawns:100 does (90% CI +/-11) and 21 bucks:100 does (90% CI +/-4).

Population Status and Trend

The mule deer population appears to be stable in the lowlands and along the Snake River breaks, but is still below the population levels that occurred from 1996-2003 based on harvest data. Mountain subpopulations also appear stable, except for GMUs 175 and 181, where harvest metrics indicate recent increases after long-term declines in both GMUs. An initial effort to determine population size was implemented in the winter of 2010 in the area of the Lower Snake River Wind Development Area. We conducted surveys following sightability protocols (Unsworth et al. 1994) and generated a population estimate for a given area in northern Garfield and Columbia Counties. It will be necessary to replicate this effort in future years to improve our knowledge of this population, but we were not able to replicate the effort in 2011. In 2012, we had funding available for aerial surveys, but rather than repeating 2010 surveys, we concentrated our efforts in GMU 181, where harvest data had indicated a 50% decrease in mule deer harvest over the last 10 years. Harvest data for Garfield and Columbia Counties shows stable or recovering harvest trends for these areas over the same time period. In 2013, we conducted aerial surveys in the north central portion of the District. A portion of this area was flown in 2010, but surveys this year incorporated more subunits, particularly along the breaks of the Snake River. The results of sightability surveys for mule deer yielded a raw count of 7,567 mule deer for 33 of 39 pre-designed subunits flown, a raw count estimate of 8,522 assuming all 39 subunits had been flown, and a modeled population estimate of 11,737 (90% CI+/-1,022) deer. The model estimated 25.9 bucks:100 does and 51.2 fawns:100 does. With the addition of this baseline data, we hope to repeat surveys within 3 to 4 years to determine population trends within this area. In general, recruitment across the District has been low, with 2013 (51.2 fawns:100 does, 90% CI+/-3.8) higher than but similar to the 10-year mean (48.0 fawns:100 does, 90% CI+/-3.8). What seems to be a long-term dry pattern may be having lasting effects on mule deer habitat resulting in chronically low recruitment. Overall, mule deer fawn ratios are low compared to the Columbia Basin north of the Snake River (76-80 fawns:100 does, 2009-11, Hoenes et al 2012), the Lower Salmon region in ID (47-62 fawns:100 does (1999-2005, Racheal ed. 2011)) and other western states, except for Nevada, which generally has fawn ratios in the 40's and notes that a small difference in fawn recruitment can make the difference between stable or declining populations (Wasley 2004).

White-tailed deer populations are improving since an EHD die-off in 2008 in the Touchet River drainage. In general, white-tailed deer numbers in the eastern Blue Mountains appear to have declined, while numbers on the westside of the Blues have improved.

Habitat

Below average Summer-Fall precipitation has occurred seven out of the last 13 years (2001-2003, 2005, 2007, 2011, 2012), which can have a negative impact on deer recruitment. Fall green-up is extremely important for mule deer along the breaks of the Snake River and in the lowland areas. Green-up provides the nutrition necessary for deer to increase fat reserves needed for winter survival and increased fecundity. A drought during the summer-fall is thought to result in poor physical condition for breeding and increased winter mortality, and can also result in poor fawn production/survival the following spring. Winter conditions over the last 5 years have been generally mild, with only slightly higher than normal spring snow pack in 2011 and 2012. Despite poor fall conditions, mild winters and normal to above normal spring precipitation have likely contributed to good over-winter survival the last several years. Late summer/fall precipitation in 2013 was well below normal except for significant precipitation in September, and again having mild winter conditions over 2013-2014 should translate into good over-winter fawn survival.

The Conservation Reserve Program (CRP) dramatically improved habitat conditions for deer in the lowland agricultural areas, providing approximately 250,000 acres of additional habitat in the 4 counties. These large areas of habitat provide connectivity across the landscape, quality forage, and fawning areas where little existed prior to this program. Unfortunately, large acreages of CRP are being lost in all counties except Walla Walla, as old contracts expire and are not eligible for renewal. To date, the CRP acreage in District 3 has shown a small but significant decline at the county and GMU level. Nationally, a lower cap on CRP acreage has been established and is likely to result in decreased CRP habitat as contracts expire. The habitat provided by the CRP program has been a contributing factor to the increase in mule deer populations during the 1990s. If CRP acreage declines significantly, we can expect a similar decline in mule deer populations in the lowlands of southeast Washington.

Yellow star-thistle (*Centaurea solstitialis*) is a major problem in the foothills and along the breaks of the Snake River south of Asotin, the breaks of the lower Tucannon River, and throughout the rangelands of western Walla Walla County. Yellow star-thistle has inundated thousands of acres of deer habitat in GMU-181 along the Snake River breaks, and this problem surely contributes to a lack of improvement in the mule deer population in this unit. While WDFW has partnered with private landowners and the Rocky Mountain Elk Foundation to fund star-thistle control efforts along the forest/ag-land interface, there has not been a similar focus on rangeland habitats. If partnerships and funding sources could be identified and developed, there may be the opportunity to improve deer habitat throughout rangeland areas of District 3.

Habitat conditions on 163,000 acres of National Forest and private land continue to improve following the extensive wildfires that occurred in 2005 and 2006 (School Fire -53,000 acres, Columbia Complex Fire-110,000 acres). The Columbia Complex Fire produced excellent conditions for habitat regeneration on over 80% of the acreage burned, whereas the School Fire burned extremely hot and will take decades to recover in some areas.

Weed control projects have been implemented on WDFW Wildlife Areas and on private lands, which should improve habitat conditions for deer. The wildfires of 2005 and 2006 will also have a positive impact on deer habitat in GMU's 154, 162, 166, and 178. WDFW has worked with private landowners in southern Columbia County on elk winter and summer range improvement. These activities will benefit mule deer and white-tailed deer as well.

Wind power development continues to expand in southeast Washington. In 2011, construction was completed on 150 turbines in northern Garfield County, and resulted in a temporary hunting closure over a significant area of the county, and new construction was started in Columbia County in 2013 and continued into 2014, again with associated temporary hunting closures. The overall development plan includes approximately 850 turbines to be constructed in northern Garfield and Columbia Counties. Another development has been proposed for northeastern Garfield County, effectively making these combined developments the largest planned windpower site in the country. It is unknown whether windpower development will negatively affect deer populations.

Damage complaints attributed to deer have been minimal in southeast Washington compared to deer densities, although we are seeing increasing complaints in some of the winery areas near Walla Walla.

Management Conclusions

Mule deer populations along the breaks of the Snake River and in the lowlands appear to be stabilizing, except for GMU 181. Mule deer populations in the mountains are thought to be considerably below desired levels, but are slowly improving, except for recent declines in GMU 175.

Periodic summer/fall drought along with localized severe winter conditions over the last twelve years (2001-2003, 2005, 2007, 2011, and 2012) resulted in lower winter fawn survival for mule deer in the arid lowlands and along the breaks of the Snake River. Fawn production/survival in four of the last 5 years has been above average, but still below levels attributed to increasing populations. The higher recruitment in 2009 may have contributed to increased harvest success seen in 2012; however 2012 fawn production saw a return to chronically low recruitment and may result in lower harvest opportunities in 2014 and 2015, although the increase in buck ratio this past winter may mitigate the lower fawn recruitment. Given favorable winter conditions in 2013/14 and apparently good over-winter survival, populations may remain stable through the 2014 hunting season.

The 2013 post-hunt mule deer buck ratio was the highest since 2000, and suggests the low fawn production in 2012 is not having significant carry-over; however, only 17% of the post-season bucks classified during winter surveys appeared to be 3-years old or older, and these were predominantly observed on private land. For comparison, 30% of 2012 post-season bucks were classified as ≥ 3years-old, and buck harvest in 2013 was the highest in the last 17 years.

The quality of bucks harvested under the three-point program has improved, compared to the era when hunters could harvest any buck. Since 1992, the mule deer buck harvest has averaged 51% four point or larger, compared to 11% prior to the three-point regulation. The white-tailed buck harvest has averaged 20% five point or better, compared to 9% prior to the three-point regulation.

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DEER STATUS AND TREND REPORT: REGION 2

PMU 21 – GMUS 203, 209, 215, 218, 224, 231, 233, 239, 242, 243
PMU 22 – GMU 204

SCOTT FITKIN, District Wildlife Biologist
JEFF HEINLEN, Wildlife Biologist

Population objectives and guidelines

In general, the Okanogan District is managed for maximum productivity and sustainable harvest of mule deer (*Odocoileus hemionus*) and white-tailed deer (*O. virginianus*) with an emphasis in PMU 21 (Western Okanogan County) on quality buck opportunity. As per the statewide game management plan, the post-season sex ratio target is a minimum of 15 bucks per 100 does; however in PMU 21 the preferred ratio is a minimum of 25 per 100. In addition to harvest information, data on buck:doe ratios, fawn production, and fawn recruitment are collected during field surveys to assess success in achieving management objectives.

Hunting seasons and harvest trends

The general modern firearm season remained at 9 days in 2013, and antlerless permit numbers for youth, senior, and disabled hunters remained conservative due to mediocre over-winter fawn recruitment in recent years. The number of antlerless permits for the private land hunt on the Methow Valley was reduced to only 20 in 2012 in response to declining damage issues. Similarly, we implemented some reductions in antlerless permit numbers for the North Okanogan, Central Okanogan private land hunts for 2013.

Hunter numbers, harvest, and hunter success have been quite stable over the last eight years in both PMU 21 and PMU 22 (Figures 1-3). WDFW check station personnel surveyed 252 hunters and examined 78 deer in 2013 (Table 1). In 2010 we moved the check station site to a new location to co-locate with USFS personnel and improve station safety and logistics. Consequently, data totals are not comparable to years before 2010. No biological sampling other than age data collection occurred in this district in 2013.

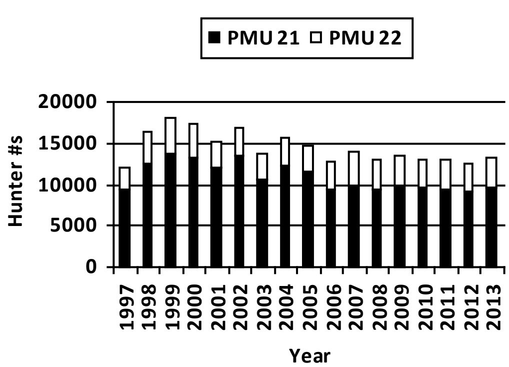

Figure 1. Trend in hunter numbers in PMUs 21 & 22.

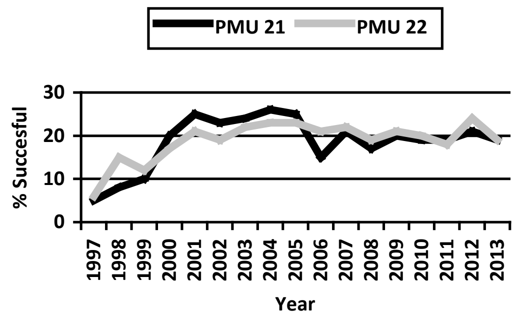

Figure 2. Trend in hunter success in PMUs 21 & 22.

Surveys

Post-hunt surveys are conducted to collect mule deer population composition data and monitor herd condition relative to demographic objectives. Helicopter surveys take place in early December when most hunting seasons have ended, when most bucks are still with does and have not dropped antlers, and when deer are concentrated on winter ranges. Deer are counted, identified to species, and classified as ≥ 3-pt buck, < 3-pt buck, doe, or fawn. This year we modified our survey techniques to explore the possibility of gathering data comprehensive enough to generate a population estimate using a sightability model, in addition to traditional composition data.

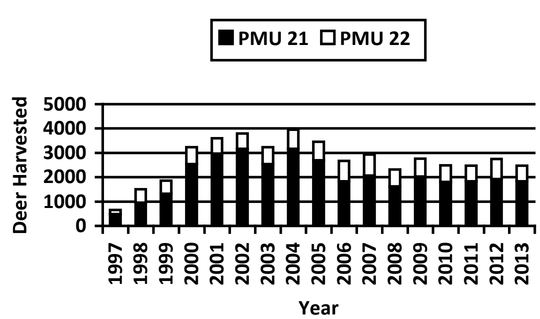

Figure 3. Trend in harvest in PMUs 21 and 22.

Table 1. Chewuch Check Station Results.

Year	Deer Type: Bucks	Antlerless	Total	Hunters	%Success
1997	5	0	5	729	1
1998	33	0	33	980	3
1999	53	0	53	1414	4
2000	72	0	72	1250	6
2001	106	27	133	1314	10
2002	54	45	99	1265	8
2003	71	6	77	840	9
2004	72	5	77	1093	7
2005	49	17	66	1114	6
2006	24	13	37	519	7
2007	41	25	66	715	9
2008	27	13	40	795	5
2009	62	13	75	796	9
2010	66	11	77	375	21
2011	37	6	43	245	18
2012	44	5	49	253	19
2013	72	6	78	252	31

Hiking surveys are conducted in early spring just as winter ranges begin to green-up, and before mule deer begin to migrate to summer range. Deer are classified as fawn or adult, and this data in combination with the post-season survey results is used to estimate over-winter fawn survivorship, and provide insight into population trend.

Biologists classified 4,131 mule deer during helicopter surveys of PMU 21 in early December 2013 (Table 2). The counts yielded overall buck:doe and fawn:doe ratios of 25:100 and 81:100 respectively. Both of these ratios are a bit above the 10-year averages and indicate good buck carryover and fawn production. Data from the expanded survey effort designed to generate a population estimate is still being analyzed. Weather and logistical constraints prevented us from surveying as much of the landscape as we had hoped and preliminary calculations suggest any estimate produced will have extremely wide confidence intervals. It appears unlikely that we will normally have the weather window or available resources to generate a population estimate for the entire PMU in a given year. Future efforts will likely focus on different portions of the PMU on a rotational basis.

Table 2. Post-season mule deer population composition counts in PMU 21 from 2013, by watershed. F:100:B is fawns and bucks per 100 does.

Area	Bucks ≥3 pt	Bucks <3 pt	Doe	Fawn	Total	F:100:B
Methow	166	193	1375	1080	3042	79:100:26
Okanogan	76	59	631	551	1317	87:100:21
Total	242	252	2006	1631	4131	81:100:25

Spring surveys after the mild winter produced an estimated over-winter fawn mortality of 38%. This is considerably below the long-term average of 52%, indicating moderate herd growth over the last year.

Table 3. Long-term post-season mule deer population composition counts for PMU 21. F:100:B is fawns and bucks per 100 does.

Year	Buck Antler Class ≥3 pt	<3 pt	Subt	Doe	Fawn	Total	F:100:B
1997	64	113	177	1464	1061	2712	72:100:12
1998	103	185	288	1735	1520	3544	87:100:17
1999	102	225	327	1301	1150	2778	88:100:25
2000	123	264	387	1425	1321	3133	93:100:27
2001	168	318	486	2067	1841	4394	89:100:24
2002	214	319	533	2059	1607	4199	78:100:26
2003	193	329	522	2854	1938	5314	68:100:18
2004	95	191	286	2086	1676	4048	80:100:14
2005	174	433	607	3367	2841	6815	84:100:18
2006	214	412	626	3343	2148	6117	64:100:19
2007	141	176	317	1935	1409	3661	73:100:16
2008	105	146	251	1499	1119	2869	75:100:17
2009	128	221	349	1762	1360	3471	77:100:20
2010	147	183	330	1371	1126	2827	82:100:24
2011	152	235	387	1327	1050	2764	79:100:29
2012	238	254	492	1433	1117	3042	78:100:34
2013	242	252	494	2006	1631	4131	81:100:25

Population status and trend analysis

Since record keeping began in the early 1900s, the history of the mule deer population in Okanogan County is characterized by gradual long-term trends, largely in response to changes in habitat quality. In the early twentieth century, the implementation of modern game management coincided with the advent of effective wildfire suppression at the landscape level. Fire suppression allowed for the widespread establishment and growth of shrub forage species on critical lower elevation winter ranges. Improving winter forage quantity and quality, coupled with controlled harvest, allowed for steady herd growth for several decades, as evidence by historical harvest data. Range condition and population levels likely peaked in the middle of the twentieth century.

Table 4. Spring mule deer population composition counts from 2014, by area for PMU 21. F:100A is fawns per 100 adults.

Area	Adult	Fawn	Total	F:100A
Methow	1503	697	2200	46:100
Oka	644	264	908	41:100
Total	2147	961	3108	45:100

For roughly the last few decades, harvest data and population estimates suggest a gradually declining population. This is likely a function of the reduced shrub diversity, declining productivity of aging shrubs (particularly bitterbrush and ceanothus), and the lack of recruitment of new shrubs under continued fire suppression regimes. As a result, even during periods of extended mild winter weather, the population is not rebounding to the historic highs of the mid 1900s, suggesting a reduction in landscape carrying capacity for deer. Overlayed on the general long-term population trends are significant short-term fluctuations driven by severe winter weather events and spikes in crop damage related doe harvest. Prior to the 1968 freeze, heavy orchard depredation by deer led to periodic culling events, but the populaltion rebounded quickly as soon as harvest pressure eased. Similarly, mule deer numbers bottomed out in 1997 following a string of hard winters; however, modelling suggests they quickly rebounded and had almost doubled, peaking in 2000 following several consecutive mild winters (Figure 4). Since then, herd size has fluctuated less dramatically in response to changes in winter severity.

Unlike mule deer, white-tailed deer have increased in the district over the long-term. Development patterns and agricultural practices, may have promoted the expansion of white-tailed deer. Whitetails are widespread in the eastern part of the district, and now inhabit most of the major drainages and valley bottoms in the western half of the county, including many places where they had not been seen historically. Relatively flat harvest figures suggest the whitetail population may now be fairly stable. Whitetail also sustained significant winter losses in the 90s, but populations rebounded with milder winters and have likely fluctuated since similar to mule deer.

In contrast to population size, herd composition is tied to harvest rather than habitat. Heavy hunting pressure on antlered mule deer in the past caused the buck:doe ratio to consistently drop below the historical minimum threshold of 10:100. Implementation of more restrictive seasons and a minimum management objective of 15 bucks per 100 does, have improved post-season sex ratios for the last 15 years. In response, the general rifle season was lengthened to 14 days in 2003; however, ratios began declining again immediately and season length returned to nine days in 2006 and has remained there since.

Table 5. Long-term spring mule deer population composition counts from PMU 21. F:100A is fawns per 100 adults.

Year	Adults	Fawns	Total	F:100A
1997	1404	232	1636	17:100
1998	1279	462	1741	36:100
1999	1393	833	2226	60:100
2000	1496	838	2334	56:100
2001	1593	707	2300	44:100
2002	1661	626	2287	38:100
2003	1516	506	2022	33:100
2004	925	335	1260	36:100
2005	1643	722	2365	44:100
2006	1635	288	1923	18:100
2007	1314	269	1583	20:100
2008	1762	436	2198	25:100
2009	1564	503	2067	32:100
2010	1943	768	2711	40:100
2011	2259	696	2955	31:100
2012	2144	728	2872	34:100
2013	1934	600	2534	31:100
2014	2147	961	3108	45:100

Habitat condition and trend

Up until recently, winter range habitat quality and quantity have likely suffered from decades of fire suppression. The resulting tree encroachment, loss of early to mid-successional forage conditions, and lack of shrub regeneration diminish forage quality and quantity in the long-term, and this situation has been exacerbated by the spread of introduced noxious weeds.

In the summer of 2014, however; conditions changed dramatically at the landscape level. Wildfires consumed over 270,000 acres in PMU 21, and the majority of the burned area overlays important mule deer winter ranges. Preliminary estimates suggest the fires burned about 40% of the total PMU winter range including at least 20% of the high deer density areas. For the most part, the fires burned hot and fast and consumed the vast majority of the critical winter shrub forage. This will significantly reduce the habitat carrying capacity for deer in the immediate future and likely for several years to come until shrubs reestablish and grow large enough to function as winter browse. Conversely, the eventual reestablishment of a younger rejuvenated shrub component on important deer winter range areas should improve carrying capacity and deer numbers in the long-term.

Besides fire, other influences have and will continue to affect habitat in the long-term. For instance, loss of winter range, due to increased human population and associated development has likely reduced landscape carrying capacity to some degree. Historically this has been most true in the Methow Valley, but more recently, development pressure has accelerated district-wide. Until recently, this had been mitigated somewhat by land acquisition and conservation easement purchases by WDFW and local land trusts; however, opposition to such activities by local county officials has curtailed these efforts. Even in the absence of opposition, WDFW and other partners can only raise the resources to protect a fraction of the available vital deer habitat, particularly as land prices and development pressure begin climbing again as the economy improves. More aggressive growth management planning is needed if critical private lands are going to continue to play an important role in deer conservation.

Over the last 15 years and prior to this summer's inferno, wild fires burned over 400,000 acres of deer habitat within the district, primarily at mid to higher elevations. This has noticeably improved summer forage quality and availability.

Decades of proactive road management have benefited deer and other wildlife; however, county officials recently opened significant additional road mileage to all-terrain vehicles, and the USFS is under constant pressure to expand ATV opportunities. This will likely increase the amount and distribution of motorized use on public lands. Similarly, recent national attempts to reverse protections for roadless areas could result in expanded road construction and motorized use locally. Overall increases in motorized use and roaded forest land would result in habitat loss and degradation, and would likely increase disturbance and illegal harvest of deer.

Despite these challenges, it is hoped that a combination of habitat conservation activities, habitat restoration actions (wildfire restoration, weed control, native plant establishment, etc), and sensible motorized use policies will slow, and perhaps even reverse the habitat degradation and population decline over the long-term. Public support and local politics will significantly influence the success or failure of these efforts.

Management conclusions

In the short-term, the recent fires will reduce the landscape carrying capacity for deer, particularly in the western portion of PMU 21. On the bright side, robust shrub reestablishment in the burned areas should improve carrying capacity and could reverse the gradual long-term decline in mule deer numbers seen over the last few decades. To avoid retarding shrub reestablishment and thus maximize the quality of recovering winter range in the burned areas, it will be important to keep deer numbers in line with the current habitat carrying capacity. To this end, implementation of short-term supplemental harvest and long-term restoration work is already underway. In addition continued efforts to protect existing habitat and maintain or improve land use planning tools will be important for maintaining habitat and a correspondingly robust herd.

Over 15 years ago, the population hit a short-term low following a string of bad winters. Almost immediately, this reduced pressure on seasonal ranges, improved productivity and recruitment, and allowed the herd to rebound quickly during a string of mild winters. Conservative antlerless hunting seasons aided recovery. More recently, herd growth and harvest reached a plateau, with productivity and recruitment falling off as the population appeared to reach or exceed the landscape carrying capacity for deer. We implemented more aggressive antlerless harvest to stabilize or slightly reduce herd size in an effort to improve productivity, maximize sustainable harvest yield, and reduce overuse of seasonal ranges. Most recently, moderately tough winters have reduced recruitment and led to a noticeable herd decline. As a result, we have reduced antlerless permits accordingly and mule deer populations have been stable or rising slowly.

For deer in the short term beginning in 2015, loss of winter range to fires and anticipated drops in fawn recruitment will reduce overall herd size and this will eventually be reflected in similar reductions in legal buck availability. Until then, the existing 9-day general hunting season and corresponding early closing date have improved buck escapement and raised the post-season buck:doe ratio. As a result, the opportunity to harvest an older age class buck is the best it's been in years.

Over the last couple of decades, populations of resident deer on the Methow and Okanogan Valley floors had increased significantly to problematic levels. Nuisance/damage complaints had risen sharply and population levels had surpassed social tolerance. Reduced harvest pressure associated with increasing development and housing density is the major contributing factor. A winter feeding effort in 1997 likely exacerbated the problem as does taught succeeding generations of fawns to look for winter forage near the feeding sites, despite the discontinuation of the feeding effort in subsequent years. Mild winters allowed deer to survive with this strategy, but more recently, tougher winters have resulted in higher fawn mortality in developed areas and damage complaint issues are down substantially. Ironically, increases in winter fawn mortality generated public calls to reinitiate feeding efforts, a move that would only start the cycle over again and expand the nuisance problems.

Instead, we have implemented antlerless permit hunts season on resident, valley-bottom deer on private land to address nuisance/damage issues. Permit numbers fluctuate with level of reported damage incidents. To date, the program is operating smoothly and appears to be helpful in reducing deer nuisance/damage complaints. The addition of a new conflict specialist to the district staff will also help address these issues.

DEER STATUS AND TREND REPORT: REGION 2

PMU 21 – GMU 243
PMU 23 – GMUS 248, 254, 260, 262, 266, 269
PMU 26 – GMUS 244, 245, 246, 247, 249, 250, 251

DAVID P. VOLSEN, District Wildlife Biologist
JON GALLIE, Wildlife Biologist

Population objectives and guidelines

The majority of deer in the Wenatchee District are mule deer, with white-tailed deer occurring at low density in certain limited areas. Management objectives for Population Management Unit (PMU) 23, Douglas County, are a post-hunt buck ratio of 15 to 19 bucks per 100 does, and a mule deer population size within landowner social tolerances. Management objectives for PMU 26, Chelan County, is conservative, with a post-hunt buck ratio objective of 25 or greater bucks per 100 does, to maintain deer populations in balance with available winter forage, and to limit conflicts with agriculture. Composition surveys, harvest estimates, modeling, and end of winter browse observations are used to monitor the population relative to objectives. Game Management Unit 243 (Manson), while managed in the Wenatchee District, is a part of the Methow PMU (21). GMU 243 lost winter-range shrub habitat to wildfire in 2001 and 2002; deer numbers have increased as habitat recovered following the fires.

Hunting seasons and harvest trends

All mule deer buck harvest is restricted to a 3-point minimum, whereas, white-tailed deer seasons allow harvest of any buck. Doe harvest is offered within some general archery seasons and through permit harvest opportunities in several GMUs for youth, senior and disabled hunters. Many of the antlerless permits offered are to second-deer permits. Deer seasons begin with the September early archery general deer season. A modern firearm and muzzleloader High Buck season run from September 15-25 in the Lake Chelan National Recreation Area, the Glacier Peak Wilderness, the Henry Jackson Wilderness and the Alpine Lakes Wilderness. The High Buck hunts overlap portions of GMUs 244, 245 and 249 in Chelan County. Early muzzleloader general deer season was open in twelve GMUs for nine days in late September and early October. The early modern firearm general deer season was open 9 days in October in all Chelan and Douglas County GMUs. Early archery general deer season hunting was open in September for 24 days in most GMUs, and late archery general season deer hunting was open in 2 GMUs in late November and early December for mule deer in GMUs 250 and 243, and white-tailed deer in GMU 243. All late season modern and muzzleloader opportunity is offered under drawing permits.

The 2013 hunting season marked the fourth year of a restructured permit drawing system for limited-entry hunts. Hunt categories had increased from five to seven with the addition of Quality and Second-deer permits. More importantly, each hunt category drawing was conducted independently of the each other category, giving hunters the opportunity to be drawn for more than one permit hunt since the change in 2010. Total permits issued for the district in 2013 were consistent with the past several years, yet down from the 935 offered in 2009. Antlerless permits were shifted into Second-deer permits in 2010, and numbers reduced in anticipation of increased harvest rates under a second-deer restriction. Quality permits totaled 97, Buck permits 10, Antlerless permits 90, Second-deer permits 165, Youth permits 75, 65 years or older permits 60 and Disabled permits 60.

In 2001, WDFW moved away from harvest report cards, and instituted mandatory reporting to monitor statewide big game harvest. The change brought more accurate reporting of harvest and an increased ability to monitor population change. Over three thousand bucks were harvested in the Wenatchee district in 1991. By 1997, buck harvest had dropped to roughly 600, indicating a significant population decline. Since 2001, the average buck harvest for the district has been 1,458, compared to an average 1,739 bucks during the period from 1991 through 2000. From 2001 through 2004 the district showed an increasing buck harvest. In 2004 the buck harvest was roughly 2000, with an alternating pattern of increasing then decreasing years through 2010. In 2009, the buck harvest increased 23% over 2008's harvest then decreased 11% in 2010 from 2009 (Fig.1). 2013 was consistent with recent trends.

In the Chelan PMU, the 1997 harvest of 247 bucks was the lowest on record. The reduction in harvest by 1997 was primarily influenced by the following factors: severe winter of 1996-1997, Tyee and Dinkelman fires (affected PMU 26), short modern-firearm hunting season, and 3-point minimum regulation. Conservative hunting seasons have been maintained since 1997.

Douglas PMU buck harvest decreased dramatically from 1996 to 1997, then, increased through 2002. Since 2002, the buck harvest has decreased each year through 2009. During the past two years harvest had increased slightly. %. While some of the decrease in past years is likely due to reduced participation and changing from general to permit only youth, senior and disabled hunting opportunities in 2005, it appears deer numbers have also decreased over time, as have landowner complaints.

All Chelan PMU data support an increasing trend toward habitat carrying capacity 1997-2004, and reaching winter habitat limitations in 2005. Chelan's buck harvest in 2004 increased 26% from 2003, but is still only 55% of the 1992 harvest of 2,206 bucks (Figure 1). The 1992 buck harvest level may not be attained again with the 3-point restriction for general seasons, even as winter ranges mature post-fire and populations increase. During 2010, 758 bucks were harvested in Chelan County, a decrease of 16% from 2009. In 2011 and 2012, 674 and 713 bucks were harvested. Harvest increased to 846 bucks in 2013. In Douglas County, buck harvest has been raising since 2008 to a high of 679 in 2012 and 672 in 2013.

The number of deer hunters in the Wenatchee District declined dramatically from 21,082 in 1992, to 6,438 in 2001. From 2001 to 2010 the number of hunters has been relatively stable, fluctuating roughly from 6500 to 8500 hunters. Since then, Douglas County hunter numbers have been stable while Chelan County numbers have dropped. General season hunter numbers in 2012 were 5704 for Chelan County and 2505 for Douglas County. (Figure 2).

Vehicles kill a large number of deer each year in the Wenatchee District, based on data collected by the Department of Transportation. More deer are killed in Chelan County than Douglas County because mountainous terrain forces migratory deer to lower elevations in the winter to avoid deep snow. Deer kill peaks in winters with deep snow accumulation at lower elevations. Construction of the wildlife fence along S.R. 97Abetween Wenatchee and Entiat has dramatically reduced annual vehicle collisions along this roadway.

In 2009, the post-hunt buck ratio objective for PMU 26 was changed from standard (15-19 bucks: 100 does) to conservative (25+ bucks: 100 does) in order to match the values of hunters utilizing Chelan County and to maintain buck numbers following the harvest peak in 2004. Post-hunt buck ratios for Douglas County (PMU 23) remained as standard (15-19 bucks: 100 does).

In the Chelan PMU, observed post-hunt ratios were 29 bucks and 83 fawns per 100 does in 2011. Surveys in 2012 and 2013 were precluded by bad weather. Legal bucks (3+ points) bucks comprised 54% of Chelan bucks, while sub-legal bucks (1 or 2 points) bucks comprised 47% of observed bucks in Chelan. The observed winter/spring fawn: adult ratio for the Chelan PMU was 44:100. Douglas County was surveyed with ground counts in 2013 and had a post hunt buck ratio of 22 bucks:100 does, and a ratio of 5.5 legal bucks:100 does. The fawn to doe ratio was 73.

Population status and trend analysis

The deer population in the Douglas PMU was reduced by the severe winter of 1996-97. However, winter conditions for these deer have been mild since this time, and the population quickly recovered. In addition, there have been significant habitat enhancements associated with the Conservation Reserve Program that have been beneficial for deer. Seasons from 2001-2003 were designed to reduce deer, and this objective was met. As a result, 2004 and 2005 seasons were more conservative, with reduced harvest opportunities for antlerless deer. Antlerless deer opportunities were increased for 2006 and 2007, and then reduced in 2008 and 2009 to slow overall declines. In the Chelan PMU, conservative seasons since 1997, and a series of mild winters, allowed this population to increase steadily through 2005.

In Douglas and Chelan PMUs, there was little harvest of antlerless animals from 1997 to 2000 (range 0-40). The average yearly antlerless harvest from 1992 to 1996 was 233 in Douglas and 441 in Chelan. The 2002 antlerless harvest in Douglas, 426, is the highest in at least 11 years. Antlerless harvest was reduced in 2004 and 2005 in the Douglas PMU, through reduction of antlerless opportunity permits. Antlerless harvest was 110 deer in 2013 in Douglas County. Antlerless harvest in Chelan County was 151 deer in 2013.

The Chelan PMU was severely impacted by the 1994 Tyee fire, which severely burned a large portion of the winter range, greatly reducing browse. In addition, the winter of 1996-97 was severe. As a result of lost habitat and winter weather, the deer population within the Chelan PMU declined. It has now recovered, based on the increase in the number of bucks harvested, high postseason buck:doe ratios, and high mature buck representation. The deer population in Chelan County is predominantly migratory (89% based on a radio-collared sample of does), and is typically widely dispersed during the modern firearm season in mid-October. Forty-five percent of the bucks observed in Chelan County during post-hunt surveys in 2006 were legal (3 point +) bucks. This percentage dropped to 13% in 2007, increasing to 17% in 2008, however, survey conditions may have played a role in producing these low results. In 2011, 53% of the bucks observed during post-season survey were legal bucks. In 2011, total bucks per 100 doe ratios in the Chelan PMU increased to 29 bucks per 100 does. Even though aerial surveys were unable to be conducted in 2013, the percentage of mature bucks appears to have remained high. It appears the herd reached carrying capacity of the winter forage base postseason 2005, based on elevated fawn mortality and heavy browse utilization. Informal observations of winter range shrub conditions suggest deer use of available forage rapidly increased 2001-2005, and population growth rate has slowed as winter habitat carrying capacity is approached. The drop in harvest in 2005, in combination with observed increased use of winter range browse and reduced fawn:doe ratios in 2005, suggest the herd had reached the biological carrying capacity of the winter range in the PMU. As a result, near-term future management will be directed toward maintaining a stable, to slowly increasing, mule deer population.

The Chelan PMU has a deserved reputation for producing large numbers of mature bucks, and many hunters express interest in maintaining the high quality of bucks in this PMU. Buck post-season composition data suggest hunting pressure truncates the buck age structure in the Douglas PMU. Although hunting pressure is reduced in some locations due to the predominance of private lands, low numbers of 3+ aged bucks post-season suggest hunters are able to kill the majority of larger bucks in the PMU due to high visibility and ease of physical access to most areas. By contrast, the high proportion of older-aged bucks in the Chelan PMU supports perceptions that many deer are unavailable for harvest under the current, early modern firearms general season structure.

Population Surveys

Both helicopter and ground surveys have been used to monitor population composition. Surveys conducted during late December or early January coincide with deer concentrating on winter range but before most antlers are dropped. These surveys were used to monitor post-hunt buck and fawn ratios relative to does. Ground surveys are conducted in late winter and early spring, after most winter weather but before dispersal, to monitor fawn: adult ratios as an index to survival. Prior to 2010 surveys were composition counts only. Poor weather conditions have precluded survey flight in recent years. New survey strategies are being evaluated to overcome these problems.

In 2010, WDFW implemented the first of a series of annual helicopter surveys designed to establish a formal population estimate for mule deer in PMU 26. A total of 30 sampling units were surveyed within delineated mule deer winter range this first year. A total of 2442 deer were observed during three days of flights. Thirty-five percent of the deer were observed on winter ranges in the Swakane unit, 25 % in the Entiat unit and 41% in the Mission unit.

Surveys were again flown in 2011 sampling 32 units within the winter range and observing 2795 deer. The distribution of deer between the Mission, Swakane and Entiat units were proportionally similar, differing from the previous year by minor amounts. Our attempt at a third year's surveys was hampered by poor weather; therefore, no estimates were obtained in 2012 or 2013.

Surveys were flown to standards set by Program Aerial Survey. (Unsworth. et. al. 1999.). Winter range is stratified into low medium and high density areas based on biologist's experience. A subset of each stratum is surveyed, and the program projects the total number of deer based on the number of units per strata. In addition, the program applies a correction factor based on the previously measured sightability of deer in various habitat structures. The ability to see deer varies based on the type of cover, snow cover and the activity of the deer. Certain conditions make observing deer more difficult, therefore the program adjust upward the number of deer in that unit based on observed conditions and deer activity. In units with minimal cover and high sightability values for deer, the program provides little or no correction to the observed numbers.

In 2010, we delineated 159 winter range sample units, stratified into low medium and high density based on elevation, habitat and previous survey results. Thirty sample unit were surveyed over a three flight days. The survey resulted in an estimate for PMU 26 of 15,798 mule deer. High amounts of variability within each stratum, combined with a relatively low numbers of sampled units resulted in wide confidence intervals for the first survey year. For 2011, we re-stratified the sample units and truncated the winter range based on observed distributions of deer. From a total of 143 sample units we surveyed 32 in 2011. We decreased within strata sample variance, yet still produced confidence interval higher than we are comfortable with. The 2011 survey estimated 18,076 were occupying winter ranges in PMU 26.

Post survey discussions have focused on methods to increase the proportion of sample units in order to tighten confidence intervals. We are also exploring other methods of stratification for future surveys. Attempts to survey the PMU in 2012 and 2013 were thwarted by bad weather.

Habitat condition and trend

Wildfires caused short-term negative impacts to deer winter range in Chelan County for several years following 1994, but in some areas deer are now benefiting due to increased quantity and quality of forage. However, shrub recovery has been slow in some winter ranges, particularly at the lowest elevations, where deer are concentrated by snows that accumulate at higher elevations. The Manson unit (GMU 243) in particular has been severely impacted by the 2000 Rex Creek fire and 2001 Deer Point fire, which collectively consumed 100,000 acres and severely reduced winter browse. This herd segment is beginning to show signs of recovery, with harvest increasing since 2008. The Douglas population is more dependent upon agricultural crops (especially alfalfa and wheat) during winter than the Chelan population.

The human population is increasing by nearly 2 % per year within the Wenatchee District. Residential and orchard development associated with this population growth continue to reduce winter range throughout the district. In 1967, Chelan County supported a harvest of 5,180 deer; it is unlikely the deer population will ever again sustain this level of harvest.

Management conclusions

Buck age structure in the Chelan PMU will require close monitoring in the future to avoid dramatically reducing buck numbers and age structure. We could probably meet buck escapement goals under the current season structure in Chelan without the 3-point regulation because many buck do not migrate to lower elevations where they are vulnerable to harvest until after the general modern firearms hunting season. However, the 3-point restriction is very popular with a large segment of the public, and is often credited for the large numbers of older, mature bucks seen on winter ranges. Consistent retention of this regulation for mule deer may also improve compliance with hunting regulations. However, this population can be strongly regulated by winter conditions, and is susceptible to weather-related declines. For the 2006-2013general season, modern firearm hunting season length was reduced from 14 to 9 days in Chelan and Okanogan counties, in response to concerns about lowered buck escapement in Okanogan County, and hunter desires to maintain older aged, large bucks in the Chelan PMU.

With the more open habitat conditions in Douglas, the 3-point regulation is working well and has increased total buck escapement. Prior to the implementation of the 3-point restriction in Douglas, buck escapement was low, estimated between 6-10 bucks:100 does. There are, however, concerns about the long-term ramifications of poor recruitment of older age bucks, as it appears most bucks are still being harvested by 3.5 years of age. Due to the open nature of this PMU, it is unlikely that age structure truncation can be avoided under general modern firearms season structure.

Population modeling of the Douglas PMU has been hampered by insufficient, inconsistently collected postseason composition data. Additional helicopter composition survey resources would help address this shortcoming; currently, limited resources are prioritized in favor of the Chelan PMU, due to the majority of public land in this PMU and resulting unrestricted public access. Additionally, interchange between the Douglas population and the population to the south, PMU 25 (primarily in GMU 272), may be so extensive that PMU 23 does not function as a closed population. If additional, consistent efforts to classify deer in PMU 23 do not result in improved alignment of simulations with observed data, a marking study may be necessary to quantify interchange between these PMUs.

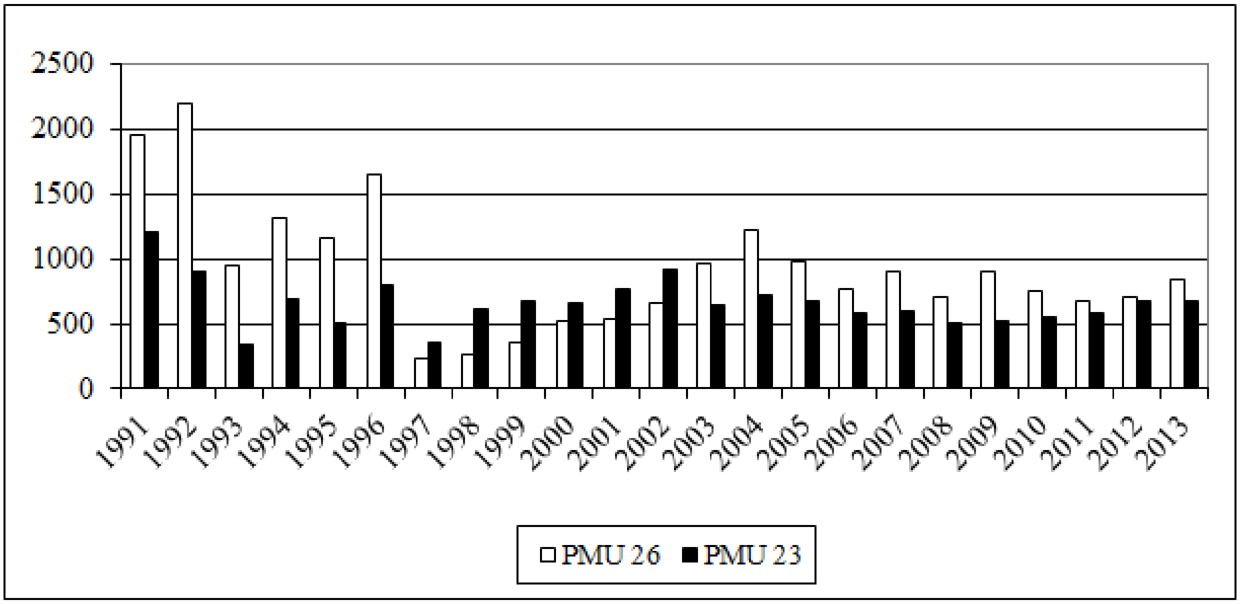

Figure 1. Antlered deer harvested from PMU 23 and PMU 26, 1991 through 2013.

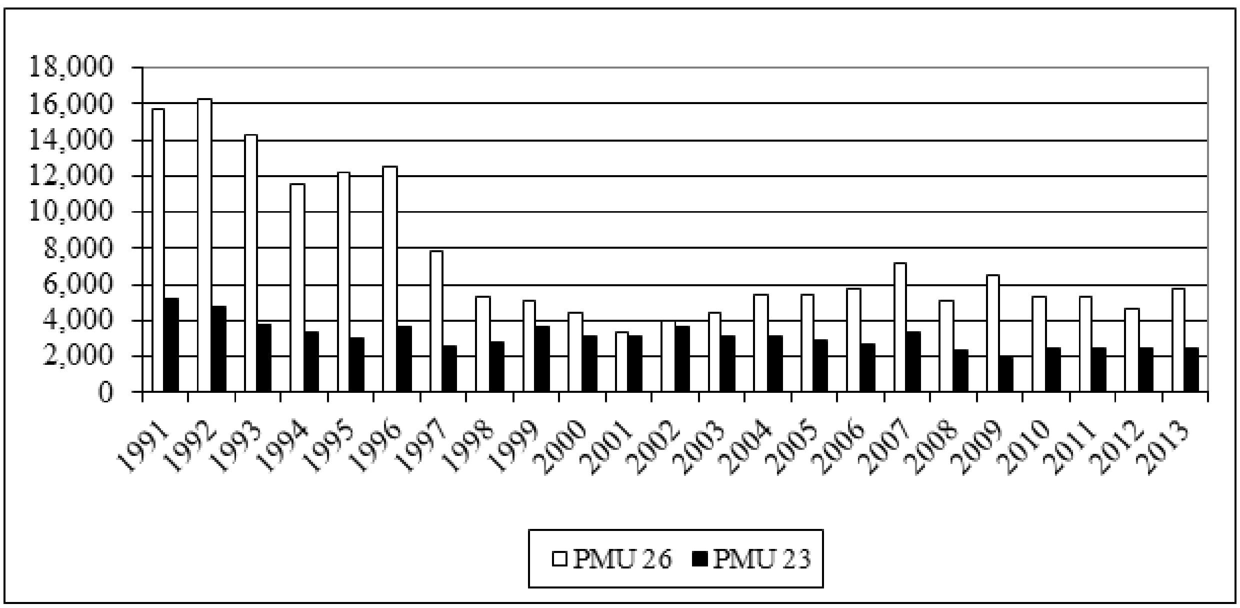

Figure 2. Numbers of hunters reported from PMU 23 and PMU 26, 1991 through 2013.

Literature

Unsworth, J. W., F. A. Leban, E. O. Garton, D. J. Leptich, and P. Zager. 1999. Aerial Survey: User's Manual. Electronic Edition. Idaho Department of Fish & Game, Boise, Idaho, USA

DEER STATUS AND TREND REPORT: REGION 2
PMU 24 – GMUS 272, 278, AND 290
PMU 25 – GMU 284

RICH FINGER, District Wildlife Biologist

Population objectives and guidelines

Both mule deer (*Odocoileus hemionus*) and white-tailed deer (*O. virginianus*) occur in Population Management Units (PMU) 24 and 25. However, mule deer dominate the harvest and white-tailed deer are only present in small groups widely distributed across the landscape. Consequently, white-tailed deer contribute less than 10% of total annual deer harvest in GMUs 272 (Beezley), 278 (Wahluke), 284 (Ritzville), and 290 (Desert).

Management objectives for PMUs 24 and 25 focus primarily on mule deer. The overall management goal is to increase deer herds to levels that are within the limitations of available habitat and minimize landowner conflicts. Additional management objectives include maintaining a post-hunt buck:doe ratio of ≥ 15:100, while maintaining or increasing hunt opportunity and hunt quality.

GMU 290 (Desert) is located within PMU 24, but overall management goals differ from those outlined above. Primary management objectives in GMU 290 include maintaining a post-hunt buck:doe ratio of ≥ 30:100 and ensuring that at least half of the male segment of the population is comprised of bucks ≥ 2.5 years old. Additional objectives are to maintain populations within the limitations of available habitat and minimize landowner conflicts.

Hunting seasons and harvest statistics

All GMUs, except GMU 290, were open during the general modern firearm season. GMUs 272, 278, and 284 had an early archery season, while GMUs 272 and 278 were also open during late archery general deer seasons. Opportunities during the early muzzleloader season were available in GMUs 272, 278, and 284.

All special permit opportunities in GMU 272 were restricted to antlerless permits in Deer Area 2011 (Lakeview) and in areas managed by the BuckRun Landowner Hunting Permit (LHP) Program. Special permit opportunities in GMU 284 were primarily limited to antlerless permits in Deer Area 2010 (Benge), but limited opportunities were available for modern firearm, muzzleloader, and archery hunters during late season hunts for any buck. No special permit hunts were offered in GMU 278.

All GMUs, except GMU 290, were open for white-tailed deer during the general modern firearm and early archery seasons. GMUs 272 and 278 were also open during the late archery general deer season for any white-tailed deer, while GMUs 278 and 284 were open during the early muzzleloader general deer season for any white-tailed buck.

GMU 290 is restricted to special permit only. Opportunities in 2012 were available for modern firearm, muzzleloader, and archery hunters.

GMU 272 Harvest estimates have been relatively stable with about 300 bucks and 50 does taken annually, by about 1,300 hunters (Table 1). Since 2004, hunters participating during the general modern firearm season have, on average, accounted for 72% of the total harvest in GMU 272. In 2013, harvest during the modern firearm season again constituted the majority (67%) of harvest, while harvest during the archery, muzzleloader, and permit (including multi-weapon) seasons constituted 17%, 7%, and 9% of the total harvest, respectively (Figure 1). Approximately, 3% of the deer harvested in GMU 272 were reported as white-tailed deer.

The number of deer harvested on BuckRun has been steadily declining since 2005 and averages 60 deer annually. Declining trends in harvest levels on BuckRun have been a result of decreases in landowner harvest rather than decreases in local deer herds.

Table 1. Estimated number of deer harvested, number of hunters, hunter success rate (Suc), and days/kill (D/K) in GMU 272, 2004-2013. Harvest estimates include deer harvested on BuckRun LHP.

	Harvest[1]					
Year	B	D	T	Hunters	Suc[2]	D/K
2004	367	38	405	1,461	0.28	13.4
2005	257	86	343	1,325	0.26	14.5
2006	294	52	346	1,165	0.30	12.7
2007	304	35	339	1,210	0.28	14.7
2008	268	51	319	1,350	0.24	17.4
2009	263	33	296	1,359	0.22	18.7
2010	290	58	348	1,337	0.26	15.2
2011	254	66	320	1,410	0.25	17.6
2012	339	64	403	1,405	0.29	14.7
2013	316	43	359	1,408	0.25	15.2
Average	***295***	***53***	***348***	***1,343***	***0.26***	***15.4***

[1]B = bucks, D = does, T = total harvest
[2]Success rates are for all weapon types and general season combined.

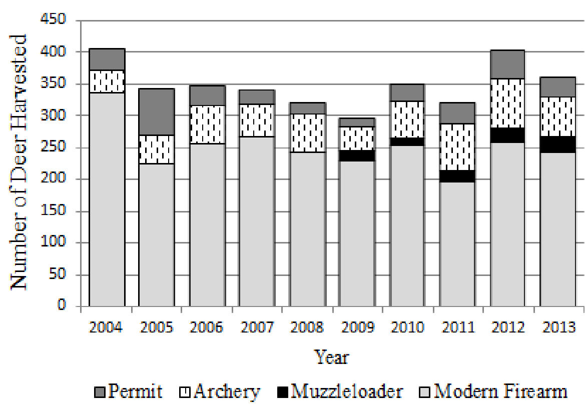

Figure 1. Estimated number of deer harvested by permit (including multi-weapon) and during the general modern firearm, muzzleloader, and archery seasons in GMU 272, 2004–2013. Data includes deer harvested on BuckRun LHP.

GMU 278

With only 64 mule deer harvested in GMU 278 during the 2013 season, harvest levels remained low. Hunter numbers steadily increased from 158 in 2001 to 281 in 2013. Overall hunter success during 2013 was 23% and well above the long-term average of 18%. None of the deer harvested in GMU 278 were reported as white-tailed deer.

GMU 284

Success rates in GMU 284 reached a 10-year high during the 2012 season but dipped slightly during 2013 while hunter numbers continued to increase, reaching a 10-year high (Table 2). Harvest levels in GMU 284 dropped from the 2012 season but were still well above the long-term average (Figure 2). Harvest during the general modern firearm season accounted for 77% of the harvest in 2013, and was close to the 10-year average of 79%. Hunter success was 44% in 2013 well above the 10-year average of 38% (Table 2). Approximately, 7% of the deer harvested in GMU 284 were reported as white-tailed deer.

Table 2. Estimated number of deer harvested, number of hunters, hunter success rate (Suc), and days/kill (D/K) in GMU 284, 2004-2013.

	Harvest[1]					
Year	B	D	T	Hunters	Suc[2]	D/K
2004	245	22	267	788	0.34	9.7
2005	235	17	252	671	0.38	7.8
2006	245	28	273	643	0.42	7.3
2007	185	31	216	613	0.35	9.5
2008	208	23	231	681	0.34	9.5
2009	273	25	298	802	0.37	8.8
2010	220	37	257	692	0.37	8.6
2011	240	36	276	752	0.37	9.7
2012	376	39	415	832	0.50	6.4
2013	351	28	379	869	0.44	7.4
Average	***258***	***29***	***286***	***734***	***0.39***	***8***

[1]B = bucks, D = does, T = total harvest
[2]Success rates are for all weapon types and general season combined.

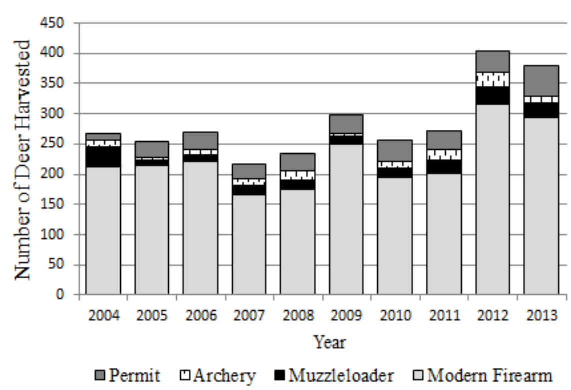

Figure 2. Estimated number of deer harvested by permit holders and during the general modern firearm, muzzleloader, and archery seasons in GMU 284, 2004–2013.

Table 3. Estimated number of mule deer harvested in GMU 290 and success rates of hunters that held modern firearm any deer permits (MF Any), modern firearm doe permits (MF doe), archery permits, muzzleloader permits, and youth permits, 2004–2013. Values in parentheses are the number of permits that were available.

	Harvest			Hunter Success				
Year	**Buck**	**Doe**	**Total**	**MF Any**	**MF Doe**	**Archery**	**Muzzleloader**	**Youth**
2004	16	11	27	0.92 (15)	0.55 (50)	0.08 (20)	0.60 (5)	na
2005	19	12	31	1.00 (15)	1.00 (50)	0.25 (21)	0.75 (4)	na
2006	32	30	62	0.93 (15)	0.88 (50)	0.60 (14)	1.00 (3)	0.65 (30)
2007	11	31	42	0.91 (15)	0.76 (50)	0.00 (12)	1.00 (2)	0.20 (6)
2008	17	28	45	0.86 (15)	0.67 (50)	0.30 (16)	0.00 (2)	1.00 (6)
2009	23	20	43	0.94 (19)	0.64 (50)	0.21 (24)	1.00 (2)	0.50 (6)
2010	21	22	43	0.89 (19)	0.63 (50)	0.13 (18)	0.50 (2)	na
2011	21	22	43	0.95 (19)	0.65 (50)	0.06 (20)	1.00 (2)	na
2012	20	22	42	0.77 (22)	0.73 (50)	0.04 (29)	0.67 (3)	na
2013	18	24	42	0.83 (23)	0.57 (50)	0.08 (32)	0.33 (3)	na
Avg.	*20*	*22*	*42*	*0.90*	*0.71*	*0.18*	*0.69*	*0.62*

[1]na = years when specific hunt types were not offered.

GMU 290
Hunters harvested 18 bucks and 24 does in 2013 (Table 3). Success rates increased for modern firearm buck hunters with 83% of hunters reporting a harvest. The success rate for the modern firearm antlerless season dropped below the long-term average and harvest rates for archery continued to be very low (Table 3).

Surveys

Post-hunt surveys are conducted to evaluate trends in productivity rates (fawns:100 does), adult sex ratios (bucks:100 does), and age structure of mule deer herds in GMUs 272, 284, and 290. Collectively, these data allow managers to evaluate the current status of mule deer populations. Due to the limited number of deer in GMU 278 post-hunt surveys are not conducted.

GMU 272
Since 1996, post-hunt herd composition surveys have been conducted annually in GMU 272 using a variety of techniques (e.g., fixed-wing, helicopter, ground surveys, etc.) and survey date has varied from late-October to early-January. However, surveys are typically conducted by ground during late-October. In 2013, biologists conducted post-hunt surveys in December using ground based road surveys. 1,266 deer were observed with a resulting buck:doe:fawn ratio of 29:100:58.

GMU 284
Post-hunt surveys in GMU 284 were conducted using fixed-wing aircraft from 2000 through 2007. Surveys were not conducted in 2005 or 2006 and were conducted using ground based road surveys in 2008. From 2009-11, aerial surveys were conducted in GMU 284 as part of a cooperative effort to monitor migratory deer herds that winter in Adams, Franklin, and Whitman counties. In the future, this aerial survey effort will likely be utilized to supplement ground count data every few years with a population estimate. Thus since 2012, survey methods reverted back to a ground effort, which took place during December. Biologists classified 324 deer with a resulting buck:doe:fawn ratio of 20:100:68.

GMU 290
Post-hunt surveys in GMU 290 had been conducted annually since 1998 using volunteer based ground surveys. However, during 2012, due to liability and habitat degradation concerns associated with the use of ATVs, the volunteer based survey was discontinued in favor of an aerial approach. The survey is conducted by helicopter and is believed to provide more reliable data due to increased detectability, reduced potential for double-counting and improved classification.

Because of ongoing hunts in GMU 290, survey timing must either occur during the rut or when hunting seasons have ended (January). We selected January for surveying the unit during 2012 for a number of reasons. First, fog is common in the unit during November. Second, a January survey represents a true, post-harvest survey which does not require correction for harvest that occurs after the survey. And lastly, many eastside biologists are relying on a limited number of survey vendors during this time of year. Unfortunately, we believe bucks were not well represented in this survey, as evidenced by a sharp decline in buck:doe ratio. We adjusted during 2013 by surveying during the rut in November.

Population status and trend analysis

GMU 272

Both harvest and survey data suggest mule deer populations in GMU 272 have remained relatively stable since 2004. The average post-hunt fawn:doe ratio from 2004–2013 has been 56:100 (Table 4) and with the exception of data from 2009 has shown low to moderate variability [Coefficient of Variation (CV) = 17%].

Table 4. Number of bucks (B), does (D), fawns (F), unclassified deer (U), total deer (T), bucks and fawns per 100 does (B:D:F), and proportion of bucks classified as ≥ 2.5 yr old (%), during post-hunt surveys in GMU 272, 2004-2013.

Year	B	D	F	U[1]	T	B:D:F	%
2004	63	435	208	0	706	14:100:48	0.40
2005	62	272	146	0	480	23:100:54	0.39
2006	67	377	197	0	641	18:100:52	0.30
2007	72	415	227	0	714	17:100:55	0.38
2008	77	366	252	12	707	21:100:69	0.31
2009	49	256	97	37	439	18:100:38	0.39
2010	100	425	246	101	872	24:100:58	0.43
2011	105	348	244	37	734	30:100:70	0.34
2012	40	151	88	18	297	26:100:58	0.42
2013	186	646	377	57	1266	29:100:58	0.55
Average	*82*	*369*	*208*	*26*	*686*	*21:100:56*	*0.39*

U[1] = Deer that were observed during surveys but could not be positively identified.

Long-term average buck:doe ratio is 22:100 (CV = 24%). The 10-year average proportion of adult bucks (≥ 2.5 years old) observed during post-hunt surveys is 39% and has shown moderate variability (CV = 18%).

Trends in the total number of deer harvested in GMU 272 suggest a stable population (Table 1). Since 2004, there has been little variability in the overall number of deer harvested (CV = 10%).

GMU 278

Because post-hunt surveys are not conducted in GMU 278, harvest trends are the only indication of relative population size. Harvest levels have historically been low (approx. 40 deer harvested annually), but have shown a significant degree of variation in the last 10 years (CV = 33%). Harvest during 2012 reached a 10-year high of 67 deer and 2013 fell just below that at 64 deer.

GMU 284

Because of the poor survey conditions present during 2007 surveys, few deer were observed and smaller bucks were not readily visible from an airplane. Consequently, data from 2007 is likely biased low for both bucks and fawns causing trends that include this data to be misleading. As such, the following analyses do not include data collected during 2007 surveys.

The average number of fawns:100 does from 2004–2013 was 68:100 and showed marginal amounts of annual variation (CV = 17%; Table 5). This suggests that herd productivity remained relatively constant during this time period. Harvest levels have shown moderate variability (total harvest CV = 25%) while trends in hunter effort (CV = 10%) have shown relatively low variability over the last 10 years.

Table 5. Number of bucks (B), does (D), fawns (F), unclassified deer (U), total deer (T), bucks and fawns per 100 does (B:D:F), and proportion of bucks classified as ≥ 2.5 yr old (%), during post-hunt surveys in GMU 284, 2004-2013. Surveys were not conducted in 2005 and 2006 and averages exclude data from 2007 due to the bias associated with this data set.

Year	B	D	F	U[1]	T	B:D:F	%
2004	63	445	270	0	778	14:100:61	0.6
2007	15	241	117	0	373	6:100:49	0.47
2008	51	211	123	31	416	24:100:58	0.35
2009	83	438	360	0	881	19:100:82	0.34
2010	46	100	82	0	228	46:100:82	0.26
2011	36	122	83	9	250	30:100:68	0.44
2012	57	195	114	14	380	29:100:58	0.49
2013	34	169	115	6	324	20:100:68	0.41
Average	*53*	*240*	*164*	*9*	*465*	*27:100:68*	*0.41*

U[1] = Deer that were observed during surveys but could not be positively identified.

Adult sex ratios (buck:doe ratio; CV = 41%) and age structure of the male segment of the population (% of bucks ≥ 2.5 year old; CV = 30%) have both shown significant amounts of annual variation over the last 10 years. Post-hunt buck:doe ratios were below the long-term average following the 2013 season (Table 5).

GMU 290
Harvest levels are below the long-term average for all weapon types (Table 3).

Survey methods have varied annually, which makes it increasingly difficult to rely on the raw counts observed during surveys to adequately reflect trends in population size. Future surveys are intended to be conducted aerially, in a standardized manner to better understand population trend.

Fawn:doe ratios indicate that productivity rates for this herd remained at moderately low levels since 2004 (Table 6) but that rates are increasing. Coincident aerial survey data during 2011 confirmed suspicions that fawns are often misclassified during the volunteer ground count. GMU 290 provides high quality habitat and fawn development is rapid, making them difficult to differentiate from does based on size alone. Aerial surveys have the added advantage of giving surveyors a better view and more time to make accurate classifications. We expect that shifting to an aerial survey will increase the reliability of our data.

Buck:doe ratios are remaining at or above management objective of 30 bucks:100 does. The proportion of bucks observed from 2004-2013 that were ≥ 2.5 years has been relatively stable (avg. 60%; CV = 7%; Table 6). The average age of harvested deer during 2013 was 3.7 and 4.4 years for bucks and does, respectively.

Table 6. Number of bucks (B), does (D), fawns (F), unclassified deer (U), total deer (T), bucks and fawns per 100 does (B:D:F), and proportion of bucks classified as ≥ 2.5 yr old (%), during post-hunt surveys in GMU 290, 2004-2013.

Year	B	D	F	U[1]	T	B:D:F	%
2004	88	210	93	14	405	42:100:44	63
2005	154	306	137	32	629	50:100:45	60
2006	102	314	140	33	589	32:100:45	67
2007	122	264	108	15	509	46:100:41	59
2008	123	246	142	49	560	50:100:58	50
2009*	146	270	125	31	572	55:100:50	62
2010*	144	291	116	12	563	52:100:43	63
2011*	97	207	60	7	371	47:100:29	57
2012	55	181	91	7	334	30:100:50	60
2013	54	117	64	0	235	46:100:55	61
Avg.	*109*	*241*	*108*	*20*	*477*	*45:100:46*	*60*

U[1] = Deer that were observed during surveys but could not be positively classified.
* = Ratios and proportions are corrected for bucks and does harvested after surveys were conducted.

Table 7. Number of bucks harvested by age class, yearly average age (Avg.), and sample size (N), from GMU 290m 1996-2011, for all submitted teeth. Dotted line between rows denotes yearly gaps in data collection.

	Age Class										
Year	1.5	3	4	5	6	7	8	9	10	Avg.	N
1996	0	3	2	1	1	0	0	0	1	4.3	8
1997	0	9	4	3	2	1	1	0	0	3.8	20
1999	1	3	2	2	0	0	0	0	0	3.1	8
2000	0	1	3	4	0	0	0	0	0	3.9	8
2001	0	1	3	2	0	0	0	0	0	3.7	6
2002	0	3	0	1	4	1	1	0	0	4.8	10
2011	0	1	4	5	4	1	0	1	0	4.8	16

Habitat condition and trend

GMUs 272, 278, and 284 Mule deer habitat in these GMUs is characterized by highly fragmented shrub-steppe, lands enrolled in the Conservation Reserve Program (CRP), and agricultural fields (primarily wheat, alfalfa, and orchards). Dominant native plant species include big sagebrush (*Artemisia tridentata*), rabbitbrush (*Chrysothamnus nauseosus*), greasewood (*Sarcobatus vermiculatus*), and spiny hopsage (*Grayia spinosa*).

Bitterbrush (*Purshia tridentata*), an important deer browse, can be located in small and widely scattered stands. However, much of the remaining native shrub-steppe has been highly degraded and is now dominated by non-native cheatgrass (*Bromus tectorum*) and native and non-native annual forbs. Additionally, with the exception of bitterbrush, most shrub species possess little to no value as winter deer food. Consequently, deer in these regions rely heavily on winter-wheat and cool season grasses to meet their metabolic demands during winter months and most often concentrate near shrub-steppe/agricultural interfaces. The threat of losing more native shrub-steppe is always present, but significant losses are not expected in the near future.

GMU 290
Although mule deer habitat in GMU 290 is also comprised of a mixture of shrub-steppe and agricultural lands, the vast majority of the deer herd is located on the Desert Wildlife Area adjacent to Potholes Reservoir. Most mule deer habitat is comprised of wetlands and shrub-steppe. Bitterbrush occurs in relatively large stands and is an important food source for this herd during winter months. Anecdotal observations suggest many of these stands are in older seral stages, characterized by mature decadent plants that provide reduced value as mule deer forage.

Continued maturation of bitterbrush in GMU 290, without the establishment of younger stands, is likely to decrease the winter carrying capacity of this unit and could result in increased crop depredation on adjacent lands.

Wildlife damage

Deer related damage complaints in PMUs 24 and 25 have historically involved orchards, alfalfa fields and haystacks, winter-wheat fields, and ornamental trees and shrubs. Orchard tree damage and damage to alfalfa haystacks are the most commonly reported types of damage to private property. Orchard damage and the potential for it, is most prevalent in GMU 272. Depredation issues related to orchards and haystacks have been marginal in recent years and were again low in 2013.

Management conclusions

Trend data in GMUs 272, 278, and 284 indicate relatively stable populations. GMUs 272 and 284 have post-hunt buck:doe ratios that satisfy the management goal of $\geq$15 bucks:100 does. Damage complaints associated with these herds have also been relatively low in recent years, indicating they have not exceeded the social carrying capacity that exists in agricultural settings. Consequently, current harvest restrictions and season lengths appear to be appropriate for these herds and will likely change little in the near future.

As deer populations approach carrying capacity they are often characterized by suppressed levels of productivity, decreased fawn survival rates, and an adult female population that is dominated by older age classes (Fowler 1981). Fawn:doe ratios have been low, suggesting that this population may be fluctuating around carrying capacity.

Because surveys in GMU 290 were conducted using volunteers, estimated ratios prior to 2012 must be interpreted with caution. Surveys were conducted in mid- to late-December when it can be difficult to correctly identify a large fawn from a young doe. If fawns are commonly mistaken for an adult female, there are 2 primary consequences. First, productivity rates are likely to be underestimated as the fawn:doe ratio would be biased low. Secondly, the buck:doe ratio would also be biased low because the number of does observed during surveys was overestimated. Therefore, observed trends in productivity rates and the adult sex ratio may also be viewed as highly conservative estimates.

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DEER STATUS AND TREND REPORT: REGION 3

PMU 31 – GMUS 379, 381

SARA GREGORY, District Wildlife Biologist

Population objectives and guidelines

This report covers the 2013 deer season harvest and winter surveys. Population Management Unit (PMU) 31 includes Game Management Units (GMU) 379 and 381. This PMU is primarily a mule deer unit, but a few white-tailed deer are harvested here each year. The population is managed to provide diverse recreational opportunity while maintaining socially acceptable deer densities. Post-hunt buck to doe ratio objectives are ≥15 bucks per 100 does.

Hunting seasons and harvest trends

Since 2000, early archery general seasons for any white-tailed deer and 3-point or antlerless mule deer have occurred in September in PMU 31. Muzzleloader general seasons were first established in this PMU in 2001. In 2013, a 9-day early muzzleloader season occurred, allowing harvest of any white-tailed or 3 point minimum mule deer in GMU 379. GMU 379 also had an 11-day late muzzleloader season with any white-tailed deer and 3-point minimum mule deer legal to harvest. In addition, an 11-day late general muzzleloader season offered an opportunity for harvest of any white-tailed deer and 3-point minimum or antlerless mule deer in GMU 381. Twenty muzzleloader special permits were issued during 28 September - 6 October for any buck in GMU 381.

The modern firearm general season was 9 days long (12-20 October) in 2013 with a 3-point minimum restriction for mule deer and any white-tailed deer opportunity in PMU 31. Ten youth, 10 senior, and 10 disabled special modern firearm permits for antlerless deer were also issued in GMU 381. In addition, 10 modern firearm quality deer permits for mid-November and 20 modern firearm antlerless permits for early-December were issued in GMU 381.

Total deer harvest has averaged 381 (range 147 - 674; SE = 37.7) since 2000. The 2013 harvest was the highest for the 14-year monitoring period and represented a 40% increase over the 5-year average from 2008-2012 (Table 1). Most of this increased harvest was due to a substantial increase in doe and buck harvest during the muzzleloader seasons, as well as an increase in the buck harvest during the modern firearm season. Modern firearm hunters harvested 74% of bucks during the general season. The percentage of harvest contributed by muzzleloader general season hunters increased slightly from 34% in 2012 to 38% in 2013. This increase was due to increased success during the general antlerless season. Archery remained a small portion of the total harvest at 1%.

Table 1. Deer harvest and hunters in PMU 31 during 2000 - 2012. Data are combined for general and permit seasons.

	Harvest			Hunters	
Year	**Buck**	**Doe**	**Total**	**Number**	**Success**
2000	119	28	147	579	25%
2001	205	72	277	699	40%
2002	239	99	338	808	42%
2003	220	60	280	913	31%
2004	214	67	281	1125	25%
2005	251	62	313	997	31%
2006	190	86	276	1017	27%
2007	235	100	335	1158	29%
2008	303	85	388	1180	33%
2009	335	170	505	1249	40%
2010	282	165	447	1192	38%
2011	337	202	539	1356	40%
2012	372	161	533	1418	38%
2013	449	225	674	1485	45%
Avg.	**268**	**113**	**381**	**1084**	**35%**

Surveys

In 2011, coordinated aerial surveys across Regions 1, 2 & 3 (and PMUs) were completed for a third year in late November and early December to estimate deer herd size at a meaningful scale. The surveyed area included randomly selected units in Whitman, Franklin, and Adams Counties. Research and observations indicated this herd is strongly migratory. Surveys were spatially and temporally designed to account for seasonal deer movements. During the aerial surveys, 5,053 mule deer were classified. Of this total, 1,356 were classified in GMU 381, primarily on private land above the breaks of the Snake River. Estimated ratios for the GMU were 19 bucks and 67 fawns per 100 does. These values will provide a reliable baseline for aerial surveys in the coming years.

Post-hunt roadside composition surveys were initiated in 2004 to estimate buck:doe:fawn ratios. These surveys are conducted from vehicles in the eastern portion of GMU 381 near the Snake and Palouse Rivers in winter prior to antler drop. Two separate surveys on two driving routes in early December 2013 yielded estimates of 15 bucks and 64 fawns per 100 does, with a high count of 589 deer classified.

Table 2. Post-hunt deer surveys in GMU 381 during 2004 - 2013. Buck, doe, and fawn numbers were from the survey that yielded the highest count. Ratios were averaged across the two surveys.

					Per 100 Does	
Year	Bucks	Does	Fawns	Total	Bucks	Fawns
2004	23	135	80	264	17	59
2005	26	120	92	238	23	77
2006	35	142	90	283	26	62
2007	18	129	87	247	21	70
2008	64	367	165	608	17	48
2009	21	158	63	242	16	43
2010	57	365	210	632	20	56
2011	58	332	183	573	19	59
2012	67	332	145	544	18	46
2013	47	321	221	589	15	69

Buck ratios were down slightly from 2012 estimates, whereas fawn ratios were up 50% (Table 2).

Over 80% of the bucks observed during roadside and aerial surveys had less than 3-point antlers. It is expected that the majority of legal bucks are harvested each year in open country. Roadside surveys, however, may be biased against observing mature bucks if they are less likely to occupy areas adjacent to roads or are less active during the day. Harvest trends indicate plenty of 3-point or better bucks continue to be available to hunters. Over the last 13 years, greater than 3 point bucks have comprised over 40% of the buck harvest and have comprised over 60% the last four years (Figure 1).

Population status and trend analysis

The results of the coordinated aerial survey across regional boundaries provided a snapshot of mule deer population size. Several more years of repeated surveys will eventually yield better trend data. Using available information, it appears the mule deer herd in GMU 381 is of adequate size to sustain the level of harvest recorded in recent years. Harvest and post-hunt composition data as an index to status and trend indicate that total harvest has remained at a sustainable rate (Table 1 & 2).

No survey data are available for GMU 379. For several years the GMU was managed with very liberal harvest seasons to reduce crop damage risk from deer.

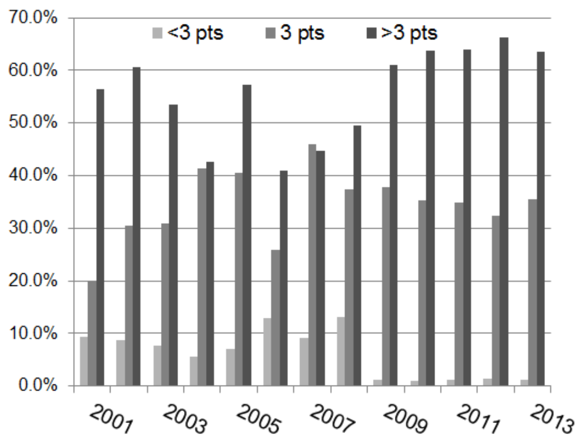

Figure 1. Antler points as a percentage of buck harvest in GMU 381.

Because of no recent deer damage complaints, it was decided to reduce harvest beginning in 2009 to increase the herd, especially on the Hanford Monument. As a result, harvest in the unit has declined from an average of 76 deer during 2006-2008 to an average of 29 since 2009. In the last 5 years, harvest has declined, especially of does. In the long term, it is anticipated that the herd will increase and eventually more deer will be available to hunters.

Habitat condition and trend

GMU 379 includes the south Columbia Basin Irrigation Project and the Hanford Reach National Monument. Intense agriculture in the irrigation project has significantly reduced historical deer habitat. Irregular terrain and shallow soils in the northern portion of the unit resulted in some habitat not being cultivated. Most of these lands receive various levels of livestock grazing. Numerous irrigation waterways traverse this landscape, providing some deer habitat. Wildfires on the Hanford Reach National Monument in 2005, and again in 2007, reduced the amount of habitat, especially shrub cover, for deer. Reduction of vegetation may in the short-term make deer more vulnerable to hunters and predators and cause them to move elsewhere to find forage and cover. In the long term, successful restoration of native vegetation may improve conditions for deer. Failure to restore native vegetation will result in expansion of cheatgrass and other invasive weeds and further degradation of deer habitat.

GMU 381 is comprised of a mixture of dryland wheat, land planted according to the Conservation Rerserve Program (CRP) and shrub steppe. Acreage in CRP increased significantly with the 1998 signup, and has increased and improved habitat for deer. The Farm Bill outlines commodity prices for wheat. Those wheat values influence farmers' decisions about whether to reenroll their fields in CRP or return to farming. If the latter case prevails, then deer habitat in the GMU will be reduced.

Management conclusions

Continuing coordinated aerial surveys in the future will provide important trend data and facilitate more informed harvest management decisions at the appropriate landscape scale. The substantial increase in doe harvest since 2009 with advent of the late muzzleloader general season requires monitoring to assure harvest is not reducing the population below desired levels.

GMU 381 deer hunting seasons are structured to provide abundant opportunity for both general season and special permit hunters. The late muzzleloader general season is a unique mule deer opportunity in eastern Washington. Maintaining this opportunity and the numerous special permit seasons requires reliable survey and harvest data. It also requires the willingness to change seasons and permit levels if the available data indicate it is necessary.

DEER STATUS AND TREND REPORT: REGION 3

PMU – 32 GMUS 328, 329, 334, 335
PMU – 33 GMUS 336, 340, 342, 346
PMU – 34 GMUS 371, 372, 373
PMU – 35 GMUS 352, 356, 360
PMU – 36 GMUS 364, 368

JEFFERY A. BERNATOWICZ, District Wildlife Biologist

Population objectives and guidelines

The population goals for mule deer (Odocoileus hemionus) in these Population Management Units (PMUs) are to maintain maximum population levels compatible with available habitat base, provide recreational opportunity, and minimize damage complaints. The buck escapement objective is ≥15 bucks per 100 does post-hunting season.

Hunting seasons and harvest trends

Game Management Units (GMUs) 329 and 371 are restricted to permit only hunting. All other units are open during the general modern firearm season for 3-point minimum bucks. The late archery season is open in GMUs 346, 352, 364, and 368. Archers were allowed to take antlerless deer during 2003-2006. GMUs 328, 330-342, 352-360, and 368 are open for muzzleloader hunters. The number of units open to muzzleloaders increased from 3 to 10 units in 2003. Antlerless harvest for modern and muzzleloader hunters was by permit only. Most antlerless hunting by all user groups was eliminated in 2007.

Deer hunter numbers increased slightly in 2013, but were 57% below the average for the 1990s, and 21% below the 10 year average (Table 1). This is likely a response to lower deer numbers and less antlerless hunting opportunity. Harvest was similar to 2012 and was 55% below the average for the 1990s and 18% below the 10 year average. (Table 2).

Surveys

Ground surveys were conducted in PMUs 32 (Table 3). Buck ratios were above objectives and fawn ratios were high for the district in 2013.

Table 1. Number of deer hunters and success rate PMUs 32-36, 1991-2013.

Year	Modern Firearm	Muzzle-loader	Archery	Total	Success Rate (%)
1991-99	20,242	708	5163	26,113	8
2000	11,688	147	3,599	15,434	9
2001	9,946	132	2,648	12,726	11
2002	9,659	106	2,577	12,342	12
2003	10,314	869	3,772	14,955	15
2004	11,677	1,069	4,024	16,770	13
2005	11,542	966	3,836	16,344	14
2006	11,430	985	3,602	16,017	9
2007	9,928	891	2,799	13,618	9
2008	9,760	860	2,890	13,510	6
2009	9,164	763	2,622	12,549	9
2010	8,650	672	2,332	11,654	7
2011	8,587	632	2,337	*11,887	8
2012	7,190	690	2,255	*10,640	9
2013	7,827	613	2,258	*11,119	9

All PMUs were surveyed for deer abundance in spring of 2013 (Table 4). In general, the deer population is still below levels seen in 2003 and 2004, but appeared to be increasing. The Muckleshoot Indian Tribe (MIT) surveyed PMU 33 in April 2014, but the technique was not directly comparable to that used by WDFW. MIT also surveyed in 2012, and the 2014 survey didn't suggest any increase from 2012.

Population status and trend analysis

Deer populations in the district now appear to be increasing the last few years, but still below historic highs. Above average precipitation combined with mild winters have helped slightly boost populations. Reported buck harvest has been fairly flat since 2006. However, reported harvest is only for non-tribal hunters. Two tribes now hunt deer in the district.

Table 2. Deer harvest for PMUs 32-36.

	PMU 32		PMU 33		PMU 34		PMU 35		PMU 36		Total	Total
Year	Buck	Doe	Buck	Doe	Buck	Doe	Buck	Doe	Buck	Doe	Buck	Doe
1980-89	996	54	721	82	112	8	370	72	250	21	2,449	237
1991-99	761	108	714	79	155	9	302	56	216	52	2,154	305
2000	482	0	461	0	179	17	140	0	121	0	1,383	17
2001	459	28	371	62	179	35	121	0	103	0	1,233	125
2002	531	62	446	75	194	32	100	3	168	1	1,439	173
2003	517	242	518	261	146	32	173	144	145	92	1,499	769
2004	633	157	540	200	155	40	148	59	140	69	1,616	525
2005	510	349	399	354	147	50	143	101	188	119	1,387	973
2006	361	197	265	144	135	41	65	49	96	74	922	505
2007	364	0	297	0	139	29	105	0	117	0	1,022	29
2008	318	0	188	0	125	11	70	0	124	0	825	11
2009	512	0	392	1	201	58	109	0	197	0	1,411	59
2010	311	0	266	0	120	8	64	0	100	0	861	8
2011	339	0	328	0	134	6	52	0	130	0	983	6
2012	312	5	286	0	122	47	75	0	143	0	938	47
2013	316	4	304	0	146	24	58	0	143	0	967	28
10-Yr Avg	418	95	348	96	142	32	100	35	131	39	1140	297

The Yakama Nation (YN) does not collect harvest data. Anecdotal field contacts indicate YN harvest may be increasing. The MIT has been hunting the district since ~2010. The MIT harvest has been slightly over 100 bucks annually. If tribal harvest were included, there would likely be a slightly increasing trend in harvest.

There appears to be a strong relationship between the expansion of an exotic louse *Bovicola tibialis* and deer population decline circa 2004. Observations of deer with hairloss are still common throughout the district. *Bovicola tibialis* is different from the exotic louse *Damalinia* (*Cervicola*) sp., which has caused hairloss in black-tailed deer in western Washington and Oregon. The louse and hairloss has probably suppressed fawn recruitment and slowed population recovery.

All PMUs have typically had buck ratios at or above the goal of 15 bucks per 100 does when surveys have had adequate sample sizes. Bucks tend to be somewhat isolated from doe/fawn groups in December and short term declines may be due to missing a few groups of bucks. Also, the majority of deer seen on surveys are <3.5 years old. One year of high fawn mortality can greatly influence subsequent buck ratio estimates.

Habitat condition and trend

There are few data on the historic or current condition of the deer range. Fires have probably negatively impacted woody browse in the lower elevations where cheatgrass often replaces shrubs after fire. In the mid to upper elevations, fire usually promotes quality forage. Unfortunately, the frequency of fire has been much higher in the lower elevations. A drought cycle was broken in 2009 and 2010 in the lower elevations. Large fires swept over prime winter range in PMU 32 in summer of 2012, 2013 and 2014. Forage production has been reduced, but no significant winter mortality has been noted yet. When a severe winter does occur, deer are expected to die in large numbers due to inadequate browse above the snow.

Management conclusions

It is unknown how the lice will affect mule deer in the long-term. Despite no antlerless hunting since 2006 and relatively favorable weather, the deer population in the district is responding slowly. Statewide, the average deer hunter success is 28% compared to 9% in 2012 for the district. The Muckleshoot Indian Tribe (MIT) initiated a doe survival study in February of 2013. WDFW is cooperating on the study and it is hoped the data will help better define both movements and deer population dynamics.

Table 3. Deer composition survey data by PMU.

Year	PMU	Total Sample	Fawns: 100 does	Bucks: 100 does
1996	32	704	49	2
1997	32	326	46	10
1998	32	325	78	16
1999	32	255	58	21
2001	32	559	47	14
2002	32	372	48	13
2004	32	1095	42	16
2006	32	194	40	18
2007	32	205	46	17
2008	32	268	57	11
2010	32	273	54	20
2011	32	127	48	26
2012	32	153	48	15
2013	32	257	63	21
1996	33	863	58	2
1997	33	427	37	8
1998	33	645	75	11
1999	33	609	44	17
2001	33	481	37	15
2002	33	1017	44	17
2003	33	666	53	11
2004	33	1050	46	20
2006	33	236	47	11
2007	33	251	60	17
2008	33	277	55	15
2010	33	322	55	17
2011	33	316	48	19
2012	33	218	47	13
1996	34	67	56	17
1999	34	120	54	20
2000	34	372	54	28
2009	34	179	45	28
1996	35	85	40	NA
1997	35	193	56	NA
1998	35	57	62	16
2002	35	191	38	30
1996	36	659	55	3
2002	36	352	48	22
2006	36	287	59	19
2007	36	269	66	18
2008	36	195	44	16
2011	36	108	52	9

Table 4. April deer population estimates.

	PMU			
Year	**32**	**33**	**35**	**36**
2003	6315 ± 669	5049 ± 666	1221 ± 133	1662 ± 94
2004	5462 ± 505	5067 ±1065	NA	NA
2005	NA	NA	1191 ± 123	1482 ± 127
2006	NA	2633 ± 275	NA	NA
2007	2771 ±236	2549 ±244	NA	~880
2008	3648 ±370	NA	NA	NA
2009	NA	NA	649 ± 73	936 ± 81
2011	NA	2961± 206	NA	NA
2012	4916 ±808	NA	NA	NA
2013	4275± 459	3364 ± 265	748 ± 176	1284 ± 147

DEER STATUS AND TREND REPORT: REGION 4
GMUs 410, 411, 412, 413, 414, 415, 416, 417, 419, 420 & 421

RUTH L. MILNER, District Wildlife Biologist

Population objectives and guidelines
Objectives for Columbia black-tailed deer (*Odocoileus hemionous columbianus*) in the islands are to maintain healthy and stable deer populations within the tolerance level of island residents, and to maximize harvest opportunity and hunt quality despite an increasing human population, which may impact the availability and quality of habitat for deer.

In order to better understand harvest patterns within the islands, GMU 410, which formerly included all of San Juan and Island Counties was divided into eight island specific GMUs, including Guemes and Cypress Islands in Skagit County. All islands that did not receive a specific designation remain as part of GMU 410. This change was made prior to the beginning of the 2013 hunting season. The individual islands assigned a GMU are as follows: GMU 411: Orcas Island; GMU 412: Shaw Island; GMU 413: San Juan Island; GMU 414: Lopez Island; GMU 415: Blakely Island; GMU 416: Decatur Island; GMU 417: Cypress Island; GMU 419: Guemes Island; GMU 420: Whidbey Island; GMU 421: Camano Island.

Hunting seasons and harvest trends
The 2013 hunting season opened with the early archery season for any deer from Sept. 1- 27, the early muzzleloader season open for any deer from Sept. 28 through Oct. 6, and the general modern firearm season open for any deer from Oct. 12-31. Late archery season was Nov. 27- Dec. 31; late muzzleloader season was Nov. 28-Dec. 15; and the late modern firearm season was Nov. 14-17. Late season hunts were also for any deer. In addition to the general season tags, second deer permits for an additional antlerless deer were available to hunters in 2013. For most islands, 20 permits each were allocated for archery and muzzleloader hunters and 30 permits were allocated for modern firearm hunters. For Whidbey Island (GMU 420), 100 modern firearm permits were available.

An unusually high number of hunters (489) reported harvesting deer from GMU 410. Given the relatively small and inaccessible islands that remain in GMU 410, it seemed likely that many of these hunters failed to review the hunting regulations, probably because they hunt the same property every year, and were therefore ignorant of the change in GMU numbers. To correct for this, Master Hunter volunteers attempted to contact all successful hunters reporting their harvest from GMU 410, asking them to clarify the actual island from which they took their deer. This exercise was moderately successful; however, nearly 1/3 of hunters on the list could not be reached. Estimated harvest with the Master Hunter corrections factored into the estimates is given in Table 1.

Table 1. Estimated Harvest for GMUs 410-417 and 419-421.

GMU #	Island Name	Total Harvest	Total Bucks	Total Antlerless
Unknown	Unknown	177		
410	Islands	5	4	1
411	Orcas	59	38	21
412	Shaw	26	18	8
413	San Juan	74	55	19
414	Lopez	47	32	15
415	Blakely	30	17	13
416	Decatur	8	7	1
417	Cypress	10	2	8
419	Guemes	12	9	3
420	Whidbey	321	246	75
421	Camano	32	16	16

Surveys
Population surveys were not conducted in these GMUs 2013.

Population status and trend analysis
Insufficient data exist to model the deer populations in the islands. One exception is Blakely Island where summer deer densities from 2007 through 2011 averaged 28.5 -52.5deer/km^2 (Long et al. 2012).

Habitat condition and trend

Human development affects the amount of habitat available for deer in the island GMUs, particularly on the larger islands where local deer populations are apparently very robust. This may be a response to edge habitats and inadvertent forage enhancements such as gardens and ornamental plantings, which provide abundant food in safe environments where hunting is limited or prohibited.

Management conclusions

Safety concerns associated with increased human development, combined with changing attitudes towards hunting have resulted in fewer areas open to hunters on many of the islands. Public hunting sites are very limited in all island GMUs. We continue to look for opportunities to partner with private landowners to open more opportunity to hunters.

The number of hunters erroneously reporting their harvest GMU was a surprise in 2013; we expect harvest data to improve as hunters become aware of the changes in GMU assignments after this first year of implementation.

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DEER STATUS AND TREND REPORT: REGION 4

PMU 43- GMU 407
PMU 45- GMUS 418, 426, 437

PAUL M. DEBRUYN, Wildlife Biologist

Population objectives and guidelines

Population goals for black-tailed deer (*Odocoileus hemionus columbianus*) in these Population Management Units (PMUs) are to maintain maximum population levels compatible with available habitat base, provide recreational opportunity, and minimize damage complaints. The population objective is to maintain a post-hunt buck:doe ratio of at least 15 bucks:100 does.

Hunting seasons

Hunting season formats differ between individual Game Management Units (GMUs) based upon geographic variation. GMU 407 is a low elevation coastal area with a high human population distributed throughout the habitat base.

GMUs 418 and 437 are mainland areas of mid to high elevation with lower human population densities than the more urbanized coastal regions. GMU 426 is a high elevation area situated well into the Cascade Mountain range. Extremely low human population, limited road access, and severe geography characterize this unit. Although by definition all deer of the black-tailed/mule species *Odocoileus hemionus*, west of the Cascade crest are considered black-tailed deer, due to its proximity to the Cascade crest and high elevation habitats GMU 426 supports more mule deer or mule/black-tail hybrids, than other lower elevation units in PMU 45.

Hunting seasons in GMU 407 include any buck modern firearms season and any deer archery and muzzleloader seasons. There are firearms restrictions west of Interstate 5 limiting hunters to archery, muzzleloaders, shotguns, or crossbows. GMU 407 has early and late seasons for all weapon types running from September first through the end of December.

Hunting seasons in GMU 437 are the same as GMU 407 with the exception of there being a two point minimum antler restriction for bucks hunted with all weapon types and the late season is limited to archery.

Hunting seasons in GMUs 418 and 426 are the same as GMU 407 with the exception of no late season hunts for any weapon types. There is a quality (special permit) modern firearm hunt in GMU 418 during November.

Harvest and recreational opportunity profiles for GMUs 407, 418, 426and 437

Black-tailed deer harvest in GMUs 407, 418, 426 and 437 during the 2013 season totaled 962 animals (Table 1). Antlerless harvest for the 2013 season totaled 167 animals (17% of total harvest) while antlered harvest totaled 795 animals (83% of total harvest). In 2013, the number of general season hunters in GMU 407 increased from 2012, and the number of deer harvested also increased. (Figure 1) In GMUs 418, 426, and 437, the number of hunters was up from 2012, and harvest was higher. The proportion of deer harvested within GMUs 407, 418, 426 and 437 (962 animals) as compared to the statewide harvest for the 2013 season (31,094 animals) indicates that these northern Region Four GMUs represent 3.1% of the statewide general season harvest.

Tribal harvest in GMUs 407-437 for the 2012 season consisted of 9 bucks and 18 does harvested in GMU 407, 39 bucks and 45 does in GMU 418, and 16 bucks and 16 does in GMU 437.

Population status and trend analysis

The only monitoring of population status and/or trends in the mainland GMUs is the anecdotal observations of hunters, WDFW field employees (enforcement officers, fish and wildlife biologists) and the field observations of other natural resource agencies (DNR, State Parks, National Parks, and U.S. Forest Service). The ongoing trend is fewer animals observed in traditional work areas over the last decade.

Wildlife damage

Deer related damage to private property has remained a chronic problem throughout all of the mainland portions of north Region Four. No damage payments were made in this general area in 2012. Six kill permits were issued by WDFW enforcement officers in Whatcom and Skagit Counties to remove antlerless deer from agricultural operations experiencing damage problems.

San Juan County (GMU 410) continues to experience high deer damage problems associated with agricultural lands and residential properties. Deer/vehicle collisions remain high and are anticipated to increase as the human population in San Juan County continues to increase.

Habitat condition and trend

No recent habitat analysis has been conducted to quantitatively define current habitat condition or trends. Road closures continue to increase and may buffer the influences of increased human disturbance throughout deer ranges in Whatcom and Skagit counties.

Management conclusions

Future goals for effectively managing north Region Four deer populations include:

1. Preserve protect, perpetuate, and manage deer and their habitat to ensure sustainable populations.

2. Manage deer for a variety of recreational, educational, and aesthetic purposes including hunting, scientific study, cultural, subsistence, and ceremonial uses by Native Americans, wildlife viewing, and photography.

3. Manage deer populations for a sustainable annual harvest.

4. Establish and implement consistent survey protocols for black-tailed deer.

Table 1. Deer harvest summary for GMU's 407, 418, 426 and 437 for 2013.

Harvest	Modern Firearm	Archery	MZL	Multiple Weapons	Special Permit	Total
Antlerless	0	130	29	7	1	167
Antlered	612	115	30	26	12	795
Total	612	245	59	33	13	962

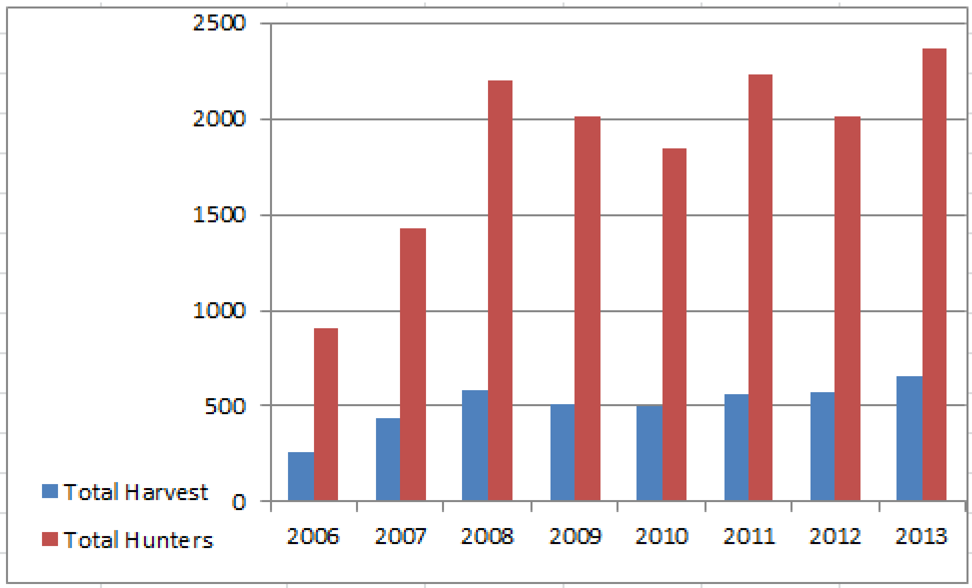

Figure 1. Deer Harvest and Number of Hunters in PMU 43 (GMU407) for 2006-2013.

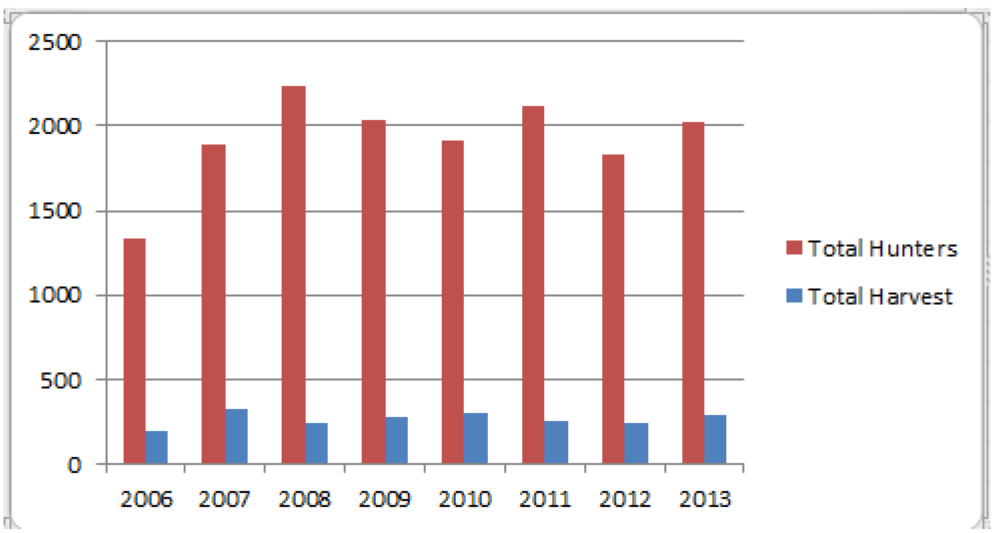

Figure 2. Deer Harvest and Number of Hunters for PMU 45 (GMUs 418, 426 and 437) for 2006-2013.

DEER STATUS AND TREND REPORT: REGION 4
PMU 44 – GMU 422, 454
PMU 47 – GMU 460
PMU 48 – GMU 466, 485

CHRIS ANDERSON, District Wildlife Biologist

Population objectives
Population objectives for Game Management Units (GMUs) 422, 454, 466, and 485 are to maintain healthy population levels of black-tailed deer (*Odocoileus hemionus columbianus*) within habitat limitations, to provide recreational opportunity, and to ensure long-term population persistence.

Population objectives for GMU 460 are to maximize harvest opportunity and maintain the post-hunt buck composition ratio at a minimum 15:100 does.

Hunting seasons and harvest trends
Management strategies are similar for GMUs 454 and 466. Both have a modern firearm season from mid-October to the end of October with annual calendar date adjustments. Each has a four-day late buck season in mid-November, also with annual calendar date adjustments. Both have an early and late archery season, for any deer. GMU 454 has both an early and late muzzleloader season for any deer.

GMU 422 was newly designated in the 2013 season and covers all of Vashon and Maury Islands. The unit has a modern firearm season from mid-October to the end of October, any deer, with annual calendar date adjustments. The unit has a four-day late any deer season in mid-November. The unit also has an early and late archery season, for any deer. GMU 422 has both an early and late muzzleloader season for any deer.

Hunting access on Vashon and Maury islands is largely on private agricultural and hobby farm properties. Hunters must take time to network with communities and property owners for opportunity and access.

GMU 454's more liberal seasons are designed to maintain the population at an acceptable level within an urban-wildlife conflict interface. However, habituated, small deer groups do occur in suburban and rural areas of GMU 454, and because of private property and safety concerns; they do not receive comparable hunting pressure.

GMU 454 exhibited a substantial increase in total buck harvest beginning in 1999 (Fig. 1). Total buck harvest post 1998 showed an approximate 82% increase in harvest compared to previous harvests. Annual harvest has been relatively stable since then.

Buck harvest in GMU 466 has oscillated back and forth indicating possible extrinsic factors in harvest rather than population changes (Fig. 2). GMU 466 antlerless harvest has generally been low with some annual variation. This is likely due to dry early fall weather and early winter snowfall, both influencing hunter success in this unit. In GMU 466, the Northwest Indian Fisheries Commission Big Game Harvest Reports show tribal harvest levels that add considerably to the total deer harvest in GMU 466. This is an additional mortality source to the total deer harvest for GMU 466. Tribal harvest numbers are considered when evaluating future hunting seasons and population trends for GMU 466. Overall, this unit receives less hunt pressure due to location and weather. However, this unit holds nice harvest opportunity and more solitude for a hunter willing to get out and put some time in working the area.

GMU 460 has been managed under an "any buck" general hunt for more than 30 years. Harvest has varied over this period, averaging about 460 deer per year from 1984 to 1998. The late buck season closure in 1998 certainly contributed to a 45% decline in total buck harvest compared to 1997. Since the late buck closure, harvest has been lower with less variation; averaging around 152 bucks taken annually from 1998-2013 (Fig. 3). Access fees in Hancock Forest Management lands in GMU 460 have increased over time and may contribute to lower number of hunters. Hunting pressure has decreased by more than half of hunters afield prior to access fees. However, a decline in hunting in this unit can be noted even before fee implementation (Fig. 4).

GMU 485 has had a limited entry special permit hunt since 1984. Concerns over population declines and hunter pressure have reduced permit numbers with accompanying reduced harvest (Fig. 5). In 2000, the special permit hunt was designated as buck only.

Beginning in 2003, a limited number of state permits for persons with disabilities was added. An equally limited youth hunt was added in 2006. In 2013, the modern firearm quality buck hunt was adjusted to "any weapon" tag. This tag requirement was broadened to provide equal opportunity for archery, muzzleloader, as well as modern firearm hunters. Overall, permit opportunity and harvest type are adjusted annually to maximize opportunity while maintaining herd population goals.

Deer that winter in the low elevations of GMU 485 may range into GMU 466 during other times of the year and be legally harvested (Raedeke 1995). Population guidelines for GMUs 466 and 485 are considered together, along with tribal harvest data, in order to make the best assessment of population trends.

Surveys

Currently no surveys are conducted in GMUs 422, 454, 460 and 466. The Muckleshoot Indian Tribe (MIT) has conducted early to mid-December post-season population flight surveys in GMU 485 since 2000. Flight data, along with individual monitoring efforts utilizing radio-collared deer are used in population estimates. Local monitoring of marked individuals provides ground truth data for utilization in mark-resight modelling for estimation of overall population parameters and resulting trends.

In 2003, a pre and post season composition flight was conducted in GMU 460. The flight resulted in classifying only 25 and 20 deer respectively. The extremely low sample size does not allow calculation of meaningful sex ratios from data. In addition, the scarcity of deer seen on these flights carried out under the same historic count methods (see Tables 1 and 2), raises concerns over a continued and apparent decline in deer numbers.

Table 1. Preseason Deer Composition Survey Results from Helicopter in GMU 460

Year	Fawn	Spike	Branch Buck	Total Buck	Total (N)
1995	67.0	8.3	6.0	20.0	114
1996	61.5	19.2	3.8	23.0	48
1998	72.0	14.0	2.3	16.3	86
1999	71.7	12.8	10.3	23.0	76
2000	51.0	11.4	0.0	11.4	57
2001	No Data				

Table 2. Postseason Deer Composition Ratios per 100 Does in GMU 460

Year	Fawn	Spike	Branch Buck	Total Buck	Total (N)
1996	62.5	3.7	8.5	12.2	144
1997 [a]	51	6.6	0	6.6	71
1998 [b]	59	4.9	13.1	18	108
1999	49	7.0	9.3	16.3	71
2000	33	3.0	19.0	23.8	35
2001	55	0	5	5	68

[a] flown 1-9-98
[b] flown 11-11 thru 12-14, 98

Population status and trends

Precise population estimates for GMUs 422, 454, 460, and 466 are unavailable. Since 2002, only mandatory hunter reports have been used to monitor deer population trends and determine hunting regulations.

Based on Muckleshoot Indian Tribe surveys, deer in GMUs 485 and 466 have appeared to be on the slight increase. However, confidence intervals are wide and therefore true changes in population are not likely to be detected. Radio-marked doe survival, previous fawn ratios, and low harvest do suggest that there should be a population increase in GMU 485 overall. That said, recent flights have not resulted in large enough deer numbers sighted to provide for as confident of an estimate as in the past (Table 3), (Vales unpubl. data 2014). This is likely due to a combination of poor weather and difficulty in spotting black-tailed deer due to their association with cover. Over a longer term of continued future survey we may see oscillation of numbers as a plausible artifact in difficulty of survey for this species. Other survey techniques may be examined in the future for comparable results and increased sightability.

Table 3. Trend in Deer Population in GMU 485 (ratios per 100 doe)

Year	# Seen	Fawn:Doe	Buck:Doe	Pop Est.
2000	118	50	19	350 ± 100
2001	106	34	31	440
2002	105	47	17	367
2003	106	56	18	434 ± 279
2004	127	55	34	402 ± 204
2005	144	60	12	645 ± 377
2006	97	53	17	572 ± 398
2007	83	48	18	578 ± 449
2008	120	38	31	681 ± 477
2009	88	64	31	505 ± 344
2010*	No Data			
2011	59	63	30	719 ± 641
2012*	50	45	16	310 ± 208
2013	49	37	23	265 ± 159

Flight data provided by D. Vales, Muckleshoot Indian Tribe Biologist.
*Poor weather prevented completion of surveys.

Habitat condition and trend

In general, the long-term trend in GMU 454 deer habitat is for a continued decline. This is consistent with development of habitat currently used by deer. However, deer are taking advantage of 1-10 acre tracts that are cleared for homes. These tracts still provide and may even improve deer forage availability, particularly during winter months, thereby improving overall body condition. This alone can lead to higher productivity and increased survival. Further, because many of these private lands are not open to general public, hunting mortality may be reduced. This can lead to increasing deer densities and may prompt some deer dispersal to surrounding habitats that are accessible to hunters in GMU 454.

The significant majority of GMU 460 is managed for timber production. Annual timber harvests create a mosaic of seral stages that can be beneficial to deer. Openings of 1 to 10 acres exist that provide a good forage base as well as riparian corridors protected by Washington Forest and Fish rules. The forest stands in these corridors provide older age classes that diversify habitat and help intercept snow during harsh winters. This may provide deer access to forage in these sites, serve as travel corridors, and provide added winter shelter.

Apparent increases in timber harvesting in the Snoqualmie Forest portion of GMU 460 may provide an increased forage base for deer over time. However, the spraying of herbicides on private industrial timberlands is of concern to ungulate forage and is being examined via internal and external research. In 2004 King County announced the purchase of development rights on the King County portion of the Snoqualmie Forest (app. 90,000 acres). This will protect a large area of commercial forest as open space and de facto deer habitat. Continued additional research into the relationship between current landscape conditions, herbicide application, deer populations, and habitat quality is needed and a focus.

Deer habitat trends in GMU 466 and 485 are dependent on timber management and subsequent seral stage development that determines forage availability. There are several thousand acres of timberlands managed primarily for wood fiber production; with considerations for recreation, fish, and wildlife.

Wildlife damage and nuisance problems

In GMU 422 and 454 deer damage to ornamental shrubs and gardens can be a problem and numerous complaints are received every year. Further, deer are now being seen in small numbers within more urban areas, such as the Seattle suburbs, where hunting is obviously not feasible. These deer are supported by many citizens and equally condemned by others because of associated property damages. There are no damage complaints for deer in GMUs 460, 466 and 485.

Hair loss syndrome

"Hair loss syndrome" (HLS) of black-tailed deer was first described in Washington in 1995. The condition is caused by a heavy infestation with a Eurasian louse of poorly defined taxonomic status in the genus *Damalinia (Cervicola) sp.* The normal hosts of this louse are non-native deer and antelope, which are not seriously affected by the lice.

In contrast, when black-tailed deer become infested, they tend to develop a hypersensitivity (severe allergic) reaction to the lice, which causes irritation of the skin and excessive grooming by the deer. Eventually, this excessive grooming leads to loss of the guard hairs, leaving yellow or white patches along the sides. Infestations are heaviest during late winter and early spring, and many affected deer, especially fawns, die during this time. The geographical distribution of HLS has steadily expanded since its first appearance and now affects black-tailed deer throughout their range in western Washington.

In 1996 within GMU 460 field surveys documented a hair loss syndrome that affects deer during the late winter and early spring surveys. Over a three-year period Bender and Hall (2001) reported rates of "hair-slip syndrome" in fawns as 55, 74, and 46% from 1999-2001. However, they concluded that HLS, based on their study, was not significant in increasing fawn winter mortality and called for future research to better determine effects HLS has on black-tailed deer populations. Continued study since then has largely determined that HLS in black-tailed deer is largely not additive in winter mortality. It is thought that HLS may increase predation risk due to poor body condition overall. Poor body condition is attributed to a combination of potential factors including poor forage, low birth weight, timing of birth; as well as afflictions including, but not limited to, HLS.

Many HLS affected individuals tend to rebound in condition and health if they pull through the winter Ultimately, HLS is very likely only a portion of the regular annual mortality factors acting synergistically in given local populations.

WDFW provides more information regarding hair loss syndrome at our Wildlife Health website: http://wdfw.wa.gov/conservation/health/hair_loss/index.html

The effects of hair-loss syndrome on black-tailed deer throughout western Washington will likely never be completely understood.

Management conclusions

Deer in GMUs 422 and 454 should continue to be managed with liberal seasons designed to keep deer at acceptable levels in developing areas. Isolated groups of deer, generally on the eastern boundary of GMU 454, should continue to offer hunting and recreational viewing opportunity.

In GMU 460, the Region will maintain the late buck season closure for modern firearm. Future survey efforts, given funding, are desired to examine population status and sex ratios.

In cooperation with the Muckleshoot Tribe and Tacoma Water, surveys will continue in GMUs 485 and 466 to increase sample size for population estimation and gain a better assessment of herd composition.

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Raedeke, K.J. and D.A. Milligan Raedeke. 1995. Big game management plan for the Green River Watershed, Tacoma, Washington. Raedeke Associates, Inc., Report to Tacoma Public Utilities, Water Division. 86pp.

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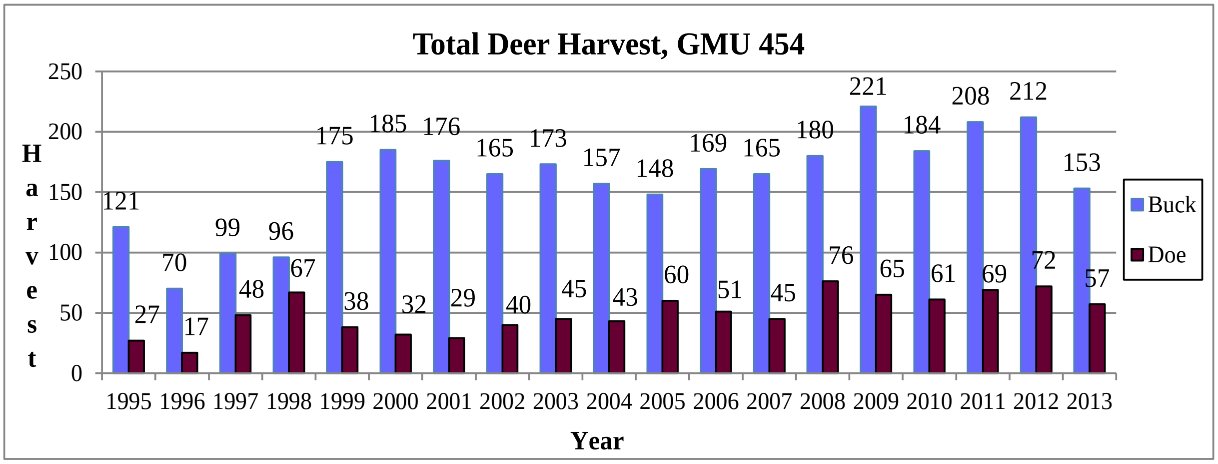


Figure 1. **Annual deer harvest in GMU 454, all weapon types, 1995-2013**.
*2004 harvest reflects uncorrected raw data reported from hunter report.

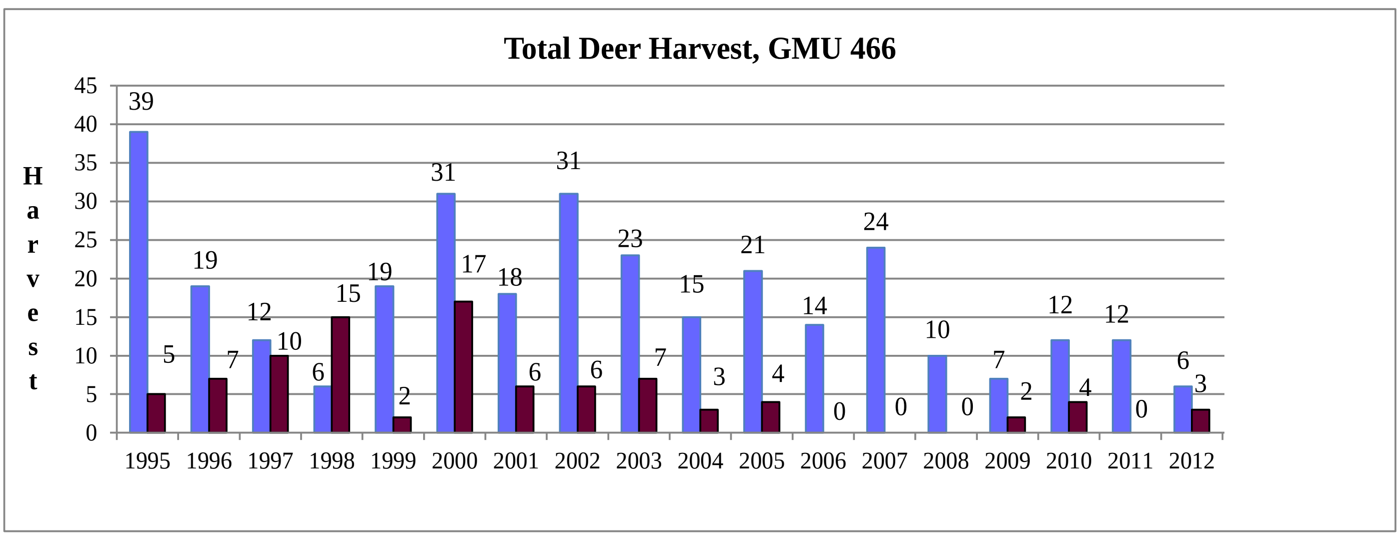


Figure 2. Annual deer harvest in GMU 466, all weapon types, 1995-2013.
*2004 harvest reflects uncorrected raw data reported from hunter reports.

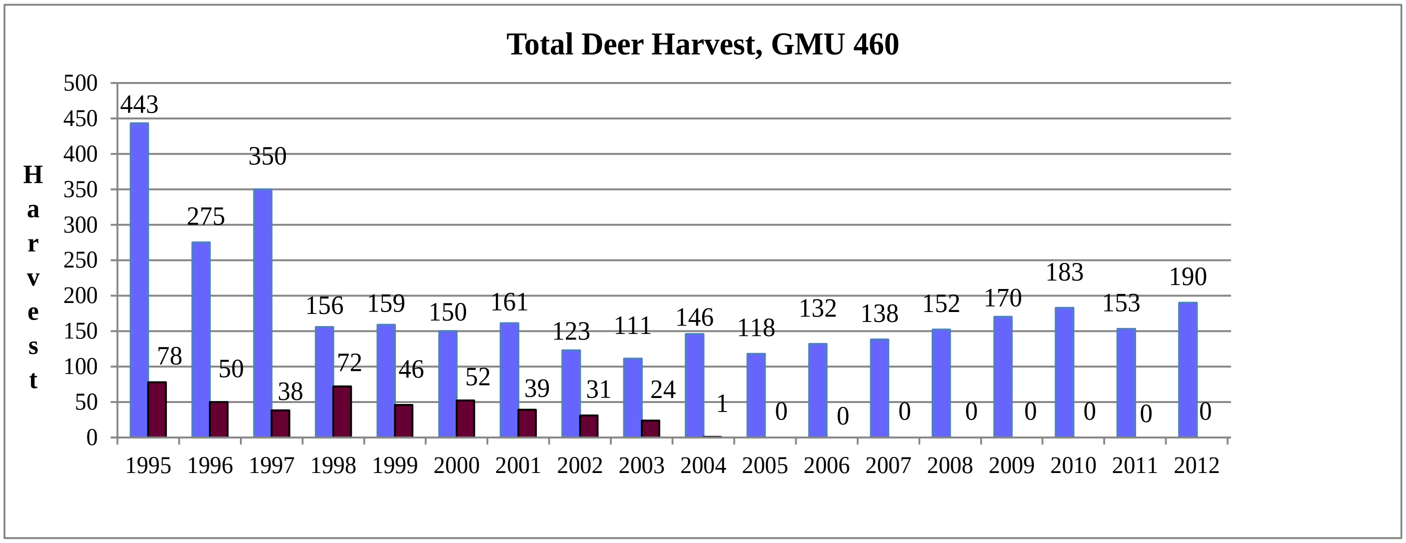


Figure 3. Annual deer harvest, GMU 460, 1995-2013, general season and special permit combined.
1997 was last year of late buck hunt.
2004 1st year of buck only archery hunt

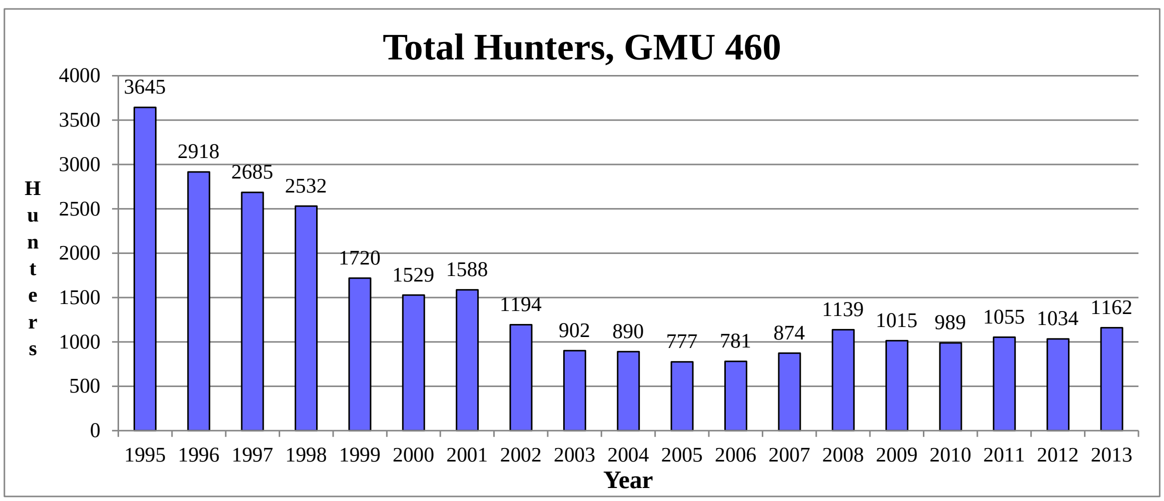


Figure 4. **Number of deer hunters, GMU 460, 1995-2013, general season and special permit combined.**
1997 was last year of late buck hunt.
2002 access fee added - Hancock Forest Management Snoqualmie Forest lands.

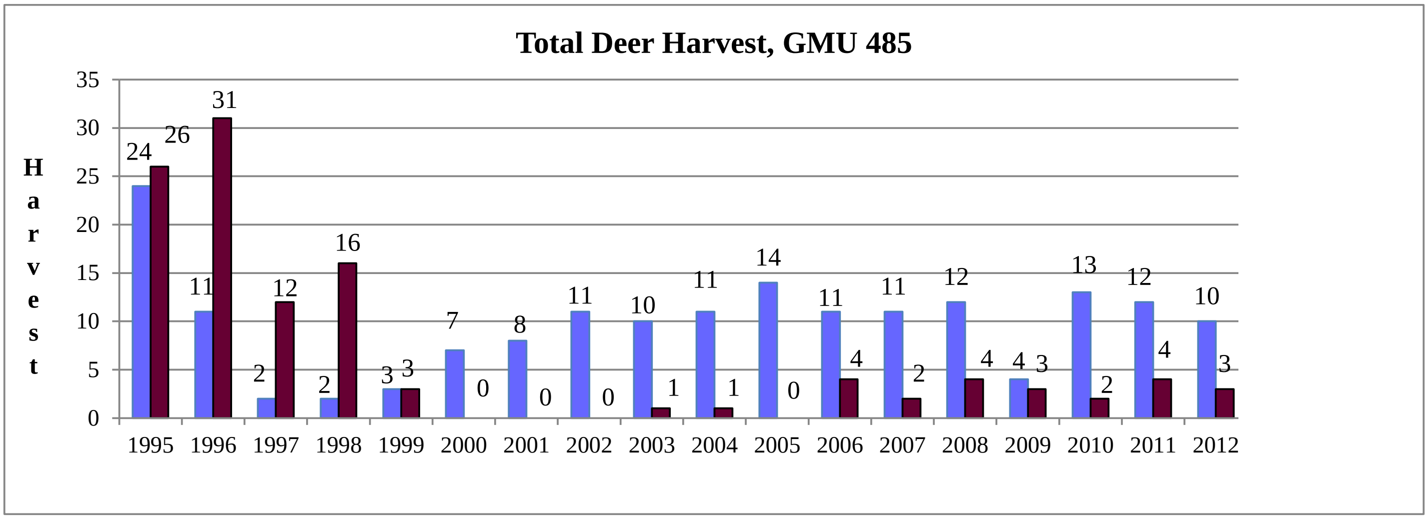


Figure 5. Annual state deer harvest in GMU 485, 1995-2013.

DEER STATUS AND TREND REPORT: REGION 4
PMU 46, GMU 448 AND 450

RUTH L. MILNER, District Wildlife Biologist

Population objectives and guidelines
Population Management Unit (PMU) 46 is composed of Game Management Units (GMUs) 450 and 448. GMU 450 is a relatively small, high elevation area. Most hunting within the PMU takes place in GMU 448, which is the larger and more accessible GMU. Objectives for black-tailed deer (Odocoileus hemionous columbianus) in PMU 46 are to provide healthy and stable deer populations for the long term and to maximize harvest opportunity and hunt quality despite an increasing human population, which is impacting the availability and quality of habitat for deer.

Hunting seasons and harvest trends
The 2013 hunting season in GMU 448 opened with the early archery season for any deer from Sept. 1-27, the early muzzleloader season open for any buck from Sept. 28 through Oct. 6, and the general modern firearm season open for any buck from Oct. 12-31. Ten modern firearm permits were available for the late buck hunt in GMU 448 from November 14-17 for any buck.

Hunter numbers were slightly increased over the previous year with 966 hunters reporting that they hunted GMU 448 in 2013 compared to 849 hunters in 2012. General season harvest in GMU 448 increased in 2013, with 169 deer harvested in 2013 compared to 118 in 2013 and 115 in 2011 (Figure 1). Hunter success rate for all weapons combined was 17% and was higher in 2013 than the previous two years (14% success rate in 2012; 13% in 2011) (Figure 2). Archery hunter success was 17% compared to the previous year's 18%. Twenty-eight animals were harvested by archers, of which nine were bucks. Modern firearm hunter success was 18% in 2013, an increase from the 14% success rate in 2012 and 12% success rate in 2011. In 2013, 135 bucks were harvested by modern firearm hunters. Only 23 muzzleloader hunters reported hunting in GMU 448, with four bucks harvested. Two bucks were taken with multiple weapon tags.

In GMU 448, 77% of hunters used modern firearms, and this group harvested 80% of the deer in 2013. Archery hunters comprised 22% of hunters and took 17% of the deer. Muzzleloader hunters accounted for 2% of hunters (23 people); 23% of hunters (22 people) had multiple weapon tags. Ten permits are issued in GMU 448 for the late buck hunt. In 2013, two bucks were taken during the late season, reported as one three point and one four point or greater. In 2012, four bucks were also harvested during the late buck season, of which two were reported as four point or greater.

Figure 1. Total Deer Harvest: GMU 448 2003-2013

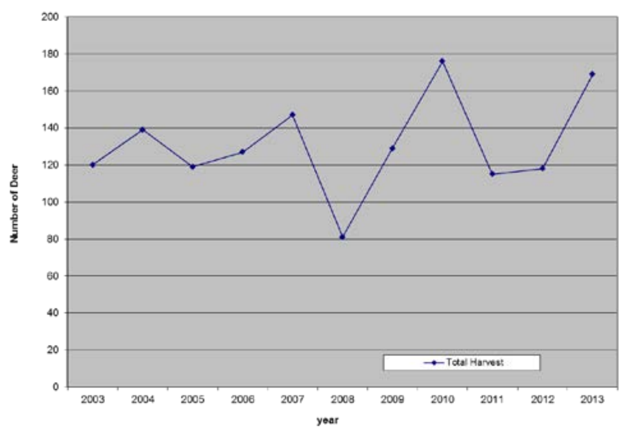
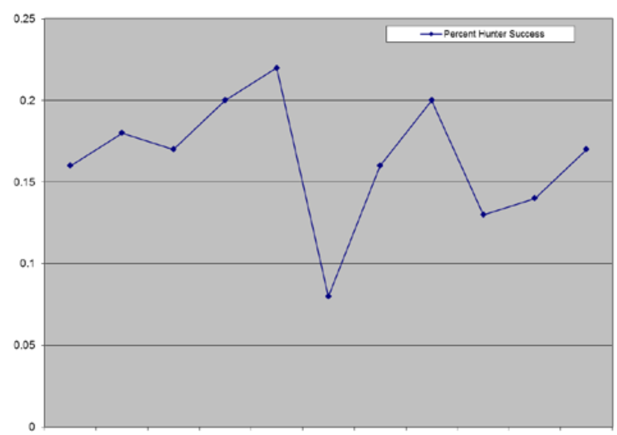


Figure 2. Percentage of Successful Hunters: 2003-2013



One hundred fifty-three hunters hunting in GMU 450 in 2013 used modern firearms, harvesting six bucks; 10 hunters used archery equipment and were unsuccessful. Success rate for the GMU was 3.6%, which is slightly below the 4.6 rate of 2012. As in previous years, relatively few people hunted in GMU 450. One hundred thirty-five hunters harvested 11 deer during the general season in 2011, with a success rate of 8%. In 2010, 106 hunters harvested 18 bucks and 3 does, for a 20% success rate. For the previous 5 years, from 2005 through 2009, the average harvest was 9 animals (range: 5 deer in 2005 to 16 deer in 2009); hunter numbers averaged 75 (range: 60 hunters in 2005 to 90 hunters in 2009); and average success rate was 12% (range 8% in 2005 to 17% in 2009).

PMU 46 is hunted by the Stillaguamish, Tulalip, and Sauk Suiattle Tribes. The tribes report harvesting 7 bucks and 2 does from GMU 448 and no deer from GMU 450 in 2013-2014.

Surveys

Population surveys were not conducted in GMUs 448 or 450 in 2012.

Population status and trend analysis

Insufficient data exist to model the deer population in PMU 46. Total harvest and hunter success for 2012 were similar to those reported in 2011. In general, we believe that the deer population is stable in this geographic area.

Habitat condition and trend

Human development in Snohomish County affects the amount of habitat available for deer in GMU 448. In the western part of the GMU outside of the urban core areas, local deer populations are apparently very robust. This is in response to edge habitats and inadvertent forage enhancements such as gardens and ornamental plantings, which provide abundant food in safe environments where hunting is limited or prohibited.

In the eastern half of the GMU, much of the forest habitat available on USDA Forest Service land is in a mid-rotation age class, with relatively tightly stocked stands that provide limited under-story vegetation. These conditions provide limited forage for deer, with the nutritional quality of the forage available unknown. A few small scale thinning projects are being undertaken to try to improve understory habitat, which could potentially benefit local deer populations. Access to Federal lands has been reduced in recent years because roads and trails have been heavily impacted by damage caused by severe weather, including floods, slides, and wind. Reduced access on Federal lands has likely affected hunter success in recent years.

Clear-cutting continues and has increased on private and State owned timberlands in GMU 448. However, herbicidal sprays applied in many clear-cuts to control brush may limit forage available to deer in these regenerating stands, which may limit deer numbers. Access to large tracts of private and state owned timberlands continues to be a challenge in much of the PMU, as many landowners are gating or decommissioning their roads and prohibiting the use of motorized vehicles. These factors may affect harvest success in GMU 448.

We expect the trend of shrinking habitat available to deer to continue, as the human population of the County continues to grow. Housing sales and new home construction is beginning to increase in Snohomish County. As human development expands into rural areas, this GMU continues to see firearm restricted areas and no-shooting zones expand. These trends will limit access to hunters in GMU 448.

Management conclusions

GMU 448 is hunted primarily by local residents who have access to private land or are well acquainted with access on public lands. Although the number of hunters has dropped compared to a decade ago, hunting is still a quality experience for those who know where to hunt in GMU 448. Hunters will find that crowding is not a problem in PMU 46.

DEER STATUS AND TREND REPORT: REGION 5

PMU 51 - GMUS 382, 388, 578
PMU 52 – GMUS 564, 568, 574
PMU 53 – GMUS 524, 554, 556
PMU 54 – GMUS 516, 560, 572
PMU 55 – GMUS 510, 513
PMU 56 – GMUS 503, 505, 520, 550
PMU 57 – GMUS 501, 504, 506, 530

ERIC W. HOLMAN, Wildlife Biologist

Population objectives and guidelines

Black-tailed deer (*Odocoileus hemionus columbianus*) and mule deer (*Odocoileus hemionus)* populations in southwest Washington are managed under the Washington Department of Fish and Wildlife's (WDFW) mandate to maximize recreational opportunities within the framework of preserving the biological integrity of the species. Specific objectives are to maintain productive populations; manage for a variety of recreational, educational, and aesthetic purposes; and manage the population for a sustained yield (WDFW 2008).

Hunting seasons and harvest trends

Information on deer harvest and hunter effort is obtained from WDFW’s mandatory reporting system. Estimates of total harvest, hunter effort, and hunter success are based on reports submitted by hunters. During the 2013 general deer season in Region 5, modern firearm hunters made up 74% of the hunters, archery accounted for 17%, and those choosing to hunt with a muzzleloader made up 7%. Finally, those utilizing “multi-season” tags accounted for approximately 3% of the Regional deer hunting effort.

Two primary harvest management strategies are employed for male deer in Region 5. During the general modern firearm season, the majority of Game Management Units (GMUs) are managed under an any-buck strategy, where any buck with visible antlers is legal for harvest. The 3 Klickitat County GMUs (578 –West Klickitat, 388-Grayback, and 382-East Klickitat), are managed under a 3-point management strategy.

Harvest of antlerless deer during general archery season is legal in many GMUs. In addition to the general-season archery harvest, permits allowing for antlerless harvest are issued based on the estimated population of deer in selected GMUs. Additionally, the damage history and record of nuisance complaints (social carrying capacity) within GMUs are considered.

In 2013, an estimated 26,875 hunters spent a total of 143,840 days deer hunting in Region 5 (Table 1). Total general-season harvest in 2013 was 4,787 with a hunter success rate of 18% (Table 1). The percentage of hunters that harvested a deer in 2013 was similar to the previous 10-year mean of 17%. The total deer harvest was slightly below the mean harvest of 5,183 during the period from 2003-2012.

Table 1. Deer Hunter Numbers and Harvest Statistics for Region 5, 2004-2013.

Year	Hunters	Days	Harvest	Success %
2004	35,455	188,370	6,832	19
2005	28,628	169,910	5,575	19
2006	31,966	174,738	5,222	16
2007	32,889	186,325	5,404	16
2008	31,013	204,116	4,911	16
2009	32,731	178,419	4,643	14
2010	30,394	163,342	5,316	17
2011	28,680	152,388	4,120	14
2012	25,838	139,119	4,791	19
2013	26,875	143,840	4,787	18

Hunter participation rates and deer harvest were not evenly distributed throughout the Region. Proportionally fewer hunters elected to hunt in Cascade Mountain GMUs relative to other areas of Region 5. In turn, those PMUs (53, 54, and 55) located in the Cascade Mountains, contributed relatively less to the overall deer harvest than their lower elevation counterparts (Table 2). It is likely that this divergence in deer hunting effort and success is the result of lower deer densities in the Cascade Mountain GMUs, a lack of openings within the forested landscape, and much lower road densities in these GMUs.

Table 2. Region 5 2013 Deer Hunters, Hunters/Square Mile, Harvest, Harvest/Square Mile, and Success/PMU

PMU	Hunters	Hunters/SQ Mile	Total Kill	Kill/SQ Mile	Success %
51	4,994	2.8	1226	0.7	25
52	4,932	4.1	994	0.83	20
53	1,031	2.8	148	0.4	14
54	3,238	1.9	228	0.13	7
55	916	2.1	108	0.24	12
56	6,915	6.9	1056	1.06	15
57	4,842	3.9	1027	0.83	21

In addition to the general-season deer hunting effort and harvest discussed above, tags were offered for special permit hunts open only to permit holders in 2013. These special permits were made available to allow controlled harvest of antlerless deer in the Region while promoting hunting by young hunters, those with disabilities, and seniors. Additionally, "late-buck" hunts in GMUs 574, 578, and 388 were offered as a quality hunting opportunity for those fortunate enough to draw these permits. Hunters selected for deer special permits in Region 5 have typically enjoyed a pooled success rate of approximately 40%. Table 3 details the harvest of deer by special permit holders in Region 5 during 2013.

Table 3. Region 5, 2013 Special Deer Permit Harvest Summary

PMU	Antlered Kill	Antlerless Kill	Total Kill
51	39	90	129
52	21	25	46
53	3	18	21
54	0	4	4
55	0	7	7
56	0	28	28
57	0	16	16
SUM	**63**	**188**	**251**

In aggregate, general and permit-only deer seasons in Region 5 during the 2013 hunting season resulted in a total harvest of 4,381 antlered and 656 antlerless deer.

Surveys

Region 5 deer demographics have historically been collected from several types of surveys and data collection efforts. These surveys include; (1) calculation of the annual buck mortality rate, (2) evaluation of female deer age structure from tooth analysis, (3) late summer productivity surveys, (4) spring counts of the Klickitat deer herd, and (5) post-hunting season surveys. The various data-collection efforts and their purpose are discussed below.

Historically, check station data were used to determine the percentage of yearling bucks in the total Regional buck harvest, i.e. Annual Yearling Buck Percentage (AYBP). In an age stable population, this percentage is assumed to be equal to the overall buck mortality rate. Essentially, yearlings are replacement animals filling voids left by the previous year's mortalities. However, small sample size and potential bias related to opening weekend deer hunting were problematic in this data set. Additionally, operation of the check stations is difficult logistically and requires far more staff than those available. For these reasons, the 2005 through 2013 AYBP used for calculation of the Sex Age Kill (SAK) model in Region 5 was generated from harvest data. Through this means, the buck mortality rate may be calculated from a sample of all reported deer harvested in the Region. Buck age is correlated to antler size in a consistent manner but varies throughout the Region. An appropriate buck mortality rate based on this correlation was applied to broad portions of the Region (Willapa, Cascades, and Klickitat). This method of calculation results in buck mortality rates of 25-50% across the Region.

The long-term estimate of annual doe mortality rates in the Region is 0.22. A large-scale effort to characterize doe mortality rates was undertaken in 2001. Tooth envelopes and an explanatory letter were sent to all hunters possessing an antlerless permit in Region 5. Additionally, incisors were taken from any female deer checked at the check stations or recovered from meat lockers. In 2001, a sample of 96 harvested female deer from the western portions of Region 5 resulted in an annual doe mortality rate of 0.219. A sample of 68 females from PMU 51 (GMUs 578 and 588 (now 388)) resulted in an annual doe mortality rate of 0.132.

Efforts to collect female deer teeth for ageing in subsequent years have relied on less expensive and less effective methods. These have included collection of doe teeth at check stations and meat lockers as well as from road-killed animals. These efforts (2002-2013) have not resulted in the collection of a useful data set for adequate evaluation of the annual female mortality rate. Updated data on the female mortality rate of deer in the Region would facilitate improved population estimation and improve the ability to appropriately establish antlerless deer seasons.

Late summer deer productivity surveys were first established in 1995. In 2013, deer observations were conducted throughout the Region from August 15th to September 30th. Personnel from WDFW's Wildlife Management Program along with a variety of volunteers from within WDFW, the U.S. Forest Service, private timber companies, and interested individuals recorded observation data for all deer encountered during field activities or recreational outings. In addition to these incidental deer observations, multiple night deer surveys (spotlighting) were conducted by a combination of Wildlife Management Staff and volunteers. Deer group sizes and composition were determined. All deer were classified as bucks, does, fawns, or unknowns. However, only those groups of deer in which all individuals were classified were included in statistical analysis to help eliminate observer bias.

During the 2013 productivity surveys, a total of 603 deer were classified. The mean value of 0.44 fawns/doe is lower than the historical average of 0.51 per doe for the Region. The surveys are conducted after the peak of neo-natal mortality, so these values are closer representatives of recruitment than fecundity. For the purpose of calculating the SAK model, more specific productivity rates are assigned to aggregations of GMUs.

For spring counts, four permanent survey routes centered on the Klickitat Wildlife Area near Goldendale, were surveyed on March 17-18, 2014 (Table 4). Routes were driven on the evening of the 17th and morning of the 18th . Deer group sizes and composition were determined. All deer were classified as fawn, adult, or unknown and the fawn:adult ratio was determined. A total of 233 deer were classified during the March 2014 Klickitat deer survey. The resulting fawn:adult ratio of 0.61 is higher than the mean value of 0.50 over the 35-year history of this survey.

Table 4. Historic Fawn:Adult Ratios for the Klickitat Spring Deer Survey, 2000-2013.

Year	Total Deer Classified	Fawn:Adult
2000	843	0.46
2001	764	0.54
2002	448	0.52
2003	647	0.52
2004	619	0.52
2005	462	0.6
2006	450	0.66
2007	344	0.67
2008	238	0.48
2009	277	0.53
2010	440	0.72
2011	363	0.45
2012	276	0.99
2013	242	0.49
2014	233	0.61

Limited post-season deer herd composition surveys were initiated in Region 5 in 2003. The surveys are intended to evaluate the effectiveness of current management strategies in meeting the buck escapement goals for PMU 51 outlined in the Game Management Plan (WDFW 2008). Specifically, the post-season buck to doe objective in the 3 Klickitat County GMUs is 15-19 bucks per 100 does. Secondarily, the surveys provide an additional opportunity to evaluate the annual fawn to doe ratio. The sparsely vegetated habitats of Klickitat County offer suitable survey conditions during daylight hours in winter.

In 2013, Regional Wildlife Program Staff conducted a combination of aerial and ground surveys during December in GMUs 382, 388, and 578. The timing of post-season surveys is designed to fall after the conclusion of the year's final hunting season (late archery) and prior to the initiation of antler casting (approximately January 1). The 2013 post-season survey included aerial observations for the first time in GMU 382. A summary of these post-season deer surveys is listed in Table 5.

Table 5. Post-Season Deer Composition Survey Summary, GMUs 382, 388 and 578, 2003-2013.

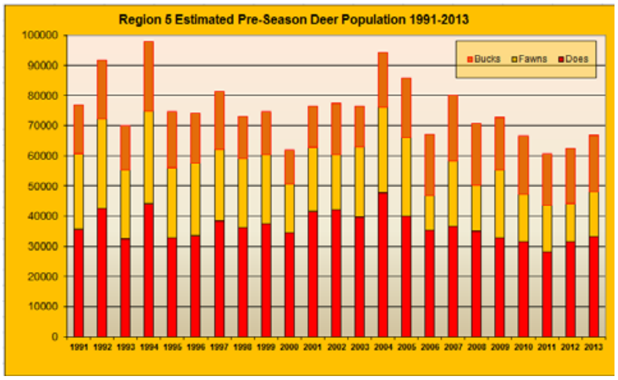
GMU	Year	Total Deer Classified	Bucks:Does: Fawns
382	2003	270	14:100:63
	2004	170	15:100:68
	2005	165	15:100:57
	2006	428	10:100:62
	2007	418	17:100:70
	2008	301	11:100:81
	2009	211	10:100:64
	2010	660	11:100:68
	2011	220	18:100:65
	2012	543	11:100:51
	2013	685	11:100:65
388	2003	376	16:100:72
	2004	127	6:100:56
	2005	364	2:100:59
	2006	589	16:100:63
	2007	403	22:100:63
	2008	420	15:100:68
	2009	419	14:100:66
	2010	601	9:100:53
	2011	454	23:100:76
	2012	361	23:100:62
	2013	562	15:100:69
578	2009	243	32:100:55
	2010	283	6:100:64
	2011	85	10:100:67
	2012	179	20:100:72
	2013	177	26:100:73
Klickitat Pooled	2003	646	15:100:68
	2004	297	11:100:63
	2005	529	6:100:58
	2006	1017	14:100:63
	2007	821	20:100:67
	2008	721	14:100:73
	2009	873	18:100:62
	2010	1544	10:100:61
	2011	759	20:100:72
	2012	1083	16:100:57
	2013	1424	14:100:67

The results from these survey efforts indicate that 2006 changes in management regimes had a beneficial impact on the post-season buck to doe ratios in the Grayback GMU. Specifically, the change to 3-point minimum with a reduction to 14 days of modern firearm hunting appears to have had a positive effect on the post-season buck to doe ratio. The initial 5 years of the 3-point antler restriction appears to have had a similar effect in GMU 578 (West Klickitat). A continuation of these survey efforts will be required to adequately assess ongoing management strategies. Ideally, this would include the availability of funding for continued aerial surveys in all 3 Klickitat County Game Management Units.

Population Status and Trend

Information compiled from hunting activity suggests a slow decline of the deer population in the Region. Hunter success rates over the past 13 years have declined from approximately 20% to 15%. Similarly, total deer harvest has also declined from roughly 7,000 to 4,500 annually during the same period. However, each of these metrics indicated slightly improved deer hunting during the 2012 and 2013 seasons. The reduced harvest in recent years can be partially explained by a concurrent reduction in the number of hunters choosing to pursue deer in Region 5. During the past 13 years deer hunters in Region 5 have declined from approximately 34,000 to 28,000.

Furthermore, the deer population is not evenly distributed throughout the Region. While the population in lower elevation portions of Region 5 remains relatively robust, those in the Cascade Mountain GMUs remain suppressed. An evaluation of estimated deer densities from population reconstruction (SAK Model), demonstrated this phenomenon as well. See Figure 1 for a graphic illustration of the estimated deer population in Region 5, generated from the Sex Age Kill Model.



Habitat Condition and Trend

Increasing urbanization in several GMUs (504, western portion of 550, 554, and 564) is resulting in a loss of quality deer habitat, an increase in human-deer interactions, and loss of hunting opportunity. Additionally, the increase in residential development along the Lewis River drainage may be negatively impacting the quality of black-tailed deer range. A portion of this habitat loss is being addressed in mitigation agreements concerning the three major hydroelectric projects (Merwin, Yale, and Swift reservoirs) on the North Fork Lewis River (Pacificorps Energy 2008).

Additional negative impacts to deer habitat are the result of certain forest management activities. While forest canopy removal (natural or otherwise) generally increases forage production, certain aspects of forestry can be detrimental to black-tailed deer. Herbicides are used by both private and public forest managers to suppress the establishment of "competing" vegetation (WADNR 2005; WADNR 1997). The broadleaf shrubs, trees, and forbs delayed by these efforts are the plants that primarily comprise the black-tailed deer diet (Crouch 1981; Brown 1961). Also, the stocking rates for seedlings in forest plantations are high, further reducing the competitive advantage that many forage species would normally have in early-successional forests. Once the densely stocked conifer seedlings reach approximately age 12, very little light is able to reach the ground, further reducing forage production. This removal of deciduous tree species along with shrubs and forbs comes at the detriment of deer and other early successional species in the forested environment. Furthermore, these dense conifer stands are harvested at approximately age 40. Harvest of such monocultural stands at a time prior to differentiation among the trees within the stand or generation of forest openings, reduces significant growth of understory shrubs.

However, silvicultural practices operate within a complex ecological relationship among geographic features, climate, soil, herbivory, etc. The complexities of these relationships are poorly understood and additional research into these dynamics could offer useful insights into both wildlife habitat management and forestry (e.g., the interaction effect of herbicides and herbivory on forage production). An initial investigation into this relationship revealed a short-term detrimental effect due to herbicide applications on industrial forestlands and long-term forage reductions due to herbivory (Geary, et. al. 2012).

Lastly, timber harvest requires the construction and maintenance of a vast system of forest roads to facilitate the removal of forest products. Studies have demonstrated the negative effects of roads on ungulates (Powell and Lindzey 2004; Rowland et. al. 2000), primarily the loss of security associated with increased human access to remote areas. Additional negative impacts from roads are weed dispersal, direct loss of habitat due to hardened surfaces, and soil erosion. In aggregate, these forest management activities cause delays or reductions in forage production, community complexity, and early successional vigor. These can have negative impacts on deer and are atypical of young forests following natural disturbances.

In the Cascades (GMUs 513, 516, 560, 572, and 574), suppression of the deer population is long-term and likely the result of habitat condition. Large amounts of forested habitat were clearcut in the 1980s prior to the listing of the northern spotted owl. Those forest stands harvested in the 1980s are now largely at an age (20-30 years) where forage production is minimal. In the Cascades, largely held in Federal ownership, subsequent timber harvest has been tremendously reduced. Additionally, active management (e.g., thinning) of forest plantations has not been extensively conducted. Furthermore, landscape-wide fire suppression assures that significant areas of fire-initiated early-succession habitats are not generated.

No specific habitat enhancements for black-tailed deer are planned outside of WDFW managed lands in Region 5. However, various management activities on Pacificorps' mitigation lands surrounding the North Fork Lewis River and limited thinning on USFS lands will benefit deer. Finally, both the Klickitat (Klickitat County) and Cowlitz (Lewis County) Wildlife Areas have on-going, long-term management practices designed to benefit black-tailed and mule deer habitat. A Habitat Guidelines reference is available to those managing black-tailed deer habitats (Nelson et al.

2008). This document has been distributed among those managing forested habitats in the Region.

Hairloss Syndrome

The habitat conditions discussed in the previous section likely influence the Region 5 deer population on a broad-scale. One potential cause of localized additive mortality on the deer population is hairloss syndrome. Reports of the problem began in PMUs 56 and 57 during 1996. Since that time, numerous reports of affected deer have been received throughout the Region. Hairloss syndrome was observed in Klickitat County for the first time in 2000. Hairloss was first documented in East Klickitat (GMU 382) in the spring of 2006. Approximately 2% of the deer observed during the March 2014 Klickitat deer survey had noticeable signs of the syndrome. Late 1990s declines in harvest, increases in buck mortality rates, and reduced productivity in the western portions of Region 5 all roughly coincide with the onset of the hairloss syndrome. Anecdotal reports from hunters, homeowners, and citizens indicate that deer are now absent from areas where they were present in high numbers during the mid-1990s. An effort to quantify some aspects of the hairloss syndrome was conducted by WDFW from 2001-03. In this study, 30-39% of fawns were found to exhibit the syndrome. However, the establishment of an association between mortality and hair loss syndrome was inconclusive (Woodin 2004).

Both the hunter generated and the biological data discussed earlier in this document suggest a slow decline in the Regional deer population. It is likely that the impact of the hairloss syndrome has been offset by significant restrictions on antlerless deer harvest opportunities imposed in the late 1990s.

Studies indicate that the species of louse (*Damalinia (Cervicola) spp.)* associated with black-tailed deer hairloss syndrome is not indigenous to North America (Bildfell et. al. 2004). Furthermore, recent collections of lice samples from Klickitat County and other portions of Central Washington indicate that the lice associated with the hairloss syndrome in these areas are those normally associated with fallow deer (*Bovicola tibialis)* (Bernatowicz, et. al. 2008).

Current Research Projects

Under the direction of WDFW's Research Science Division, an effort to better understand the ecology and demographics of western Washington black-tailed deer is being conducted. Study animals are distributed in several locations on a combination of State forestlands and private industrial forests. Within Region 5, five does from the western portion of GMU 568 (Washougal), and 8 does from GMU 550 (Coweeman), were captured via helicopter net-gun in early 2014. The does were outfitted with collars carrying both traditional VHF and satellite transmitters. Additionally, the deer were equipped with VITs (Vaginal Internal Transmitters) designed to facilitate the capture of fawns in the spring of 2014.

Intensive monitoring was conducted during the May-June birthing period by Regional Wildlife Program Staff. Eleven does remained alive with functional equipment during the birthing period and a total of 16 fawns associated with the study does were captured and radio-collared. Subsequent work, conclusions, reports, and publications are anticipated in association with this research project.

Summary

The cumulative effects of increased development, certain forest management activities, reduced federal timber harvest, and hairloss syndrome have combined to slowly reduce the Region's deer population in recent years. Furthermore, distribution of the deer population is not uniform, with deer much more abundant in the lower elevation portions of the Region. As recently as the 1980s, habitat conditions were more favorable throughout the Region and anecdotal reports consistently state that there were many more deer in Region 5 during those years. Given the changes in habitat condition in the years that have followed, it is likely that these sentiments are correct. Unfortunately, monitoring methodologies have evolved throughout this time span and therefore meaningful comparisons of current population size to those of the past are not possible.

At this time, WDFW does not have the authority to implement landscape level programs or regulations that would change the habitat conditions that fundamentally control deer populations. Very large scale changes that would benefit deer at the population level would include such things as a moratorium on the sub-division of private property, changes to the Forest Practices laws, and the establishment (through cutting or burning) of tens of thousands of acres of early-successional forest on federally-managed lands. Favorable habitat changes of these magnitudes are not realistic in the foreseeable future of western Washington State.

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DEER STATUS AND TREND REPORT: REGION 6

PMUs 61 – 67; GMUs 601 – 684

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Population objectives and guidelines

Black-tailed deer (*Odocoileus hemionus columbianus)* in Region 6 are managed to maintain productive populations, while providing for multiple uses; including recreational, educational and aesthetic (WDFW Game Management Plan 2008). Deer populations are generally monitored at the Population Management Unit (PMU) level, which is a collection of Game Management Units (GMU) (Table 1).

Table 1. WDFW Population Management Unit/Game Management Unit Framework, Region 6.

PMU	61	62	63	64	65	66	67
GMU	658 660 663 672 673 681 684 699	652 666 667	642 648 651	621 624 627 633	607 615 618 636 638	601 602 603 612	653 654

Hunting seasons and harvest trends

Hunting seasons are set at the GMU level. Buck harvest is generally any antlered buck, although the Skokomish (636), Mashel (654) and Bear River (681) GMUs are managed as 2 point minimum units. Antlerless harvest is limited to certain weapon types and/or by permit.

Hunters must select a specific weapon type, modern firearm, archery, or muzzleloader, to hunt deer in Washington. Hunting seasons are established for each weapon type and hunters can only hunt during the season established for the weapon they've selected to hunt with. Alternatively, 8,500 multi-season permits were offered through the Department's drawing system. These allow selected hunters to hunt during any general season; thus they do not have to select a weapon type and can hunt during any open modern firearm, muzzleloader, or archery season.

The general hunting season length varies depending on the weapon type selected. In 2013, modern firearm hunters had 24 days to hunt, while archery hunters had up to 62 days and muzzleloader hunters had up to 27 days. Modern firearm and muzzleloader hunters also had an additional 11 days to hunt during the September High Buck Hunt; a hunt that overlaps the general archery season. Additional hunting opportunity was provided in Region 6 during the 2013 season with 935 special permits offered.

Region-wide black-tailed deer harvest for general and special permit seasons combined in 2013 was estimated to be 4,930 deer, a 9% decrease from 2012; of these, 15% were does and 85% were bucks.

PMU 61

PMU 61 consists of 8 GMUs: 658, 660, 663, 672, 673, 681, 684, and 699. Combined general, permit and tribal season deer harvest in this PMU was estimated to be 1,222 deer in 2013; a 2% increase compared to 2012 and higher than the 5-year average of 1,192 (Figure 1). Annual deer harvest from all sources (including tribal harvest) has averaged 1,232 deer since 2001. Modern firearm hunters comprise the largest user group (Figure 2) and harvest the largest percentage of deer in this PMU (Figure 3). On average, tribal hunting accounts for 1% of the total deer taken in this PMU each year. Since 2001, general season success rates have averaged 16% for archery hunters, 19% for modern firearm hunters, and 19% for muzzleloader hunters (Figure 4).

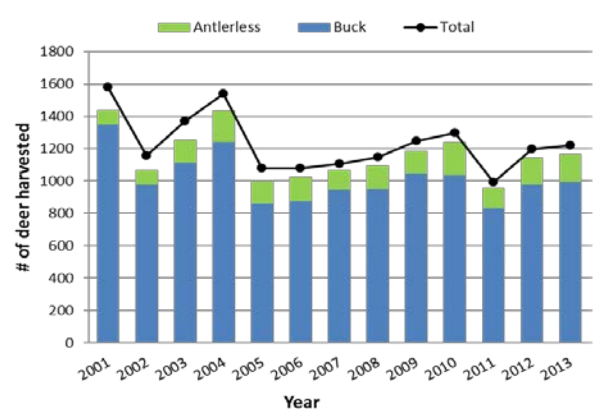

Figure 1. Total number of black-tailed deer harvested in PMU 61, from 2001–2013. Total includes deer harvested in general, permit, and tribal seasons; while, buck and antlerless totals are from the general state season only.

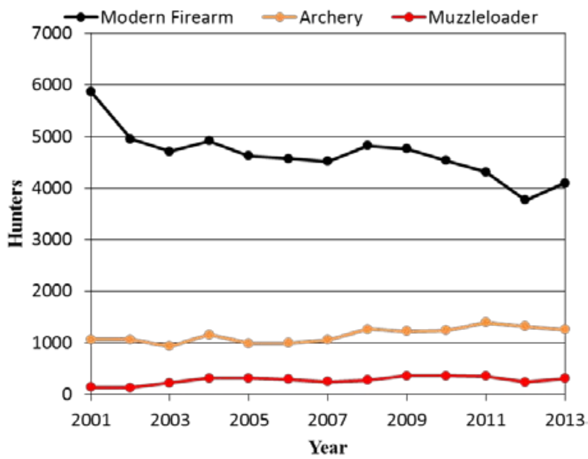

Figure 2. Number of general season deer hunters by weapon type in PMU 61, from 2001–2013.

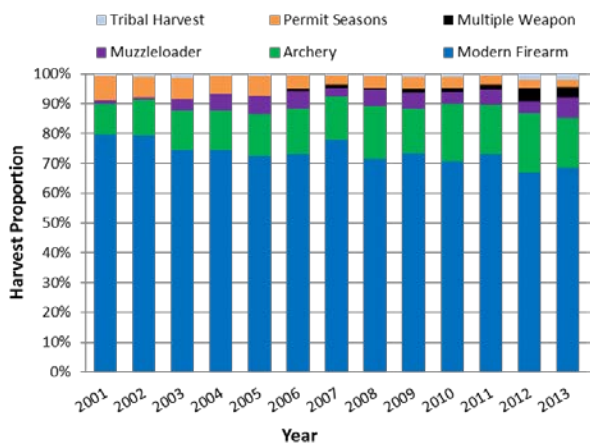

Figure 3. The proportion of deer harvested by weapon type, permit or tribal hunting within PMU 61, from 2001–2013.

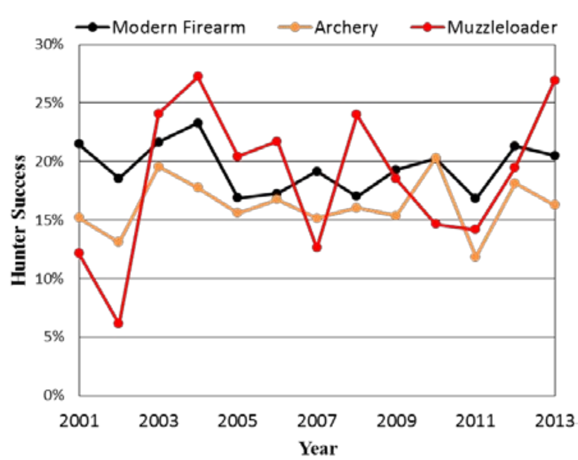

Figure 4. Hunter success by weapon type during the general season in PMU 61, from 2001–2013.

PMU 62

PMU 62 consists of 3 GMUs: 652, 666, and 667. Combined general, permit and tribal season deer harvest in this PMU was estimated to be 1,148 deer in 2013; a 5% decrease compared to 2012 and lower than the 5-year average of 1,188 (Figure 5). Annual deer harvest from all sources (including tribal harvest) has averaged 1,400 deer since 2001. Modern firearm hunters comprise the largest group (Figure 6) and harvest the largest percentage of deer in this PMU (Figure 7). The large drop in hunter participation in this PMU during 2013 may be related to decreased access to the Vail Tree Farm in GMU 667. On average, tribal hunting accounts for 1% of the total deer harvest in PMU 62. Since 2001, general season success rates have averaged 18% for archery hunters, 23% for modern firearm hunters, and 16% for muzzleloader hunters (Figure 8).

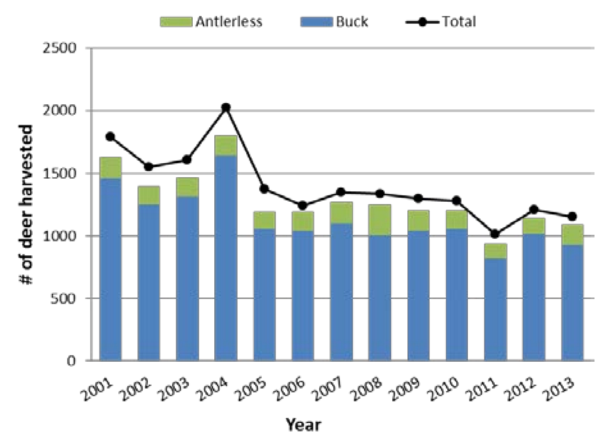

Figure 5. Total number of black-tailed deer harvested annually in PMU 62, from 2001–2013. Total includes deer harvested in general, permit, and tribal seasons; while, buck and antlerless totals are from the general state season only.

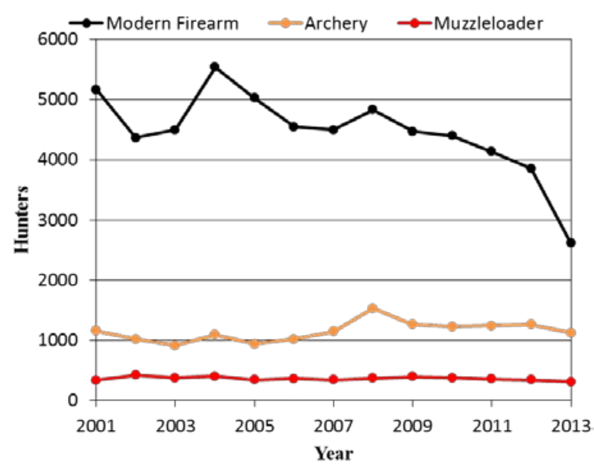

Figure 6. Number of general season deer hunters by weapon type in PMU 62, from 2001–2013.

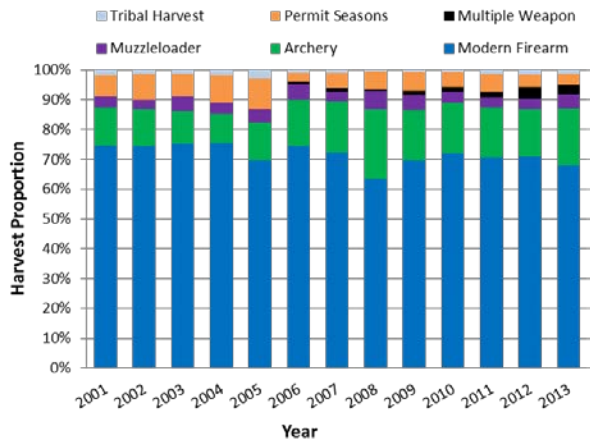

Figure 7. The proportion of deer harvested by weapon type, permit or tribal hunting within PMU 62, from 2001–2013.

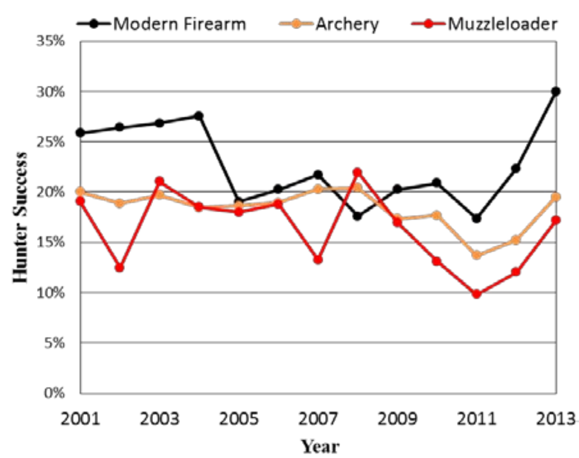

Figure 8. Hunter success by weapon type during the general season in PMU 62, from 2001–2013.

PMU 63

PMU 63 consists of 3 GMUs: 642, 648, and 651. Combined general, permit and tribal season deer harvest in this PMU was estimated to be 762 deer in 2013; an 18% decrease compared to 2012 and lower than the 5-year average of 906 (Figure 9). Annual deer harvest from all sources has averaged 1,114 deer since 2001. Modern firearm hunters comprise the largest group (Figure 10) and harvest the largest percentage of deer in this PMU (Figure 11), albeit modern firearm hunter participation has been declining. On average, tribal harvest accounts for 8% of the total deer harvest in PMU 63. Since 2001, general season success rates have averaged 19% for archery hunters, 21% for modern firearm hunters, and 20% for muzzleloader hunters (Figure 12).

The sharp changes in general season success rates among the muzzleloader group seen in 2003 and 2011 can be explained by regulation changes. In 2003, the general late muzzleloader season in GMU 651 was changed from any buck to any deer. In 2005, the legal deer in the general late-muzzle loader season was changed to any buck until the last 9 days of the season, when any deer was legal. In 2011, all antlerless harvest during the late muzzle loader season was changed to permit only; data suggesting low fawn recruitment and higher than expected doe mortality prompted this regulation change.

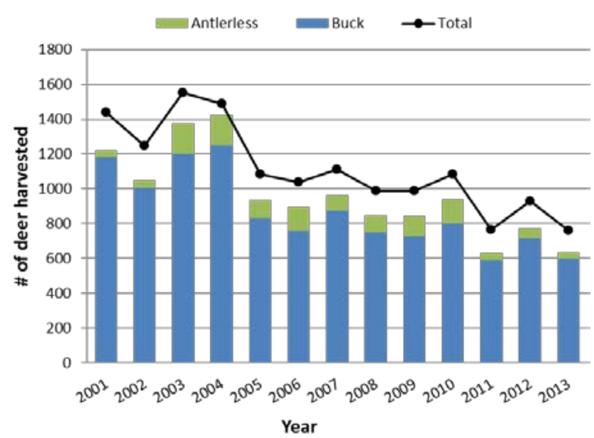

Figure 9. Total number of black-tailed deer harvested annually in PMU 63, from 2001–2013. Total includes deer harvested in general, permit, and tribal seasons; while, buck and antlerless totals are from the general state season only.

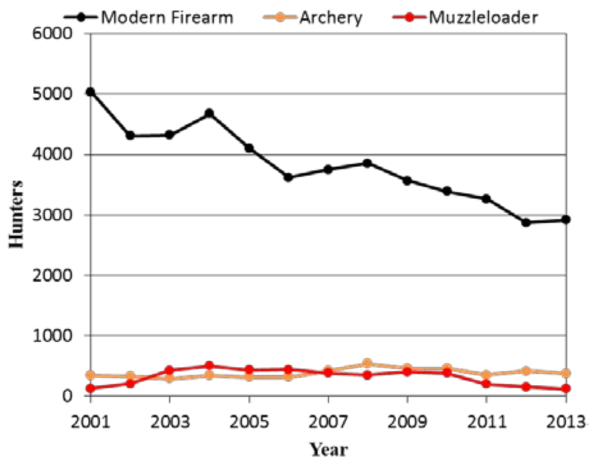

Figure 10. Number of general season deer hunters by weapon type in PMU 63, from 2001–2013.

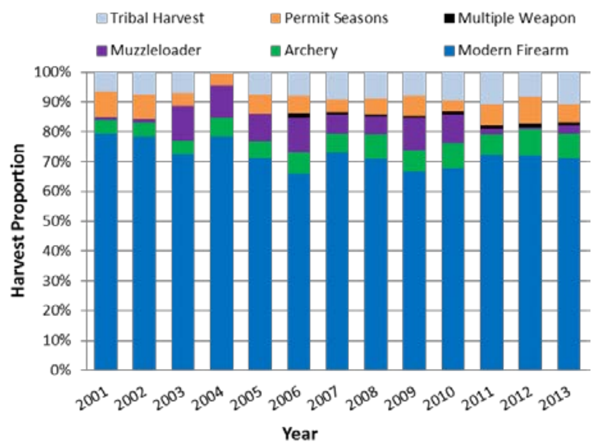

Figure 11. The proportion of deer harvested by weapon type, permit or tribal hunting within PMU 63, from 2001–2013.

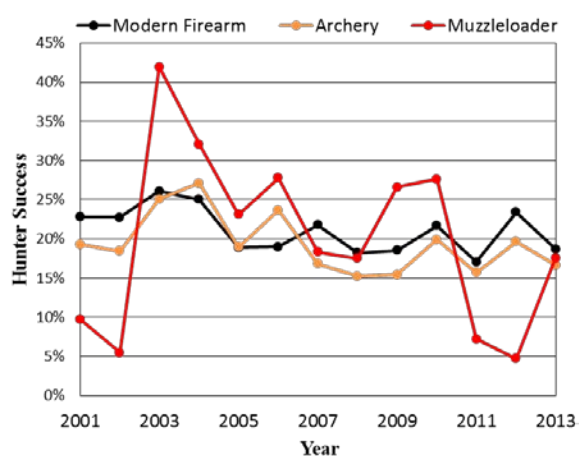

Figure 12. Hunter success by weapon type during the general season in PMU 63, from 2001–2013.

PMU 64

PMU 64 consists of 4 GMUs: 621, 624, 627, and 633. Combined general, permit and tribal season deer harvest in this PMU was estimated to be 1,111 deer in 2013; an 18% decrease compared to 2012 and lower than the 5-year average of 1,225 (Figure 13). Annual deer harvest from all sources has averaged 1,094 deer since 2001. Modern firearm hunters comprise the largest user group (Figure 14) and harvest the largest percentage of deer (Figure 15). On average, tribal hunting accounts for 7% of the total deer harvest in PMU 64. Since 2001, general season success rates have averaged 21% for archery hunters, 22% for rifle hunters, and 15% for muzzleloaders (Figure 16).

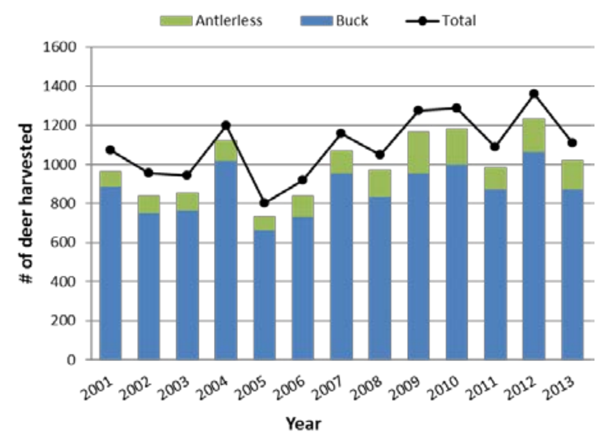

Figure 13. Total number of black-tailed deer harvested annually in PMU 64, from 2001–2013. Total includes deer harvested in general, permit, and tribal seasons; while, buck and antlerless totals are from the general state season only.

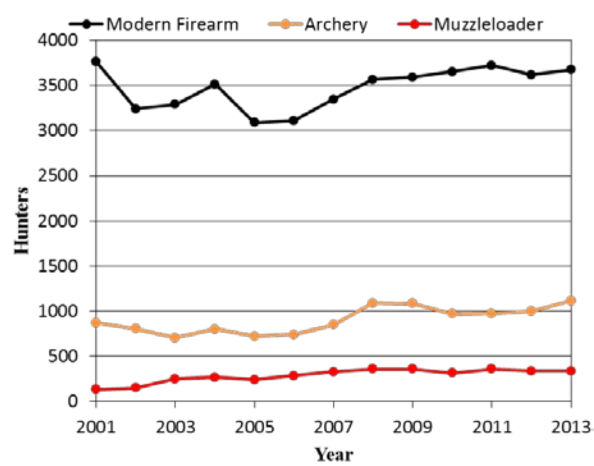

Figure 14. Number of general season deer hunters by weapon type in PMU 64, from 2001–2013.

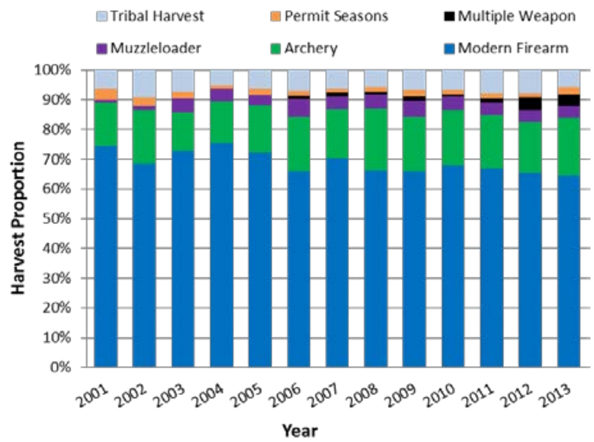

Figure 15. The proportion of deer harvested by weapon type, permit or tribal hunting within PMU 64, from 2001–2013.

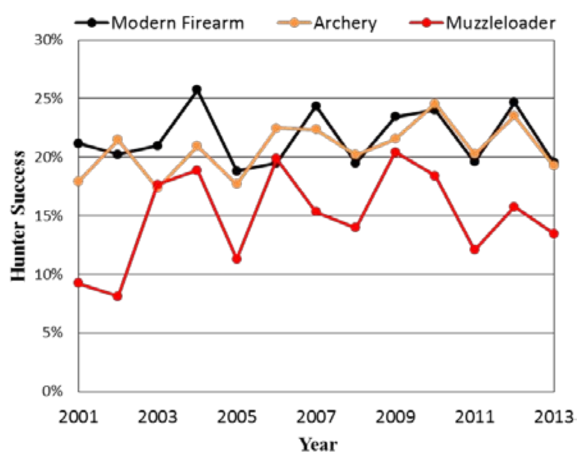

Figure 16. Hunter success by weapon type during the general season in PMU 64, from 2001–2013.

PMU 65

PMU 65 consists of 5 GMUs: 607, 612, 618, 636, and 638. Combined general, permit and tribal season deer harvest in this PMU was estimated to be 270 deer in 2013; a 12% decrease compared to 2012 and lower than the 5-year average of 306 (Figure 17). Annual deer harvest from all sources has averaged 331 deer since 2001. Modern firearm hunters comprise the largest user group (Figure 18) and harvest the largest percentage of deer in this PMU (Figure 19). On average, tribal hunting accounts for 18% of the total deer harvest in PMU 65. Since 2001, general season success rates have averaged 11% for archery hunters and 15% for modern firearm hunters (Figure 20). Since 2006, hunter success has averaged 4% for muzzleloader hunters (Figure 20). General muzzleloader seasons were opened in GMUs 607, 615 and 636 in 2009, which accounts for the increase in muzzleloader success in this PMU. Prior to 2009, only GMU 638 was open for muzzleloader hunting; a hunt with little participation and success.

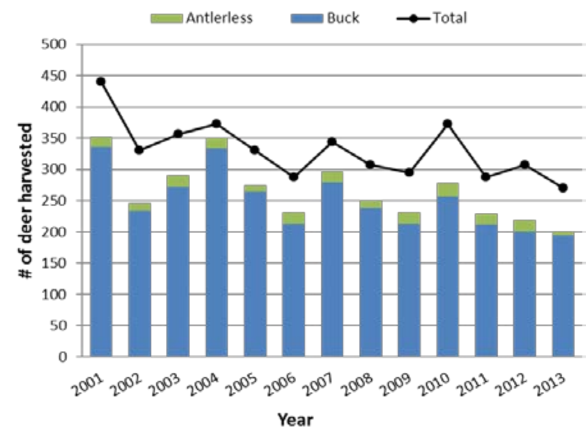

Figure 17. Total number of black-tailed deer harvested annually in PMU 65, from 2001–2013. Total includes deer harvested in general, permit, and tribal seasons; while, buck and antlerless totals are from the general state season only.

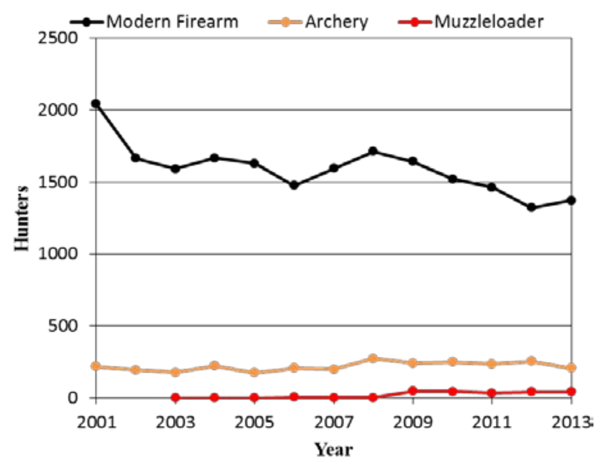

Figure 18. Number of general season deer hunters by weapon type in PMU 65, from 2001–2013.

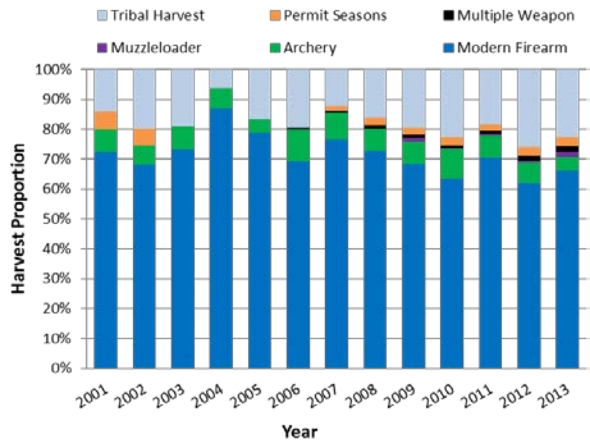

Figure 19. The proportion of deer harvested by weapon type, permit or tribal hunting within PMU 65, from 2001–2013.

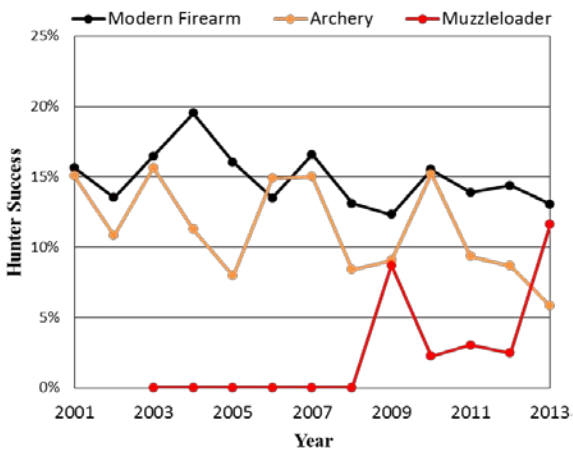

Figure 20. Hunter success by weapon type during the general season in PMU 65, from 2001–2013.

PMU 66

PMU 66 consists of 4 GMUs: 601, 602, 603, and 612. Combined general, permit and tribal season deer harvest in this PMU was estimated to be 268 deer in 2012; a 3% decrease compared to 2012 and lower than the 5-year average of 285 (Figure 21). Annual deer harvest from all sources has averaged 311 deer since 2001. Modern firearm hunters comprise the largest group (Figure 22) and harvest the largest percentage of deer in this PMU (Figure 23); albeit modern firearm hunter participation has been declining. On average, tribal hunting accounts for 13% of the total deer harvest in PMU 66. Since 2001, general season success rates have averaged 17% for archery hunters, 20% for modern firearm hunters, and 10% for muzzleloader hunters (Figure 24).

Due to data indicating low fawn recruitment and adult doe survival, antlerless hunting was restricted beginning in the 2010 season; this likely explains the dramatic drop in archery hunter success among this group in 2010.

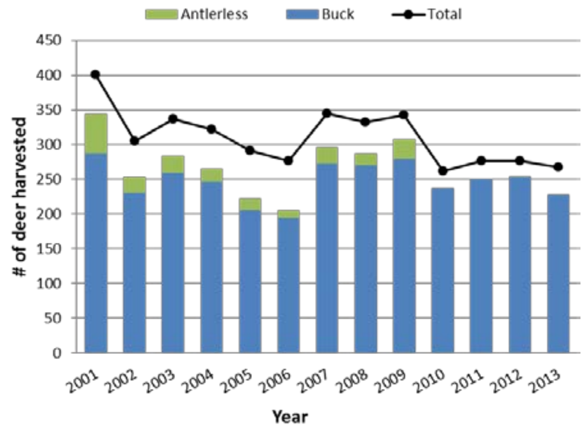

Figure 21. Total number of black-tailed deer harvested annually in PMU 66, from 2001–2013. Total includes deer harvested in general, permit, and tribal seasons; while, buck and antlerless totals are from the general state season only.

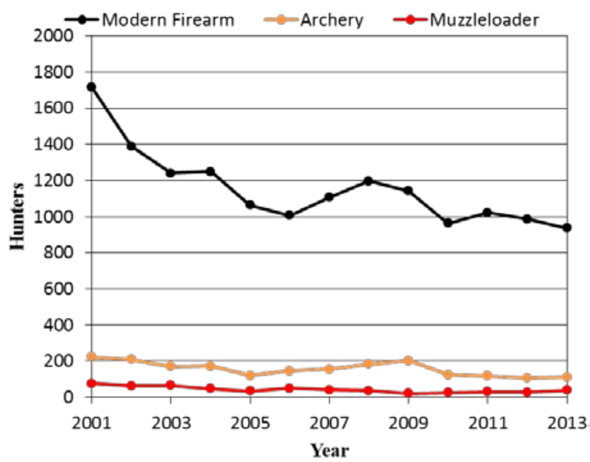

Figure 22. Number of general season deer hunters by weapon type in PMU 66, from 2001–2013.

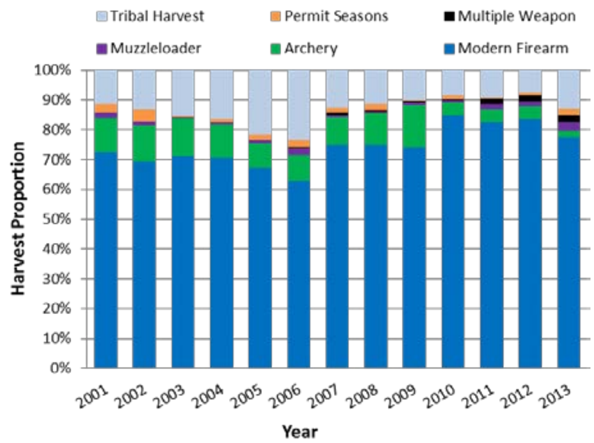

Figure 23. The proportion of deer harvested by weapon type, permit or tribal hunting within PMU 66, from 2001–2013.

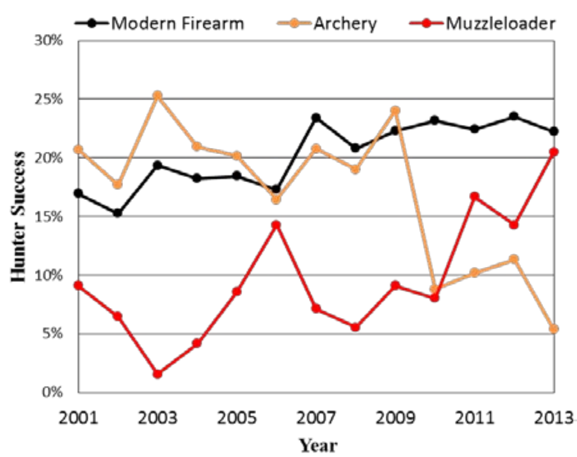

Figure 24. Hunter success by weapon type during the general season in PMU 66, from 2001–2013.

PMU 67

PMU 67 consists of 2 GMUs: 653 and 654. Combined general, permit and tribal season deer harvest in this PMU was estimated to be 443 deer in 2013; a decrease of 6% compared to 2012 and lower than the 5-year average of 469 (Figure 25). Annual deer harvest from all sources has averaged 545 deer since 2001. Modern firearm hunters comprise the largest group (Figure 26) and harvest the largest percentage of deer in this PMU (Figure 27). On average, tribal hunting accounts for 11% of the total deer harvest in PMU 67. Since 2001, general season success rates have averaged 17% for archery hunters, 18% for modern firearm hunters, and 16% for muzzleloader hunters (Figure 28).

The decline in success among muzzleloader hunters is occurring in GMU 654 where a general late season 2-point minimum buck hunt has occurred for many years. A number of factors could be influencing success during this hunt, including changes in habitat, hunter access, deer numbers, or weather.

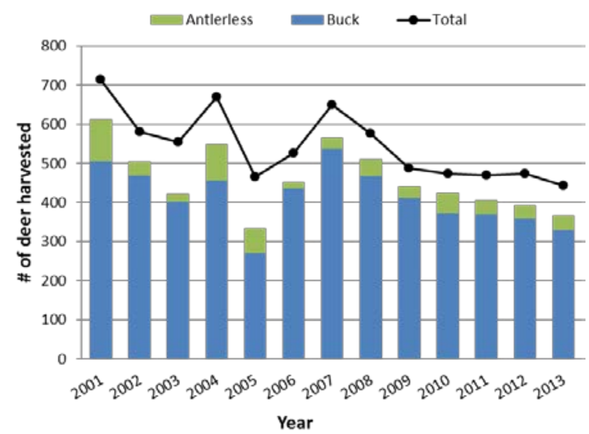

Figure 25. Total number of black-tailed deer harvested annually in PMU 67, from 2001–2013. Total includes deer harvested in general, permit, and tribal seasons; while, buck and antlerless totals are from the general state season only.

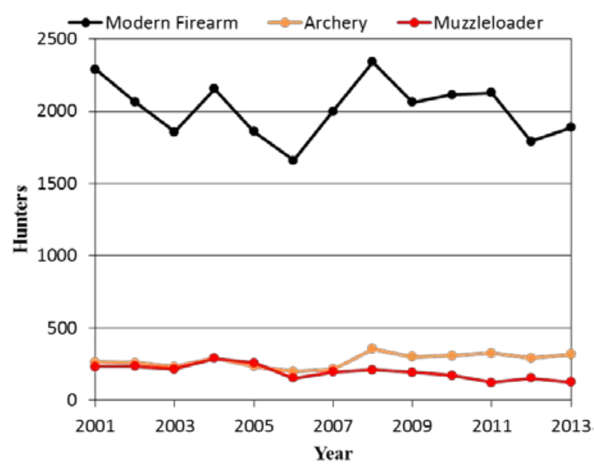

Figure 26. Number of general season deer hunters by weapon type in PMU 67, from 2001–2013.

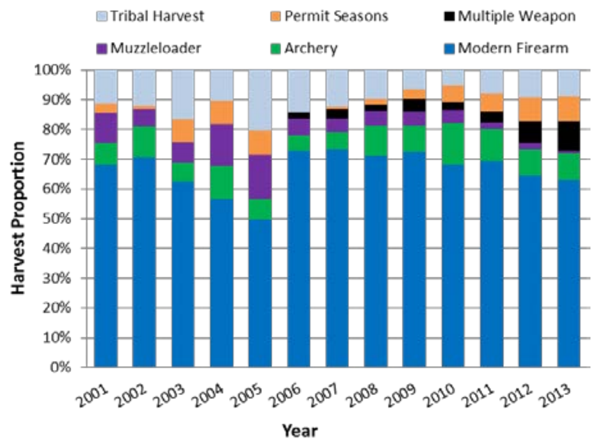

Figure 27. The proportion of deer harvested by weapon type, permit or tribal hunting within PMU 67, from 2001–2013.

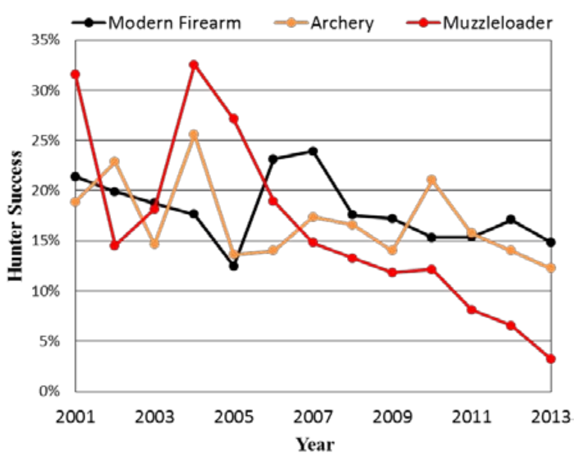

Figure 28. Hunter success by weapon type during the general season in PMU 67, from 2001–2013.

Monitoring

Monitoring is primarily achieved via mandatory hunter reporting and, when funding is available, through composition surveys or more targeted projects related to specific GMUs or study areas. Tribal game harvest reports are compiled and published annually by the Northwest Indian Fisheries Commission (for data referred to in this document, see the NWIFC Big Game Harvest Reports for Western Washington Treaty Tribes; 2001-2013). Tribal research also provides valuable information on black-tailed deer in Region 6, through work conducted independently and in cooperation with WDFW.

No composition flights were flown in 2013 by WDFW in Region 6.

Population status

In Region 6, black-tails occupy a range of habitats, often with dense vegetation, and they have a secretive life history, both of which combine to limit their visibility (Brown, 1961). Thus accurately estimating their abundance remains elusive. The WDFW is currently exploring harvest-based population models, which may prove useful, provided sufficient data is collected. The primary objective of deer management in Region 6 is to maintain generally stable populations at the PMU level. We attempt to achieve this objective largely through manipulating hunting seasons.

Harvest-based statistics (deer harvest, hunter numbers, success, and catch per unit effort) can provide an index to population trends, and during this review period suggest deer populations in PMUs 61, 62, 64, and 66 are relatively stable, while PMUs 63, 65, and 67 appear to be stable or slightly declining. It is likely that population trajectories at the GMU level or localized areas within a GMU differ from the PMU trend overall.

Habitat status and trends

Black-tailed deer consume a variety of browse including woody shrubs, forbs, lichens, and some grasses and have a selective foraging strategy, preferring to consume the most nutritious plants, rather than consuming more low quality forage (Nelson et al. 2008). Woody shrubs and forbs are typically more abundant in younger, more recently disturbed sites (<20 years old) with less canopy cover than sites in mid- to late-seral stages. Logging largely replaced natural means of early seral habitat creation decades ago, and was likely the reason for higher deer abundance observed previously in Region 6 (Nelson et al. 2008). Anecdotal observations today suggest intensive clearcut logging in the 1970s in some GMUs has created vast areas of single-aged stands in the mid- to late-seral stage of forest succession; the least productive for ungulate forage. While in other units, active timber harvest continues to create early seral habitat. The effects of changes in forest management strategies, particularly increased use of herbicides and decreased burning are poorly understood, but may negatively influence ungulate forage and ultimately deer abundance. Two studies were recently initiated to examine these effects.

In 2009, WDFW began a study examining the effects of forest management practices on black-tailed deer reproduction and survival. One hundred and forty eight does and 206 fawns have been fitted with either GPS or standard VHF collars at 8 sites in Regions 5 and 6 (C. Rice, pers. communication). A preliminary analysis of data from 2009-2011 (does not include all radio-tagged deer) indicates adult does utilize a variety of habitat types/stand ages, are non-migratory, and have relatively small home ranges (range=0.18–0.98 km^2; median=0.35km^2) (Rice, 2012). The project is expected to continue through 2017 and further analysis will be conducted as new data is collected.

In 2012, WSU with funding provided by the Muckleshoot Tribe, WDFW, National Council for Air and Steam Improvement, and Weyerhaeuser, initiated a project studying the nutritional ecology of black-tailed deer and how timber management practices influence the availability and quality of forage for black-tailed deer. Data from this project are currently being analyzed with a report expected in late 2014.

Hunter Access

WDFW actively works with timber companies to maintain hunting access, as the vast majority of deer hunting opportunities in Region 6 occur on private industrial forestlands. There is an increasing trend among timber companies to restrict public access or require an access permit to hunt or recreate on their lands. This will impact hunting opportunities in Region 6, as the number of access permits issued may be lower than previous hunter participation rates and the cost of the permit is an added burden hunters must bear to hunt in some units.

Access may also be restricted due to the risk of fire danger; this predominately affects early season archery and muzzleloader hunters. All hunters are encouraged to check ahead of time to determine if any landowner restrictions apply to the area they plan to hunt.

Management conclusions

No major changes to the general seasons are anticipated for the 2014 deer season. The number of special permits was decreased to 870; 80 Quality Buck, 375 Antlerless, 170 Second Deer, 130 Youth, 40 65 or older, 55 Disabled, and 20 Master Hunter permits. The number of antlerless permits in GMU 648 was reduced from 110 to 25, as the deer population in this unit appears to be declining. New youth hunts were added in GMUs 621 and 627; 10 each.

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Rice, C. 2012. Forest management and black-tailed deer reproduction: preliminary analysis, 2009-2011. Wildlife Program, Washington Department of Fish and Wildlife, Olympia, WA, USA.

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Elk

ELK STATUS AND TREND REPORT: REGION 1
SELKIRK HERD
GMUs 101, 105, 108, 111, 113, 117, 121

DANA L. BASE, District Wildlife Biologist
ANNEMARIE PRINCE, Assistant District Wildlife Biologist

Population objectives and guidelines
The primary goal of elk management in the Colville District is to provide for sustainable annual hunter harvest while maintaining a viable and productive elk population. The harvest objective is to maintain a post hunting season bull to cow ratio of 12 to 20 bulls per 100 cows (Washington Department of Fish and Wildlife 2008).

Hunting seasons and harvest trends
Elk are widely scattered in small groups throughout the densely forested region of northeastern Washington. As a consequence, elk in northeastern Washington are difficult both to survey and to hunt successfully.

Since 2003, there were multiple shifts in the seasons and opportunities for archery and muzzleloader elk hunters. In the 2003 – 2005 season package, the early archery season opened later than in the past (Sept. 8) and spanned 14 days. In 2009, it was reduced to 13 days and remained at this length through 2013. In 2003, muzzleloaders gained the opportunity to hunt elk in the Selkirk GMU (113). Also in 2003, the muzzleloader season in GMUs 101, 105, 108, and 121 was separated from the modern firearm season and placed in a muzzleloader only hunt in early October. In 2006, GMU 117 was added to the muzzleloader season making all GMUs open to all hunt methods during their respective seasons. Season timings and increased opportunities for archers and muzzleloaders resulted in a significant increase in harvest for those groups. While hunter numbers for archers and muzzleloaders have held steady since 2008, the number of modern firearm hunters has been variable (Figures 1). However, this hasn't had a large effect on total harvest (Table 1 and Figure 2).

The "multiple season" elk tag was introduced in 2006 and has resulted in variable harvest. Hunter success is generally higher for multi-season tag holders and was at approximately 10% in 2013 compared to general methods at about 5%.

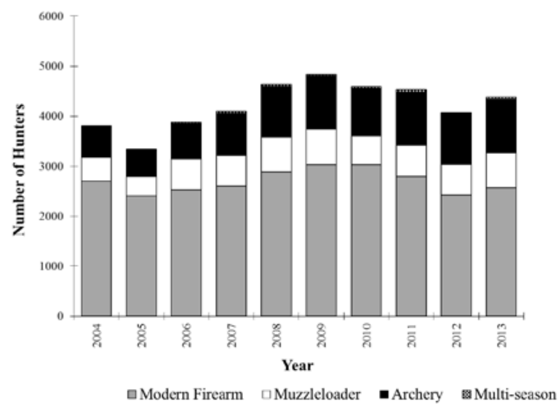

Figure 1. Number of elk hunters by hunt method for GMUs 101-121, 2004 – 2013.

As a result of development of the Selkirk Elk Herd Management Plan (2011), hunting opportunity for any elk within GMUs 101, 105, 108, and 121 changed to antlered bull only in 2012. With the exception of the early archery season, antlerless elk may still be taken within these GMUs, but may now be taken only by special permit. For the 2013 season, 160 special permits were available in District 1 (Table 2).

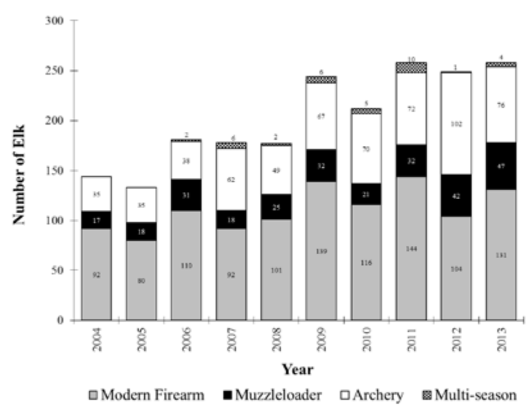

Figure 2. Number of elk harvested by hunt method for GMUs 101 – 121, 2004 – 2013.

Special permit antlerless hunts are designed to provide added hunter opportunity for antlerless elk and address landowner conflict where it occurs. In District 1, special permits for antlerless elk provide enhanced recreational opportunity for hunters, but the harvest is modest and of limited utility in addressing elk damage concerns. The special permit harvest in 2013 was 29 34 elk and hunters had a success rate of 18% (Table 2).

Surveys

Devoting substantial resources for surveying elk has not been a high priority in District 1 because harvest levels are relatively low for the northern Selkirk Herd compared with other regions of the state. In addition, surveys in the Selkirk Herd area are hampered by extensive forested habitat. For management decisions, we primarily rely on trends in harvest (Table 3). From 2004 – 2013, the proportions of bulls harvested by antler point category has remained fairly stable (Table 3).

No aerial surveys focusing exclusively on elk have been accomplished for several years. The best opportunity to observe elk for ground-based surveys is in the early spring from mid-March to early May. Qualified volunteers have been enlisted when available to help survey elk. During early mornings or early evenings before dark, observations of elk concentrating on "green-up" fields or within forest openings are recorded. Calf:cow ratios and trends in total elk observed is the most reliable information gathered in early spring surveys in District 1. Survey effort and coverage has varied considerably since 1998, however, and in 2013 no spring surveys were conducted.

Population status and trend analysis

While this elk population appears to be within the range of the current population objective, better estimates are needed. Precise estimates of the total population, post hunting season bull:cow ratios, and bull age structure cannot be calculated using current data and methods. Population data are limited, but there is currently no indication that bull: cow ratios or opportunities for quality bull hunting are declining. In fact, stable hunter harvest, winter and spring surveys, and anecdotal information indicate that elk populations are increasing. High calf ratios observed in spring composition surveys support the general observation of a growing elk population.

Habitat condition and trend

Habitat conditions for elk in the Pend Oreille sub-herd are changing both positively and negatively. Road closures by federal, state, and private land managers were aggressive in recent years, and are highly beneficial for elk security. Logging continues on federal and state forest lands and even more intensively on private lands. The high rate of logging during the 1990s in central Pend Oreille County produced early successional forest and the accompanying forage that elk select. Recently, large tracts of private industrial timberlands were treated with herbicides to control hardwood shrubs that compete with regenerating conifer trees. Elk may be affected by this broad-scale herbicide application because forage could be reduced in sprayed areas.

Wildlife damage

Elk damage to standing hay, baled hay, and stored hay continues in the Cottonwood Creek drainage (GMU 117) southeast of Chewelah and the Skookum Flats area of GMU 113. To help alleviate elk damage, antlerless permit opportunity increased substantially within GMU 117 beginning in 2008 with a permit season that included December 16-31. In addition, all user groups currently have general seasons within both GMUs 117 and 113, which puts pressure on elk that frequent agricultural land there. WDFW may issue Landowner Damage Prevention Permits when and where circumstances are appropriate as another means of addressing damage to lands open to hunting.

Habitat enhancement

The Colville National Forest, with grant money from the Rocky Mountain Elk Foundation (RMEF), implemented many projects designed to benefit elk. As of 2010, completed projects amounted to an enhancement of 57,799 acres. Most of the projects involved prescribed burning to enhance winter forage production, but there were also projects to restore aspen stands and reclaim roadbeds for improved habitat. The majority of these projects were in the prime elk areas of Pend Oreille County (J. McGowan, USFS, pers. comm. 2010).

Management conclusions

The management objective for elk in the Colville District is being met with a sustained annual harvest of a viable and productive elk population with desirable population characteristics. While there are unreliable post-season survey data on bull:cow ratios, the prime bull (6 point +) percentage in the 2013 bull harvest was 26% which is indicative of desirable population characteristics for elk productivity and quality bull hunting opportunities (Table 3).

In recent years, WDFW provided increased opportunity or changed season timing to improve equity among the three hunting method groups. Hunter participation and harvest is now well dispersed across the Colville District for all three hunting methods. Discounting multi-season permit holders, in 2013, modern firearm hunters accounted for 59% of the participation and 47% of the kill. Archers accounted for 25% of the hunters and 34% of the kill and muzzleloaders accounted for 16% of the hunters and 19% of the kill.

The number of special permits issued for antlerless elk increased from 54 in 2003 to 110 in 2013 for the three primary elk GMUs, 111, 113, and 117. While there was considerable interest in these special permits, the resulting harvest was modest. In 2010, the success rate made a big jump with better than 1 in 5 special permit holders harvesting an antlerless elk. In 2011, the success rate of permit holders declined to 18%, but held steady at that same rate in 2012 and 2013.

In April of 2012, the Fish and Wildlife Commission adopted hunting seasons allowing only antlered bulls rather than any elk to be harvested for most general seasons within GMUs 101, 105, 108, and 121. This change is recommended in the Selkirk Elk Herd Management Plan as a means to moderately increase the elk population and its distribution throughout the Colville District.

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Table 1. Antlered bull and antlerless elk harvest, Colville District, GMUs 101-121, 2004 – 2013.

Year	Antlered Harvest	Antlerless Harvest	Total Harvest
2004	108	36	144
2005	102	31	133
2006	136	45	181
2007	120	58	178
2008	119	68	187
2009	187	89	276
2010	147	85	232
2011	158	100	258
2012	201	51	252
2013	205	58	263

Table 2. Special permit allocations and harvest, Colville District, GMUs 101-121, 2004 – 2013.

Year	Permits Issued	Antlered Killed	Antlerless Killed	Success Rate
2004	65	0	4	6%
2005	75	1	5	8%
2006	95	2	6	8%
2007	120	1	10	9 %
2008	120	1	20	18%
2009	120	0	16	14%
2010	120	0	25	21%
2011	135	0	24	18%
2012	160	1	27	18%
2013	160	0	34	21%

Table 3. Antler point distribution (high side) from hunter harvested elk, Colville District, GMUs 101-121, 2004 – 2013.

Year	1-2 points	3-5 points	6+ points	Repts. Rec'd.
2004	34 (37%)	30 (33%)	28 (30%)	92
2005	42 (42%)	34 (34%)	26 (26%)	102
2006	60 (44%)	31 (23%)	45 (33%)	136
2007	29 (24%)	52 (44%)	38 (32%)	119
2008	37 (31%)	44 (38%)	37 (31%)	118
2009	66 (36%)	68 (38%)	47 (26%)	181
2010	35 (24%)	51 (35%)	61 (41%)	147
2011	43 (27%)	66 (42%)	49 (31%)	158
2012	60 (30%)	75 (37%)	66 (33%)	201
2013	88 (43%)	63 (31%)	54 (26%)	205

ELK STATUS AND TREND REPORT: REGION 1

SPOKANE SUBHERD OF SELKIRK ELK HERD
GMUS 124, 127, 130, 133, 136, 139, 142

MICHAEL T. ATAMIAN, District Wildlife Biologist
CARRIE L. LOWE, Wildlife Biologist

Population objectives and guidelines

The goal for this elk (*Cervus elaphus*) subherd is to manage the population for a sustained yield at levels compatible with agriculture production and within tolerance levels of landowners occupying the rural-urban interface. Consequently "any elk" seasons are offered in these GMUs (WDFW 2011).

These harvest strategies are mainly directed to control populations where agricultural damage and nuisance problems have persisted or increased. For the past few years, however, many local landowners have recognized the economic benefits of providing fee access for elk hunting, which has resulted in fewer damage complaints, increased hunter access, and subsequently, increased harvest.

Hunting seasons and harvest trends

The 2013 general elk hunting seasons for Game Management Units (GMUs) 124-142 did not change from the previous year. All units allowed the harvest of <u>Any Elk.</u>

Hunter numbers were the highest ever this year with 2891. The lowest numbers occurred in 2005 with only 2223 (Fig. 1). This year, archery hunter numbers remained about the same, while muzzleloader and modern firearm hunter numbers increased slightly (Fig. 1). This year's overall hunter success was 9.4%, down from last year's 11.36% and the ten-year high of 11.97% in 2010 (Table 1). Muzzleloaders' success decreased this year by over 6% to 10.1% archer's had the lowest success with 5.7% and modern firearm hunters had 10% success (Table 2). Muzzleloader harvest decreased by 41 animals–from 112 in 2012 to 71 this year, modern firearm harvest decreased by 13, and archery harvest stayed the same (Fig. 2).

Total elk harvested during the general season was 272, down from last year's 318 (Table 1 and Fig. 2). When looking at harvest by GMU (Fig.5), the decrease was driven predominantly by lower harvest in GMU 130. Hunter numbers stayed about the same in this unit, but success was dramatically lower. The greatest harvest increase occurred in GMU 124, while GMUs 133 & 139 experienced proportionally large decreases. GMUs 127, 136, & 142 harvest remained stable.

Bull harvest was nearly the same as last year, both years a considerable decrease from the all-time high of 168 in 2011 (Table 1). As usual, GMUs 124, 127 & 130 provided the majority of the bull harvest (Fig. 5); however this year harvest in GMU 124 nearly doubled, while GMU 130 decreased by almost half. GMUs 139 and 142, two of the historically less productive units, – remained stable after increasing dramatically in 2011 (Fig. 3 & 4).

After last year's highest-ever antlerless harvest in the general season (193), antlerless harvest dropped this year to 161 (Table 1). The variability in the general antlerless harvest is driven primarily by access to private land and presence of elk on these lands during the hunting seasons. The presence of elk is a function of weather, snow depth, hunter pressure, and forage availability.

The Turnbull National Wildlife Refuge (NWR) permit hunts were offered again this year. The same number of permits was offered again on the refuge this year as last year – 1 bull and 62 antlerless. This permit hunt coincides with the general seasons off the refuge, thus creating the potential for permit hunters to push the elk off of Turnbull NWR increasing the likelihood of being harvested. A total of 8 cow elk were harvested during these hunts compared to 19 taken last year (Table 4). One permit hunt in Turnbull was cancelled due to the Federal government shutdown, resulting in some lost opportunity.

Antler point classes (1-2, 3-5, and 6+ points) reported in the harvest have varied considerably from year to year. This year's data shows a decrease in the 3-5pt category but an increase in the older 6+ bulls (Table 3).

Surveys

Composition counts have been conducted primarily in GMU 130 on and around Turnbull NWR due to limited survey funds, the lack of success in earlier attempts of aerial surveys in the more forested area of GMU 124 and 127, and the fact that GMU 130 comprises on average ~50% of the harvest. Surveys are also conducted in this area because Turnbull NWR has been able to provide survey costs. Composition count data from the aerial surveys in GMU 130 (Table 6) show that since 2004, the bull:cow ratio has been at or above the 15 to 35 bulls:100 cows pre-hunt management objective (WDFW 2008). This year it increased slightly from last year to 18 (±5.4) bulls to 100 cows (90% C.I., Skalski et. al 2005) still near the minimum management value.

The calf to cow ratio was lower this year with 49 (±9.9) calves per 100 cows compared to last year's 61 (± 12.7) (Table 6).

Population status and trend analysis

Since mandatory reporting began in 2001, harvest reports indicate an increasing trend of elk being harvested in District 2. The increase in harvest appears to be due to increases in current herds and also elk expanding into new areas. This is corroborated by numerous sightings of elk in new areas by WDFW staff and local landowners, as well as more damage complaints from landowners in GMU 139 & 142.

Habitat condition and trend

The greatest concern for these elk herds in the past has been the agricultural conversion of native habitat, thereby reducing available elk habitat. Now, elk habitat degradation due to urban expansion, increased roads, and human disturbance has become the highest concern. Habitat loss due to development continues to occur, especially in GMUs 124, 127, and 130 around the main Spokane metropolitan area, with the redistribution of urban populations outward into rural settings impacting the elk population in these GMUs.

There has been a concern for habitat damage to aspen and other vegetation from high elk numbers on Turnbull National Wildlife Refuge. This concern resulted in the limited entry hunt being offered on the refuge and also an on-going research project at Eastern Washington University studying the movements of collared elk in and around Turnbull and the vegetation on the refuge.

Elk Damage

During the last few years, elk damage complaints have decreased in GMUs 124-130 now that landowners have discovered that having elk can be an economic benefit to them by leasing their land to hunters. When localized complaints are received, hazing, damage permits, and Master Hunters have been effective tools for targeting offending elk. It is important that an adequate number of these permits continue to be made available to address landowner concerns.

While the core herd area is in GMUs 124 – 130, there are indications of increasing elk numbers in GMUs 139 and 142 which are dominated by agriculture (wheat and lentils). Consequently, we have begun receiving damage complaints from these GMUs. Many of these elk migrate back and forth from Washington to Idaho. Elk in these areas are in scattered groups, occupying habitats wherever they can find relative seclusion and safety, frequently being found in Conservation Reserve Program (CRP) plots. As a result of this expansion, harvest strategy in all GMUs will remain "any elk".

Management conclusions

Harvest data from the last 10 years indicates an increasing elk population in the District. Some of this harvest is likely due to the Turnbull NWR permit hunts and the additional impact of moving animals off the refuge and making them more available for harvest. The Turnbull permit hunts were created to address damage to aspen stands on the refuge and also to address complaints from neighboring landowners.

Considering the fact that both the aerial surveys and the number of mature bull elk harvested indicate a potentially low number of mature bulls in the population, bull numbers will continue to be closely watched to determine if possible bull hunting restrictions need to be made.

The overall increase in harvest (particularly of antlerless elk) will hopefully result in reduced damage on the refuge and complaints from local landowners. However, we will maintain aerial surveys in this area to insure that herd numbers or ratios do not drop below management objectives (WDFW 2008).

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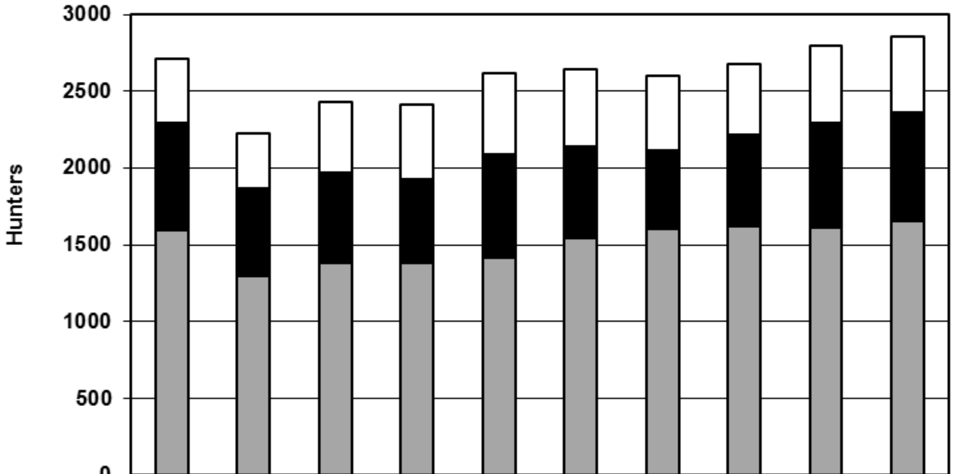
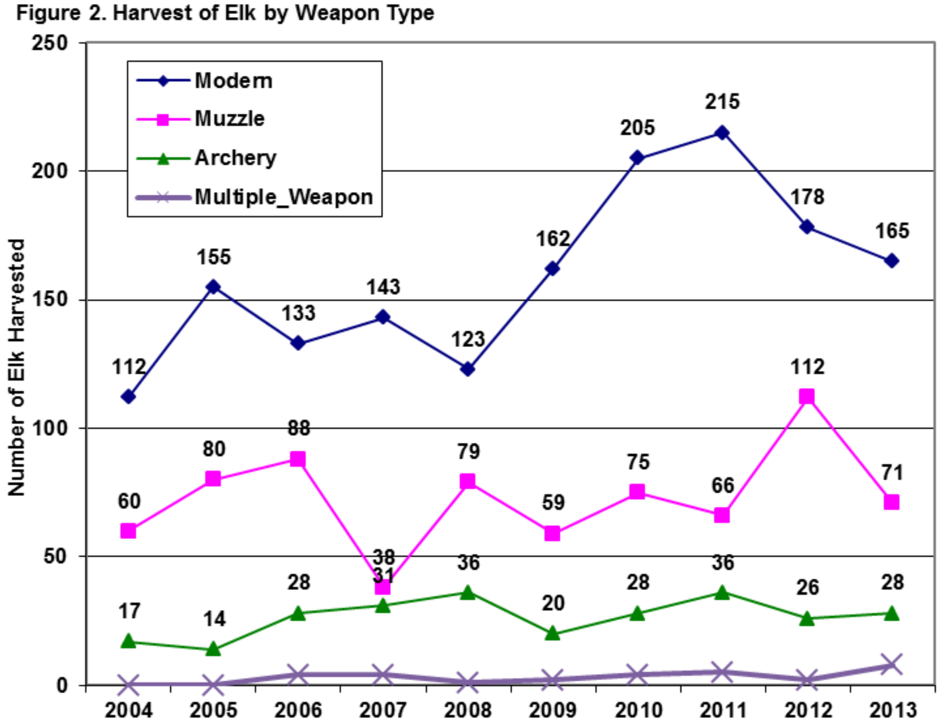
Note: All figures and tables reflect general season harvest results only, unless noted otherwise.

Figure 1. Number of Elk Hunters by Weapon Type



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Archery	410	351	460	484	532	504	483	458	498	493
Muzzle	697	572	586	545	671	593	507	599	685	702
Modern	1600	1300	1384	1386	1415	1545	1607	1620	1610	1658

Figure 2. Harvest of Elk by Weapon Type



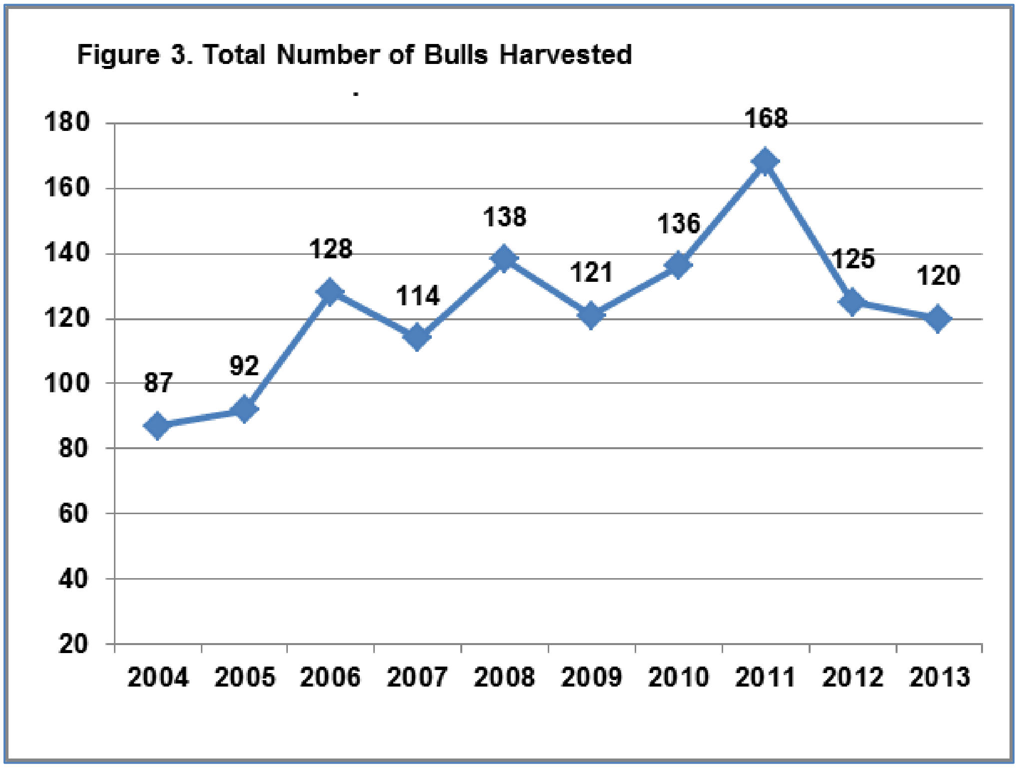


Figure 3. Total Number of Bulls Harvested
180
160
140
120
100
80
60
40
20
87
92
128
114
138
121
136
168
125
120
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013

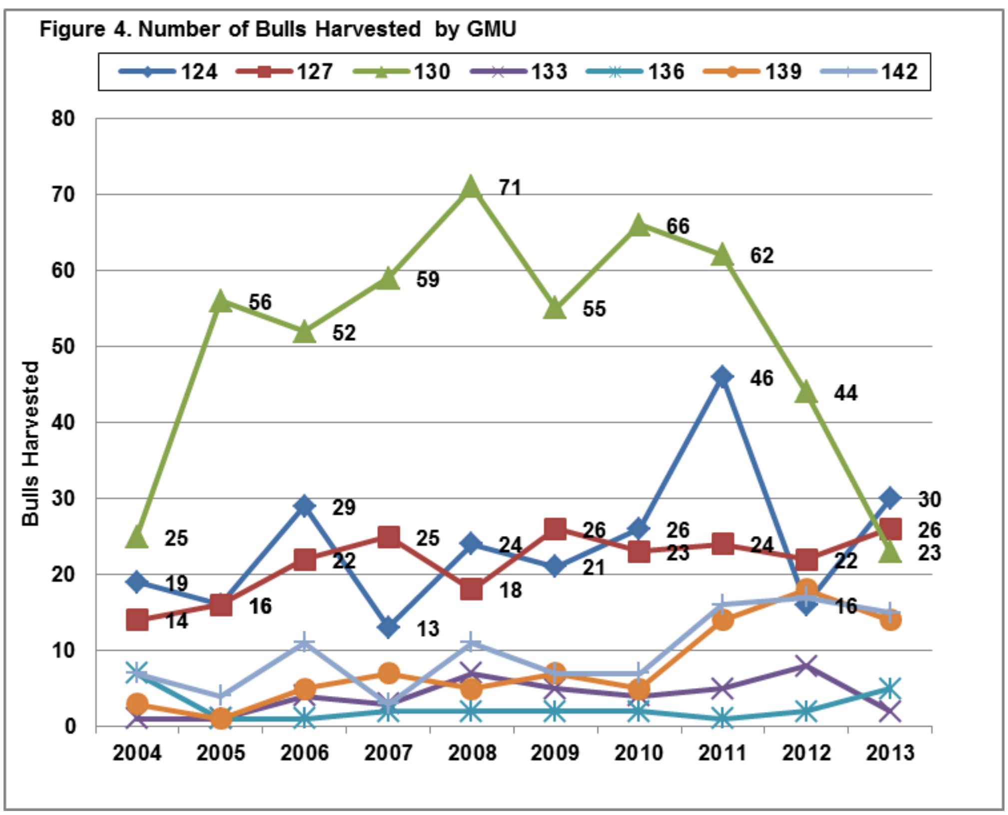


Figure 4. Number of Bulls Harvested by GMU
124
127
130
133
136
139
142
Bulls Harvested
80
70
60
50
40
30
20
10
0
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013

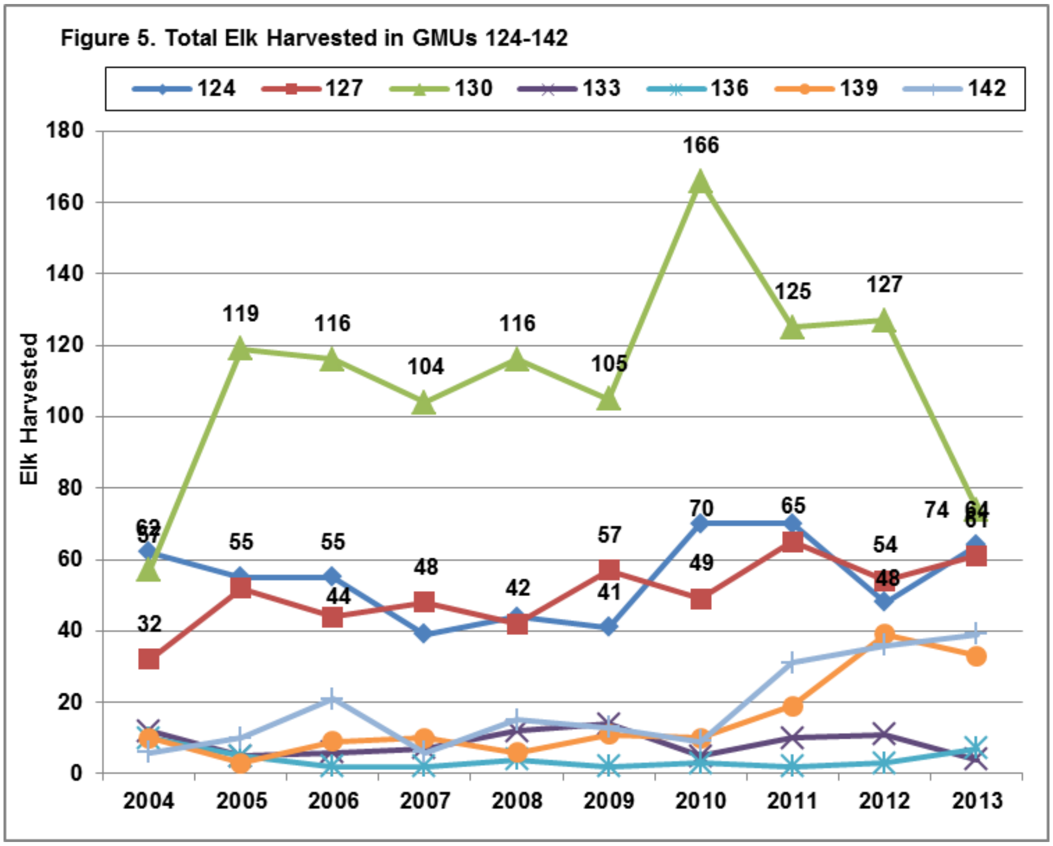


Table 1. Elk harvest, hunters and hunter days for GMUs 124-142.

Year	Bulls	Antlerless	Total	Hunters	Hunter Days	Hunter Success
2004	87	102	189	2,707	6,246	6.98%
2005	92	157	249	2,223	8,992	11.20%
2006	128	125	253	2,441	10,323	10.36%
2007	114	102	216	2,427	10,663	8.90%
2008	138	101	239	2,624	11,134	9.11%
2009	121	122	243	2,659	10,955	9.14%
2010	136	176	312	2,607	10,807	11.97%
2011	168	154	322	2,698	11,394	11.93%
2012	125	193	318	2,800	11,646	11.36%
2013	120	152	272	2,891	13,153	9.41%
Average	**123**	**138**	**261**	**2,608**	**10,531**	**10.04%**

Table 2. Hunter success by weapon type.

Year	Archery	Modern	Muzzle	All
2004	4.15%	7.00%	8.61%	6.98%
2005	3.99%	11.92%	13.99%	11.20%
2006	6.09%	9.61%	15.02%	10.36%
2007	6.40%	10.32%	6.97%	8.90%
2008	6.77%	8.69%	11.77%	9.11%
2009	3.97%	9.95%	11.76%	9.14%
2010	5.80%	12.76%	14.79%	11.97%
2011	7.86%	13.27%	11.02%	11.93%
2012	5.22%	11.06%	16.35%	11.36%
2013	5.68%	9.95%	10.11%	9.41%
Average	**5.59%**	**10.45%**	**12.04%**	**10.04%**

Table 3. Antler point proportion for GMUs 124-142.

Year	1-2 Pt	3-5 Pt	6+ Pt
2004	43.42%	42.11%	14.47%
2005	49.47%	41.05%	9.47%
2006	38.71%	38.71%	22.58%
2007	44.64%	33.93%	21.43%
2008	31.72%	40.00%	28.28%
2009	42.28%	44.72%	13.01%
2010	41.5%	39.85%	18.80%
2011	37.50%	42.86%	19.64%
2012	45.67%	40.94%	13.39%
2013	45.22%	32.17%	22.61%
Average	**41.64%**	**40.46%**	**17.90%**

Table 4. 2013 Turnbull NWR Elk Permit Hunt.

Hunt Number	Weapon Type	Applicants	Permits Issued	Actual Hunters	Total Harvest	%Hunter Success (of Actual Hunters)	%Success of Permits Issued	Permit Type
2000	FMA	568	1	1	1	100.00%	100.00%	Quality Bull
2205	F	400	6	4	0	0.00%	0.00%	Antlerless
2206	F	359	6	4	3	75.00%	50.00%	Antlerless
2207	F	427	6	4	2	50.00%	33.33%	Antlerless
2265	A	135	14	8	0	0.00%	0.00%	Antlerless
2285	M	142	9	0	0	N/A	N/A	Antlerless
2286	M	196	9	7	2	28.57%	22.22%	Antlerless
2600	FMA	144	6	4	0	0.00%	0.00%	Disabled
2700	FMA	92	6	3	1	33.33%	16.67%	Master Hunter
Totals		**2463**	**63**	**35**	**9**	**35.86%**	**27.78%**	

Table 5. 2013 Harvest and proportion of harvest for GMUs 124-130.

	Harvest	Proportion
GMU 124	64	22.7%
GMU 127	61	21.6%
GMU 130	74	26.2%
GMU 124-130	199	70.6%
GMU 133-142	83	29.4%
Total	**282**	

Table 6. Summary of Turnbull NWR Composition Surveys (±90%CI)

Year	Bulls	Cows	Calves	Total	Ratio (bull:cow:calf)
2004	36	211	106	353	17 ±5.1 :100: 50 ±9.8
2005	No Survey Flown				
2006	49	207	113	369	23 ±6.2 :100: 54 ±10.5
2007	50	140	78	268	35 ±9.7 :100: 55 ±12.9
2008	61	145	111	317	42 ±10.6 :100: 76 ±15.9
2009	35	146	79	260	23 ±7.4: 100: 54 ±12.4
2010	66	248	146	460	26 ±6.1: 100: 58 ±10.1
2011	41	193	106	340	21 ±6: 100: 54 ±10.9
2012	28	166	102	296	16 ±5.7: 100: 61 ±12.7
2013	39	207	103	349	18 ±5.4: 100: 49 ±9.9

ELK STATUS AND TREND REPORT: REGION 1

PMU 13 – GMUS 145, 149, 154, 157, 162, 163, 166, 169, 172, 175, 178, 181, 186

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MARK VEKASY, Assistant District Wildlife Biologist

Population objectives and guidelines

Elk (*Cervus elaphus*) populations in six of eight major elk game management units (GMUs) are at or near management objective. Most of the elk population within the Blue Mountains is at or near population management objective, with the exception of the Wenaha and Tucannon. The elk living in the Wenaha unit comprised a majority of the elk in the Washington Blue Mountains until the late 1980s, but declined during the 1990s to less than 500 elk. Elk numbers in the Wenaha are still struggling, but appear to be slowly increasing. The Blue Mountains Elk Management Plan is currently being revised, and will include an updated population objective.

Hunting seasons and harvest trends

The general season bull harvest was restricted to spike-only in 1989 in order to increase bull survival and post-hunt bull:cow ratios, and improve breeding efficiency. Prior to spike-only management, bull:cow ratios historically ranged from 2-5 bulls:100 cows, and few bulls older than 2.5 years of age were observed during post-hunt surveys. After implementation of the program, bull:cow ratios increased to management objective (>12 bulls:100 cows) within 3 years. Currently, a diverse age structure is observed in the post-hunt bull population.

Total bull harvest in the Blue Mountains has been increasing over the last 10 years. Between 2003 and 2012, the bull harvest averaged 230 bulls/year. Hunters harvested a total of 262 bulls in 2013 (Table 1), which is 14% above the 10-year average. The increase in the bull harvest can be attributed to an increase in elk numbers, improved calf survival, and an increase in "any bull" special permits. Surveys in early 2014 showed an unexpected increase in bull ratios and calf survival.

Branched-antlered bulls are harvested under special permits in all GMUs (Table 2). In 2013, 236 "any bull" special permits, targeting a harvest of 135 bulls, were issued in one "permit-only" entry unit and eleven "spike-only" units for rifle, muzzleloader, and archery hunters, excluding auction, raffle, and incentive permits. Branched-antlered bull special permit hunters averaged 59% success with 199 (37 failed to report) permit holders harvesting 112 bulls. Six point or larger bulls comprised 84% of the harvest. Large, mature bulls continue to be harvested in the Blue Mountains, and generate much public interest for both hunting and viewing.

The Mill Creek Watershed (GMU 157) is a limited entry unit managed in cooperation with the City of Walla Walla (City water supply), U.S. Forest Service, WDFW, and Oregon Dept. of Fish & Wildlife. Washington issued 45 Watershed permits in 2013. Normally, some Watershed permit holders do not hunt because they fail to research the area before applying, and are not aware of the rugged terrain. In 2013, of the 41 harvest reports returned, 38 hunted, harvesting 16 bulls and 0 cows. Bulls harvested in the Watershed consisted of 81% six point or better.

Antlerless elk hunting is by special permit for modern firearm (MF), muzzleloader (ML), and archery hunters in GMUs 149, 154, 162, 163, 172, 175, 178, and 181. General season archery hunters are allowed to hunt antlerless elk on private lands in GMU 162 and 172, and unit wide in GMUs 149, 154, 163, 175, and 178. A total of 404 antlerless elk permits were issued in 2013, which doesn't include landowner damage control permits: MF 299, ML 90, Archery 15. Hunters harvested a total of 146 antlerless elk from eight GMUs. MF hunters harvested 80 antlerless elk, ML harvested 29, and archers 1. Archers harvested an additional 36 antlerless elk during the general archery seasons.

The antlerless harvest is generally focused on sub-populations on private land to alleviate agricultural damage. As in 2012, 2013 permit levels were decreased slightly to address declining counts in private land zones. The strategy of targeting antlerless elk on private land has been successful in reducing agricultural damage complaints, while allowing elk populations on public land to increase and maintain the overall elk population near management objective.

Poaching of adult bulls appears to have remained at low levels compared to the severe levels experienced between 2000 and 2002. Only a few poaching cases were reported in 2013, compared to 50+ bulls poached during 2000-2002.

Surveys

Post-season surveys are conducted to determine population estimates and herd composition in late winter. The 2014 survey was conducted between February 28 and March 15. The 2014 Blue Mountains elk population is estimated to be 5,774 (90% CI +/- 390, Table 3). Some surveys are conducted on winter range in Oregon north of the Wenaha River and an unknown percentage of those elk likely do not return to summer range within Washington.

Population status and trend analysis

Winter calf ratios in 2014 were estimated at 34.7 calves:100 cows (*90% CI* +/- 1.2), a large increase over last year's 26.1 ratio and the second highest in the last 20 years. Post-hunt bull/cow ratios in 2014 were estimated at 29.5 bulls:100 cows (*90% CI* +/- 9.5, Table 3). Surveys conducted along the Oregon border (GMUs 157, 169, 172, and 186) include survey zones within Oregon (Table 4). It is thought that a majority of these animals wintering in Oregon, north of the Wenaha River, migrate into Washington later in the spring, but little data is available to confirm this. Some historic data (Mace 1967) described movement patterns of wintering elk at Bartlett and Eden (south of the Wenaha River) Benches in Oregon. Approximately 35% of the elk wintering at these 2 feed sites summered in Washington.

Research

There is no ongoing elk research being conducted within the Washington portion of the Blue Mountains at this time.

The results from the Washington Blue Mountains Elk Vulnerability Study were published in the Journal of Wildlife Management (McCorquodale et al. 2011) and through a department report, which was made available to the public in 2011.

Habitat condition and trend

The Pomeroy Ranger District has made progress in closing old roads and reducing road densities in GMU-175. WDFW biologists continued working with the USFS to address concerns with the South George Vegetation Management project, which includes the Hogback-Triple Ridge road complex. WDFW appealed the South George Vegetation project in 2012 on concerns regarding road density. The USFS recognized the Departments concerns and agreed to change the seasonal closure dates for the Triple Ridge/Hogback road system through a phased approach. By 2015, the road system will be closed August 1 – April 30, 2016. These dates will be effective until further notice to protect critical elk summer range. While there have been some complaints from hunters concerning reduced access, most of the road closures have been on redundant roads that parallel each other, and access in this area remains high.

The Pomeroy Ranger District is also struggling to find funds to replace broken gates and patrol for gates incorrectly left open. This has increased the vulnerability of elk in large areas of summer range within GMUs 166 and 175. WDFW will need to continue working with the USFS on this issue for the foreseeable future.

The road closure program on the Walla Walla Ranger District is complete.

Habitat conditions on 163,000 acres of National Forest and private land will continue to improve over the next 10 years due to extensive wildfires that occurred in 2005 and 2006 (School Fire-2005, Columbia Complex Fire-2006), however, large areas of the Wenaha-Tucannon Wilderness that have not been allowed to burn continue to have poor habitat conditions for elk.

The Umatilla National Forest Access Management and Fire Management Plans should improve habitat conditions over time, and prescribed burns are being implemented throughout the forest to reduce fuel loads and improve stand conditions. The WDFW will work closely with the USFS to reduce road densities and improve habitat effectiveness in areas of high value elk habitat.

Habitat enhancement

Projects to control weeds on WDFW Wildlife Areas and elk winter range on private land were implemented in 2009-2011. Long-term habitat improvement projects will be developed in conjunction with the Blue Mountains Elk Initiative (BMEI), Rocky Mountain Elk Foundation (RMEF), U.S. Forest Service, and county weed boards.

Elk Damage

While actual elk damage claims are low, complaints from farmers are very common and elk damage continues to be a problem in some units and is largely being addressed by lure crop payments and issuance of landowner depredation permits. The largest damage issues occur in GMU-154 Blue Creek, GMU-162

Dayton, and GMU-178 Peola. Damage tags generally begin to be issued in June, but the bulk of permits are issued in July and August as mountain grasses go to seed and peas and garbanzo beans become attractive to elk. Damage to wheat is generally limited to trailing issues as elk move through fields traveling to more desirable crops, but younger wheat fields are also grazed.

In 2011, the Department undertook a new approach to mitigating damage. An attempt was made to enroll any landowner with historic damage into a Damage Prevention Cooperative Agreement (DPCA). These agreements allow the Department to issue permits to landowners, which they may use to focus hunting pressure on damage-causing elk on their land, even outside the hunting season. It requires the landowner to provide reasonable access to hunters during hunting seasons, but also allows them to have a hunter with an unfilled elk tag take an animal at other times during their DPCA period. More than 70 landowners have signed agreements. Some of these had previously claimed damage, but they agreed to suspend their claims in exchange for antlerless elk permits, and in some cases cash compensation. These permits could be used by the landowner or any person they designate. Cash compensation (up to $5,000) is offered to landowners willing to engage in forage enhancement projects, to offset the costs of replacement feed, or who are willing to enroll in the more liberal Department hunting access programs. Acceptance of these incentive payments requires the landowner to waive all claims to elk damage. Although still in its infancy, the program seems to have increased landowner tolerance for elk, and since few of the permits are actually used to harvest an animal, it has not added much to cow mortality during the first 2 years. Department records indicate that in 2011, of the 75 elk permits that were issued, 19 were filled. In 2012, of the 122 permits issued, at least 26 were filled. The Department strives to focus antlerless elk removal on GMUs where elk suppression is the goal.

The sub-population that inhabits the wind power project lands in the Marengo unit (GMU 163) appears to have stabilized in recent years and has been kept in check with antlerless harvest opportunities and damage prevention permits given to landowners.

Damage issues in GMU-181 have decreased from a high of 10-years ago after issuing landowners preference permits for antlerless elk in lieu of damage. Periodically, high numbers of elk move into the western portion of the unit when snowfall exceeds 8 – 12 inches on the adjacent Asotin Creek Wildlife Area. Usually the elk return to the public lands within 2 – 3 weeks when the snow melts.

An unknown number of elk (100-200) are periodically located in the Peola unit (GMU 178) and are herded through the elk fence when opportunities arise. Efforts will continue to herd these elk back inside the elk fence and onto public land in GMUs 166 and 175 during 2014-2015.

Management conclusions

The spike-only management program has been in place for 24 years. Management objectives were to increase the number of bulls in the post hunting season population and create a diverse age structure within the bull population, while maintaining general season hunting opportunity. The increased number of adult bulls in the population has improved breeding (Noyes et al. 1996). Most cows (93%, WDFW unpublished data) are now being bred by October 2, compared to only 55% prior to the management change.

The increased number of adult bulls has allowed the WDFW to offer quality special permit hunting opportunity for branch-antlered bulls. The intense rutting activity and presence of large, adult bulls has also resulted in a tremendous increase in recreational elk-viewing.

Winter calf ratios have improved this year after moderate values the last 2 years, but the total number of calves recruited has remained relatively stable due to increasing number of cows (Table 3). Low calf survival has had negative impact on hunting opportunity through reduced recruitment from the mid-1980s through mid-2000s. Low calf recruitment is thought to be the major factor still preventing Wenaha elk from increasing in numbers.

Shed antler hunting activity continues to be a concern for elk on the winter range. Shed antler hunting activity in GMUs 154, 162, 166, 169, 172, and 175 can be extremely intense during March and April. Elk use patterns in GMUs 154, 166, 169, 172, and 175 have changed over the last decade due to disturbance caused by shed antler hunting activity. Bull groups are broken and scattered into the upper elevation timber and snow, while cow/calf groups can be redistributed onto agricultural lands. Shed antler hunting and other activities on winter range are putting elk under increased stress at a critical time of year.

Recommendations were developed in 2009 to reduce harassment and control human activities on elk winter range, especially shed antler hunting. In July 2013, WDFW staff met with USFS and ODFW staff to discuss the issue and propose possible management recommendations to address the level of disturbance.

Agricultural damage continues to occur in site specific locations in GMUs 154, 162, 163, 172, 178, and 181 resulting in damage control hunts being implemented by the Department. The current damage control strategy to target specific groups of elk on private land for damage control has reduced damage claims on a majority of private lands.

Habitat values have declined in some areas due to roads (GMUs 154, 175) and noxious weeds (154, 169, 175, & 186), although extensive wildfires in 2005 and 2006 have improved habitat conditions on a majority of the 163,000 acres burned in GMUs 154, 162, 166, 175, and 178.

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Noyes, J.H., B.K. Johnson, L.D. Bryant, S.L. Findholt, and J.W. Thomas. 1996. Effects of bull age on conception dates and pregnancy rates of cow elk. Journal of Wildlife Management: 80(3):508-517.

Table 1. 2013 Blue Mountains elk general season and permit harvest combined, and prior 10-year history.

	Bulls					Antlerless Harvest
Year	Spikes	Adult	Total	Antlerless	Total	Cows:Bulls
2003	209	16	225	149	374	66
2004	193	32	225	194	419	86
2005	146	45	191	251	442	131
2006	163	47	210	203	413	97
2007	133	47	180	151	331	84
2008	90	85	175	125	300	71
2009	171	90	261	103	364	39
2010	125	125	250	156	406	62
2011	162	115	277	136	413	49
2012	139	163	302	140	442	46
2013	139	110	249	137	386	55

Table 2. 2013 Special Permit Bull Elk Harvest-All Weapons, Blue Mountains, WA., and prior 10-year history.

Year	Bull		Hunter Success	Percent 6 Point+
	Permits	Harvest		
2003	57	3	5%	100%
2004	73	20	27%	95%
2005	82	26	32%	78%
2006	100	35	35%	86%
2007	119	33	28%	94%
2008	107	65	61%	85%
2009	141	95	67%	95%
2010	183	131	72%	98%
2011	236	111	47%	100%
2012	289	150	52%	96%
2013	236	112	47%	84%

Table 3. Elk population estimates for the Blue Mountains generated by the Idaho Sightability Model.

Year	Population Estimate	90% CI	Antlerless		Bulls			Total Bulls	Unclass	Ratios:100 Cows	
			Cows	Calves	Yearlings	Raghorns	Adult			Bulls	Calves
2004	4,723	554	3,290	833	182	97	321	600	0	18.2	25.3
2005	No Survey										
2006	4,341	193	2,817	847	157	184	335	676	0	24.0	30.1
2007	4,328	233	2,753	674	213	254	420	887	13	32.2	24.5
2008	4,748	102	2,987	842	190	191	403	783	136	26.2	28.2
2009	4,925	355	3,089	905	184	193	504	881	51	28.5	29.3
2010	4,921	97	2,951	835	202	251	521	972	162	33.0	28.3
2011	5,638	356	3,392	1,257	259	182	520	961	30	28.3	37.0
2012	4,900	610	3,090	945	196	110	540	847	16	27.4	30.6
2013	5,102	124	3,420	894	224	122	429	774	14	22.6	26.1
2014	5,774	390	3,364	1,166	280	161	551	992	250	29.6	34.7

Table 4. Raw counts of elk observed during 2014 aerial surveys.

GMU	Total	Antlerless			Bulls			Total Bulls	Ratios		Subunits
		Cows	Calves	BA Bulls	Spikes	Raghorns	Adult		Calves	Bulls	Surveyed/ Available
154	486	310	106	52	18	5	45	70	34	23	3/3
157	460	262	92	68	21	19	49	89	35	34	2/2
162	1,095	661	251	100	54	24	76	154	38	23	5/7
163	-	-	-	-	-	-	-	-	-	-	0/1
166	551	320	124	80	28	17	63	107	39	34	6/8
169	-	-	-	-	-	-	-	-	-	-	0/5
172	1,140	687	241	152	59	35	117	212	35	31	4/4
175	990	559	166	56	32	5	51	88	30	16	3/5
178	-	-	-	-	-	-	-	-	-	-	0/2
181	175	107	37	18	12	7	12	31	35	29	2/3
186	129	99	21	5	4	2	3	9	21	9	2/2
Total	5,026	3,005	1,038	531	228	114	416	760	35	25	27/42

ELK STATUS AND TREND REPORT: REGION 3

PMU 31 – GMUS 379, 381
PMU 32 – GMUS 328, 329, 335
PMU 33 – GMUS 336, 340, 342, 346,
PMU 34 – GMUS 372, 373
PMU 35 – GMUS 352, 356, 360
PMU 36 – GMUS 364, 368

JEFFREY A. BERNATOWICZ, District Wildlife Biologist, PMUs 32-33, 35-36
SARA GREGORY, District Wildlife Biologist, PMUs 31, 34

Population objectives and guidelines

The post-season population objectives for the Yakima and Colockum elk (*Cervus elaphus*) herds are 9,025-9,975 and 4,275-4,725, respectively. A goal of <350 animals has been set for the Rattlesnake Hills sub-herd (PMU 34). The postseason bull ratio goal is within the range of 12- 20 bulls per 100 cows for all herds.

Hunting seasons and harvest trends

Elk hunting seasons in Region 3 have changed frequently over the years. The major changes in recent years have been:
1994: All branched antler bull hunting became permit only in all PMUs except 34.
2000: Entire region came under one eastern elk tag by weapon.
2003: Early archery general season changed from September 1-15 to September 8-21. The late Archery season was set at November 20-December 8. Damage hunts changed from muzzleloader to any Advanced Hunter.
2004: Antlerless elk were no longer legal for Archery general season in PMU 32.
2009: PMU 32 became true-spike only for general seasons.

In 2013, the general seasons outside of PMU 34 were:

Archery: Early season September 3-15, true-spike only in PMU 32, spike or antlerless in PMUs 33, 35, and 36. Late season: November 27-December 8, spike or antlerless all units except GMU 328 (true-spike only).

Muzzleloader: October 5-11, PMU 32: True-spike only. PMUs 33, 35, and 36 spike-only.

***Modern Firearm*:** October 26- November 3, PMU 32: True-spike only. PMUs 33, 35, and 36 spike-only.

PMUs 31 and 34 have been managed separately from the remainder of the region with an array of liberal seasons allowing the harvest of antlerless and any bull elk. A substantial number of damage permits have been issued to landowners to target problem elk and to reduce the size of the Rattlesnake Hills sub-herd. In addition, in 2013, a modern firearm general season for antlerless elk occurred in the Blackrock Elk Area (private land west of Hanford, Elk Area 3722) September 7-22. To further reduce the Rattlesnake sub-herd, a general modern firearm season for any elk occurred in GMU 372 during October 26-November 3, 2013.

Harvest of any elk also occurred in PMU 31 and GMU 373 during a modern firearm general season during October 26-November 15, 2013. There were also archery and muzzleloader general seasons for any elk in PMU 31 and GMU 373 during 2013. Early archery occurred September 3-15. Late archery in PMU 31 was held October 27-November 15 and in GMU 373 during November 25-December 8. Finally, opportunity for muzzleloader hunters occurred during a late season hunt in PMU 31 and GMU 373 during October 27-November 15.

In 2013, the reported number of elk hunters in Region 3 was similar to 2012. (Table 1). The reported hunter numbers were 20% below the 10-year average. Elk tag sales have been stable during the period of decline. Almost 30% of hunters are apparently purchasing tags to apply for special draw permits. If not drawn, they don't hunt.

Reported harvest was slightly below average for the Colockum and Yakima herds. Total success in the region was just below average. The recent change to a "true-spike" regulation in Colockum (PMU 32) was designed to decrease harvest and increase yearling bull escapement. Bull harvest in the Colockum had been the lowest in recent history since the change to "true-spike", but increased in 2012 and declined slightly in 2013 relative to 2012. Harvest data for the Rattlesnake Hills sub-herd has been variable (Table 4). Harvest has typically ranged between 43 and 101 since 1999. The exceptions were 2000 (harvest =212) and 2007 (harvest = 137) when wildfires displaced large numbers of elk from Hanford and the ALE site. In 2013, field personnel documented a harvest of 96 elk (47 bulls, 49 antlerless).

No elk were reported harvested in GMU 373 in 2013. In GMU 381, 4 bulls and 4 antlerless elk were harvested. Two bulls were also harvested in GMU 379. Elk numbers are low in these units and are managed liberally to prevent crop damage risk.

Surveys

A post-hunt aerial survey was conducted over 100% of the Colockum winter range in March 2014. The Yakima herd was not surveyed due to lack of snow and elk on winter range/feed sites.

PMU 34 was surveyed as a separate area in February 2014. All survey units on the Hanford ALE site and a randomly selected subset of units on Central Hanford and surrounding private land to the south and west of ALE were also surveyed.

Total calf recruitment in the Colockum remained near a 15 year high (Table 2). The observed bull ratio in the Colockum remains below objective, and decreased in 2014 despite good yearling bull recruitment (Table 2). The change to "true-spike" has greatly increased the number and percentage of yearling bulls that survive through the hunting seasons. Adult bull numbers in the herd are likely better than surveys indicate due to geographic segregation of wintering bulls and cows. Detectability and percentage of bulls on surveyed winter range are suspected to be complicating issues and are currently being studied.

The Yakima herd was not surveyed, but populations going into the 2013 season were well above objectives (Table 3).

Population status and trend analysis

In March 2014, the Colockum was estimated at 6, 018 ± 24 (Table 2). The Yakima herd was 1800 elk over objective in 2013 (Table 3) and harvest was fairly low. Both herds are above population objectives. There are several possible factors accounting for the increases in observed elk abundance: reduced antlerless harvest (Table 1), more accurate counts due to increased use of aerial photography during surveys, and elk redistribution among areas within and outside of the survey areas; only the first would necessarily reflect an increase in actual population size. Recent experiments with photography indicated that elk numbers were often being under-estimated in larger groups. Photography is now used for all large groups of elk. In the Colockum, roads on the southern half of the winter range have now been closed during Feb-Apr for ~7 years. Large numbers of elk are being observed within the closure. Some elk may have moved in from outside the survey area. In 2014 there was another large increase in cow elk numbers that was not logical based on recruitment and 2013 harvest. The survey area in the Yakima herd has also been expanded in recent years.

The Rattlesnake Hills sub-herd grew from less than 100 elk in the early 1980s to about 840 by 1999. In 2000, a trapping effort and high harvest, due to wildfire, reduced the herd to about 520. Surveys in February 2014 yielded a herd size estimate of 1,060 elk. Ratios per 100 cows were 55 bulls and 30 calves. No surveys were conducted in GMU 373, 379 or 381.

Habitat condition and trend

The overall acreage of summer range for the Colockum herd is increasing due to timber harvest and wildfire effects, but much of the area is also heavily grazed by livestock. Large areas now lack hiding cover and when human activity increases in late summer, many elk concentrate in and around the Coffin Reserve. A large fire on the westside of the core Colockum range removed much of the cover in fall 2012. Eventually, forage should increase on summer range, but hiding cover will be reduced. In 2013, a large fire burned about 72,000 acres of elk winter range. There was some fall re-growth, but there was an obvious short-term reduction in available forage. The winter of 2013-2014 was mild and no significant overwinter elk mortality occurred.

The U.S. Forest Service (USFS), Washington Department of Natural Resources (DNR), and WDFW manage the majority of summer range for the Yakima herd. Habitat quality for elk varies across these ownerships depending on management emphasis and underlying land cover. The USFS shifted toward a late seral stage management emphasis over 20 years ago. The lack of recent timber harvest has reduced forage production on a portion of summer range. Insect outbreaks have recently killed conifers over a substantial area. Prescribed burns and wildfires are starting to improve forage quantity and quality where they have occurred.

In the range of both Colockum and Yakima elk, human use is high. Activity on winter and spring range has increased drastically with increased bull numbers and the resultant increased number of shed antlers in the spring. Many people now participate in shed antler hunting in the spring on these elk ranges.

The major change to habitat for the Rattlesnake Hills elk was a fire that consumed most winter range in June 2000. In August 2007, approximately 67,000 acres burned mostly on ALE and some private land west of ALE. The short-term effect of these fires was to reduce herd productivity and push elk onto private land. Today, the herd seems to have recovered from these disturbances. The population has grown to the highest levels ever observed, and calf numbers indicate high recruitment of additional elk. Elk continue to move onto the properties surrounding ALE.

Crop damage

Elk damage to agricultural crops is a concern throughout Region 3. Most of the problem areas within the Yakima elk herd area have been fenced. However, in some areas the fence is deteriorating and needs to be repaired or replaced. Extended Master Hunter seasons below the fence were enacted in 2003 in an attempt to reduce crop damage.

The Colockum herd is not fenced and damage is being managed by hunting and hazing. The boundaries of the hunts are adjusted frequently, depending on where damage is occurring. In 2004, the damage season was extended to August 1 – February 28th. In recent years the general damage season has closed in mid-December. Additional problem elk are being managed through landowner damage hunts and permits. The goal is to eliminate/displace elk that have developed a habit of foraging on private agricultural lands. The program may be more successful if disturbance could be further reduced on the public lands where elk presence is desired.

Historically, the Rattlesnake Hills elk caused the most significant damage in Region 3. Claims have largely been for damage to dry land wheat fields south of ALE. Typically elk enter the fields from ALE after sunset and return to ALE prior to sunrise. Starting in 2005, landowners have been issued damage prevention permits beginning in mid-May through June to target any bulls damaging wheat. In July, only spikes are hunted, and after August 1st permits become antlerless or spike elk only. The proximity of these elk to valuable perennial crops further increases the risk. Several orchard and vineyard managers west of ALE have fenced their crops or have selected to waive damage payments in return for damage prevention permits. These farms are relatively small and surrounded by rangeland. In contrast, the area south of ALE near Prosser and Benton City contains large acreages of orchards and vineyards. The number of elk complaints in this area has increased since the August 2007 fire. Controlling the herd size is problematic as the core use area is on ALE, where hunting is currently prohibited.

In 2005, WDFW worked with USFWS to draft an elk control plan that included tightly controlled hunting on ALE, but the Department of Energy (DOE), which owns the land, objected to public hunting on this site at the time. In 2011, WDFW, the Yakama Nation, and USFWS drafted another hunt plan for the ALE. The plan was supported by DOE and was published on the Federal Register for public review. All indications were that a hunt was going to occur in the fall of 2012. Unfortunately, two other northwest tribes objected to the hunt, and the USFWS backed off plans for the 2012 hunt.

Management conclusions

The recent rapid increases in observed elk populations within the Colockum and Yakima herds are likely due to changes in survey techniques, high calf recruitment, and/or some minor elk redistribution. Antlerless opportunity is being substantially increased in both herds with the goal of slightly reducing both populations. Low bull recruitment in the Colockum has reversed with “true-spike”. However, total adult bull numbers observed on winter range were still under objective in early 2014. A study underway on adult bull movements and survival should answer some important questions about adult bull mortality and seasonal distribution.

Extensive permit seasons may have slowed the Rattlesnake Hills sub-herd growth, but not stabilized elk numbers. In the case of wildfire (as seen in 2000 and 2007), displacement of elk onto private land has led to increased harvests. However, wildfires are not desirable from a public property, safety, or habitat management perspective. Hazing and targeting problem elk has reduced, but not eliminated damage. Landowner tolerance and WDFW’s ability to pay for damage are finite. The Rattlesnake Hills sub-herd should be reduced to <350. Landowners and hunters have not been targeting enough antlerless elk to reverse sub-herd growth. Bulls have averaged over 50% of the total harvest the last 5-years (Table 4). A controlled hunting program on ALE will probably be needed to reduce the sub-herd and reduce the risk of crop damage.

Table 1 Region 3 Elk Hunter Success, 1992-2013.

	Colockum harvest		Yakima harvest		Regional hunter numbers				
Year	Bull	Cow	Bull	Cow	Modern	Muzz	Archery	Total	Success (%)
1992	611	652	1,348	1,246	26,928	4,086	5,865	36,879	10
1993	801	613	1,513	1,020	26,513	4,618	5,989	37,120	11
1994	550	433	782	770	26,328	5,503	6,114	37,945	7
1995	542	731	970	2,418	21,341	5,517	5,622	32,480	15
1996	469	660	631	892	20,288	6,190	4,819	31,297	8
1997	449	593	911	1,069	21,237	5,490	5,558	32,285	9
1998	335	255	717	426	18,253	3,918	3,701	25,872	7
1999	492	239	975	889	20,128	4,705	4,362	29,195	9
2000	392	214	1,140	1,058	25,383	4,554	5,549	35,486	8
2001	385	245	1,450	1,549	23,278	4,305	5,363	32,959	11
2002	379	358	1,184	1,442	22,204	4,791	6,177	33,172	10
2003	513	591	1,017	1,157	21,926	6,119	5,914	33,959	10
2004	424	393	1,083	1,373	20,888	3,342	6,521	30,751	11
2005	449	218	1,013	772	23,291	3,789	6,760	33,840	6.5
2006	418	302	927	1,093	20,654	3,497	5,972	30,123	9
2007	381	241	802	695	19,045	2,743	5,618	27,406	8
2008	327	282	799	826	18,552	2,898	5,578	27,028	8
2009	250	160	1,019	787	17,160	2,474	5,141	24,775	9
2010	182	121	694	440	16,320	2,400	4,942	23,662	7
2011	188	119	658	761	15,047	2,262	4,651	*22,371	7
2012	333	226	975	1,095	14,974	2,707	5,146	*22,924	11
2013	252	303	639	782	15,002	2,983	4,923	*23,145	8
10 YR AVG	347	265	899	900	18,786	3,223	5,624	28,943	9

*Includes multi-weapon tags

Table 2. Colockum elk winter survey results, 1999-2014.

	Antlerless		Bulls		Total	Ratios (per 100 cows)	
Year	Cow	Calves	Spike	Branched	Elk	Calves	Bulls
1999	3,871	1,061	84	242	5,258 $\pm$ 2,048	27	8
2000	2,697	570	60	130	3,457 $\pm$ 940	21	7
2001	3,464	719	100	170	4,453 $\pm$ 543	21	8
2002	2,800	829	119	391	4,172 $\pm$ 566	30	18
2003	3,060	526	96	238	3,920 $\pm$ 445	17	11
2004	2,388	782	63	209	3,442 $\pm$ 168	33	11
2005	3,084	770	46	86	3,986 $\pm$ 391	25	4
2006	2,244	873	73	116	3,306 $\pm$ 160	39	8
2007	2,829	843	118	104	3,918	30	9
2008	2,859	917	43	77	3890$\pm$20	32	4
2009	3,723	732	80	85	4,621 $\pm$ 21	20	4
2010	3,549	839	69	137	4,594	24	6
2011	3,695	995	121	68	4,880$\pm$15	27	5
2012	3,924	1,121	153	107	5,305$\pm$11	29	7
2013	4,057	1,265	164	227	5,712$\pm$35	31	10
2014	4,517	1,226	154	121	6,018$\pm$24	27	6

Table 3. Yakima elk winter survey results, 1999-2013.

	Antlerless		Bulls		Total	Ratios (per 100 cows)	
Year	Cow	Calves	Spike	Branched	Elk	Calves	Bulls
1999	10,399	3,479	442	716	15,036 ± 4,334	33	11
2000	8,125	2,528	421	703	11,777 ± 1,242	31	14
2001	6,896	2,652	464	698	10,710 ± 830	38	17
2002	6,611	2,337	356	970	10,274 ± 609	35	20
2003	6,815	2,007	413	599	9,834 ± 983	29	15
2004	6,217	2,806	357	688	10,068 ± 457	45	17
2005	6,242	2,013	253	343	8,851 ± 843	32	10
2006	5,717	2,926	273	673	9,589 ± 270	51	17
2007	6,167	2,000	518	674	9,359	35	18
2008	6,001	2,368	290	820	9,478 ± 389	39	18
2009	6,076	1,816	267	737	9,133	30	17
2010	5,834	1,890	150	715	8,589	32	15
2011	6,902	2,534	442	678	10,556±161	37	16
2012	7,847	2,963	472	766	12,048±1110	38	16
2013	7,454	2,730	369	757	11,308±169	37	15

Table 4. Rattlesnake Hills Elk Harvest 1985-2013. Data derived through landowner and hunter interviews.

Year	Bulls	Antlerless	Unk	Total	% Bull
1985	2	1	0	3	67%
1986	10	2	1	13	77%
1987	6	8	0	14	43%
1988	4	9	0	13	31%
1989	8	3	0	11	73%
1990	3	0	0	3	100%
1991	14	0	0	14	100%
1992	8	0	0	8	100%
1993	9	5	0	14	64%
1994	18	15	0	33	55%
1995	17	3	0	20	85%
1996	17	2	0	19	89%
1997	17	3	0	20	85%
1998	18	15	0	33	55%
1999	22	41	38	101	22%
2000	95	104	13	212	45%
2001	17	58	0	75	23%
2002	45	8	0	53	85%
2003	46	33	0	79	58%
2004	17	47	0	64	27%
2005	29	27	0	56	52%
2006	36	59	0	95	38%
2007	59	78	0	137	43%
2008	24	19	0	43	56%
2009	28	22	0	50	56%
2010	50	32	0	82	61%
2011	47	48	0	95	49%
2012	53	32	0	85	62%
2013	47	49	0	96	49%
28-yr avg	26	25	2	53	50%
last 5 yrs avg	45	37	0	82	55%

ELK STATUS AND TREND REPORT: REGION 4

PMU 43 - GMU 407
PMU 45 – GMUS 418, 437
PMU 46 – GMUS 448, 450

PAUL M. DEBRUYN, Wildlife Biologist

Population Objectives and Guidelines

Proposed management objectives are outlined in the draft North Cascade Elk Herd Plan (WDFW 2012). The draft plan is currently being reviewed by the co-managers and others and is not final. Proposed objectives in the plan include the following:

- Increase elk population numbers to current population objective of 1,950 animals throughout the managed range of the North Cascades elk herd. *This objective has generated controversy and is being reviewed by WDFW and the co-managers.*
- Manage hunted elk units for minimum post-season bull ratios of 12 - 20 bulls:100 cows, with overall bull mortality rates of less than or equal to 50 percent, consistent with the statewide Game Management Plan 2009-2015 (WDFW 2008).
- Address public safety by reducing elk/vehicle collision rate on State Route 20 between Sedro Woolley – Concrete.
- Minimize elk damage complaints on private property. Use current documented damage complaints as a measure of success.
- Promote elk herd expansion and hunter access to areas with reduced potential for elk-related agricultural impacts. Create a new elk area in the eastern portion of GMU 437 (Sauk) to facilitate this.
- Develop a community-based, elk damage management plan for the lower Skagit River Valley area and the Acme agricultural area similar to the Upper Snoqualmie Elk Management Model and/or the Blue Mountain Elk Damage Plan.
- Encourage the U. S. Forest Service, DNR, and private timberland owners to improve elk habitat capacity.
- Increase public awareness of the elk resource and promote viewing and photographic opportunities.

Hunting season and harvest trends

Conservation closures were established in both GMUs 418 and 437 in 1997 until 2007 when a limited-entry bull only permit hunt was initiated in GMU 418. In 2013 the total number of permits in 418 was 50 (25 spike only, 25 any bull), which were divided equally among state and tribal hunters. The 25 state permits were allocated as 6 archery (3 spike only, 3 any bull), 6 muzzleloader (3spike only, 3 any bull), 11 modern firearm (6 spike only5 any bull), with the contingency for the westside raffle tag and auction tag (any bull) holder potentially being used in GMU 418. In 2013, the auction tag holder did not hunt in 418 but the raffle winner did, so the total number of state permits used was 24. Of the 24 state permit holders who drew GMU 418 bull elk permits, 20 harvested bulls (9 spikes, 11 branch antlered bulls). Tribal hunters harvested 19 bulls using GMU 418 permits from their allocation of 25 tags. 2013 general season state harvest outside of GMU 418 included 5 branched bulls, three taken with modern firearms and 2 taken with muzzleloaders, and 7 antlerless all taken with muzzleloaders in GMU 407. Tribal hunters harvested two cows in GMU 407, 19 bulls in GMU 418 and 17 bulls and 9 cows in GMU 437.

Elk-related Agricultural Damage Hunts

In the Skagit Valley (portions of GMUs 418 and 437) 75 cows were harvested on permits issued by the conflict specialist. In the Acme area (GMUs 407 & 418), 6 cows were harvested with damage permits issued by the conflict specialist. Thirty master hunter tags were allocated for damage areas in Region 4 North (Skagit and Whatcom Counties); fourteen of these tags were filled by the end of calendar year. Additionally, U.S.D.A. Wildlife Services lethally removed 4 branch antlered bulls from G.M.U.437.2013.

Other Mortality

There was one documented poaching/closed season violations in unit 418 with one branch antlered bull poached.

Other reported sources of human-related mortality include a minimum of 33 elk-vehicle collisions that resulted in dead elk along State Route 20 between Sedro Woolley and Concrete.

Surveys

In 2005, biologists from WDFW and the Point Elliott Treaty Tribes initiated a study to assess the size of the North Cascades elk herd and develop a practical monitoring strategy (McCorquodale et al. 2013). This study evaluated two monitoring approaches: sightability-correction modeling and mark-resight modeling, taking advantage of existing radio-marked elk from the 2003-2005 Mount St. Helens translocations. Additional capture and radio collaring of bull elk was required since bulls were underrepresented in the marked sub-population. Between 2005 and 2011, 40 bull elk were captured and radio tagged. The culmination of this work supports the ongoing use of radio collared elk in a mark-resight modeling approach to estimate population parameters. This involves two post-hunt aerial surveys conducted in late winter when elk sightability is maximized. As of June 2013, 40 animals in the North Cascades herd had functioning radio collars. Future population monitoring requires ongoing capture and radio collaring of elk to maintain an adequate sub-population of marked animals. Beginning in 2011, biologists from WDFW and the Point Elliott Tribes began using modified collapsible Clover traps to trap and collar cow elk. Although somewhat labor intensive, live trapping avoids the need to chemically immobilize the animal and eliminates the cost and danger associated with aerial darting. A total of 10 elk were trapped from 2011 to 2013. Of these, 7 cows were outfitted with VHF radio collars, one cow outfitted with a GPS collar, and 2 young bulls were released without collars.

Population status and trends

The North Cascade elk herd steadily increased in size following successful reintroduction efforts in 1946 to an estimated peak of 1,700 animals in 1984 (WDFW 2002). Overharvest, poaching, and habitat-related impacts lead to a major population decline in the 1990s. By the late 1990s, the entire population had decreased to an estimated 425 animals. Efforts to rebuild the herd (including herd augmentations in 2003 and 2005, forest road access management, forage enhancement, and a moratorium on hunting) have contributed to population recovery and the population is approaching the current objective of 1,950 elk.

Based on 2013 survey data, the estimate for the surveyed portion of the Nooksack herd was 1007 animals (Figure 1). The estimated number of cow elk in this area was 547 (Figure 2), while the estimated number of branch antlered bulls was 266 (Figure 3). The surveyed portion of the range of the Nooksack herd includes core habitat in the Nooksack and Skagit River drainages. Peripheral areas support small numbers of elk but are not surveyed due to practical, logistical and financial considerations. Given what we know about elk numbers in these other areas we estimate that the entire herd currently consists of about 1300 animals.

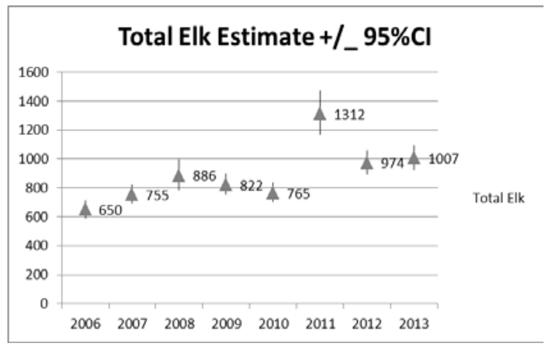

Figure 1. Post-hunt, mark-resight population estimate for surveyed portion of population of the North Cascades elk herd

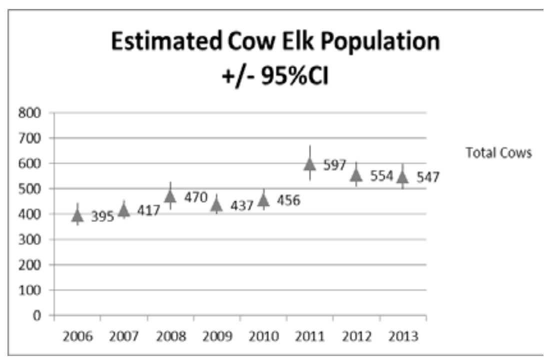

Figure 2. Post-hunt, mark-resight cow subpopulation estimate for surveyed portion of population of the North Cascades elk herd

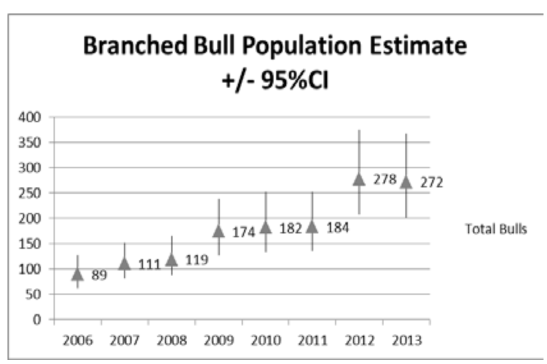

Figure 3. Post-hunt, mark-resight branch antlered bull subpopulation estimate for surveyed portion of population of the North Cascades elk herd

Estimates of bull:cow and calf:cow ratios (shown in Table 1) illustrate that this growing herd is meeting most of its population management objectives. Due to the low sightability and the small number of collared bulls (particularly branch antlered bulls), the bull:cow ratio estimates are likely to be biased low. Overall, these estimates suggest that the ongoing limited-entry bull harvest is successfully providing quality harvest opportunities without adversely affecting population growth or age stricture within the bull cohort.

Table 1. Post-hunt, 2013 ratio estimates of bulls, branch antlered bulls, and calves (all are per 100 cows) for the surveyed portion of the North Cascades elk herd

Year	Bull:Cow	BA Bull: Cow	Calf:Cow
2009	30.4	17.9	35.8
2010	23.5	17.7	25.8
2011	30.0	18.2	47.0
2012	27.3	18.7	37.1
2013	27	19	38

Recent aerial surveys and ground observations also indicate that the herd expanding into previously vacant historical range. A pattern of population expansion from the population core to peripheral areas (including agricultural lands) has occurred over the past several years.

Habitat condition and trends

Comprehensive habitat assessment using modern spatial analysis techniques remains one of the highest priorities. Location data from 15 elk that were outfitted with GPS collars between 2008 and 2009 was used to validate summer forage habitat models developed by the US Forest Service Pacific Northwest Research Station.

WDFW staff is working with Central Washington University on a project that will utilize this data set and GIS data layers from the Forest Service habitat models focusing on the North Cascades elk herd.

Beginning in 2013, tribal biologists (with assistance from WDFW) intend to outfit several cow elk with GPS collars to evaluate movement patterns and habitat utilization.

The primary objectives of these projects are to: 1) develop habitat enhancement projects to encourage herd expansion into areas with reduced potential for future elk-related agricultural conflicts; 2) develop alternatives for managing elk in agricultural environments; and, 3) address the escalating public safety issues associated with increasing numbers of elk-vehicle collisions.

Problems limiting the effectiveness of the current elk range include the loss of habitat associated with forest land conversion, residential development, mortalities from elk-vehicle collisions, and disturbance from multiple recreational uses on the land (e.g. hiking, horses, snowmobiles, and ORVs).

A cooperative project to reduce elk/vehicle collisions on highway 20 between Concrete and Sedro Woolley was initiated in 2013. Biologists from WDFW, WSDOT, Western Washington University and some of the Point Elliot Tribes are studying elk crossing behavior and investigating remedial measures. Solar powered warning signs have been installed by WSDOT in areas with histories of collisions and seem to have reduced the number of incidents. GPS enabled collars have been placed on elk in the vicinity of the highway and are providing insight into the problem.

The core management area of the North Cascade herd within the South Fork Nooksack River has gone through a series of ownership changes. In 2005, Sierra Pacific Industries purchased much of the core range. Sierra Pacific has continued to limit vehicular access on most of their road network. Other than standard timber operations and permitted elk and bear hunters, access is limited to foot traffic only. Any increase in public access would likely have a negative effect on the herd.

Elk-Related Agricultural Conflicts

Current annual spring surveys are likely inadequate for estimating the total number of elk that utilize agricultural lands throughout the year. Based on those surveys, anecdotal observations from natural resource personnel from various entities, and reports from landowners, it is likely that 300 or more elk currently utilize agricultural lands at least some portion of the year. WDFW intends to work with members of a new stakeholder group to involve landowners in developing an estimate in the agricultural landscape. Data from this effort will complement data from annual mark-resight surveys.

The majority of damage occurs in the Highway 20 corridor between Sedro-Woolley and Concrete in Skagit County and the Acme area in Whatcom County. Issuing damage permits to harvest elk in problem areas appears to reduce crop damage to some degree, but has not appreciably reduced the number of animals in the agricultural landscape. In addition to continuing to lethally remove elk using damage permits and limited master hunters, WDFW is expanding efforts to address this issue by implementing other targeted hunting opportunities. As outlined in the draft herd management plan (WDFW 2012), additional strategies for address elk-related agricultural damage include fencing, herding and hazing, and enhancing forage on forestlands away from agricultural conflict areas.

Recreational Use

An elk public viewing area, developed in cooperation with the Skagit Land Trust and Skagit County, has been established along Highway 20 west of Concrete. This site (locally referred to as Hurns Field) provides a year-round opportunity for public elk viewing. Establishing a similar site in Whatcom County has the potential to provide additional public viewing opportunities. However, it is critical that such a site be located in place that would not exacerbate or create new elk-related agricultural damage or public safety issues.

The limited-entry bull permit hunt in unit 418 was expanded for 2012 to include a total of 50 tags (26 any bull, 24 spike only) divided equally between state and tribal hunters. The allocation to state hunters was 11 modern firearm tags (5 any bull, 6 spike only), 6 muzzleloader (3 any bull, 3 spike only) and 6 archery (3 any bull, 3 spike only), and the contingency for the western Washington raffle tag and auction tag holder potentially being used in GMU 418. Few elk reside in in GMUs 407 and 448. Due to the potential for agricultural conflicts and higher residential housing densities, WFDW is managing for low elk densities in these units and offers over the counter tags for all firearm types with liberal season lengths and antler restrictions. Future elk population expansion in the eastern portion of GMU 437 will provide future hunting opportunities. Special damage control hunts will continue to be adapted to address elk-related agricultural conflicts while providing harvest opportunities – particularly for those enrolled in WDFW's master hunter program.

Management Goals

The goals for the North Cascades elk herd are to:

- Manage the North Cascades herd for a sustained yield;
- Manage elk for a variety of recreational, educational and aesthetic purposes including hunting, wildlife viewing, photography, cultural and ceremonial uses by Native Americans, and scientific study; and,
- Manage and enhance elk and their habitats to ensure healthy and productive populations.

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ELK STATUS AND TREND REPORT: REGION 4

PMU 44 – GMU 454
PMU 47 – GMU 460
PMU 48 – GMU 466, 485

CHRIS ANDERSON, District 12 Wildlife Biologist

Population objectives and guidelines

Precise population estimates for elk (*Cervus elaphus*) in Game Management Units (GMUs) 454 and 460 are unavailable. Current estimates for elk numbers in these areas are based on limited surveys and knowledge of herd and sub-herd sizes. Current numbers have been reported as 200-250 elk in GMU 454 and 400-500 elk in GMU 460 (WDFW). Elk occurring in GMU 454 are generally restricted to the eastern portions of the GMU. These areas are typically near core area elk herd refugia. This largely includes adjacent industrial timber and municipal watersheds away from the suburban growth and sprawl. However, habituated, small satellite herds do occur in suburban and rural areas of GMU 454. Population estimates for this game unit are likely low as they are based on older data. Current harvest levels (e.g. 2013 total harvest of 112 animals; Fig. 1) would indicate a plausibly larger population. This is given anecdotal elk presence observed by staff recently in comparison to overall relatively similar total annual harvest reported over a number of past years. Future surveys to update population estimates are needed as funding and survey opportunities become available.

Elk in GMU 460 are scattered throughout the potential range in small, somewhat isolated groups that normally range in size from 8-12, but occasionally approach >75 elk. The North Bend-Snoqualmie herd (Elk Area 4601) has grown to an estimated >400 animals (Upper Snoqualmie Elk Management Group, unpublished data). This data is based on repeated years of mark-recapture data; albeit small numbers of captures. That said it provides a general index of animal numbers within that portion of the valley. Occurrence varies on the extremes, with elk found from isolated wilderness areas and managed timberlands to suburban/urban populations.

The Green River elk herd in GMU 485 is a sub-population of the North Rainier Elk Herd that exhibited a decline during the 1990s. Elk historically occurred in the Green River watershed, but numbers were limited. In the early 1960s with increased timber harvest, elk populations expanded. There are no historical population estimates, but late winter, early spring numbers likely peaked at about 800-900 elk between 1988 and 1991. Elk population estimates for GMU 485 indicate a continuing increase since 2000 (Table 1) (WDFW unpubl. data 2001, Muckleshoot Indian Tribe unpubl. data 2014).

Table 1. GMU 485 Post-hunt elk herd composition, 1984-2013 (ratios per 100 cows).

Year	Total Bulls	Calves	Pop Est ± 95%
1984	9	21	
1985	10	30	
1986	13	23	
1987	10	15	
1988	19	22	
1989	18	21	
1990	27	15	
1991	30	14	
1992	20	21	
1993	22	12	
1994	20	13	
1995	13.5	10	
1996	8.4	11.5	
1997[a]	6.3	14.8	
1998[a]	27	7	
1999[a]	14.7	6.4	161 ± 27
2000[a]	22.8	9.9	147 ± 14
2001[a]	7.9	23.7	124 ± 45
2002[a]	16.1	32.3	174 ± 55
2003[a]	30.3[b]	15.2	204 ± 34
2004[a]	23	27	190 ± 25
2005[a]	27	54	265 ± 62
2006[a]	36	47	298 ± 62
2007[a]	25	43	297 ± 37
2008[a]	19	41	387 ± 103
2009[a]	26	30	408 ± 90
2010[a]	20	32	389 ± 51
2011[a]	17	30	443 ± 108
2012[a]	14	24	476 ± 152
2013[a]	18	24	548 ± 105
2014[a]	21	38	511 ± 117

[a] Flight data provided by D. Vales, Muckleshoot Indian Tribe Biologist
[b] Ratios include bulls not classified

In 1984, GMU 485 became a unique management unit where access is limited by the City of Tacoma to protect water quality and eliminate unauthorized access. That same year GMU 485 became established as a quality bull area with additional high success antlerless hunts. This continued through 1996. Harvest levels had dropped over this period and reassessment of this permit hunt occurred. It is currently a very limited quality bull hunt with high harvest success.

GMU 466, also part of the Green River watershed, consists of multiple ownerships including U.S. Forest Service lands. GMU 466 retains public access and hunting opportunities for bull elk with a 3-point minimum.

Hunting seasons and harvest trends

Management strategies vary for the different GMUs. GMU 454 has liberal seasons set for all weapon types. This is intended to maintain the population at a level that curbs damage complaints while providing for harvest and watchable wildlife opportunity where land use conflict is minimal. Harvest for years 1995-2013 in GMU 454 are presented in Fig. 1.

Hunting seasons in GMU 460 include a 3-point minimum for all weapon types. This is designed to allow the population to grow at a slow rate and for elk to expand their range. Antlerless harvest was eliminated since the 2000 season to enhance herd growth. Harvest for years 1995-2013 in GMU 460 is presented in Fig. 2.

GMU 466 continues to be included in the general season (no muzzleloader) with 1998 being the last year an antlerless elk could be taken. GMU 466 elk intermix with GMU 485 elk, and a small number of collared elk have been shown to move to winter range down the east side of the Cascades on Manastash Ridge to the L.T. Murray Wildlife Area (D. Vales, Muckleshoot Indian Tribe, pers. comm.). In part due to the bull only hunt, total elk harvest in GMU 466 dropped substantially (Fig. 3).

Tribal harvest as reported by the Northwest Indian Fisheries Commission (NWIFC) (see http://nwifc.org/publications/big-game-harvest-reports/) in GMU 466, has also added to the total elk harvest for this GMU. Some tribal harvest continues to include cows in this unit and cooperative efforts between the tribes and state are vital to increasing the future productivity of this sub-herd (Note: the Muckleshoot Indian Tribe and other tribes have closed GMU 466 to antlerless hunting since 1998).

Beginning in 1992 the Muckleshoot Tribe began exercising treaty hunting rights in the Green River Watershed. Subsequently, permit allocation changed to include the Tribe as follows: 1992 and 1993 - 15 elk (6 spike, 9 antlerless); 1994 - 31 elk (6 spike, 19 antlerless, 6 branch-antlered bulls); 1995 and 1996 - 43 elk (6 spike, 35 antlerless, 2 branch-antlered bulls). No permits were issued from 1997-2003 because of the continued population decline.

In GMU 485 the hunter success rate was initially high, averaging 91% (range 78-100%) between 1984 and 1991. Between 1992 and 1995 the success rate declined, averaging 67% (range 44-83%). The 1996 success rate of 27% was a notable exception to the past and the lowest recorded since 1984.

Currently, the Muckleshoot Tribe collects age and reproductive data as part of continuing research efforts. The tribe and Tacoma Water also contribute flight dollars for herd composition flights. Management decisions, permit levels, and allocation result from annual meetings between the State, Muckleshoot Tribe and Tacoma Water. Since 2000 herd composition surveys have shown an average bull:cow ratio of 23:100.

After 3 consecutive years of high bull:cow ratios and an increasing population trend, in consultation with the Muckleshoot Tribe, a 1 special permit any bull hunt for all citizens and 1 any bull tag for the tribe was instituted for the 2004 season by special permit. This was a successful hunt with the tribe and the state each taking one bull. Subsequent survey flights indicated no change in the bull:cow ratio and the permit allocation of 1 elk each for the tribe and the state was instituted for the 2005 season. It was further agreed that the limited hunt would be biologically acceptable and not affect the future growth of the herd, while at the same time allowing hunter opportunity; the first since 1997.

During the 2005-2009 seasons a limited entry 3 bull permit each for the state and the Muckleshoot Tribe has occurred. Since 2010, the State and Muckleshoot Tribe have increased harvest to 6 “any bull” permits each. Hunter success thus far has averaged 96% (range 83-100%). This co-management harvest level will continue in 2014.

Surveys

Currently no surveys conducted in GMU 454 and limited surveys occur in 460 because of limited funds and difficulty in surveying elk in the suburban/rural interface.

Prior to 1986 elk composition surveys for GMU 485 were primarily from the ground by foot or vehicle; standardized helicopter surveys are now the primary method.

Beginning in 1996, WDFW flights in June, July, and August were conducted to better assess calf production and to document and compare recruitment with traditional September composition surveys in GMU 485. Calf:cow ratios averaged 40:100 for June-August and declined to 26:100 by September.

Since 1997, the Muckleshoot Tribe has flown post-hunt herd composition surveys late March through mid-April. This spring survey estimates the population size and sex-age ratio based on previous year's harvest and natural mortality factors. This flight also affords a yearling calf count to provide for a measure of annual survivability.

Population status and trend analysis

Based on limited, primarily anecdotal information, the elk population in GMU 454 is very likely increasing. Landscape conversion and resulting built-natural matrix changes still provide for elk use but reduce or eliminate hunt opportunity and plausibly some natural predator pressure. A small number of elk from adjacent GMU 490 may use eastern portions of GMU 454 and southern portions of GMU 460. The elk population in GMU 460 is likely increasing slowly, with concentrated growth occurring in and around the city limits of North Bend and Snoqualmie.

In GMUs 485 and 466 there are no historic population estimates for comparison, but the long history and experience with this elk herd from field observations and sub-herd location suggests this herd declined from about 1992 to 2001. Also, the total number of elk counted during post-hunt helicopter composition flights in spring has shown a decline in the mid-to-late nineties. However, the population in GMU 485 has generally been increasing since the turn of the 21st century.

Factors that may be affecting this herd are: 1) a density dependent decline associated with landscape forestry management changes to less preferred seral forest stages. Forest structure and age, if not managed to provide for elk limiting needs, may result in less productive habitat. In turn this may reduce winter range carrying capacity resulting in elk numbers exceeding carrying capacity;. This can have a negative effect on recruitment; 2) predation may affect recruitment. GMU 485 was closed to bear and mountain lion harvest until 2000. It must be kept in mind that a combination of forestry management techniques, predator-prey interactions, as well as other factors such as seasonal range connectivity and overall forage quality affect herd population dynamics. These and other factors must continue to be considered in herd management planning at the local and landscape levels.

Calf mortality study

A calf mortality study was initiated in May of 1998 to determine the sources of elk calf mortality in GMUs 466 and 485. This was a cooperative study involving the Muckleshoot Indian Tribe, Tacoma Water, Weyerhaeuser and Plum Creek Timber Companies, the Army Corp of Engineers, and WDFW. The Muckleshoot Indian Tribe and WDFW continued with the study in 1999. The Muckleshoot Indian Tribe continued with the study through 2004.

Results suggested that predation, predominantly mountain lion, is the primary source of death to radio-equipped calves.

It has been noted that elk herds on the west side of the Cascade Mountains tend to have poor nutritional condition in general. Further research to distill differences in calf survival and both proximate and ultimate causes is necessary to understand these relationships (WDFW 2002, D.Vales, pers. comm. 2003).

Habitat condition and trend

In general, quality and quantity of typically preferred elk habitat in GMU 454 is declining, primarily as a result of habitat conversion. Elk have largely switched to use of agricultural areas, rural fringe hobby timber plantings (such as Christmas tree farms or smaller timber lots), and natural spaces often managed more so for non-consumptive human recreational use. The shift in landscape composition in 454 has created refuge for elk. Elk now utilize private lands that are generally near the borders of municipal urban growth areas and often either difficult to hunt due to no access or not able to be hunted due to management regime, local laws, and safety concerns. As a result, it is likely that the suburban-rural to exurban interface land matrix that GMU 454 encompasses provides atypical, but generally good, forage and habitat. Adaptations by elk in this landscape, both spatially and temporally, are resulting in quite healthy looking individuals with little hunt pressure and opportunity available.

Habitat trends in GMU 460 are more favorable to typical management efforts and harvest of elk; where several thousand acres of timberlands managed for wood fiber, fish, recreation, and wildlife can support an increasing elk population. There is strong community support for elk sub-herds occupying farmland, open space, parks, and conservation areas in the rural and suburban fringes of GMU 460.

The Green River Watershed (GMU 485) has interspersed ownership of private, state, and federal timberlands. Most of the timberlands are intensively managed and create a mosaic of seral stages, which means a mosaic of clearings mixed with different age stands of trees. Average rotation between successive harvests is about 60 years on private and state lands. These managed lands also contain remnant old growth forest, primarily in federal ownership, at higher elevations (> 2500 feet).

Habitat enhancement activities

Past and present work in GMU 485 has included cooperative projects with the U.S. Army Corp of Engineers, Tacoma Water, and the Muckleshoot Tribe to create open meadow grass habitat plots for elk. These mitigation measures were enacted to compensate for the anticipated loss of habitat from raising the Howard Hanson Dam and subsequent loss of habitat due to additional water storage.

In August 2000 a 250 acre forage enhancement project with the Rocky Mountain Elk Foundation, Tacoma Water, and the Bonneville Power Administration was completed. The project was highly successful and involved spraying and mowing of scotch broom along power line corridors to stimulate elk forage. The work and collaboration has continued with consecutive projects occurring through 2008. In summer of 2005, $30,000 from the combined sources of the Rocky Mountain Elk Foundation, the Muckleshoot Indian Tribe, BPA, and Tacoma Water was used to continue efforts on reducing scotch broom cover and improve forage quality. Over 550 acres have been treated mechanically and/or chemically to improve forage conditions on the range.

In addition, Tacoma Water implemented habitat improvement work and elk pasture creation to mitigate the effects of raising the water level of the Howard Hanson Reservoir. These projects, in the form of seeded fields and timber thinning, cover over 300 acres and provide valuable winter and summer forage for elk.

Wildlife damage and nuisance problems

In GMU 454, elk damage to ornamental shrubs, gardens, and pastures is a problem and numerous complaints are received every year.

In GMU 460, elk damage is a notable problem in some golf courses, Christmas tree farms, nurseries, and blueberry farms. Vehicle-elk collisions have increased as well. GMU 460 has good elk habitat, primarily on managed forestlands and the potential to support about 450-550 elk without damage concerns. However, damage complaints within the city limits of North Bend and Snoqualmie and vehicle-elk collisions on I-90 are raising concerns. As a result, the Upper Snoqualmie Valley Elk Management Group was formed in 2008. The group is made up of citizens, WDFW wildlife and enforcement division personnel, city and county staff. The primary role of the group is to address the problems associated with the rapidly increasing herd.

Further, Washington Department of Transportation has initiated monitoring and collaborative academic studies to examine vehicle-elk collisions along I-90. These are examining use of corridors and patterns related to this use.

All of these groups in GMU 460 are working together to address these concerns with human-elk conflict, while continuing to provide for the herd and recreational opportunities.

Elk in GMUs 485 and 466 have not largely been a problem to private property with little nuisance complaints received. However, continued monitoring of herd growth and opportunities to track any herd outmigration from these GMUs will be valuable as surrounding communities continue to expand and develop adjacent to core herd use areas.

Management conclusions

Elk in GMU 454 should continue to be managed with liberal seasons designed to keep damage issues at acceptable levels in developing areas. Isolated sub-herds, generally on the eastern boundary of the GMU should continue to offer hunting and recreational viewing opportunity.

Currently the most important concern in GMU 460 is to get an accurate assessment of the population size and distribution of elk. Survey information would facilitate management, habitat protection, and the setting of population objectives.

Several small sub-herds occur within and immediately adjacent to the urban boundaries of the cities of North Bend and Snoqualmie. Strong community interest suggests these elk represent a “quality of life” indicator consistent with a rural lifestyle and characterized by open space consisting of greenbelts, local parks, and conservation areas. Encounters of elk and humans along the urban interface present an opportunity for building and expanding public interest in wildlife conservation.

Management goals for the Green River sub-herd include maintaining the population at a minimum 500 elk, maintaining high bull to cow ratios and ensuring a majority of bulls reach the prime age class (5-10 years).

The GMU 485 permit hunt is one of Washington’s most popular because of the opportunity to harvest and view quality bulls coupled with the high success rates.

Cooperative efforts between Tacoma Water, the Muckleshoot Tribe, and WDFW will continue to assess herd composition and population numbers while enhancing habitat in order to achieve population objectives and improve forage conditions in GMU 485.

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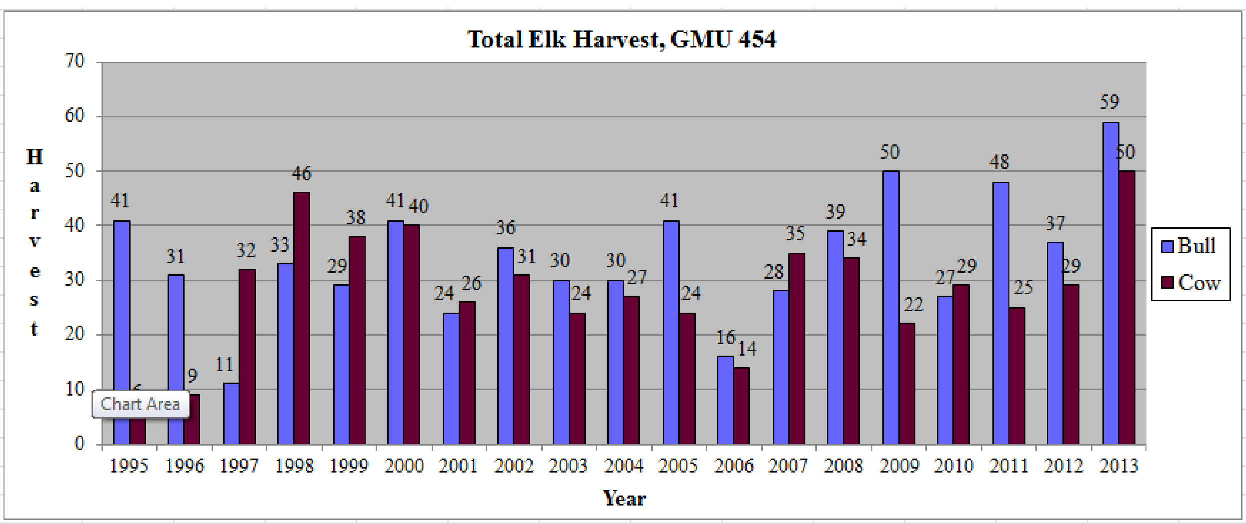

Figure 1. **Annual elk harvest, GMU 454, 1995-2013 (all weapon types combined)**

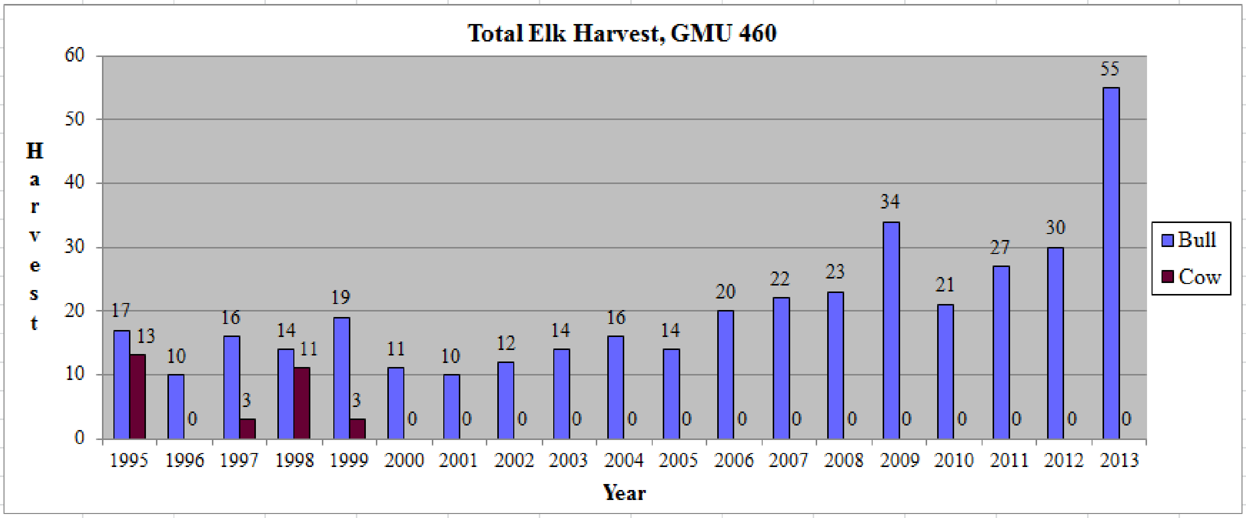

Figure 2. Annual elk harvest, GMU 460, 1995-2013 (all weapon types combined)

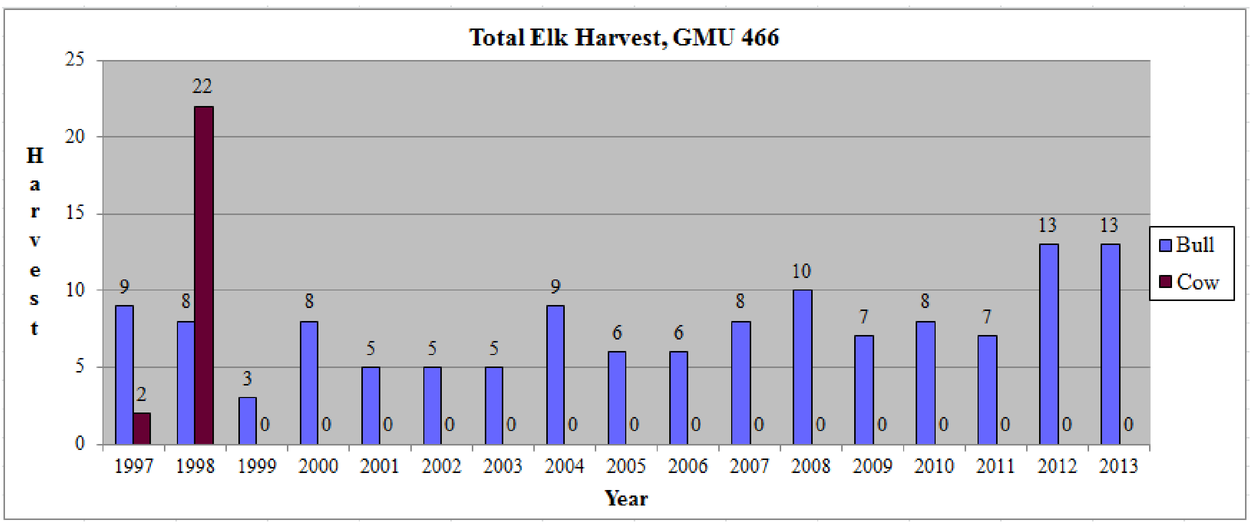

Figure 3. Annual elk harvest, GMU 466, 1997-2013 (all weapon types combined)
*2004 harvest reflects uncorrected raw data reported from hunter reports

ELK STATUS AND TREND REPORT: REGION 5
PMUs All, GMUs All

STEFANIE BERGH, Wildlife Biologist
ERIC HOLMAN, District Wildlife Biologist

Population Objectives/Guidelines
Region 5 contains all or part of three elk herds. The largest in the Region and the state is the Mount Saint Helens (MSH) herd followed by the Willapa Hills herd, and the South Rainier elk herd. Management plans for two of the herds, MSH and South Rainier have been written to date, and the Willapa Hills herd plan is scheduled for completion in fall 2014. The Game Management Units (GMUs) comprising each herd are listed in Table 1.

Table 1. Region 5 elk herds and associated GMUs

Herd	GMUs
Mount Saint Helens	578, 388, 564, 568, 574, 522, 524, 554, 556, 560, 572, 505, 520, 550, 503
South Rainier	510, 513, 516, 667
Willapa Hills	506, 530, 501, 504, 684, 681, 673, 658, 672, 660, 663

The MSH elk herd plan was adopted in November of 2006. Many factors, which include increased human population and development, damage complaints, and declining habitat on United States Forest Service (USFS) and other timberlands, suggest a reduction of elk is needed to bring the herd into balance with the amount of available habitat (WDFW 2006). Other objectives specified in the MSH elk herd plan are to continue post-season bull ratio and mortality rate goals for open-entry, three-point, and permit-entry units that are consistent with State goals (WDFW 2008). The plan also outlines objectives to continue efforts to monitor and improve winter habitat and wintering elk populations in the Toutle River valley. In addition, plan goals address minimizing damage conflicts, increasing public appreciation of the elk resource, and using the best available science to monitor the herd.

The South Rainier elk herd plan was adopted in 2002 and is on a list of plans to be reviewed. Specific goals of the South Rainier herd plan are to increase the estimated elk population in the eastern half of the herd's range in keeping with habitat limitations and landowner tolerances, to minimize elk damage to private property, to encourage/maintain the current habitat availability on USFS lands, and to maintain current elk winter range. Other goals include managing the herd with the best available science and developing private/public partnerships to improve habitat and management of elk in the South Rainier herd.

The herd plan for the Willapa Hills is being developed jointly with WDFW Region 6 and the management strategies will follow the same general goals as the other two herd plans and the Game Management Plan. Some of the main goals of the plan include: implement a standardized and statistically valid survey protocol that will generate reliable estimates or indices of population size and herd composition; keep the Willapa Hills elk herd at its current level by maintaining harvest levels during general hunting seasons; continue to strive to mitigate elk damage and minimize the number of elk damage complaints; work cooperatively with timber companies to maintain hunter access; increase public awareness of the elk resource by creating an informative brochure on elk viewing; cooperate and collaborate with Treaty Tribes to implement the Plan; and coordinate season setting and herd management in traditional hunting areas.

General Hunting Seasons and Harvest Trends
In 2013, elk were managed under four principal harvest strategies in Region 5. From year to year, these strategies and/or what GMUs are in each of the categories can be modified to promote healthy elk populations and restrict elk numbers if needed where they are not tolerated by the public, while offering a variety of hunting opportunities. These strategies are summarized for the modern firearm general season in Table 2. General hunting seasons for archers and those choosing to hunt with muzzleloading firearms may differ from the listed strategies.

Table 2. Summary of modern firearm general season harvest strategies in Region 5.

Antler Restriction	GMU (s)
3 pt. min.	503 , 505, 506, 510, 513, 516, 520, 530, 550, 560, 568, 572, 574, 578
3 pt. min. or antlerless	501, 504
Any elk	564, 388, 382
Permit only (limited entry, permit draw)	522, 524, 556

In Region 5, a total of 24,230 general season elk hunters spent 134,140 days afield in 2013 (Figure 1).

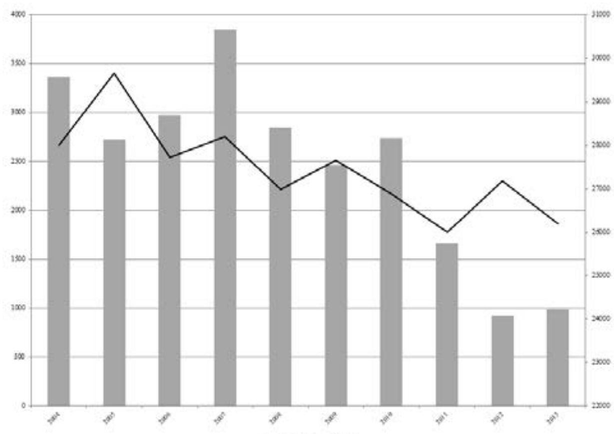

Figure 1: General season harvest and hunter numbers for all user groups from 2004-2013.

Region 5 general season harvest was 1,866 elk and is broken down by user group as follows: 506/27% in archery, 273/15% in muzzleloader and 1,016/54% in the modern firearm season; the other 71 elk were killed by multi-season permit holders. Overall, hunter success during the general season was 7.7%, which is below the 10 year average of 8.8%. The 2013 general season elk harvest of 1,866 was down 23% from the most current 10 year average (2004-2013) and is down 19% from the 2012 harvest. Table 3 lists a summary of the 2013 general season elk harvest in all Region 5 GMUs.

Table 3. Summary of general season elk harvest, all weapons combined, for 2013 in Region 5.

GMU	Antlerless Harvest	Antlered Harvest	Total Harvest
382	0	0	0
388	2	1	3
501	27	18	45
503	28	22	50
504	28	12	50
505	30	45	75
506	50	195	245
510	0	15	15
513	0	48	48
516	0	57	57
520	70	207	277
524	0	0	0
530	45	200	245
550	13	208	221
554	3	17	20
556	0	0	0
560	46	219	265
564	38	25	63
568	1	30	31
572	2	23	25
578	7	45	52
TOTAL	403	1463	1866

Permit Hunting Seasons and Harvest Trends

Harvest of elk by permit in Region 5 is designed to provide opportunities for quality bull harvest, seniors and youth, and different weapon types. The harvest of antlerless elk in Region 5 is primarily allowed by permit and some of these permits were issued in designated elk areas and are designed to help minimize damage being caused by elk. Additionally, the opportunity to hunt bull elk is on a permit-only basis in GMUs 522, 524, and 556. Beginning in 2007, permit levels increased for modern firearm, muzzleloader, and archery (both bull and antlerless permits) throughout the Region. This was mainly as a result of increased antlerless permits within the MSH herd GMUs to achieve the herd reduction goal. In 2013, these permit levels leveled out and/or decreased in parts of the Region.

A total of 3,171 special permits were distributed within 95 hunts in the Region for the 2013 season. Of this total number of permits, 2,765 were antlerless only permits (805 fewer permits than in 2012). The total permit harvest in 2013 for the Region was 969.

Table 4 and Figure 2 depict the number of antlerless only elk permits and antlerless harvest for all user groups combined in Region 5 during 2013. Please note some of the antlerless harvest in the table below is made up of antlerless animals that were taken on a 3pt min/antlerless permit and both GMU and Elk Area permits are included.

Table 4. Antlerless only permit levels and antlerless harvest for all user groups combined for 2013 in Region 5.

GMU	Antlerless Permits	Antlerless Harvest
504	75	7
505	68	14
506	50	31
520	630	160
522	61	11
524	300	87
530	212	93
550	410	150
554	75	15
556	360	147
560	120	34
568	85	15
572	35	13
574	100	19
578	184	29
TOTAL	2765	825

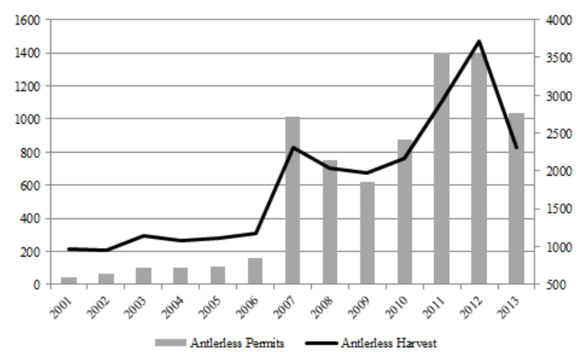

Figure 2: Region 5 antlerless elk harvest and permit numbers 2001-2013

Three GMUs (522, 524, 556) within Region 5 are permit-entry only units for all elk hunting. All of these GMUs are within the MSH herd. The status of these units as permit-entry only for bull harvest is unique within Region 5 and was implemented due to the negative impacts on habitat and loss of elk after the eruption of Mt. St. Helens. Bull permits in these units have slowly increased over time and now include all user groups (modern firearm, archery, and muzzleloader) (Table 5).

Table 5. Bull permit levels and associated harvest for all weapons combined in permit entry only GMUs in Region 5.

GMU	Number of Bull Elk Permits	Bull Elk Harvest	Success Rate
522	30	12	40%
524	148	58	39%
556	189	51	27%

Surveys

A research project in the Region to develop a more robust method of population estimation has been completed (McCorquodale et al. 2014). Using the Sightability based method of population estimation, a site specific model was developed during this research. Portions of selected GMUs in both the Mt. St. Helens and Willapa Hills herd areas were surveyed in the spring of 2014. The resulting population estimates for these surveyed areas are presented in Population Status and Trend below.

In addition to the surveys discussed above, an annual winter elk mortality survey is conducted on the Mount St. Helens Wildlife Area in the spring. Additionally, once a month throughout the winter, elk counts are performed from a fixed point overlooking the Wildlife Area to determine elk use and winter severity. Figure 3 shows the winter elk mortality for the past 15 years and the peak winter elk counts for the past eight years on the mudflow portion of the Wildlife Area. The number of mortalities (40) found in the 2014 survey was exactly average based on surveys since 1999. Winter conditions this year were not particularly harsh and there were never large groups of elk concentrated on the Wildlife Area.

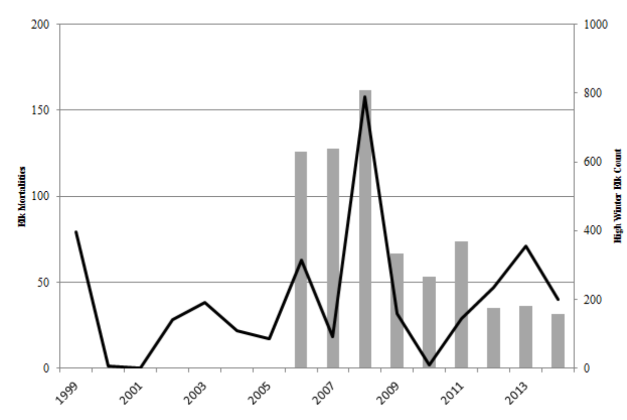

Figure 3: Elk mortality and high elk counts on the mudflow portion of the Mt. St. Helens Wildlife Area 1999-2014.

Population Status and Trend

In the past, several sources of information were used to assess elk herd size and composition. Most of these data came from harvest reports and annual aerial surveys. For 15 years (ending in 2007) estimates of size and composition of Region 5 elk herds were derived using a method known as the *Sex-Age-Kill* (SAK) model (Bender and Spencer 1999). The SAK model used fall aerial survey data to estimate components of the elk population (bulls, cows, and juveniles). Unfortunately, through time, this method did not perform adequately to meet Region 5's need for reliable information. This was mostly due to assumptions inherent to the method that were unrealistic. In the years following discontinuation of the use of the SAK model, different methods and levels of population monitoring attention have been applied to different segments of the regional elk population. These are discussed below.

Mount St. Helens Herd

Because of the need for essential information about the size, composition, and dynamics of the MSH elk herd, in 2007 Region 5 began planning for a new population monitoring strategy. This strategy was implemented in 2009 in a cooperative venture of the Olympia Deer and Elk Section and Region 5 staff biologists. In support of the development of a new monitoring strategy and with the intent to produce more reliable estimates promptly, WDFW biologists radiomarked elk in the winters of 2009-2012 across a northwestern core area of the MSH elk herd (GMUs 520, 522, 524, 550, and 556). In March and April 2009-2012 project staff conducted 2 weeks of intensive aerial surveys across the 5-GMU study area (in 2013 and 2014, only one survey period was conducted). These resighting flights were used to generate statistically robust estimates of elk numbers in the survey area using mark-resight models. The data collected was also used to derive sightability-correction models for aerial surveys of the MSH elk herd. The data collection phase of this effort was completed in the spring of 2013 and the analysis was completed in 2014 (McCorquodale et al. 2014) . The mark-resight method was found to be more effective at accounting for undetected elk while the sightability model appeared to underestimate true abundance. The trend estimates were found to be similar and the yearly estimates highly correlated, so the sightability model was seen as useful despite its underestimation. The sightability model is also more cost effective since no marked animals are required and only one flight repetition per spring is needed. Estimates of elk abundance during this period indicate approximately a 30% decline in the overall population within the core study area. For a detailed discussion of elk population trends in the core GMUs of the MSH herd area, see McCorquodale et al. 2014. During these years of work in the core GMUs, no population monitoring occurred in the southern or eastern portion of the MSH herd area.

In 2014, post-season surveys were conducted in the core GMUs and the sightability model was used to estimate abundance while composition was also calculated. This effort resulted in a total elk population estimate of 2,368 (2219-2678 95% CI) for this portion of the MSH herd (GMUs 520, 522, 524, 550, and 556). It is anticipated that this method will continue to be used in the core area of the MSH herd to monitor the population on an ongoing basis.

The post-season surveys conducted in selected GMUs within the Mt. St. Helens and Willapa Hills herd areas provide an evaluation of current elk management strategies in meeting the sex ratio goals outlined in the Game Management Plan (GMP) (WDFW 2008). Specifically, the GMP calls for post-season bull to cow ratios of 12-20 bulls per 100 cows, and 2-10% mature bulls within the bull segment of the population. Table 7 shows the post-season sex and age ratios for the selected GMUs within the MSH herd area during surveys conducted in the spring of 2014. The unusually high bull to cow ratios reflect the combined effects of extremently limited hunting opportunity in GMU 522, permit-only bull elk hunting in GMU 524, and the liberal allotment of antlerless elk tags among many of the St. Helens area GMUs in recent year. The survey results indicate that current management strategies are exceeding the minimum post-season goal of 12-20 bulls per 100 cows. The calf to cow ratios withing the survey portion of the MSH herd area are typical for elk in Western Washington and Oregon.

Table 7: Sightability model corrected sex, and age ratios for 2014 post-season elk flights, Region 5.

Herd	GMU	Bull:Cow	Calf:Cow
Mt. St. Helens	520	47:100	29:100
	522	54:100	27:100
	524	290:100	53:100
	550	28:100	40:100
	556	24:100	33:100
Willapa Hills	506	15:100	38:100
	530	17:100	38:100

Willapa Hills Herd

Since habitat, land management, and elk behavior in the Willapa Hills and MSH herds are similar, the sightability model developed for the MSH herd was used in the Willapa Hills herd in 2014. Post-season surveys were conducted in GMUs 506 (Willapa Hills) and 530 (Ryderwood) using the same protocol developed in the MSH herd. The same WDFW staff conducted both MSH and Willapa Hills surveys lending some consistency to the evaluation of the sightability model's use in Willapa Hills.

This effort resulted in a total elk population estimate of 1,538 (1,413-1,844 95% CI) for GMU 530 (Ryderwood) and GMU 506 (Willapa Hills) combined. In 2015, it is anticipated that post-season surveys will be conducted in the other GMUs (mainly 658, 673, 681) that make-up the Willapa Hills herd. A subsequent rotation of survey effort among the GMUs comprising the Willapa Hills will be implemented.

Composition information resulting from the 2014 survey is included in Table 7. Survey results in the two surveyed Willapa GMUs indicate that current management strategies are meeting the post-season bull to cow objectives. Again, the calf to cow ratios withing these two GMUs are typical for elk in Western Washington and Oregon.

South Rainier Herd

The Puyallup Tribe of Indians developed a sightability model for estimating elk abundance (Gilbert and Moeller 2008). To facilitate development of the model, the Tribe used radio-marked cow elk that were collared as part of research being conducted by the Tribe. Estimates of elk numbers in the areas surveyed are based on spring helicopter surveys, where the data collected is entered into the computer model. The measure of the visibility bias or correction factor is then used to adjust raw counts of animals observed to an unbiased estimate of population size and structure. It should be noted that WDFW did not participate in developing or reviewing this model or analyzing the data collected during survey efforts. The information provided by the Puyallup Tribe provides estimates for wintering elk in the upper Cowlitz River basin within portions of GMUs 513, 516, 510, and 503 and is presented in Table 8.

Table 8. Spring population estimates for elk in portions of GMUs 513, 516, 510, and 503, Puyallup Tribe of Indians, 2006-2014.

Year	Population Estimate
2006	938
2007	964
2008	815
2009	1084
2010	1282
2011	1618
2012	1495
2013	1562
2014	1430

Habitat Condition and Trend

Region 5 continues to face loss of elk habitat through: (1) establishment of extensive Late Successional Reserves (LSR) on USFS lands that reduce forage habitat, (2) increased residential development along the three hydroelectric reservoirs (Merwin, Swift, and Yale Reservoirs), (3) intensive forest management that limits forage production on industrial forest land, and (4) general increases in development and human encroachment throughout the lowlands of Region 5, which can result in a lower tolerance by landowners to the presence of elk.

Some mitigation for the loss of winter range along the North Fork Lewis River watershed has been addressed in the Lewis River Wildlife Habitat Management Plan (Pacificorps Energy 2008). The Plan is a cooperative management agreement between Pacificorps, the utility company managing Merwin, Swift, and Yale Reservoirs; the Rocky Mountain Elk Foundation (RMEF); the Cowlitz Tribe of Indians; the USFS; the surrounding Counties; and WDFW. The plan is currently in year 5 of 50 and emphasizes elk as a primary species. These mitigation efforts benefit the southern portion of the MSH elk herd.

Many of the management issues for the northern part of the MSH elk herd stem from the natural and management-induced changes on the landscape since the 1980 eruption of Mount St. Helens. During the early post-eruption phase, the recovering landscape was dominated by early seral habitats. Such habitat provided excellent foraging opportunities for elk. However, as much of the affected landscape is industrial timberland, the forest landowners undertook a massive reforestation effort to restore the timber assets they lost in 1980. In the 3 decades since, these second-growth forests have grown up and the canopy has closed, reducing the amount of quality elk foraging habitat. Renewed logging has created a current mosaic of clear cuts, relatively open young regeneration stands, and low forage-potential closed canopy forests. Post-logging treatments on industrial timberland (*i.e*., herbicide application) often reduce/delay the forage values produced by logging for the first 2-3 years relative to what would naturally occur (*e.g*., what occurred on the early post-eruption landscape) (Geary et al. 2012). Limited timber harvest on federal forests in the last two decades has led to a generally declining trend in habitat quality for elk, and a large tract of federal land within the Mount St. Helens Monument has retained its dramatically altered character near the volcano (*i.e*., is generally poor elk habitat).

Two of the biggest factors affecting the habitat of the South Rainier herd are the extensive development of LSRs within the Gifford Pinchot National Forest and the continual development of the herd's winter range along the Cowlitz River Valley. Elk numbers remain too high in the valley for public tolerance; however it is the prime winter range for the herd.

Commercial forest owners in two Willapa Hills units (530 and 506) have increased timber harvest activity in the past 5 years; much more acreage is now in early successional stages.

Habitat Enhancement
Mount. St. Helens Herd

The WDFW continues to take steps to enhance forage quality on the North Toutle mudflow through plantings and fertilization on the Mt. St. Helens Wildlife Area. Lime and/or fertilizer treatments were applied to over 160 acres to maintain and enhance forage production. Portions of these sites were also harrowed to break up and control moss and thatch that can inhibit the growth of forage plants. All of the enhancement sites that were rehabilitated over the past several years are beginning to make significant contributions to the forage base. WDFW will continue to collect clip plot samples to monitor and compare productivity between sites.

WDFW mowed Wildlife Area pastures in the Hoffstadt Unit to maintain plant vigor and palatability until the winter period and sprayed the perimeter of the pastures to control non-native blackberries that were encroaching into the openings. Approximately 5,000 trees were planted in the upland areas and riverbank of the North Fork Toutle River to help reduce bank erosion and reestablish tree cover in areas where scotch broom had been removed. Scotch broom control efforts included hand spraying individual plants on approximately 250 acres. WDFW staff also surveyed and treated all yellow and mouse-ear hawkweed encountered on approximately 800 acres of the Mudflow Unit of the Wildlife Area.

Elk forage enhancements are a primary focus of the mitigation efforts relative to the North Fork Lewis River discussed earlier. Activities on the mitigation lands managed by Pacificorps include forest canopy removal, fertilization, establishment of forage plots, treatment of invasive plants, maintenance of farmlands and meadows for elk habitat, and creation of meadows and openings within the forested landscape. These activities are conducted on approximately 13,000 acres surrounding the reservoirs.

Habitat improvements have also occurred on the federally managed lands in the Siouxon and Lewis River GMUs within the MSH elk herd area. These projects have primarily consisted of thinning forest stands to foster development of older-age forests with a robust understory component. The projects have totaled several hundred acres in the past several years and have been completed in a cooperative arrangement between the USFS, RMEF, and WDFW.

South Rainier Herd

Past and present work in GMUs 513 and 516 has included cooperative projects between the USFS (Gifford Pinchot), the Puyallup Tribe of Indians, and the RMEF to pre-commercially thin summer and winter range areas to improve forage for the South Rainier elk herd. Since 2004, more than 1,478 acres of wide-spaced thinning projects have been completed on both summer and winter range areas. In 2013-2014, 900 acres on the Gifford Pinchot National Forest were thinned, 100 acres were wide-spaced thinned, and 26 of those acres had slash piling. Funding has been provided via U.S. Fish and Wildlife Service Tribal Wildlife Grants, the Puyallup Tribe of Indians, RMEF, and the USFS. These projects have and will continue to provide valuable winter and summer forage for elk.

Wildlife Damage

Complaints of damage to crops continue. These complaints come from all over Region 5. Crop damage complaints are concentrated in the valleys; the historical winter range areas for elk within the Region. To mitigate the loss of agricultural products in these high damage areas, regional biologists, conflict specialists, and WDFW law enforcement have created special late and early season damage hunts within specified elk areas as well as implemented a pool of Master Hunters for Region-wide response to damage. These hunts are designed to decrease the herd causing the damage and to haze elk from the area. Additionally, non-lethal means of discouraging elk use of these areas are employed. These methods include fencing, noisemakers, hazing, scarecrow-like devices, etc.

Unfortunately, the elk causing the most damage are located in areas where access for hunting is limited. As long as high quality forage exists within areas with limited hunting access, damage will continue.

Disease

Since 2008, WDFW has received increasing reports of elk with misshapen hooves in Cowlitz, Pacific, Lewis, Clark, Wahkiakum and Grays Harbor counties, all within the range of the Willapa and Mt. St. Helens elk herds.

Reports have been increasing in number and geographic scope, and hunters are regularly seeing and sometimes harvesting an elk with this condition. It has been noted in both males and females, old as well as very young animals, and in any hoof.

The Technical Advisory Group working on the disease diagnostic effort came to consensus that the disease is most consistent with an infectious bacterial hoof disease that leaves elk with missing or misshapen hooves and that the disease shares many features and most resembles treponeme-associated contagious ovine digital dermatitis (CODD) in sheep. In addition, environmental factors, including wet conditions, are likely important in disease initiation and propagation. These bacteria (Treponema sp.) have been linked to an increase of hoof disease in sheep and cattle in many parts of the world, but have never before been documented in elk or other wildlife. There is no reason to believe that elk hoof disease is contagious to humans and similar diseases in livestock do not affect humans. Thousands of elk have been harvested in southwest Washington since the disease first appeared and WDFW is not aware of any cases of human disease that have been associated with hoof disease in elk.

Microscopic examination of tissues, including meat, from elk affected by hoof disease has not revealed evidence of infection, inflammation, or any other indication that the meat is unsuitable for human consumption. In all animals inspected to date, the disease has been limited to the hooves, and the meat has been normal. Domestic animals that are severely affected by hoof disease are commonly slaughtered, and hoof disease in domestic animals does not cause federal meat inspectors to condemn the meat as unsuitable for human food.

In August 2014 the Washington Fish and Wildlife Commission adopted a rule intended to minimize the spread of the disease. This regulation requires hunters to leave the hooves of any elk taken in the affected area on site.

The Department also developed a webpage for elk hoof disease that includes a reporting tool and included information in the 2013-2014 and 2014-2015 big game hunting pamphlets.

Surveys to estimate prevalence and distribution are being developed. These will begin in fall 2014 and use volunteers and public observations. A study to determine the effects of the disease on population parameters such as survival and reproduction is also being developed and is scheduled to start in early 2015. Disease management tools such as animal density reduction, selective removal, and fencing to reduce transmission are all being considered.

Research Projects

In the past, overwinter elk mortality has been an issue of high public interest. Public attention has focused on the very visible Toutle River mudflow, particularly on the WDFW managed Mount St. Helens Wildlife Area. Periodic pulses of overwinter elk mortality have occurred here and have always generated intense media interest.

The effort to research population monitoring protocols within the MSH herd area also yielded insights into and estimates of annual elk mortality from the fate of radiocollared elk (McCorquodale et al. 2014). The best fit model of bull survival found it to be constant across all years of the study at 0.56 (95% CI = 0.43-0.68). Annual cow survival was estimated to be 0.85 (95% CI = 0.78-0.91) during 2009-2011 in GMUs 520, 522, 524, and 556. During the same years, cow survival was much lower in GMU 550 at 0.64 (95% CI = 0.48-0.78). Cow survival in the final year (2012-2013) was estimated to be 0.52 (95% CI = 0.38-0.65) across all of the GMUs. Low survival of these radiomarked elk in the final year of the study also paralleled a high number of unmarked, winter-killed elk tallied during the annual mortality survey on the mudflow (Figure 3). These resuts suggest that the winter mortality survey on the St. Helens Wildlife Area may likely serve as an indicator of the severity of winter conditions across a broader area.

During the captures of elk for radio collaring in 2009-2012, data were collected on elk age, reproductive status, and physical condition (fat level). These data are valuable for assessing animal "*performance*", which provides a basis for inference about the quality of habitat that these elk are occupying. Using ultrasound examination and body condition scoring, the estimated mean ingesta free body fat (IFBF) was 5.64% for non-lactaters and 3.26% for lactaters, which suggests food limitation. Of the 109 cow elk captured, 73 (67%) were found to be pregnant. Pregnant elk had higher IFBF scores than non-pregnant elk.

Another aspect of the body condition data collected from the MSH elk herd took place from 2009-2012. Antlerless elk permit holders in the MSH herd area were sent informational packets soliciting submittal of biological samples from their harvested cow elk. Requested samples included the heart (with pericardium), kidneys, incisors, reproductive tracts, and the animals' lactation status. Body condition in elk can be evaluated by the amount of fat surrounding the heart and kidneys (Kistner et al. 1980). This type of data collection over a broad geographic area is key to understanding the condition of this herd (Cook et al. 2013). WDFW received organ samples from 364 hunter-harvested cow elk to estimate fall IFBF for elk in the MSH herd. Geographic area and lactation status both had an effect on IFBF, but year and cow age did not. IFBF was higher for cow elk harvested in GMU 560 and Columbia Gorge GMUs than from the core 5-GMU study area (520, 522, 524, 550 and 556). Mean fall IFBF was estimated at 12.51% for non-lactaters and 10.84% for lactaters, controlling for other factors (McCorquodale et al. 2014). Together these evaluations of body condition indicate that elk in the western portion of the MSH herd area were in less than ideal condition during the years encompassing these efforts. Future evaluations of body condition for elk in these areas would shed light on whether the reduction in population leads to an improvement in animal condition.

In the South Rainier elk herd area and specifically within Mt. Rainier National Park, a cooperative effort lead by the U.S. Geological Survey (USGS), and partnering with Mt. Rainier National Park, WDFW, Muckleshoot Tribe of Indians, and the Puyallup Tribe of Indians began in 2008 and is aimed at producing a better estimate of elk in the Park in the fall months. Fall surveys are flown within the southern and northern portions of the Park, with each partnering entity contributing one flight. A hybrid double-observer and sightability model is being used to adjust raw counts and compositional data in order to develop a robust population estimate of elk within the sub-alpine zone of the Park. This is part of a larger effort focusing on both the North and South Rainier elk herds within the Park. A report on this study is currently under review for publication.

The Puyallup Tribe of Indians began a study in 2013 to assess prey selection by cougars (*Puma concolor*) in the range of the South Rainier herd. Information from the Tribe states that they will use data from radio-collared cougars to estimate prey composition, age and sex classes of prey, predation rates, and habitat attributes at kill sites.

Management Conclusions

In the past, survey coverage has been inadequate to provide representative sampling of most parts of the Region, but a new survey effort in the Willapa Hills herd and continuing efforts in the MSH and South Rainier herds has helped inform management decisions. The general season elk harvest and success in the Region have both been on the decline since peaking in 2007. The population reduction goal outlined in the MSH elk herd plan has been achieved and the herd is being managed to acheive stabilization. Continued monitoring efforts within this herd should provide a useful estimate of the population.

Significant efforts will continue in order to understand the cause, prevalence, distribution, population affect, and the management implications for the Region's elk affected with hoof disease.

The South Rainier elk herd plan is slated to be revised and the Willapa Hills plan will be finalized by the end of 2014; the new goals presented in those plans will guide the future management.

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ELK STATUS AND TREND REPORT: REGION 6

PMU 61–GMUS 658, 660, 663, 672, 673, 681, 684, 699
PMU 62–GMUS 652, 666, 667
PMU 63–GMUS 642, 648, 651
PMU 64–GMUS 621, 624, 627, 633
PMU 65–GMUS 607, 615, 618, 636, 638
PMU 66–GMUS 601, 602, 603, 612
PMU 67–GMUS 653, 654

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Population Objectives and Guidelines

In general, the Department manages elk (*Cervus elaphus spp*.) with the primary goal of promoting viable and productive elk populations. Secondary management goals include maximizing hunter opportunity while also providing for a variety of other recreational, aesthetic, and educational purposes. General guidelines outlined in the Department's Game Management Plan (WDFW 2008) that direct management decisions to ensure these goals are met include:

1. Maintaining populations with a pre-hunt bull:cow ratio of 15–35:100.
2. Maintaining populations with a post-hunt bull:cow ratio of 12–20:100.
3. Maintaining total bull mortality rate of less than or equal to 50%.

The Department has developed management plans that outline objectives and strategies to address management issues specific to each of Washington's 10 elk herds. Region 6 contains all or portions of four elk herds; the Olympic herd, Willapa Hills herd, South Rainier herd, and North Rainier herd (Table 1). Specific population objectives and guidelines for each Population Management Unit (PMU) vary in accordance with the associated herd plan. Each plan is available for review and can be accessed through the Department's website.

There are 13 Treaty Tribes in Region 6 that reserve off-reservation hunting rights, and every PMU in Region 6 contains at least one Game Management Unit (GMU) with off-reservation hunting. Thus, effective management of elk herds in Region 6 is, in most instances, a cooperative effort between the Department and Treaty Tribes that have a vested interest in a particular herd. In several GMUs, Treaty Tribes have taken the lead in collecting information that is being used to better manage local elk herds (e.g., survey data, population estimates, research, etc.). In their commitment to a cooperative management approach they have shared that information with the Department, some of which has been provided in this report. Credit is given accordingly when that information is presented.

Table 1. The elk herd with which each Region 6 Population (PMU) and Game (GMU) Management Unit is associated.

Herd	PMUs	GMUs*
Olympic	63	642, 648, 651
	64	621, 624, 627, 633
	65	607, 615, 618, 636, 638
	66	601, 602, 603, 612
Willapa Hills	61	658, 660, 663, 672, 673, 681, 684, 699
North Rainier	62	652
	67	653, 654
South Rainer	62	667

*GMU 666 is not listed because it is not identified as part of the elk herd area in any of the four elk herd plans.

Hunting Seasons and Harvest Trends

The Department implements a variety of harvest strategies to achieve its management goals for elk in Region 6 (Table 2). When (season timing and length) and where (GMU and/or Elk Area) these strategies are implemented depends on the population objectives for a specific area. For example, permit opportunities for antlerless elk are primarily restricted to agricultural areas that have experienced chronic elk damage and the objective is to limit elk numbers in a localized area.

Table 2. Game Management Units (GMUs) in Region 6 that were open during the 2013 general modern firearm, archery, and muzzleloader seasons. Also included are the associated bag limits.

Season	Bag Limit	GMUs
Modern Firearm	Any elk	666
	3 pt. min	601, 602, 603, 607, 612, 615, 618, 624, 627, 633, 638, 642, 648, 651, 652, 654, 658, 660, 663, 667, 672, 673, 681, 684
Early Archery	Any elk	652, 666
	3 pt. min or antlerless	624, 654, 660, 667, 672, 673, 681, 684, 699
	3 pt. min	601, 602, 603, 607, 612, 615, 618, 627, 633, 638, 642, 648, 651, 658, 663
Late Archery	Any elk	666
	3 pt. min or antlerless	667, 672, 681, 699
	3 pt. min	603, 612, 615, 638, 648
Early Muzzleloader	Any elk	666, 684
	3 pt. min or antlerless	652, 654, 667
	3 pt. min	602, 603, 607, 627, 633, 638, 642, 660, 663, 672
Late Muzzleloader	Any elk	666, 684
	3 pt. min or antlerless	652
	3 pt. min	601, 618, 658, 667

PMU 61(GMUs 658, 660, 663, 672, 673, 681, 684, 699)

An estimated 432 bulls and 183 antlerless elk were harvested in PMU 61 during the 2013 season. Compared to the 2012 season, bull harvest was unchanged (431 bulls in 2012), while antlerless harvest decreased by 16% (217 antlerless elk in 2012). Trends in total harvest have been relatively stable since 2001 (Figure 1).

There were 4,730 hunters who participated during the general modern firearm, archery, and muzzleloader seasons combined and spent a total of 26,352 days pursuing elk in PMU 61 during the 2013 season. The number of modern firearm and muzzleloader hunters has been relatively stable since 2006, while the number of archery hunters has slightly increased (Figure 1).

Since 2001, hunters participating during the general modern firearm and archery seasons have accounted for the majority of elk harvested in PMU 61 (Figure 1). In 2013, modern firearm hunters accounted for 43% of the total harvest while archery hunters accounted for 36%.

Hunter success rates were 11%, 12%, and 14% during the 2013 general modern firearm, archery, and muzzleloader seasons, respectively. Archery hunters have historically experienced the greatest success among general season user groups, but hunter success during the muzzleloader season has been similar to success during the archery season the past two years (Figure 1). Catch-per-unit effort (CPUE) during the general modern firearm season has been trending upwards since 2006 (Figure 1).

PMU 62 (GMU 652)

An estimated 133 bulls and 133 antlerless elk were harvested in PMU 62 during the 2013 season. Compared to the 2012 season, bull harvest declined by 16% (159 bulls in 2012), while antlerless harvest increased by 10% (121 antlerless elk in 2012). Total harvest has been trending upward since 2001 (Figure 2).

There were 2,128 hunters who participated during the general modern firearm, archery, and muzzleloader seasons combined and spent a total of 11,426 days pursuing elk in PMU 62 during the 2013 season. Similar to total harvest, hunter numbers during each general season have been trending upward since the early 2000s (Figure 2).

Since 2001, hunters participating during the general muzzleloader seasons have typically accounted for the greatest proportion of elk harvested in PMU 62 (Figure 2). In 2013, muzzleloader, modern firearm, and archery hunters accounted for 42%, 23%, and 22% of the total harvest, respectively.

Hunter success rates were 10%, 8%, and 15% during the 2013 general modern firearm, archery, and muzzleloader seasons, respectively. Hunters participating during the general muzzleloader season have historically experienced the greatest success among general season user groups (Figure 2). CPUE during general modern firearm and muzzleloader seasons has been trending upward since 2008 (Figure 2).

PMU 63 (GMUs 642, 648, 651)

An estimated 66 bulls and 12 antlerless elk were harvested in PMU 63 during the 2013 season. Compared to the 2012 season, bull harvest declined by 4% (69 bulls in 2012) while antlerless harvest increased by 9% (11 antlerless elk in 2012). Following a peak in harvest during the 2008 season, total harvest declined sharply in 2009 and has continued to decline (Figure 3). However, general season antlerless opportunities were discontinued in 2012 and general season bull harvest has been stable since 2010 (Figure 3).

There were 987 hunters who participated during the general modern firearm, archery, and muzzleloader seasons combined and spent a total of 4,944 days pursuing elk in PMU 63 during the 2013 season. The number of hunters participating during the general modern firearm season has been trending downward since 2001, but has been relatively stable the last few years. The number of archery hunters declined after general season antlerless opportunities were eliminated, but were similar in 2012 and 2013 (Figure 3).

Since 2001, modern firearm and tribal hunters have accounted for >70% of the elk harvested in PMU 63 (Figure 3). In 2013, modern firearm and tribal hunters accounted for 42% and 27% of the total harvest, respectively.

Hunter success rates were only 5%, 6%, and 4% during the 2013 general modern firearm, archery, and muzzleloader seasons, respectively. Success rates for modern firearm and archery hunters have, for the most part, been similar and followed similar trends since 2001 (Figure 3). Trends in CPUE during general modern firearm and archery seasons have been relatively stable since 2006 (Figure 3).

PMU 64 (GMUs 621, 624, 627, 633)

Elk occur at very low densities in PMU 64 and harvest is mostly limited to permit only opportunities. In 2013, only 16 bulls and 6 antlerless elk were harvested (Figure 4). Tribal harvest has, on average, accounted for 57% of the total harvest since 2001 (NWIFC).

PMU 65 (GMUs 607, 615, 618, 636, 638)

An estimated 164 bulls and 20 antlerless elk were harvested in PMU 65 during the 2013 season. Bull harvest decreased by 18% (199 bulls in 2012), while antlerless harvest was nearly identical (21 antlerless elk in 2012). Total harvest has been trending upward since 2001 (Figure 5).

There were 1,598 hunters who participated during the general modern firearm, archery, and muzzleloader seasons combined and spent a total of 8,456 days pursuing elk in PMU 65 during the 2013 season. The number of archery and muzzleloader hunters has been increasing since 2008, while the number of modern firearm hunters has been increasing since 2011 (Figure 5).

Since 2001, modern firearm hunters have, in most years, accounted for the greatest proportion of elk harvested in PMU 65, while the proportion of harvest attributed to tribal hunters has varied (Figure 5). In 2013, modern firearm hunters accounted for 27% of the total harvest, while archery and tribal hunters accounted for 17% and 41%, respectively.

Hunter success rates were 5%, 8%, and 3% during the 2013 general modern firearm, archery, and muzzleloader seasons, respectively. Since 2001, hunter success rates and estimates of CPUE have been quite variable for all user groups (Figure 5).

PMU 66 (601, 602, 603, 612)

There were an estimated 128 bulls and 24 antlerless elk harvested in PMU 66 during the 2013 season, which were similar to harvest levels during the 2012 season (127 bulls, 20 antlerless elk). Estimates of total harvest have been trending upward since 2001; albeit harvest has been similar the past three years (Figure 6).

There were 885 hunters who participated during the general modern firearm, archery, and muzzleloader seasons combined and spent a total of 4,250 days pursuing elk in PMU 66 during the 2013 season. Hunter numbers for all user groups have been trending upward since 2007 (Figure 6).

Since 2001, tribal hunters have, on average, accounted for 54% of the elk harvested in PMU 66. In 2013, tribal harvest accounted for 57% of the total harvest while modern firearm and archery hunters accounted for 18% and 13%, respectively (Figure 6).

Hunter success rates were 5%, 11%, and 8% during the 2013 general modern firearm, archery, and muzzleloader seasons, respectively. Since 2001, hunter success rates and CPUE have been quite variable for all user groups (Figure 6).

PMU 67(653, 654)

There were an estimated 128 bulls and 60 antlerless elk harvested in PMU 67 during the 2013 season. Bull harvest increased by 10% compared to the 2012 season (116 bulls), while antlerless harvest increased 18% (51 antlerless elk in 2012). Trends in total harvest have been increasing since 2001 (Figure 7).

There were 813 hunters who participated during the general modern firearm, archery, and muzzleloader seasons combined and spent a total of 3,923 days pursuing elk in PMU 67 during the 2013 season. Hunter numbers for all user groups have been relatively stable since 2007 (Figure 7).

Since general season opportunities were reduced in 2006, harvest has been somewhat evenly distributed among modern firearm, archery, muzzleloader, and permit hunters (Figure 7). Since 2001, tribal hunters have, on average, accounted for 34% of the elk harvested in PMU 67. In 2013, tribal harvest accounted for 27% of the total harvest.

Hunter success rates were 12%, 12%, and 14% during the 2013 general modern firearm, archery, and muzzleloader seasons, respectively. Since 2001, hunter success rates have been variable for all user groups, but have generally increased (Figure 7). Trends in CPUE have also been variable, but in general have been stable to slightly increasing (Figure 7).

Surveys

In general, the Department conducts preseason or postseason surveys, but rarely conducts both in the same biological year. Preseason (August–September) surveys are completed to evaluate population productivity (calves:100 cows) and to estimate the preseason bull:cow ratio. The Department conducts postseason (March–April) surveys to assess calf recruitment rates and the postseason bull:cow ratio, which is used as an index of bull escapement. Due to logistical or financial constraints, timing of preseason and postseason surveys has, on occasion, diverged from the typical survey months of August–September and March–April.

Bull:cow ratios estimated during both seasons are viewed as minimum, or conservative estimates because they are most likely biased low. This negative bias occurs because mature bulls tend to segregate themselves from cow-calf groups and occur in smaller bachelor groups, which decreases the probability of observers detecting them during surveys. Although this bias is prevalent during postseason surveys, it occurs during preseason surveys as well, but assumedly to a lesser degree.

The majority of the survey data presented for Region 6 is the result of collaborative efforts between the Department and several Treaty Tribes.

PMU 61

The Department has completed preseason and postseason surveys in PMU 61 since 2000. However, surveys have not occurred on an annual basis and have not been consistent among GMUs. The majority of survey efforts have occurred in GMU 673. The Department did not conduct composition surveys in PMU 61 during the 2013 season. However, postseason aerial composition surveys were conducted in GMUs 506 and 530 which are located in the Willapa Hills elk herd area and are believed to be representative of GMUs in Region 6. Biologists observed 1,273 elk with resulting bull:cow:calf ratios of 17:100:38 and 30% of the bulls observed had branched antlers.

PMU 62

The Department did not conduct composition surveys in PMU 62 during the 2013 season.

PMU 63

Preseason and postseason composition surveys have been completed in PMU 63 since 1995, but have not occurred on an annual basis. Most survey effort has been concentrated in GMUs 648 and 651. Through the years, surveys have been completed by Quinault tribal biologists, Point No Point Treaty Council biologists, Skokomish tribal biologists, and Department biologists. Biologists did not conduct pre- or postseason composition surveys during the 2013 season.

PMU 64

Elk occur in PMU 64 at very low densities and are surveyed from the ground by relocating marked groups in GMU 621 that are being monitored for other management purposes. Intensive monitoring of these groups has occurred since the early 1990s and resulting ratio estimates are the result of collaborative efforts among Point No Point Treaty Council, Skokomish tribal, and Department biologists. Biologists conducted a postseason ground-based composition survey following the 2013 season and observed 163 elk. The resulting bull:cow and calf:cow ratios were 19:100 and 44:100, respectively.

PMU 65

Preseason and postseason composition surveys have been completed in PMU 65 since the late-1980s, but since 2000 the majority of survey efforts have occurred in GMU 607. Surveys have been completed by biologists from the Department, Point No Point Treaty Council, Makah tribe, Quinault tribe, Quileute tribe and Skokomish tribe. Although composition surveys were conducted during the 2013 season, the data associated with those surveys was not available for this report.

PMU 66

Preseason and postseason composition surveys have been completed in PMU 66 since the late-1980s and have been a collaborative effort among biologists from the Makah tribe, Quileute tribe, Lower Elwha Klallam tribe, Point No Point Treaty Council, and the Department. Surveys have occurred consistently in GMUs 601, 602, and 612 since the 1990s. Although composition surveys were conducted during the 2013 season, the data associated with those surveys was not available for this report.

PMU 67

One of the primary survey efforts that occurs in PMU 67 is completed as part of a collaborative effort among the National Park Service, U.S. Geological Survey, Muckleshoot Indian Tribe, Puyallup Tribe of Indians, and the Department to monitor elk populations on summer ranges in Mount Rainier National Park (MRNP). Although these surveys provide some insight into the status of this population, it is not known if estimated age and sex ratios are representative of the entire population or if inferences should be limited to elk that reside in MRNP. Data collected during surveys that were conducted in 2013 were not available for this report.

Population status and trend analysis

Formal estimates or indices of population size at the PMU level do not exist for any elk herd in Region 6. Occasionally, estimates exist at the GMU level and those data are presented when available. In the absence of formal estimates, the Department relies on harvest data as indices of population trend.

Bull:cow ratios are used to determine if the Department is meeting its management objective of maintaining populations with a minimum of 15 bulls:100 cows in the preseason population and a minimum of 12 bulls:100 cows in the postseason population.

Preseason calf:cow ratios are used to index long-term trends in population productivity and postseason calf:cow ratios are used to provide a relative index of the potential for populations to increase, decrease, or remain stable. Potential rate of change (λ) is evaluated following the procedures of White and Bartmann (1998), where,

$$\lambda = \frac{R_{C:C}S_C + 2S_F}{2}$$

and,

$R_{C:C}$ = Ratio of calves to adult cows

S_C = Calf survival rate

S_F = Adult cow survival rate

The value 2 accounts for the even sex ratio among calves. Postseason surveys are completed at a time when it is believed most over-winter mortality events have already occurred and very few calves will die before they are considered recruited into the population in June. Thus, in the above equation calf survival is assumed to be 100%. In addition, annual survival of adult cows is assumed to be 85%. Adult cow elk typically exhibit high rates of survival (Stussy et al. 1994, Raedeke et al. 2002, Bender et al. 2006, 2008) and assuming a survival rate of 85% is a realistic assumption and most likely represents a conservative estimate.

However, it is important to point out this data is being used as a very general index of the potential for a population to increase or decrease if hunting was not allowed. In no way is it intended to represent the realized rate of change (Skalski et al. 2005).

PMU 61

Trends in total harvest (stable), CPUE (relatively stable), and hunter success rates (stable to slightly increasing) all indicate the elk population in PMU 61 has, in general, been stable since 2001.

Long-term trends in preseason calf:cow ratios indicate productivity rates for elk in PMU 61 have been slightly declining from levels observed in the early 2000s (Figure 8). However, postseason calf:cow ratios indicate calf recruitment rates have been at levels that would promote stable to increasing elk populations (Figure 8).

Preseason and postseason bull:cow ratios indicate the Department is achieving its management objective of maintaining elk populations with a minimum of 15 bulls:100 cows in the preseason population and a minimum of 12 bulls:100 cows in the postseason population (Figure 8).

PMU 62

Trends in total harvest (increasing), CPUE (stable to increasing), and hunter success rates (stable to increasing) all indicate elk populations in PMU 62 have increased since 2001.

Productivity and potential population growth rates cannot be assessed in PMU 62 at this time.

PMU 63

Inferences relating to trends in population size are somewhat limited because different inferences can be made depending on the harvest parameter that is analyzed. Trends in total harvest indicate a declining population since 2008, trends in CPUE indicate a relatively stable population, and trends in hunter success rates indicate a relatively stable population (Figure 3).

Long-term trends in calf:cow ratios indicate population productivity in PMU 63 declined during the mid-2000s, but has recently increased (Figure 9). Since 2008, postseason calf:cow ratios (Figure 9) indicate calf recruitment rates have been at levels necessary to promote stable elk populations.

Preseason bull:cow ratios indicate the Department is achieving its management objective of maintaining elk populations with a minimum of 15 bulls:100 cows in the preseason population and that preseason bull:cow ratios have been relatively stable since the late 1990s (Figure 9). Postseason bull:cow ratios were at or below the management objective of 12-20 bulls:100 cows, 2009–2011 (Figure 9).

PMU 64

Inferences that can be made from harvest data are limited because almost all hunting opportunity is restricted to permit only hunts.

Long-term trends in preseason and postseason calf:cow ratios indicate productivity and recruitment rates have declined from levels observed during the late-1990s and early-2000s; a period of population growth following conservation closures and an increase in clear-cut logging activity in GMU 621 (Figure 10). Postseason calf:cow ratios indicate calf recruitment rates have been at or below the minimum levels necessary to promote population growth, 2007-2010, but increased to historical levels in 2013.

Preseason and postseason bull:cow ratios indicate the Department is achieving its management objective of maintaining elk populations with a minimum of 15 bulls:100 cows in the preseason population and a minimum of 12 bulls:100 cows in the postseason population (Figure 10). However, long-term trends indicate bull:cow ratios may have declined from levels observed during the 1990s and have become much more variable (Figure 10).

PMU 65

Trends in total harvest indicate the elk population in PMU 65 has remained stable or increased slightly since 2001 (Figure 5). Trends in CPUE and hunter success rates have, in most years, varied accordingly with hunter numbers, which also indicates a stable to increasing population (Figure 5).

Long-term trends in calf:cow ratios indicate population productivity has been relatively consistent since the 1990s (Figure 11). Postseason calf:cow ratios indicate calf recruitment rates have been at or slightly below levels necessary to promote an increasing population (Figure 11).

Preseason and postseason bull:cow ratios indicate the Department is achieving its management objective of maintaining elk populations with a minimum of 15 bulls:100 cows in the preseason population. However, postseason bull:cow ratios have been at or slightly below the minimum objective of 12 bulls:100 cows in the postseason population (Figure 11). Over the long-term, bull:cow ratios have been relatively stable.

PMU 66

Trends in total harvest indicate the elk population in PMU 66 has slightly increased since 2001 (Figure 6). Trends in CPUE and hunter success rates during the general modern firearm season have varied accordingly with hunter numbers, which also indicates a stable to slightly increasing population (Figure 6).

Preseason and postseason calf:cow ratios indicate herd productivity and calf recruitment rates have varied little from year to year, but have slightly declined from levels observed during the 1990s (Figure 12). Postseason calf:cow ratios indicate recruitment rates have occurred at minimum levels necessary to promote stable to increasing elk populations.

Preseason and postseason bull:cow ratios indicate the Department is achieving its management objective of maintaining elk populations with a minimum of 15 bulls:100 cows in the preseason population and a minimum of 12 bulls:100 cows in the postseason population (Figure 12).

PMU 67

The Department has been collaborating with NPS, Muckleshoot and Puyallup tribal biologists, and researchers from USGS to develop a hybrid double-observer sightability model to estimate the number of elk from the North Rainier herd that are located on subalpine summer range in MRNP (Happe et al. 2013). Estimating abundance for this portion of the North Rainier herd is relevant for the Department because some of those elk migrate out of MRNP and are available for harvest during seasons established by the Department and Treaty Tribes. Because surveys only occur in subalpine habitats, resulting estimates are intended to be an index of sub-population size rather than a formal estimate of the entire population. Surveys have been completed since 2008, with estimates ranging from 294 elk in 2008 to 424 elk in 2009 (Happe et al. 2013). Overall, indices show this sub-population has been stable or slightly increasing.

However, surveys being conducted in MRNP only represent a small portion of the elk available for harvest in PMU 67. Therefore, harvest data is still the strongest indicator of population trend in PMU 67. Long-term trends in total harvest indicate the elk population in PMU 67 has been increasing since 2001 (Figure 7). Trends in hunter success (increasing) and CPUE (increasing) also indicate elk populations have been increasing since 2001 (Figure 7). In addition, the Muckleshoot Indian Tribe has been conducting mark-resight surveys in a portion of GMU 653 to estimate the postseason population those estimates also indicate an increasing population (MIT, unpublished data).

Research

Hoof Disease

An increasing incidence of hoof deformity in elk has been reported in southwest Washington. These elk show severely overgrown and deformed claws, and often marked emaciation. Although reports of deformed hooves in elk have occurred sporadically in southwest Washington for over a decade, the number and geographical distribution of these reports increased dramatically in 2008.

Currently, the Department is collaborating with the Washington State University College of Veterinary Medicine and other specialists from around the world to identify the cause of hoof disease in southwest Washington elk herds. With guidance from this technical team of specialists, the Department collected samples from affected (Regions 5 and 6) and non-affected areas (Regions 3 and 6) during three separate sampling periods (February-March 2013, July-August 2013, and January 2014). Preliminary results suggest the involvement of an infectious bacterium. Current diagnostic efforts are focused on specialized bacteriology testing to rule out infectious organisms including several types of bacteria that are the most common causes of infectious hoof diseases in domestic livestock. The Department is also developing investigations into survival, prevalence, distribution, and management strategies for this hoof disease.

Mortality Studies

In February 2011, the Department captured and radio-collared 22 adult cow elk in GMU 615. The elk were initially captured as part of a study that had been designed to estimate population size using mark-recapture techniques. That study was discontinued shortly after the elk were collared. However, the Department has continued to monitor those elk and over the past 3 years, annual survival has averaged >90%.

Habitat Studies

Timber management practices that include shorter stand times and the use of herbicides may affect the availability and quality of elk forage in Region 6. However, changes in understory composition and structure following the use of herbicides is not simply an effect of the herbicide, but rather an interaction between the management treatment and herbivory by deer and elk (Riggs et al. 2005). Little is understood about that interaction in coastal regions of western Washington, but is the focus of ongoing research that is occurring in Region 6 and is being completed by Washington State University. The primary intent of the project is to determine the effect of current timber management practices on the quantity and quality of forage available to black-tailed deer (*Odocoileus hemionus columbianus*). However, it is anticipated their findings will have implications for elk as well.

Habitat condition and trend

Elk habitat in Region 6 is dominated by second-growth forests and clearcuts, which are different in structure and composition than old-growth forests that once dominated the landscape (Edmonds 1979). This change in forest structure and composition has influenced elk by altering forage quantity and quality as well as the juxtaposition of foraging habitats to security cover. Industrial timber management practices have also resulted in a high density road system that has increased human access to remote areas.

Recently, there have been no major changes in the status of elk habitat in Region 6. At a more localized scale (e.g., GMU) habitat trends are directly related to the proportion of timber stands that are in early seral stages. In recent years, logging has increased in several GMUs, which has resulted in an increase of foraging habitats.

Habitat enhancement

The Department actively manages < 1% of the land base in Region 6, which limits its ability to implement habitat management actions that would benefit elk at the landscape level. Therefore, the Department must work cooperatively with other land management agencies (e.g., U.S. Forest Service, Department of Natural Resources) to effectively manage habitat on public lands. In addition, the Department is working to encourage private timber companies and other private landowners to manage their lands in a way that promotes long-term benefits to elk.

The U.S. forest service has begun variable density thinning projects and native forage seeding in several areas on the Olympic peninsula that should result in better forage conditions in some areas of the Olympic National Forest.

The Department currently manages over 500 acres of high quality elk forage in Region 6. In addition to the elk forage plantings several hundred more acres are managed for waterfowl and other species that also benefit elk.

Elk damage

Elk damage complaints continue to be a substantial management concern in Region 6. Elk damage occurs in tree farms and conifer plantations, hay and alfalfa fields, hay stacks, orchards, and other agricultural crops. Elk also have the ability to damage agriculture infrastructure by running through fences.

Although the Department receives elk damage complaints throughout Region 6, chronic damage issues have persisted in several GMUs. These GMUs include GMU 621 (Dosewallips, Duckabush, and Hamma Hamma river valleys), GMU 638 (Quinault river valley), GMU 652 (Buckley/Enumclaw are), GMU 660 (Chehalis River valley), GMU 667 (Centralia Coal Mine) and GMUs 672 and 673 (Willapa River valley).

In most circumstances, the Department addresses damage complaints by working with landowners to increase access to their property during hunting seasons so hunters can help resolve the problem. The Department has also established four Elk Areas in Region 6 to address chronic elk damage issues by providing antlerless permit opportunities with the intent of limiting population growth in these localized areas.

The number of damage complaints received in 2013, were similar to past years.

Management conclusions

Trends in harvest and survey data indicate elk populations in PMUs 61, 62, 65, 66, and 67 are stable or increasing with preseason and postseason bull:cow ratios that satisfy management objectives. Consequently, current bag limits and season lengths appear to be appropriate for these populations.

Harvest and survey data in PMU 63 indicate a slightly declining to stable population. In response to this observed trend, the bag limit in GMU 648 during the general archery season was changed from “3 pt. minimum or antlerless” to “3 pt. minimum” during the 2012 season. The Department will continue to monitor this population and if necessary, make additional changes to harvest regulations in an effort to promote population stability.

Elk in PMU 64 are primarily found in GMU 621 and a small portion of GMU 624. Conservation closures within Tribal and State hunting seasons were initiated in the 1990s to promote population growth in GMU 621. Elk numbers, as indicated by herd counts, responded positively, so the Department and local Tribes reopened elk hunting in GMU 621 on a permit or limited basis. The permit only seasons have been maintained to promote population growth. Although no current population estimate is available, increases in individual herd size and an increase in elk-human conflicts in this GMU suggest elk numbers in this unit may be approaching management objectives. In the near term, the Department will retain elk hunting by permit only, but may change permit numbers and/or legal elk allowed to provide hunting opportunity, while addressing issues of elk damage/conflict. Elk in GMU 624 are primarily found near the town of Sequim where the management objective is to limit population size through the use of targeted permit only hunting due to safety concerns, as the elk remain in close proximity to the city of Sequim and private residential areas.

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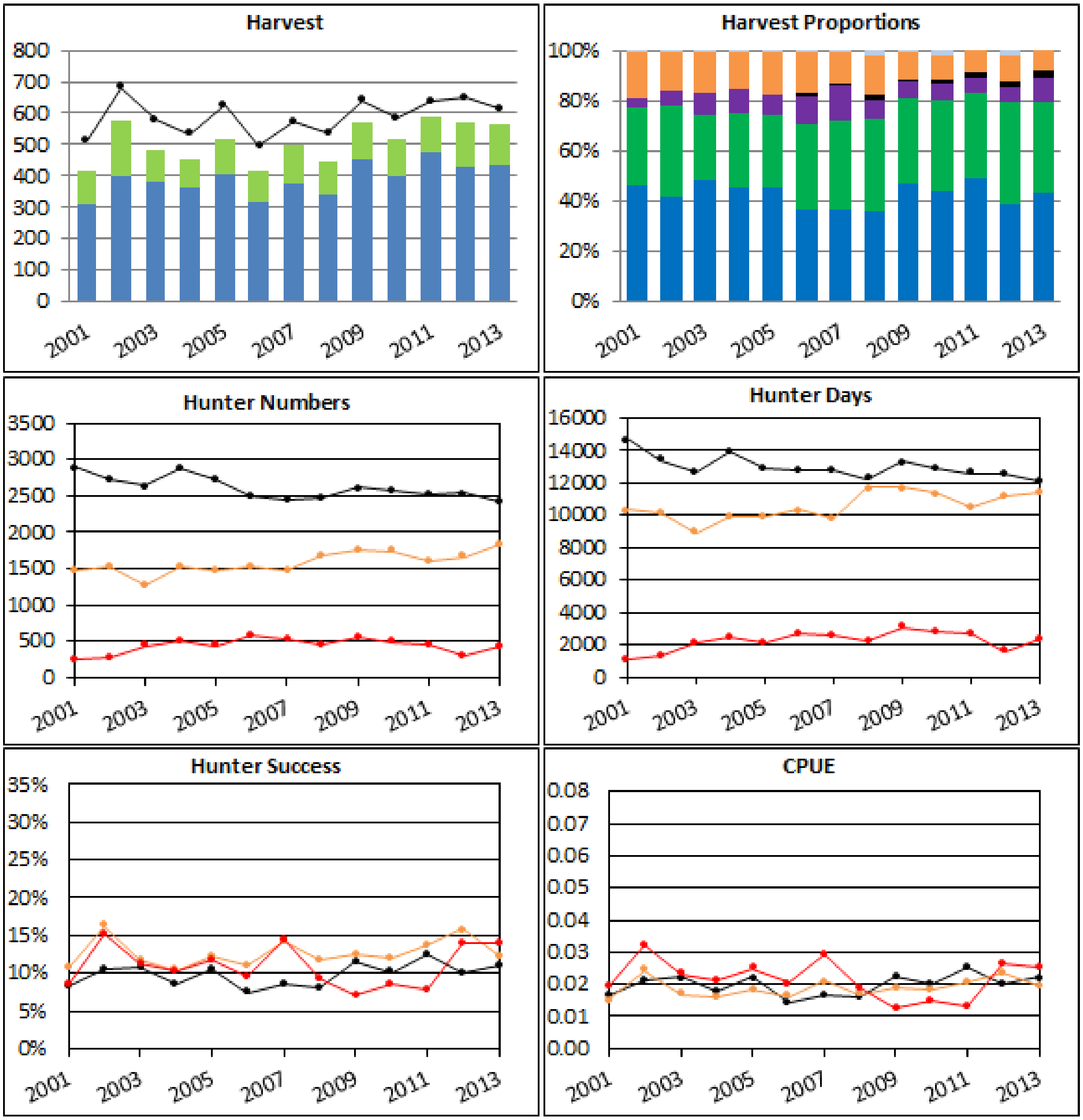

Figure 1. Estimates of the number of elk harvested, harvest proportions, hunter numbers, hunter days, hunter success, and catch-per-unit-effort (CPUE) in Population Management Unit 61, 2001–2013. Harvest estimates include the number of bulls (blue) and antlerless elk (green) harvested during general modern firearm, archery, and muzzleloader seasons combined, while total harvest (black line) includes the number of elk harvested during general seasons, permit seasons, and tribal seasons combined. Harvest proportions include the number of elk harvested during general modern firearm (blue), general archery (green), general muzzleloader (purple), multiple weapon (black), permit (orange), and tribal (light blue) seasons. Hunter numbers, hunter days, hunter success, and CPUE are provided for general modern firearm (black), archery (orange), and muzzleloader (red) seasons.

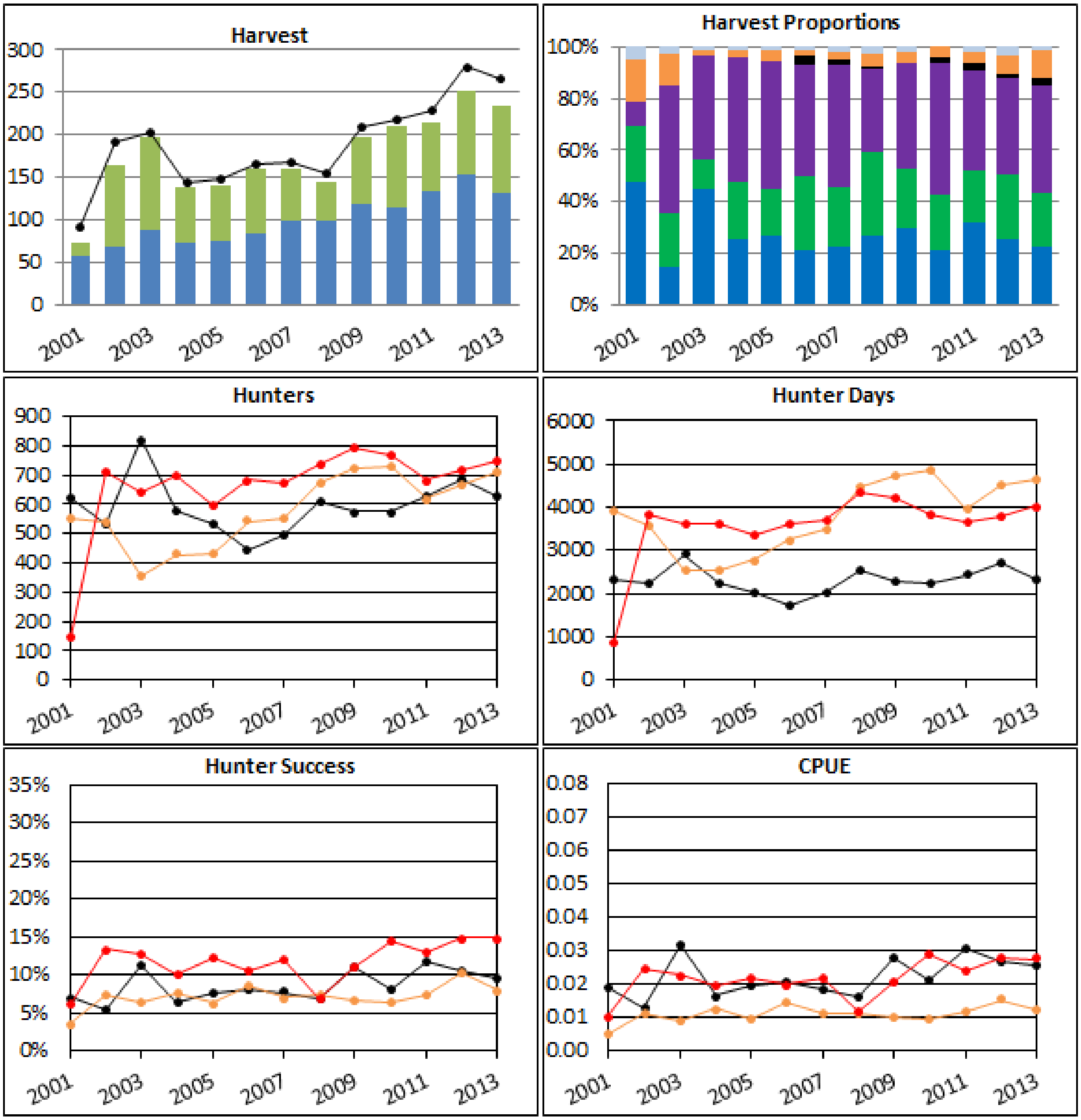

Figure 2. Estimates of the number of elk harvested, harvest proportions, hunter numbers, hunter days, hunter success, and catch-per-unit-effort (CPUE) in Population Management Unit 62, 2001–2013. Harvest estimates include the number of bulls (blue) and antlerless elk (green) harvested during general modern firearm, archery, and muzzleloader seasons combined, while total harvest (black line) includes the number of elk harvested during general seasons, permit seasons, and tribal seasons combined. Harvest proportions include the number of elk harvested during general modern firearm (blue), general archery (green), general muzzleloader (purple), multiple weapon (black), permit (orange), and tribal (light blue) seasons. Hunter numbers, hunter days, hunter success, and CPUE are provided for general modern firearm (black), archery (orange), and muzzleloader (red) seasons.

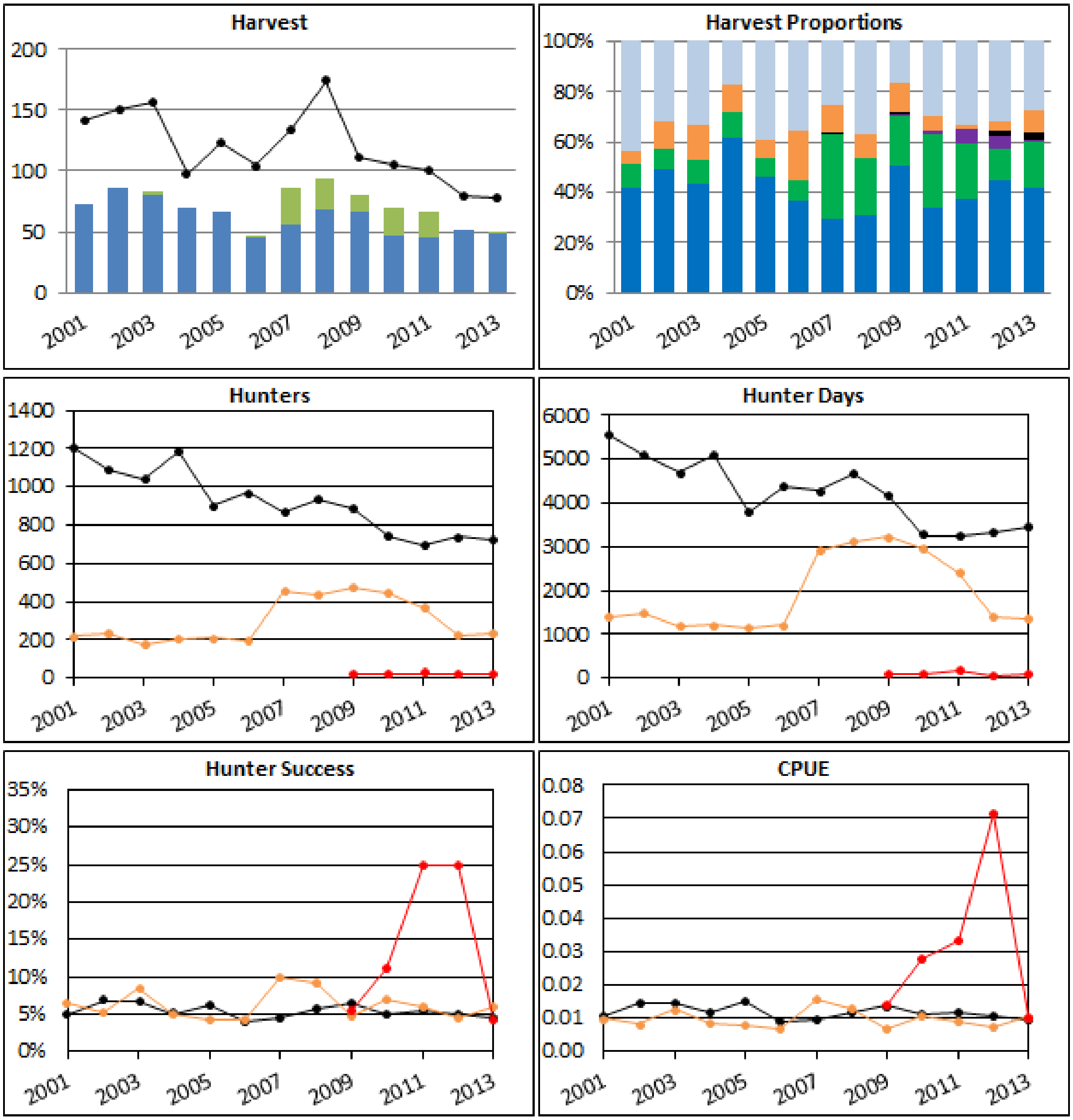

Figure 3. Estimates of the number of elk harvested, harvest proportions, hunter numbers, hunter days, hunter success, and catch-per-unit-effort (CPUE) in Population Management Unit 63, 2001–2013. Harvest estimates include the number of bulls (blue) and antlerless elk (green) harvested during general modern firearm, archery, and muzzleloader seasons combined, while total harvest (black line) includes the number of elk harvested during general seasons, permit seasons, and tribal seasons combined. Harvest proportions include the number of elk harvested during general modern firearm (blue), general archery (green), general muzzleloader (purple), multiple weapon (black), permit (orange), and tribal (light blue) seasons. Hunter numbers, hunter days, hunter success, and CPUE are provided for general modern firearm (black), archery (orange), and muzzleloader (red) seasons.

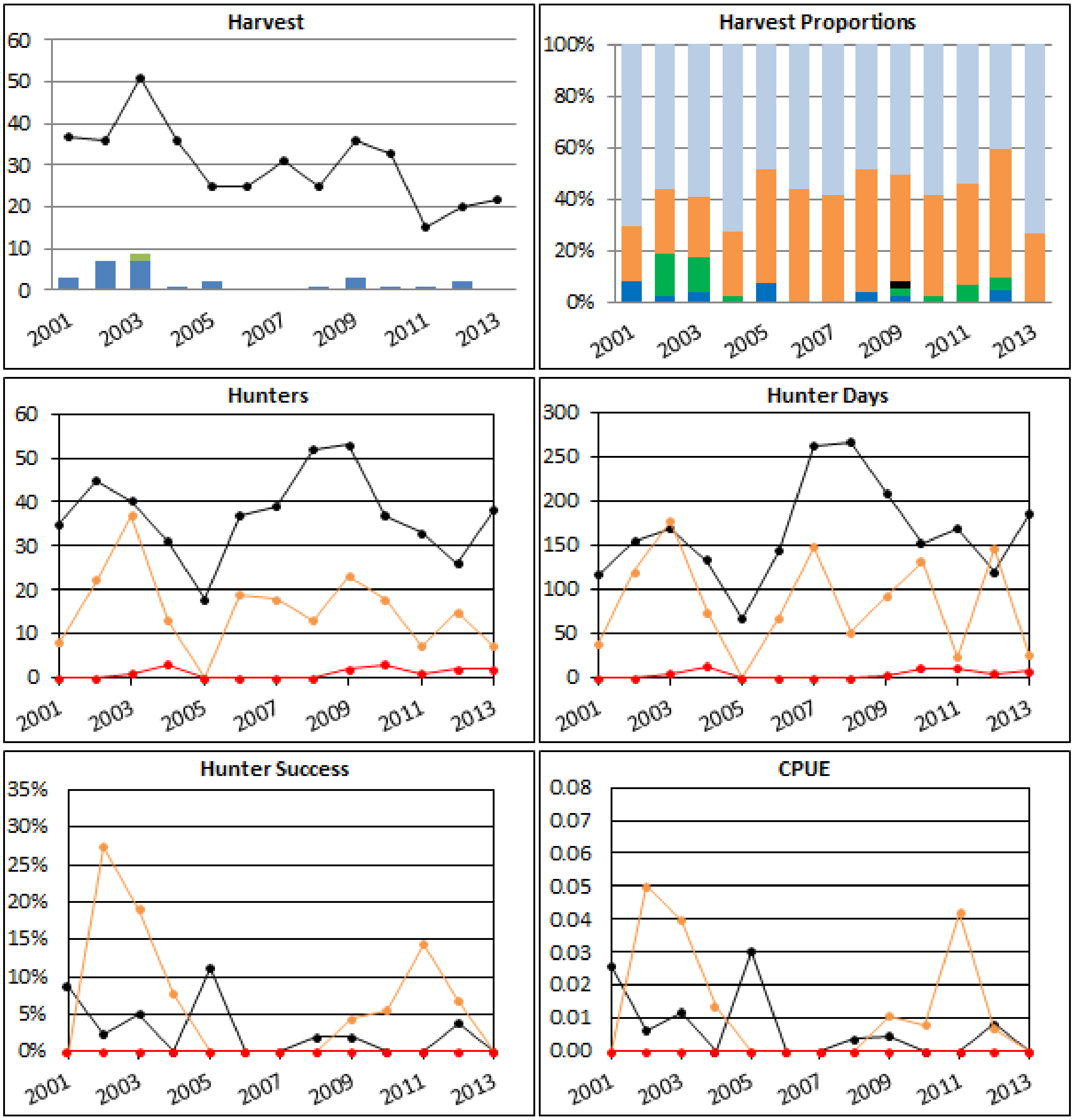

Figure 4. Estimates of the number of elk harvested, harvest proportions, hunter numbers, hunter days, hunter success, and catch-per-unit-effort (CPUE) in Population Management Unit 64, 2001–2013. Harvest estimates include the number of bulls (blue) and antlerless elk (green) harvested during general modern firearm, archery, and muzzleloader seasons combined, while total harvest (black line) includes the number of elk harvested during general seasons, permit seasons, and tribal seasons combined. Harvest proportions include the number of elk harvested during general modern firearm (blue), general archery (green), general muzzleloader (purple), multiple weapon (black), permit (orange), and tribal (light blue) seasons. Hunter numbers, hunter days, hunter success, and CPUE are provided for general modern firearm (black), archery (orange), and muzzleloader (red) seasons.

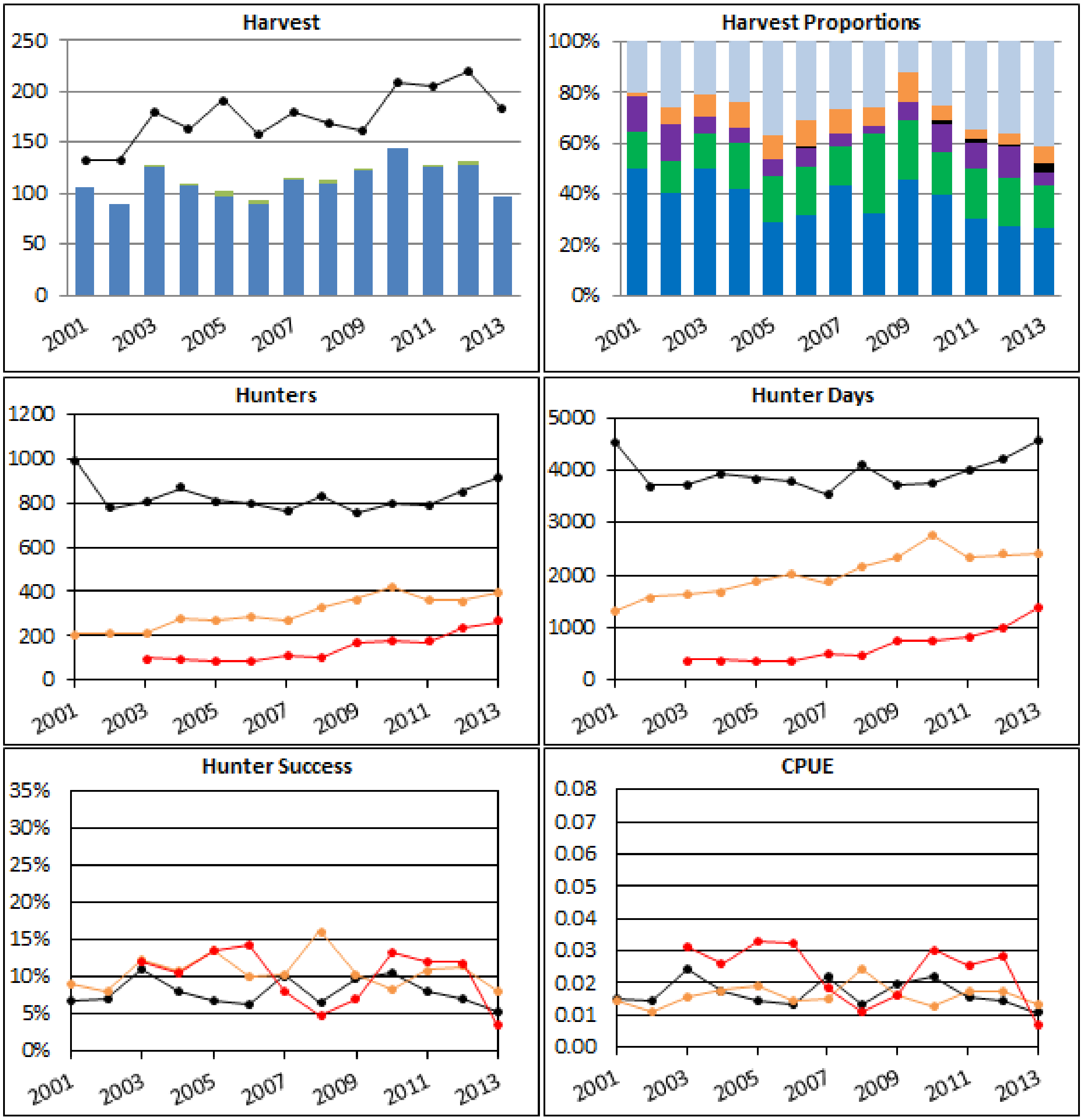

Figure 5. Estimates of the number of elk harvested, harvest proportions, hunter numbers, hunter days, hunter success, and catch-per-unit-effort (CPUE) in Population Management Unit 65, 2001–2013. Harvest estimates include the number of bulls (blue) and antlerless elk (green) harvested during general modern firearm, archery, and muzzleloader seasons combined, while total harvest (black line) includes the number of elk harvested during general seasons, permit seasons, and tribal seasons combined. Harvest proportions include the number of elk harvested during general modern firearm (blue), general archery (green), general muzzleloader (purple), multiple weapon (black), permit (orange), and tribal (light blue) seasons. Hunter numbers, hunter days, hunter success, and CPUE are provided for general modern firearm (black), archery (orange), and muzzleloader (red) seasons.

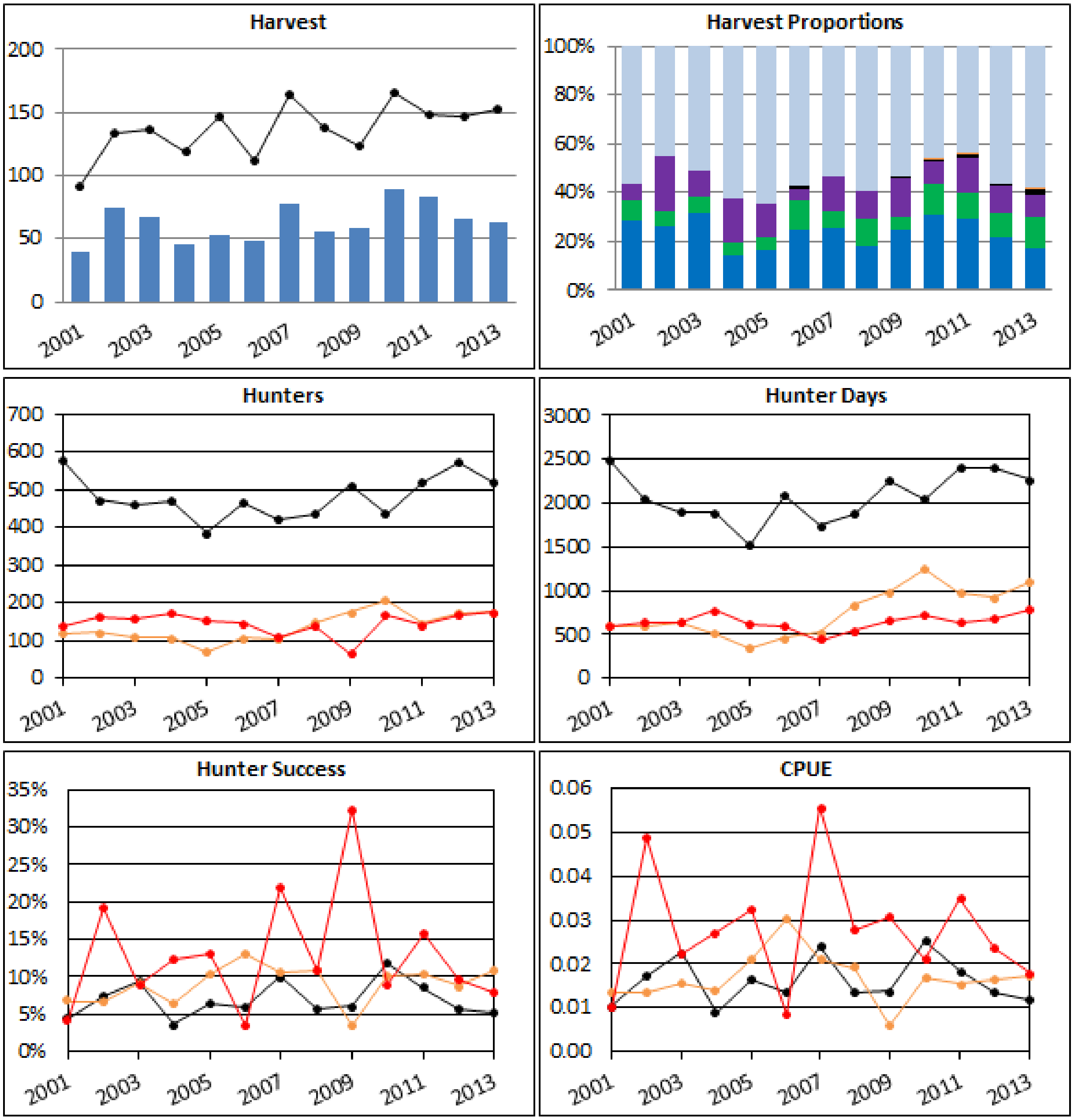

Figure 6. Estimates of the number of elk harvested, harvest proportions, hunter numbers, hunter days, hunter success, and catch-per-unit-effort (CPUE) in Population Management Unit 66, 2001–2013. Harvest estimates include the number of bulls (blue) and antlerless elk (green) harvested during general modern firearm, archery, and muzzleloader seasons combined, while total harvest (black line) includes the number of elk harvested during general seasons, permit seasons, and tribal seasons combined. Harvest proportions include the number of elk harvested during general modern firearm (blue), general archery (green), general muzzleloader (purple), multiple weapon (black), permit (orange), and tribal (light blue) seasons. Hunter numbers, hunter days, hunter success, and CPUE are provided for general modern firearm (black), archery (orange), and muzzleloader (red) seasons.

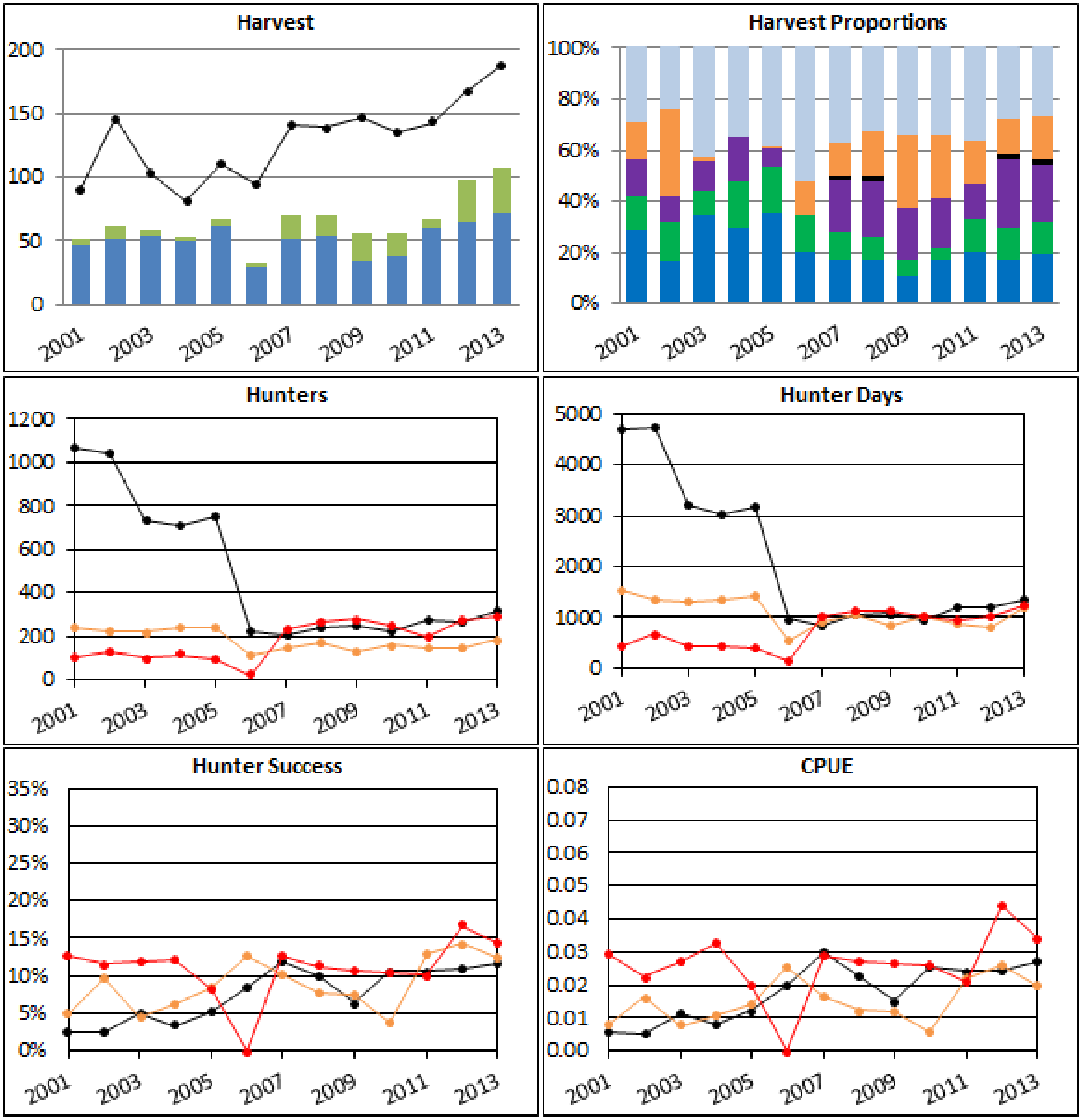

Figure 7. Estimates of the number of elk harvested, harvest proportions, hunter numbers, hunter days, hunter success, and catch-per-unit-effort (CPUE) in Population Management Unit 67, 2001–2013. Harvest estimates include the number of bulls (blue) and antlerless elk (green) harvested during general modern firearm, archery, and muzzleloader seasons combined, while total harvest (black line) includes the number of elk harvested during general seasons, permit seasons, and tribal seasons combined. Harvest proportions include the number of elk harvested during general modern firearm (blue), general archery (green), general muzzleloader (purple), multiple weapon (black), permit (orange), and tribal (light blue) seasons. Hunter numbers, hunter days, hunter success, and CPUE are provided for general modern firearm (black), archery (orange), and muzzleloader (red) seasons.

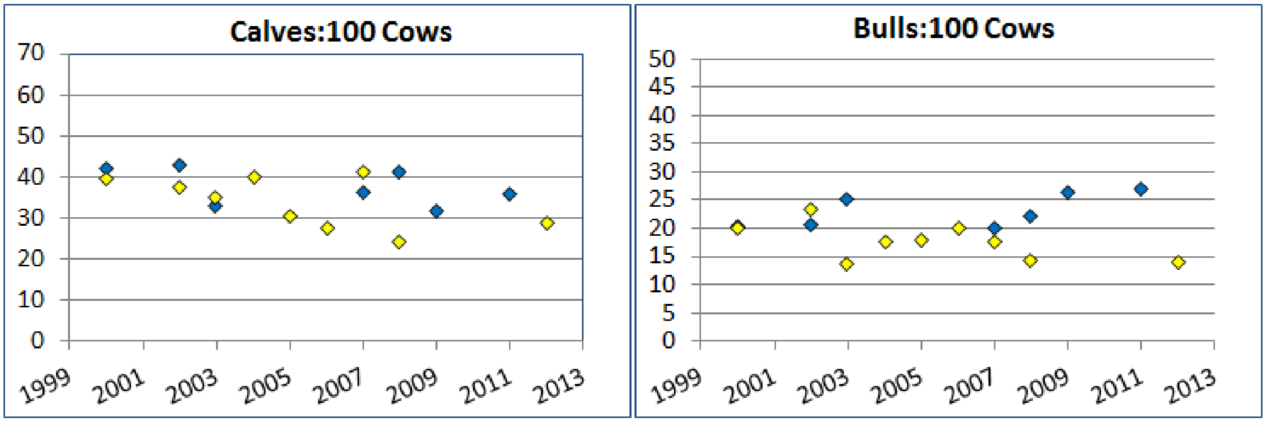

Figure 8. Long term trends in observed age and sex ratios during preseason (blue) and postseason (yellow) composition flights in Population Management Unit 61, 2000–2013.

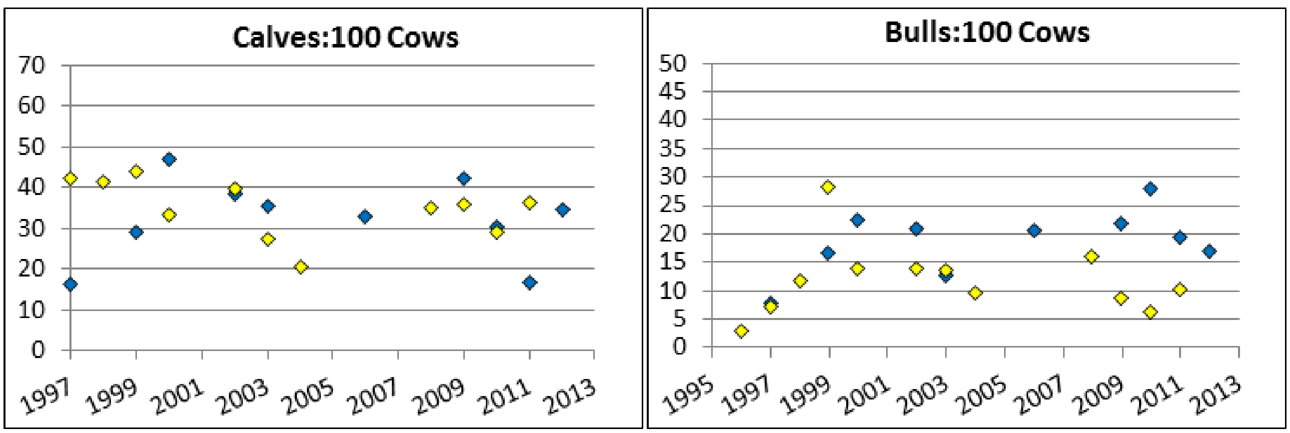

Figure 9. Long term trends in observed age and sex ratios during preseason (blue) and postseason (yellow) composition flights in Population Management Unit 63, 1996–2013.

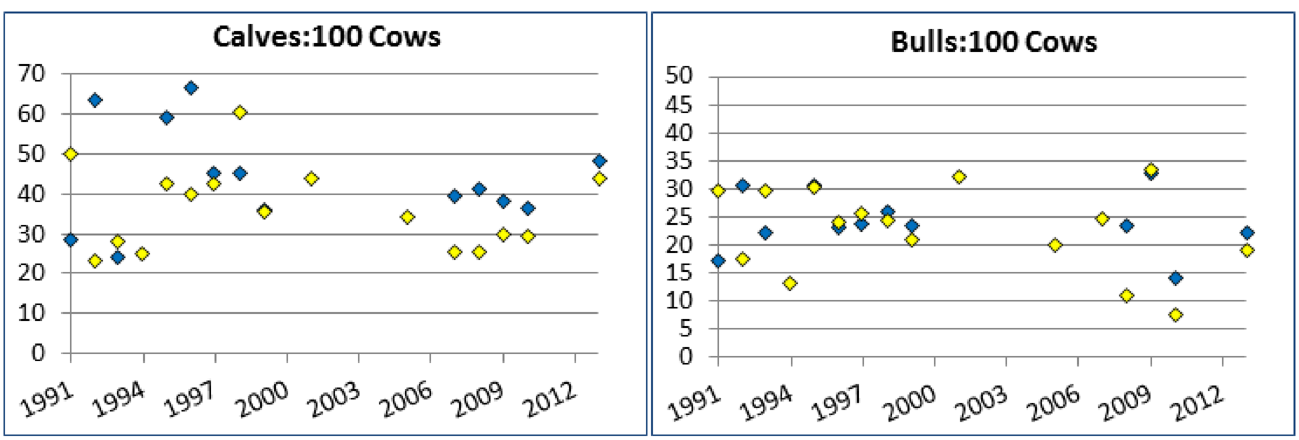

Figure 10. Long term trends in observed age and sex ratios during preseason (blue) and postseason (yellow) composition flights in Population Management Unit 64, 1991–2013.

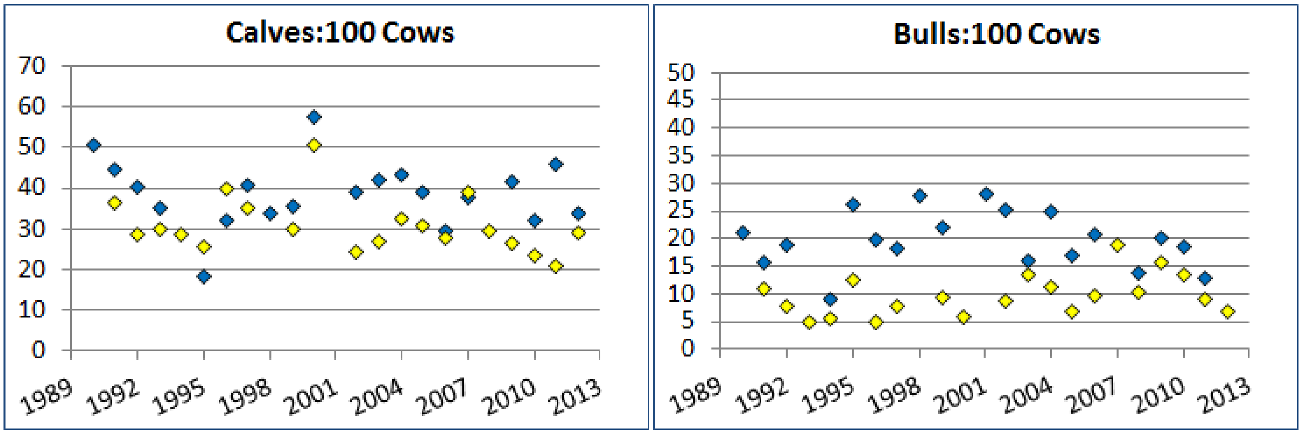

Figure 11. Long term trends in observed age and sex ratios during preseason (blue) and postseason (yellow) composition flights in Population Management Unit 65, 1990–2013.

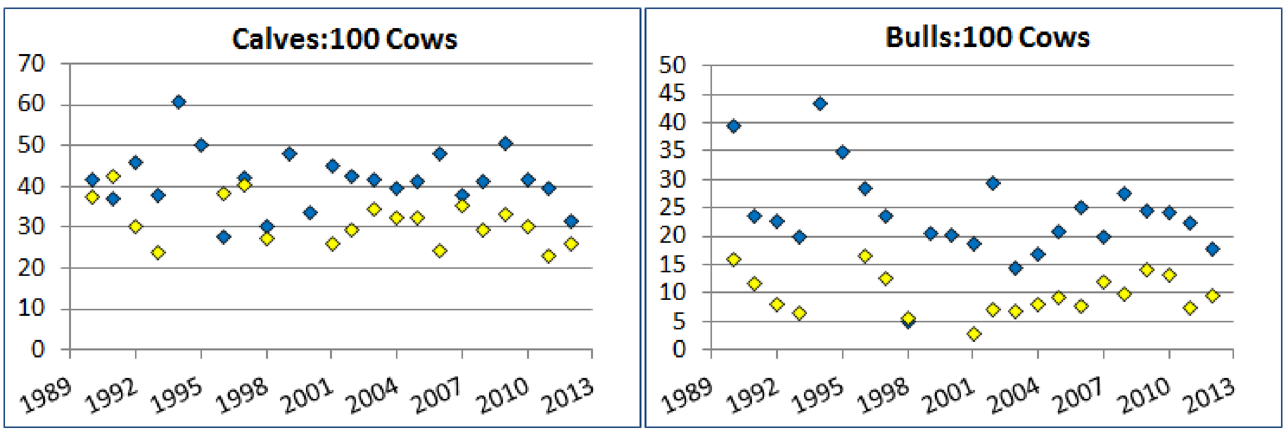

Figure 12. Long term trends in observed age and sex ratios during preseason (blue) and postseason (yellow) composition flights in Population Management Unit 66, 1990–2013.

Mountain Goat

MOUNTAIN GOAT STATUS AND TREND REPORT
STATEWIDE

RICHARD B. HARRIS, Special Species Section Manager

Population objectives and guidelines
The population monitoring objective for mountain goats is to be able to detect a decline in population size reliably within 3 years or less. The harvest objective is to provide recreational hunting opportunities in individual mountain goat herds where harvest success averages >50% over a 3-year period, while at the same time goat population size remains stable or increasing. Specific guidelines for managing harvest within sustainable limits are discussed in WDFW (2008). The harvest guidelines are to limit harvest opportunity to 4% or less of the total population, only allow harvest in goat populations meeting or exceeding 100 total animals, and limit harvest of nannies (females) to 30% or less. These specific guidelines may be revisited as part of the next 6-year Game Management Plan.

Hunting seasons and harvest trends
Mountain goat hunting opportunity in Washington is limited by permit. Permit availability (and therefore hunter opportunity) decreased substantially beginning in the late 1990s (Figure 1), and is currently considerably lower than during the 1980s (which, in turn, was a reduction from the peak years of permit availability during the 1960s and 1970s, Rice and Gay 2010). Sixteen permits (14 general permits, 1 raffle permits, and 1 auction permit) were available in 11 goat management units in 2013. The 2013 mountain goat season provided 47 days of mountain goat hunting (September 15 to October 31; except that archery hunters, auction, and raffle permit hunters' seasons began September 1). Hunters were able to use any legal weapon and harvest any adult goat with horns greater than 4 inches (although hunters were encouraged to select billies (males).

Of the 16 permits available in 2013, 15 were used by hunters. These hunters reported harvesting a total of 12 goats. Estimated success was thus 75%.

Given the sensitive nature of mountain goat populations and their generally small sizes (see Population status and trend analysis, below), only goat populations that are surveyed annually, and meet or exceed population guidelines described in WDFW 2008 are considered for recreational hunting.

Surveys
With one exception, surveys were conducted using a helicopter and generally occurred between July and September. (Surveys in the Lake Chelan area have recently been using winter-time boat-based surveys). For most surveys, the total number of goats on an area-wide basis was estimated using a sightability correction model (Rice et al. 2009) developed specifically for use in Washington State. Because the funding level was not sufficient to survey all goat units, priority was given to hunted units.

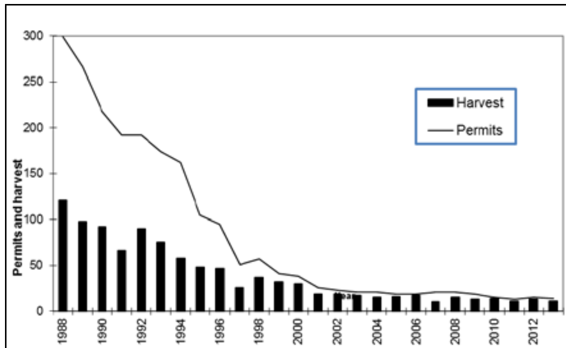

Figure 1. Special permits (line) and mountain goat harvests (vertical bars) in Washington, 1988-2013.

Population status and trend analysis
Mountain goat populations have declined in Washington relative to estimated historical levels. Goat populations within the state were considered to have exceeded 10,000 animals (including those within federally-managed areas) as recently as 1961 (Johnson 1983). As of 2008, our best estimate is that mountain goats within Washington number between 2,400 and 3,180. Of these, about 450 live primarily within National Parks (Rice 2012). Hunting opportunity has decreased accordingly, and current permit levels are conservative and represent 4% or less of estimated population in herds that are stable or increasing, and which have been surveyed routinely. Despite the overall declining trend in goat numbers and range, a few populations are doing well. Goat populations around Mt. Baker, along the lower Cascade crest, in Goat Rocks, and along the north shore of Lake Chelan appear to be stable, and populations in the Naches Pass and Bumping Units may be increasing.

Habitat condition and trend

Fire suppression policies and natural forest succession continues to degrade critical mountain goat foraging habitat. Fire suppression allows conifers to invade these natural openings and decreases their foraging value for goats. The degradation and loss of alpine meadows, coupled with increasing recreational human use and disturbance of alpine habitat are likely the two greatest negative impacts to mountain goats. Climate change may pose challenges of an uncertain nature for mountain goat populations in the future.

Management conclusions

The largest obstacles to effective mountain goat management are i) a consistent funding base to assess the status of goats, ii) difficulty of estimating the size of individual herds, and iii) the existence of large areas of suitable goat habitat where goats are absent. Management activities are now being directed toward a goat translocation project to begin rebuilding goat populations in areas of vacant suitable habitat within the Cascade Mountains.

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MOUNTAIN GOAT STATUS AND TREND REPORT: REGION 2
METHOW

SCOTT FITKIN, District Wildlife Biologist
JEFF HEINLEN, Wildlife Biologist

Population objectives/guidelines

The Methow unit (Goat Unit 2-2) is currently being managed for population growth and increased distribution. We encourage the public to take advantage of watchable wildlife opportunities at the salt lick along the Hart's Pass Road and on Grandview Mountain just northwest of Palmer Lake.

Hunting seasons and harvest trends

Over the long-term mountain goat populations have declined significantly in some portions of the North Cascades. Research findings suggest historical hunting levels may have been to high and unsustainable for goats. As a result, statewide mountain goat strategies do not recommend harvest permits until surveys indicate a population size of at least 100 goats in a population management unit. Limited resources caused a gap in survey data over a five year period and resulted in the suspension of harvest in the unit for 3 years (2009-2011) (Table 1).

Table 1. Summary of harvest information for mountain goats in the Methow Unit.

Year	Permits	Hunters	Harvest	Success	Goats seen/hunter
1995	8	8	8	100%	31
1996	8	8	5	63%	8
1997	5	5	4	80%	20
1998	5	5	3	60%	22
1999	5	5	4	80%	32
2000	5	5	5	100%	23
2001	2	2	0	0%	11
2002	2	2	1	50%	26
2003	2	2	2	100%	31
2004	2	2	1	50%	26
2005	2	2	1	50%	48
2006	2	1	1	100%	23
2007	2	1	1	50%	4
2008	2	2	2	100%	38
2009	--	--	--	--	--
2010	--	--	--	--	--
2011	--	--	--	--	--
2012	1	1	1	100%	11
2013	1	1	1	100%	16

Anecdotal reports during this time suggested a total Methow Unit population of over 100 animals, and possibly some limited range expansion. As a result, a single annual harvest permit was offered in both the 2012 and 2013 seasons. Due to the 2013 survey yielding detections of only 26 goats within the unit boundary harvest was suspended for 2014.

Table 2. Population composition counts from the Methow Unit.

Year	Kids	Yearling	Adults	Minimum Population	Kids:100 Adults
1995	--	--	--	--	--
1996	16	--	41	57	39
1997	20	--	49	69	41
1998	--	--	--	--	44
1999	--	--	--	--	--
2000	11	--	36	47	31
2001	10	--	50	60	20
2002	19	--	61	80	31
2003	8	--	45	53	18
2004	13	17	52	82	*25
2005	18	13	65	96	*28
2006	7	5	31	43	*23
2007	18	5	38	61	*47
2008	--	--	--	--	--
2009	5	--	13	18	*38
2010	--	--	--	--	--
2011	--	--	--	--	--
2012	--	--	--	--	--
2013	6	5	15	26	*40
2014	--	--	--	--	--

*Starting in 2004 adults and yearlings were classified separately. Prior to 2004 yearlings were classified as adults. Therefore, the ratio K:100 has changed to exclude yearlings starting in 2004.

Surveys

As resources allow, we conduct annual surveys to determine minimum population size and herd productivity. These data are used to generate hunting permit allocations in accordance with statewide management guidelines. Poor survey conditions and timing produced a small sample size in 2009. Similarly, weather forced the 2013 survey outside of the preferred seasonal window and resulted in the classification of only 26 animals with a ratio of 40 kids per 100 adults. No survey was conducted in 2014 (Table 2).

Population status and trend analysis

This unit had been monitored closely from 2000-2007 with a stable population being observed. The 2009 and 2013 surveys suggest a decline in the population size; however, to what extent this decline is real or the result of a sampling artifact is unclear given the unavoidable suboptimal timing of the recent survey efforts. Continued annual aerial counts in very early summer will be needed to adequately document the status and trend in this population. Incidental observations outside of the traditional hunting unit verify that small numbers of goats are persisting in pockets scattered throughout suitable habitat in the Okanogan District. Little survey work has been done in these areas due to lack of resources. Population size and trend are unknown for these animals.

Habitat condition and trend

Goats in the Okanogan District contended with a mild to average snow pack this past year.

Goat habitat is almost entirely within secured areas and habitat availability remains stable. Habitat quality varies noticeably throughout goat range in the Okanogan District due to past wildfires of varying ages. For instance, regenerating burns in the Handcock Ridge area are improving forage conditions in this portion of the Methow Unit. Conversely, the fire in the Mt Gardner area is now over 25 years old and forage conditions may have passed the peak post-fire conditions. Overall, the unit is currently characterized by a mosaic of successional stages. Much of the district's goat habitat is in wilderness areas. As a result, changes in habitat quality will occur primarily through natural, unpredictable events such as wildfires and avalanches, rather than human intervention.

Management conclusions

Management objectives should continue to focus on population growth and distribution expansion. Resources are needed to allow for a consistent and methodical survey effort annually in late June to better determine population size and trend.

Significant differences in productivity between the north and south portions of the unit may be developing. Limited data from telemetry and survey flights suggests fairly minimal interchange occurs between the two herd segments. In addition, suitable goat habitat adjacent to this unit is sparsely populated and could likely support more animals than exist currently. Consideration should be given to augmenting the Methow Unit and surrounding areas to potentially boost genetic diversity and improve overall population numbers.

Also, the Handcock Ridge band spends significant time west of the Cascade Crest to the northwest of the Methow Unit boundary, and occupied goat range extends beyond the unit boundary to the south. As a result, redrawing and/or splitting the Methow into two units extending across administrative district boundaries should be explored.

MOUNTAIN GOAT STATUS AND TREND REPORT: REGION 2
CHELAN COUNTY

DAVID P. VOLSEN, District Wildlife Biologist
JON GALLIE, Wildlife Biologist

Population objectives and guidelines
The statewide management goals for mountain goats are to ensure healthy productive populations and native habitats, to provide opportunities for a wide range of non-consumptive uses, and to enhance populations to provide sustained recreational hunting opportunities. Statewide mountain goat strategies recommend that prior to a population being hunted, that it be surveyed a minimum of three years to determine its population size and trend, and that the population numbers a minimum 100 goats within the management unit. For stable or increasing goat populations meeting these guidelines, harvest is limited to no more than 4% of the total population, with harvest of females maintained at <30% of the total (WDFW 2008).

Hunting Seasons and Harvest Trends
Until 2001, no goat harvest had occurred in Chelan County in over 20 years. In 2001, 2 permits were authorized for North Lake Chelan, and 2 male goats were harvested (Table 1). Only one permit was issued each year from 2002-2008, with permits again increased to 2 in 2009. Hunter success has increased recently with 6 goats taken in the last three years. Rugged terrain, remote wilderness areas, and very limited access limits hunting success. An overall success rate of 67% meets the threshold required to maintain a permit. Of the 14 goats harvested since 2001, 4 have been nannies (28%).

A single permit will continue to be issued for the South Lake Chelan unit. The unit has only been open for hunting for two years, last year being the first successful harvest.

Mountain goat populations within the East-central Cascades (Chiwawa, East Stevens Pass, North Wenatchee Mtns, and Stehekin) have not been surveyed intensively enough to effectively determine their population size, and are currently closed to hunting. Recent surveys conducted via driving routes suggest that goat numbers in the North Wenatchee Mountains Unit are increasing and may warrant intensive helicopter sightability based surveys.

Surveys
As part of a hydropower license agreement, the Chelan Public Utility District (PUD) annually completes 12 winter wildlife surveys by boat on Lake Chelan along both north and south shores. For Lake Chelan, the total number of known goats is the result of comparing results from all surveys completed during each winter. This is the only annually collected, long-term data for Chelan County mountain goats (Pope and Cordell-Stine, 2014). However, the varied and rugged terrain as viewed from the lake makes sighting and correctly classifying mountain goat age and sex difficult, and contributes to high variability in the composition data. Kid numbers and ratios might also be biased high due to the large number of unclassified mountain goats recorded in the surveys.

Recent counts of goats collected along driven winter survey routes in other mountain goat areas in Chelan County suggest goat numbers are increasing. Priority should be given to acquiring population data using helicopter sightability protocols on goat populations within the East-central Cascades zone (Table 2).

Population Status and Trend Analysis
Mountain goat populations in Chelan County are well below historic levels of the 1960s. Except for the minimum counts collected along Lake Chelan, mountain goats are not monitored closely enough in Chelan County to document population size and trend. Observational data suggests that numbers are increasing from historical low numbers of 30 years ago. The Lake Chelan populations (which the PUD has monitored for the last 30 years) appear to be roughly stable (Table 3). Kid: adult ratios appear adequate for population growth, averaging 27 kids:100 adults over the last three years. This most recent winter saw unusually dry conditions, with very little snowfall, and as a result, surveys found few goats because most remained up at higher elevations. This produced rather low counts, but this likely does not reflect a population decline, rather a limitation in survey capability. The North Lake Chelan surveys averaged 54 goats (range: 43-78), with 22 kids:100 adults (range: 22-32) over the last three years. Goat counts for the North Lake Chelan population have decreased over the last 4 years, although it is

unknown if this is a true population decline or a problem with lake-based visibility, which causes high sighting variability. Future harvest may have to be adjusted to keep within management objectives and avoid impacting population growth.

The South Lake Chelan surveys over the last three years averaged 90 goats (range: 50-117), with 22 kids:100 adults (range: 10-29). This population has consistently had higher observed production than the North Shore over the last ten years. A minimum count of more than100 goats on the South Shore has been documented in three of the previous five years. Although herd productivity and habitat conditions are good, it is unknown if there are additional bands of goats from other populations utilizing the South Lake Chelan unit as winter range, or whether they are all resident herds.

Research

A statewide mountain goat research project was initiated to determine habitat use, seasonal range, population status, methods of survey, and population limiting factors in 2002. There were 3 adult nannies fitted with GPS collars during 2004 in District 7. One was collared on Nason Ridge, and one each on the North and South Lake Chelan Units. In 2005-2006, all goats were found to concentrate their activity in 4-5 mi^2 areas near their capture locations.

Insight was also gained on gene flow and interaction between populations. This was highlighted by two nannies collared on Gamma Ridge on Glacier Peak who traveled 10-12 miles east to the south shore of Lake Chelan. Any potential hunting opportunity offered in South Lake Chelan would have to take into account the potential harvest of goats from Region 4 as well. In addition, in fall 2006, 3 goats collared on Gamma Ridge were found in the Chiwawa region of Chelan County.

Habitat Condition and Trend

Fire suppression during the last 50 years has decreased habitat for mountain goats in Chelan County. Most mountain goat habitat is within wilderness areas and is managed by Okanogan-Wenatchee National Forest. Wilderness designation precludes most forms of habitat alteration, with changes in habitat condition occurring from forest fires. Fires are anticipated to reduce habitat initially, but increased forage post-fire will be beneficial to mountain goats. Over the last decade, several major fires in the Lake Chelan Basin (both shores), and North Wenatchee Mountains (Icicle and Tumwater Canyons) have burned substantial mountain goat habitat and range. The subsequent increase in early seral stage vegetation and forage may have contributed to the increase in mountain goat counts during the same time period (both in terms of increased production and visibility).

Management Conclusions

Mountain goat populations in Chelan County are below historic levels, thus the most of their populations are not hunted. Population trends in areas outside the Lake Chelan area cannot be effectively monitored without additional survey resources. Based on Chelan PUD survey data, average kid production is gradually increasing in both the north and south shore populations. Resources should be directed to helicopter sightability surveys Lake Chelan to produce a sightability-corrected abundance estimate (Rice et al. 2009) and compare that with boat survey data. Additional emphasis should be placed on more surveys in District 7, particularly those in the East-central Cascades to better understand trends in mountain goat populations and their distribution.

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Table 1A: Summary of Mountain Goat Harvest for North Lake Chelan

Year	Permits	Hunters	Harvest	Male	Female	Success	Goats Seen/Hunter	Days Hunted
2001	2	2	2	2	0	100	24	6
2002	1	1	0	0	0	0	0	20
2003	1	1	0	0	0	0	12	8
2004	1	1	1	1	0	100	3	3
2005	1	1	0	0	0	0	25	15
2006	1	1	0	0	0	0	0	1
2007	1	1	0	0	0	0	27	12
2008	1	1	1	0	1	100	25	8
2009	2	2	2	2	0	100	17	8
2010	2	2	2	2	0	100	35	5
2011	2	2	2	0	2	100	35	9
2012	2	3*	3*	2	1	100	52	7
2013	2	3*	1*	1	0	0	60	0

Table 1B: Summary of Mountain Goat Harvest for Lake Chelan

Year	Permits	Hunters	Harvest	Male	Female	Success	Goats Seen/Hunter	Days Hunted
2012	1	0	0	0	0	0	0	0
2013	1	1	1	1	0	100	20	6

* Includes Raffle/Auction hunter harvest

Table 2. Mountain Goat Counts in Chelan County 2000 – 2014

Year	North Lake Chelan	South Lake Chelan	Stehekin	Chiwawa	North Wentachee Mtns	East Stevens Pass	Total
2000-01	68	31	6		35		140
2001-02	44	28	2	12		1	87
2002-03	71	39		19		18	147
2003-04	72	56					128
2004-05	118	49					167
2005-06	91	57	4				152
2006-07	75	102					177
2007-08	104	76					180
2008-09	95	66		15	23	20	219
2009-10	81	128		9	69	22	309
2010-11	78	94		8	38	10	228
2011-12	43	116			71	12	242
2012-13	74	103			56		233
2013-14	45	50			78		173

Table 3. Mountain Goat Population Composition for Lake Chelan, Chelan County, 2001-2013

Year	Adults	Kids	Total Count	Kids:100 Adults
2001	60	14	74	23
2002	89	21	110	24
2003	103	25	128	24
2004	138	29	167	21
2005	120	29	149	24
2006	129	48	177	37
2007	113	26	139	23
2008	92	24	116	26
2009	133	39	172	29
2010	92	39	131	42
2011	116	33	149	28
2012	111	31	142	28
2013	42	7	49	17
Average	103	28	131	27

MOUNTAIN GOAT STATUS AND TREND REPORT: REGION 3
BLAZED RIDGE, BUMPING RIVER, NACHES PASS

JEFFREY A. BERNATOWICZ, District Wildlife Biologist

Population objectives/guidelines
The statewide goals for mountain goats are:

1. Preserve, protect, perpetuate, and manage mountain goats and their habitats to ensure healthy, productive populations.

2. Manage mountain goats for a variety of recreational, educational, and aesthetic purposes including hunting, scientific study, cultural and ceremonial uses by Native Americans, wildlife viewing and photography.

3. Enhance mountain goat populations and manage for sustained yield.

4. For populations to be hunted, a minimum of 100 goats and 25 kids: 100 non-kids over a 3-year period.

5. Harvest should not exceed 4% of a stable population.

Hunting seasons and harvest trends
Mountain goat season are open only to hunters drawing a special permit. In 2013, there were three permits spread over three units (Tables 1-3) in Region 3 and 3 goats were taken.

Surveys
Tables 1-4 show annual survey results for mountain goat units. The Kachess Ridge mountain goat unit is currently not open to hunting and has not been surveyed since 2005. Historically goat surveys were conducted in June and/or September. September surveys tended to yield the higher counts, but conflict with timing of other surveys and hunting seasons. Years with the lowest counts were typically those with June surveys. In 2013, surveys were conducted during August. Since 2009, raw counts have been corrected for visibility bias using a WDFW model.

Population status and trend analysis
The status of mountain goat populations is assessed using aerial surveys (Rice et al. 2009) and, as an ancillary data source, interviews with hunters, guides, and other people knowledgeable about local mountain goats.

All goat populations in the Region probably declined from historic levels due to over harvest. Research suggests that stable harvests are those no more than approximately 4% of the adult population. Goats were historically managed with more liberal permit numbers and with harvest rates often over 10%. Since 1996, harvest has been more conservative and populations are increasing in the area of the Bumping River as well as Naches/ Corral Pass. Goat populations in the Blazed Ridge area have been difficult to assess. Tallies from ground observers often exceed those of the aerial survey results. This unit is more forested than others and bands of goats maybe missed annually. The trend for Kachess Ridge is unknown, as no surveys have been conducted since 2005.

Habitat condition and trend
The majority of goats in the Bumping, Tieton, and Naches Pass areas spend summers in wilderness areas where short- term habitat is mostly influenced by weather cycles. However, fire suppression has reduced open meadow habitat in wilderness areas. Recent insect outbreaks have killed timber, making these areas prime for a large fire. Recreational use could also be influencing use of available habitat. There is no comprehensive documentation of where these goats winter. Outside the wilderness, timber harvest and road building may impact habitat.

The Blazed Ridge and Kachess Units are mostly outside wilderness areas. Timber harvest continues in both units. The north portion of the Blazed Ridge unit has been particularly heavily logged. The timber cutting has probably improved summer habitat, but may have removed winter cover. Road and trail densities have also increased. There are often roads at the top and bottom of every ridge. Off-road vehicle use and general recreation is heavy in the Blazed Ridge unit.

It is unknown how goats react to roads and human activity, which have increased with Washington's population. Major highways (e.g., I-90) have probably limited movements among herds over time. Smaller highways and developments (e.g., ski areas) could also limit movement and use of areas. This may limit re-colonization and recovery of some areas and may have long-term implications for genetic diversity.

Management conclusions

Goat populations in Region 3 have declined over historic levels, probably due to over-harvest. Harvest rates have been reduced and populations appear to now be recovering. Harvest guideline #4 has not always been followed closely. Until 2013 (Naches/Corral Pass) the three-year average has never exceeded 100 adults in any unit. However, unit boundaries may not correspond to biological populations. It is likely that gene flow occurs among all goats south of I-90. Hunting units have changed over time. Previously, Blazed Ridge was lumped with Naches Pass. Lines have arbitrarily been drawn with little knowledge of population structure or movements. This has led to a conservative harvest. Following decades of overharvest, it was prudent to be very conservative. Now that populations are recovering, it may be time to review populations and harvest. For units within the region, there were an estimated 265 adult goats in 2013. A 4% offtake quota would thus have suggested issuing 10 permits instead of 3. The estimate of 265 goats likely remains biased low. The visibility correction model (Rice et al. 2009) can only adjust for groups of goats seen, and not all groups are seen within a unit on a given survey. Surveys do not cover all habitats. The northwest 1/3 of the Bumping unit is not surveyed and the unit abuts Mount Rainer National Park. Groups of goats are known to cross the boundary. North of I-90, the Kachess unit was probably the smallest in the state and has limited habitat. It is unlikely the unit ever had 100 adult goats. A meaningful subdivision of the population would probably stretch between I-90 and Hwy 2. The entire area has never been surveyed, but observations suggest there are well over 100 adult goats between these highways. If surveyed, there may be justification for additional hunting opportunity.

Guideline #5 (4%) may be overly simplistic. Game populations are much more impacted by female harvest than male harvest. Other states use a point system where harvest of females is accounted for differently than harvest of males. A point system that would account for the demographic distinction between harvesting billies and nannies is currently under consideration for adoption as part of the next 6-year Game Management Plan.

Literature Cited

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Table 1. Harvest and surveys for Bumping River (Mountain goat Unit 3-7)

Harvest Information				Survey Data (for 2009 and later, figures represent points estimates from sightability-corrected model; Rice et al. 2009)			
Year	Permits	Hunters	Harvest	Kids	Adults	Total	K:100
1990	15	14	11				
1991	10	9	7	5	12	17	42
1992	10	10	9	12	66	78	18
1993	6	6	5	7	43	50	16
1994	6	5	4	5	35	40	14
1995	2	2	2	3	30	35[a]	17
1996	6	5	5	20	39	59	51
1997	1	1	1	12	49	61	25
1998	2	2	2				
1999	2	2	2				
2000	2	1	1	7	22	39	32
2001	2	2	2	14	46	60	30
2002	2	2	2	25	52	77	48
2003	2	2	2	24	59	83	41
2004	2	1	1	16	39	55	41
2005	2	2	2	32	66	98	48
2006	2	2	2	15	39	54	38
2007	2	2	1	9	40	71[a]	22
2008	2	3*	3*	15	53	68	28
2009	2	2	2	17	46	63	27
2010	1	1	1				
2011	1	1	1	28	75	103	37
2012	1	1	1	39	103	142	38
2013	1	1	1	43	108	151	39

* Includes auction/raffle

[a] Includes unclassified

Table 2. Harvest and surveys for Naches/Corral Pass (Mountain goat Unit 3-6 and 4-38)

Harvest Information				Survey Data (for 2009 and later, figures represent points estimates from sightability-corrected model; Rice et al. 2009)			
Year	**Permits**	**Hunters**	**Harvest**	**Kids**	**Adults**	**Total**	**K:100**
1990	12	>7	>7				
1991	12	8	6	10	42	52	24
1992	12	10	9	11	86	97	13
1993	14	12	11	5	18	23	28
1994	14	11	9	13	27	40	48
1995	5	3	2	9	78	87	12
1996	14	11	9	23	58	81	40
1997	5	5	5	10	55	65	18
1998	7	7	7				
1999	5	5	5				
2000	5	5	5	21	48	69	44
2001	5	5	4	3	18	21	17
2002	4	3	4	18	41	59	44
2003	3	3	3	18	62	80	29
2004	2	2	1	21	61	82	34
2005	2	2	2	40	55	95	73
2006	2	2	2	18	73	91	25
2007	2	1	1	25	67	107	37
2008	2	3*	3*	37	79	116	47
2009	1	1	1	41	106	147	39
2010	1	1	1	29	74	103	39
2011	1	1	1	37	96	133	38
2012	1	1	1	34	112	147	32
2013	1	1	1	45	104	169[a]	43

* Includes auction/raffle

[a] Includes unclassified

Table 3. Harvest and surveys for Blazed Ridge (Mountain goat Unit 3-10)

Harvest Information				Survey Data (for 2009 and later, figures represent points estimates from sightability-corrected model; Rice et al. 2009)			
Year	Permits	Hunters	Harvest	Kids	Adults	Total	K:100
1991				9	22	31	41
1996	3	2	1	27	57	79	47
1997	1	1	1	40	99	139	40
1998	6	6	6				
1999	6	6	6				
2000	6	6	5	18	43	61	42
2001	2	3*	2*	13	40	53	32
2002	1	1	1	15	40	55	37
2003	1	2*	2*	27	66	93	29
2004	2	3*	3*	17	63	80	27
2005	2	2	2				
2006	2	2	2	30[a]	83[a]	113[a]	36
2007	2	1	1	22	56	78	39
2008	2	2	1	22	50	72	44
2009	1	1	0	15	52	67	22
2010	1	1	1				
2011	1	1	1	14	32	46	44
2012	1	1	1	26	78	104	33
2013	1	1	1	14	53	67	27

* Includes auction/raffle

[a] Probable double count of ~15 animals

Table 4. Harvest and surveys for Kachess Ridge (Mountain goat Unit 3-11)

Harvest Information				Survey Data			
Year	Permits	Hunters	Harvest	Kids	Adults	Total	K:100
1991				21	39	60	54
1992				7	18	25	39
1993				14	44	58	32
1994-5		NO DATA					
1996	1	1	1	11	25	36	44
1997	1	1	1	1	5	6	20
1998	1	1	1				
1999	1	1	1				
2000	1	1	1	5	32	37	16
2001	1	1	1	6	22	28	27
2002	1	1	1	6	18	24	33
2003	0			No	Survey		
2004	0			8	18	26	44
2005	0			13	23	36	57
2006-13	0			No	Survey		

MOUNTAIN GOAT STATUS AND TREND REPORT: REGION 4
MT. BAKER AREA

PAUL DEBRUYN, Wildlife Biologist

Population Objectives/Guidelines
The management objective for mountain goat units in northern Region 4 is to maintain stable populations in all units for public viewing and harvest opportunities. Specific guidelines for managing harvest within sustainable limits are discussed in WDFW's Game Management Plan (2008). The harvest guidelines are to limit harvest to 4% or less of the total population, only allow harvest in goat population meeting or exceeding 100 total animals, and limit nanny harvest to 30%.

Hunting Seasons and Harvest Trends
A rebounding mountain goat population in the Mount Baker area has recently facilitated renewed hunting opportunities in this area. In 2007, Mount Baker units 4-3 –Chowder Ridge and 4-7 – Avalanche Gorge were reopened with one permit issued per unit. This hunt opportunity has been conservatively managed, with a maximum annual allocation of 5 permits in both 2010 and 2011 (Table 1). Because two tags have been issued in at least one hunt unit over the past three years, there has also been the potential that the statewide auction and raffle permit holders could also hunt in this area.

Surveys in 2012 and 2013 showed higher numbers of goats and the number of permits was set at 4 for 2013, two in Avalanche Gorge and one each in Chowder Ridge and Lincoln Peak. Two of the four tags were filled (one in Chowder Ridge and one in Avalanche Gorge) and neither the auction or raffle winner harvested goats in the unit. One billy was harvested by a tribal hunter.

Surveys
In July 2013, an aerial mountain goat survey was conducted in the Mt. Baker/Loomis Mountain areas of Whatcom and Skagit Counties. A Bell Jet Ranger helicopter was used to fly the survey area. The survey routes were the same as in previous years' surveys but varied slightly (as occurs in most years) in response to weather and habitat changes. A total of 310 goats were observed within the Mt. Baker and Lake Ann, and Loomis Mountain survey blocks (Table 2).

Table 2. 2013 Mountain Goat Survey Results for the Mount Baker Area

Survey Block	Total	Adults	Yearlings	Kids	Unknown
Black Buttes	25	14	0	6	0
Heliotrope	31	17	0	9	0
Chowder Ridge	119	72	11	36	0
Sholes Glacier	0	0	0	0	0
Coleman Pinnacle	74	39	6	27	0
Lava Divide	10	9	0	1	0
Lake Ann	38	28	4	6	0
Loomis Mountain	13	10	2	1	0
Total	**310**	**189**	**23**	**86**	**0**

The overall number of goats observed on Mount Baker rebounded substantially in 2012 and 2013 from the 2011 survey, when only 206 goats were observed. A significant component of this increase was kids, resulting in a sizeable jump in kid: adult ratio of 18:100 in 2011 to 52:100 in 2013(Table 3).

Table 3. Mt Baker* Mountain Goat Surveys 2004-2013

Year	Kids	Yearling	Adult	Unk.	Total	Kids:100 Adults
2004	56	26	136	3	222	41
2005	78	64	178	11	331	44
2006	79	53	189	3	324	42
2007	77	32	219	0	328	35
2008	72	32	196	8	308	37
2009	89	33	209	0	331	43
2010	71	39	195	7	312	29
2011	24	47	134	1	206	18
2012	85	34	184	0	303	46
2013	79	17	151	12	259	52

*Mt. Baker includes the following survey blocks: Black Buttes, Heliotrope, Chowder Ridge, Sholes Glacier, Coleman Pinnacle, Lava Divide, Lake Ann, and Loomis Mountain.

When adjusted for sightability bias due to group size, terrain obstruction, and vegetative cover, the 2013 estimate for all areas surveyed was 326 animals (Table 4). The estimated ratios of kids/(adults+yearlings) was 0.39(95% CI = 0.37-0.41) and of (kids+yearlings)/adults of 0.58 (95% CI = 0.53-0.58) were among the highest ever observed at Mount Baker.

Table 4. Estimates for the Mount Baker Area

	Observed	Estimates	90% CI
Groups	41		
Total	310	326.0	310.4-341.5
Adults	189	201.7	190.4-212.9
Yearlings	23	24.3	21.9-26.7
Kids	86	87.9	84.0-91.8
Unknown	12	12.1	11.2-13.1
Adults & Yearlings	212	226.0	213.2-238.7
Juveniles	109	112.2	106.8-117.6
Kids/Adult+Yl	0.41	0.39	0.37-0.41
Juv/Adult	0.58	0.58	0.53-0.58

Population Status and Trend Analysis

The majority of historical information regarding goat numbers and distribution has been derived from harvest report cards and questionnaires returned by permitted hunters. Historically, goat management units 4-2, 4-3, 4-4 and 4-5 collectively encompassed the Mt. Baker range in Whatcom and Skagit Counties. Harvest in these units during the period 1969-85 totaled 121 animals with an average harvest of 13 goats per season. For the period 1986-95, harvest totaled 26 animals with a 6 goat per season average. By 1996, all of the Mt. Baker GMUs were closed to hunting due to declines in harvest and goats reported by permit hunters.

An aerial survey of the Mt. Baker GMUs was conducted in 1996. That survey documented only 61 animals (an average of 8.7 goats per unit). A similar survey completed in 2000 covering 80% of the range documented 88 animals (an average of 17.6 goats per unit). An October 2001 survey that covered 100% of the Mt. Baker range documented a total of 121 (an average of 24.2 goats per unit). These survey data indicate a 178% increase in the average goats seen per unit in 2001 when compared with the 1996 survey.

After remaining stable or slightly increasing between 2002 and 2010, survey numbers declined in 2011. Numbers of kids observed in 2011 were particularly low suggesting high winter mortality and low fecundity. High snowpack in the summer of 2011 could also have altered goat migration behavior and thus biased survey numbers, but subsequent observations suggest that there was a real drop in population numbers in 2011 potentially related to a winter kill event. In 2012 and 2013, this trend was reversed.

Habitat Condition and Trend

The Mount Baker area mountain goat population has rebounded substantially since the low abundances in the 1980s and 1990s. Consistent population estimates from 2005 to present suggest that this population is at or nearing carrying capacity. Conservative hunting, which was reestablished in 2007, appears to be having negligible effects on population size, age/sex structure, and population trend.

The majority of goats in the Mount Baker area are within the Mount Baker Wilderness area on the Mount Baker-Snoqualmie National Forest and the adjacent North Cascades National Park. Federal land management restrictions are protective of habitat qualities critical for the maintenance of a robust mountain goat population. However, this area has seen an increase of recreational uses including hiking, backcountry skiing, and snowmobiling. Discussions on goat management between WDFW and the Tribes are ongoing and remain a high priority.

Literature Cited

WDFW. 2008. Game Management Plan. Washington Department of Fish and Wildlife. Olympia, WA. USA. 136p.

Table 1. Summary of harvest information for mountain goats in Mt. Baker Area (2008-2013)

Hunt Unit	Year	Permits	Hunters	Harvest	Success (%)	Goats seen	Kids seen	Days hunted
Chowder Ridge	2008	1	1	1	100	1	0	1
	2009	1	1	1	100	65	15	2
	2010	1	1	1	100	92	35	3
	2011	1	1	1	100	85	12	5
	2012	2	2	2	100	NA	NA	NA
	2013	1	1	1	100	50	0	0
Lincoln Peak	2008	0	-	-	-	-	-	-
	2009	1	1	1	100	47	14	8
	2010	2	2	2	100	56	8	5
	2011	2	2	2	100	100	31	19
	2012	1	1	0	0	25	10	0
	2013	1	0	0	0	3	0	0
Avalanche Gorge	2008	1	1	0	0	40	2	0
	2009	1	1	1	100	9	1	1
	2010	1	1	1	100	27	7	4
	2011	1	0	0	0	0	0	0
	2012	0	-	-	-	-	-	-
	2013	2	2	1	50	22	0	14
Dillard Creek	2009	1	0	0	0	-	-	-
	2010	1	1	1	100	40	20	12
	2011	1	1	1	100	6	2	9
	2012	0	-	-	-	-	-	-
	2013	0	-	-	-	-	-	-

MOUNTAIN GOAT STATUS AND TREND REPORT: REGION 5
GOAT ROCKS, SMITH CREEK, TATOOSH

STEFANIE BERGH, Wildlife Biologist
ERIC HOLMAN, Wildlife Biologist

Population Objectives and Guidelines
Region 5 of the Washington Department of Fish and Wildlife (WDFW) has two mountain goat population management units that have been monitored in recent years; Smith Creek (Goat Unit 5-3), and Goat Rocks/Tieton River (Goat Unit 5-4/3-9). The Goat Rocks/Tieton River Unit has historically contained one of the highest goat populations of any goat unit in the state of Washington (Rice 2012). Current population goals for these three areas are to maintain or expand current population levels.

Hunting Seasons and Harvest Trends
Hunting opportunity for mountain goats in Washington is allowed only to those selected in the Special Permit Drawing. Those fortunate enough to draw a mountain goat tag may hunt only within a specified goat unit. Hunters are allowed to hunt only with archery equipment from September 1-14 and may use firearms from September 15 through October 31. The bag limit is one goat of either sex, with horns longer than 4 inches, although hunters are encouraged to refrain from shooting nannies. Tag allocation for each unit is conservative in nature, with dual goals of providing a high-quality hunt for those successful in the permit draw and having little or no effect on the goat population.

Mountain goat studies completed by WDFW have led to a new population guideline to direct harvest management (WDFW 2008). A goat unit must have an estimated population of 100 or more to allow harvest. Furthermore, harvest levels are designed to remove 4% or less of the adult population (WDFW 2008). The Smith Creek and Tatoosh Units both have populations of less than 100 individuals and no permits have been issued for these units since 2008. These units will be monitored periodically to determine if populations have improved to the point of allowing hunting again. Three tags were offered in the Goat Rocks/Tieton River Goat Unit during 2013. All 3 of the permits holders reported killing a goat: two billies and 1 nanny (Table 1). Unlike in some past years, neither the auction nor the raffle goat permits were used in the Goat Rocks/Tieton River Unit.

Population Status and Trend Analysis
In 2013, the Goat Rocks/Tieton River Unit was surveyed, yielding 308 animals observed (Table 2) and a sightability-corrected population estimate of 323 (Table 3) with a 95% confidence interval of 307 to 338. The Smith Creek Unit was most recently surveyed in 2012, yielding a sightability corrected estimate of 64 goats (95% confidence interval: 48-79; Table 3). Additional areas in Region 5 known to be occupied by mountain goats were not surveyed due to lack of funding and because no hunting permits are currently offered for these smaller populations. Unsurveyed areas populated with mountain goats in Region 5 include Tatoosh, Dark Divide, Mt. St. Helens, Mt. Adams, and the Mt. Margaret Backcountry.

Sightability corrected aerial surveys conducted over the past several years suggest stability in the Goat Rocks and Smith Creek goat populations. Aerial surveys conducted in the mid-2000s by WDFW indicate that mountain goat populations in the Tatoosh unit have declined. None of the mountain goat populations in Region 5 are scheduled for aerial survey in 2014, however, an effort to quantify the number of mountain goats in the Mt. St. Helens and the Mt. Margaret Backcountry area using ground-based observers is planned. Incidental observations collected by USFS personal have suggested an increase in goat abundance in these areas.

Habitat Condition and Trend
High elevation openings characteristic of goat habitat are being lost in the Smith Creek Unit due to conifer encroachment. Alpine meadows are critical mountain goat foraging areas. Given the limited extent of suitable goat habitat in the Smith Creek Unit, the loss of habitat represents a threat to the sustained viability of this goat population. Results of the cooperative Cispus Adaptive Management Area project indicate that in the four study areas (Stonewall ridge, South Point ridge, Smith ridge, and Castle Butte) a total of 404 acres of alpine meadow were lost in the period spanning 1959-1990 (Kogut 1996).

High alpine meadows are thought to be primarily created through disturbance such as avalanche, disease, wind-throw, and fire (Hemstrom 1979). Periodic fire is considered to be one of the most important factors in the creation and maintenance of alpine meadow (Olmsted 1979). United States Forest Service policy currently dictates the suppression of both man-made and naturally occurring fires. This policy has probably resulted in the losses of alpine meadow documented in the above study. In the years since the completion of this study, the loss of meadow has likely continued. Thus, the need for restoration and preservation of these areas is paramount to continued healthy goat populations.

Habitat Enhancement

Budgetary, logistical, safety and other constraints in both the USFS and WDFW make the possibility of a prescribed burn program in the foreseeable future unlikely. However, naturally occurring high-elevation fires have occurred recently in areas associated with Mt. Adams and could occur elsewhere. Another possible avenue to address conifer encroachment is through the use of girdling and snag creation.

Management Conclusions

Mountain goats in Region 5 are valued for both viewing and hunting opportunities. Consequently, harvest quotas are kept at conservative levels to maximize both the consumptive and non-consumptive recreational attributes of these populations. Management direction dictates that two of the traditionally hunted units in Region 5 (Smith Creek and Tatoosh) remain closed until populations increase.

The continuation of annual aerial surveys is needed to document trends in population and productivity. Aerial surveys provide the least biased and most efficient method of census, particularly considering the large expanse of area involved. Additionally, the proposed ground-based survey of goats associated with Mt. St. Helens and the Mt. Margaret Backcountry may prove to be a useful method in those locations.

Raffle and auction permit holders sometimes select the Goat Rocks unit as it has one of the highest numbers of goats and has a long history of successful goat hunting. As such, harvest by raffle and auction permit holders must be factored into and considered when setting the permit level for Goat Rocks. A proposed system of multi-year quotas for each sex may address this issue and is likely to be included in the newest Game Management Plan.

Based upon the results of the cooperative Cispus AMA study, alpine meadow restoration in the Smith Creek Unit is recommended. Fire management in potential goat habitat will also play an important role in the expansion of goat populations outside of the Goat Rocks.

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Table 1. Hunter Survey Summary Goat Rocks 2004-2013

Year	Permits Issued	Harvest	% Success	Average # Goats Seen/Hunter	Average # Days/Harvest
2004	6	4	67	87	13
2005	6	6	100	25	18
2006	5	5	100	65	3
2007	5	3	60	56	9
2008	5	5	100	46	4
2009	5	5	100	40	2
2010	5	4	80	51	3
2011	3	4	100+	60	3
2012	3	3	100	48	1
2013	3	3	100	9	5

Note: Harvest exceeded permit numbers in 2011 due to hunting by Auction and Raffle Permit holders.

Table 2. Raw Survey Data from Mountain Goat Flights Region 5 2004-2013

Goat Unit	Year	Adult	Yearling	Kid	Unknown	Total	Kid: Adult
Goat Rocks/ Tieton River	2004	183	31	43	0	261	23:100
	2005	188	47	66	0	303	35:100
	2006	203	14	71	0	290	35:100
	2007	No Survey in 2007					
	2008	178	23	60	7	268	34:100
	2009	170	33	73	0	276	43:100
	2010	181	14	36	0	217	20:100
	2011	205	17	31	0	253	15:100
	2012	146	22	33	0	231	23:100
	2013	234	2	72	0	308	30:100
Smith Creek	2004	16	3	11	0	30	69:100
	2005	15	6	11	0	32	73:100
	2006	16	6	5	0	27	31:100
	2007	28	0	6	0	34	21:100
	2008	9	2	4	2	17	44:100
	2009	No Survey in 2009					
	2010	28	6	8	0	42	29:100
	2011	No Survey in 2011					
	2012	32	4	14	0	50	44:100
	2013	No Survey in 2013					
Tatoosh	2004	5	0	2	0	7	40:100
	2005	12	4	6	0	22	50:100
	2006	16	0	4	0	20	25:100
	2007	1	0	1	0	2	NA
	2008	0	0	0	0	0	NA

Table 3. Sightability Corrected Mountain Goat Survey Results Region 5 2004-2013

Goat Unit	Year	Population Estimate (90% CI)
Goat Rocks/Tieton River	2004	250 (237-263)
	2005	341 (322-359)
	2006	308 (291-326)
	2007	No Survey
	2008	282 (No CI)
	2009	285 (274-297)
	2010	224 (213-236)
	2011	259 (250-268)
	2012	246 (232-261)
	2013	323 (307-338)
Smith Creek	2008	32 (No CI)
	2009	No Survey
	2010	41 (33-49)
	2011	No Survey
	2012	64 (48-79)
	2013	No Survey

Bighorn Sheep

BIGHORN SHEEP STATUS AND TREND REPORT
STATEWIDE

RICHARD B. HARRIS, Special Species Section Manager

Population objectives and guidelines

The population objectives for bighorn sheep herds are to maintain each herd at levels indicated in Table 1 and to monitor herds at a level where a 20% change in population size can be detected in 3-years or less (Game Management Plan 2008). The harvest objective for bighorn sheep is to maintain a harvest success that averages >85% over a 3-year period, while at the same time bighorn population size remains stable or increasing. Strategies and harvest thresholds to obtain these objectives are described in the WDFW's Game Management Plan (2008). WDFW biologists are currently in the process of revisiting the herd objectives, and we expect to have revisions prepared for next year's report.

Washington Department of Fish and Wildlife continues cooperative work with the Foundation for North American Wild Sheep, Idaho Department of Fish and Game, Oregon Department of Fish and Wildlife, U.S. Forest Service, and the Bureau of Land Management on restoration of bighorn sheep within Hells Canyon. Project activities included monitoring lamb production and mortality, sightability surveys, and disease investigations related to spillover of pathogens from domestic to bighorn sheep.

Hunting seasons and harvest trends

Bighorn sheep hunting opportunity in Washington is limited to permit-only hunting. Permit availability, and therefore hunter opportunity, has steadily increased in Washington (Figure 1). In 2013, 28 special season permits, 1 auction permit, and 4 raffle permit were available (including the potential from multi-species raffles) in 10 different sheep management units. Most 2013 bighorn sheep seasons were September 15 to October 10, (except 4 areas; either October 1-10 or November 5-30). Hunters had the choice of any legal weapon to harvest any bighorn ram (no curl restrictions). Of the 33 permits available in 2012 (including the auction and raffles), reports were received from all hunters, who killed 31 sheep (hunter success rate = 94%). One ram permit holder (in Vulcan Mountain), and one ewe permit holder (in Mt. Hull) did not harvest a bighorn.

Table 1. Population size objectives for specific bighorn sheep herds.

Herd	Population objective[b]
Hall Mountain[a]	40 - 70
Asotin Creek[a]	50 - 60
Black Butte[a]	300
Wenaha[a]	140
Cottonwood Creek[a]	50 - 60
Tucannon	60 - 70
Vulcan	80 - 110
Mt. Hull	55 - 80
Sinlahekin	50
Swakane	50 - 60
Quilomene	250 - 300
Umtanum (+Selah Butte)	250 - 300
Cleman Mountain	140 - 160
Lincoln Cliffs	90-100
Lake Chelan	100 - 150
Tieton River	75 - 150
Total	1,750 - 2,130

[a] Rocky Mountain bighorn sheep
[b] Based on biologists' estimates of habitat capacity, including forage, escape cover, and water sources.

Surveys

All bighorn sheep herds in Washington are surveyed annually. In 2013, both ground counts and aerial surveys were used to survey and classify sheep as lambs, ewes, or rams. In some herds, rams were further classified as yearling, less than 3/4 curl, or greater than 3/4 curl; in other herds, rams were classified according to the Class I-IV system. Surveys were conducted at differing times throughout the year, with a general pattern for most regions being to survey total herd composition in winter. Some herds were also surveyed post-lambing in early summer.

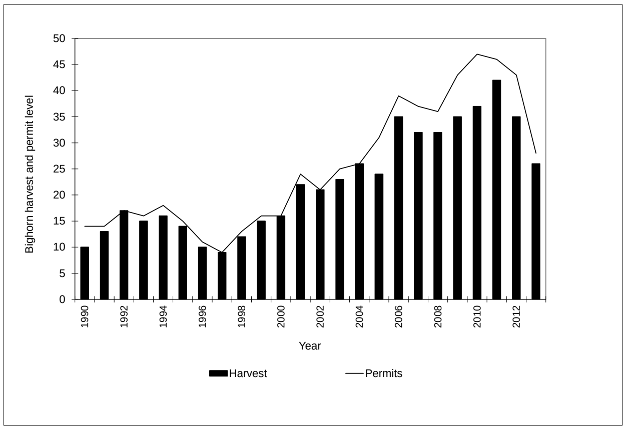

Figure 1. Regular draw permits (line) and harvest (bars) of bighorn sheep in Washington, 1990-2013.

Population status and trend analysis

Survey results indicate bighorn populations are stable in most areas (see regional reports), with many populations having increased since the 1990s. Notable exceptions are the Hall Mountain bighorn herd, which has remained small (and is not currently hunted), and some of the Blue Mountain herds, most of which have recently experienced disease outbreaks.

Rocky Mountain bighorns in the Blue Mountains continue to struggle as they recover from the 1995 pneumonia outbreak. Lamb mortality has remained high and ewe survival has declined in several herds; however, the total sheep population has remained fairly stable, with a sizable mature ram component.

Mycoplasma ovipneumoniae induced pneumonia continues to plague 4 of the 5 Blue Mountain bighorn populations; Asotin, Black Butte, Wenaha, and Mountain View. The Tucannon herd has not experienced pneumonia caused mortality, but do carry scabies (*Psoroptes ovis*). Bighorn populations in the Blue Mountains have not recovered from the pneumonia die-off as quickly as some herds, possibly from re-infection from domestic sheep and goats that exist within the range of multiple herds. The presence of domestic sheep and goats within and adjacent to bighorn sheep range presents a constant and substantial risk of another major epizootic. WDFW actively works with landowners near bighorn sheep herds to make sure accurate information is available and options to minimize contact are made available.

Other government agencies have encouraged landowners to use domestic goats for weed control. This type of weed control program presents a substantial risk to bighorn sheep populations in southeast Washington.

Scabies continues to be present in all five herds, with unknown effects on the populations. The Tucannon herd suffered a major die-off caused by scabies when it was infected in 1999.

California bighorn populations remained stable in most herds (see individual herd reports). In December 2009, an outbreak of pneumonia was discovered at the north end of Umtanum. *Mycoplasma ovipnuemonia* was documented in the Umtanum/Selah Butte herd. Forty-four sheep are known to have died from December 2009-May 2010. Forty-two were found in the north portion of Umtanum and only 2 at the south end. No natural mortalities were found east of the river in Selah Butte. Recognizing the long-term effects of this disease in bighorn sheep, the Department initiated a culling action of bighorns with clinical signs of pneumonia in the Umtanum herd. Sixty-nine sheep were culled from the herd in an attempt to slow the spread of the disease, increase subsequent lamb recruitment, and better understand the disease distribution. All animals culled from west of the river tested positive for some degree of pneumonia or presence of *Mycoplasma ovipneumoniae.* East of the river, there did not appear to be significant signs of disease, but *Mycoplasma ovipnuemonia* could not be ruled out in a few individuals. By August 2010, lamb survival was very low on both sides of the river. Observations of coughing sheep and samples from hunter harvested rams in September confirmed that the disease had spread to Selah Butte. Two of 4 sheep sampled in Umtanum during September were clear of pneumonia, possibly because the disease outbreak was waning. No significant adult mortality has been observed on either side of the river since early 2010, and both lamb and adult survival appears to be high in both 2011 and 2012. While there may have been some double counting of ewes and lambs during aerial surveys in 2012, the herd had, by 2012 recovered to within objectives.

In early 2013, we captured and radio-collared 25 ewes and 5 rams from the Umtanum/Selah Butte herd, to monitor post-recovery lambing and survival. Although initial survival in summer 2013 was high, we documented poor survival in late summer, resulting in poor recruitment. Thus, it appears that the pneumonia has yet to completely clear from the Umtanum/Selah Butte herd. Preliminary results from lambing season 2014 suggest that recruitment remains poor.

In early 2013, the Tieton herd became the latest casualty of pneumonia. We began documenting an unusual number of road-killed animals in late winter 2013. By late March, it was clear that a major die-off had been underway for some weeks, and we surveyed the herd using a helicopter. Where we'd estimated approximately 150 sheep in this population in late 2011 (and as many as 200 or so earlier), we were able to account for only 35 live animals (with almost as many carcasses visible). Veterinary sampling confirmed that all animals had gross lesions consistent with pneumonia, and molecular testing confirmed the presence of *M. ovipnuemoniae* in all animals. Because of the virulence of the disease (indicated by the rapid on-set and incidence of mortality), and the proximity to the uninfected Cleman Mountain herd, WDFW decided to remove all remaining animals in the Tieton Herd. As of late mid-September 2013, the combination of agency, USDA Wildlife Services, and independent contractors had removed all but 3 animals, and indications were that these had either died or dispersed far from the Tieton area.

Also in early 2013, the Sinlahekin herd experienced either a dramatic die-off, or an unexpected and unexplained range shift. From an estimated 90-95 animals in 2011 (from a count of 82), we were able to document only 26 animals during repeated counts in 2013. This herd had earlier been documented to have contracted scabies from the mite *Psoroptes ovis*, but large-scale mortality from this mange mite is usually considered rare. In early February 2014, we captured and tested 11 animals from the Sinlahekin herd; none tested positive for active infection or antibodies to *Mycoplasma ovipneumoniae*. These animals were also outfitted with GPS radio-collars, and their status will be monitored. The status of this herd remains unknown and a source of concern to WDFW.

Habitat condition and trend

Range conditions for bighorn sheep varied from poor to excellent. Recent fires in the vicinity of the Mt. Hull, Tucannon, Swakane, Manson, and Lake Chelan herds have rejuvenated vegetation and reduced conifer encroachment, improving habitat conditions generally for bighorns. Conversely, noxious weed invasion, primarily yellow-star thistle, continued to be a major concern for many bighorn sheep ranges (particularly in the Blue Mountains). Grazing also is a concern in several areas of the Blue Mountains and Yakima River basin.

Management conclusions

Bighorn sheep management in Washington centers on four main issues at this time: 1) minimizing the probability of new disease outbreaks, 2) helping herds infected with pneumonia-causing bacteria cope with, and ultimately recover from, persistent disease; 3) recovering depleted herds via augmentation; and 4) maintaining, and where possible increasing, habitat quantity and quality. WDFW continues to consider the possibility of establishing new self-sustaining herds in the few remaining areas of unoccupied habitat where land ownership might allow it, but implementation is currently a lower priority than maintaining existing herds.

Disease outbreaks associated with domestic-bighorn interactions is the primary concern for several herds. Disease has decimated or threatens at least 7 bighorn sheep herds at present. For those herds, eliminating the risk of disease transmission between domestic and bighorn sheep is the priority.

Noxious weed control is important for maintaining quality forage habitat for sheep and aggressive programs aimed at eliminating invading species and restoring native grasses are essential. Noxious weed control can be accomplished only in conjunction with better overall range grazing practices. Where the potential exists for conflicts between bighorn sheep and domestic sheep, particularly on federal lands, we should seek cooperative agreements that place a priority on the restoration of native species (i.e., bighorn sheep).

BIGHORN SHEEP STATUS AND TREND REPORT: REGION 1
HALL MOUNTAIN

ANNEMARIE PRINCE, Assistant Wildlife Biologist
DANA L. BASE, District Wildlife Biologist

Population objectives and guidelines

Rocky Mountain bighorn sheep were introduced to Hall Mountain in Pend Oreille County, Washington from Alberta, Canada in 1972 (Johnson 1983). The founder herd included 5 rams and 13 ewes. Two additional ewes were translocated to Hall Mountain in 1981 from Thompson Falls, Montana. The traditional objective has been to maintain a population of 40–70 Rocky Mountain bighorn sheep within the Hall Mountain herd (WDFW 2008). In the past this population was used primarily as a source for Rocky Mountain bighorn sheep transplants into other areas of Washington State.

The Hall Mountain herd was not hunted until 2009 when this population of bighorn sheep was made available for harvest to the Rocky Mountain bighorn sheep state raffle permit winner. On December 2, 2010, the winner of the Rocky Mountain bighorn sheep raffle permit harvested a full horn curl ram which was the first hunter-harvested bighorn sheep ever from this herd.

Surveys, population status, and trend analysis

From the early 1970s through 2002, ground surveys at the Noisy Creek winter feeding station were carried out to estimate the total number of sheep, sex ratio, and lamb production (Table 1). In 2003, the winter feeding station was dismantled and feeding discontinued. Observations in the vicinity of the feeding site were made during the first post-feeding winter (2003-2004) to assess response of the sheep to the loss of the food source; few sheep were observed. A survey conducted the following winter (2004-2005) documented 27 bighorn sheep at the feeding site. As sheep were replaced by their progeny, they largely lost fidelity to the winter-feeding site. USFS personnel reported observations totaling 12 sheep (4 rams, 6 ewes, 2 lambs) in early summer, 2012.

With the loss of the ability to reliably survey sheep at the feeding site each winter, other survey techniques and protocols have been used. Ground-based surveys are time intensive and generally require more than one visit to obtain a count. As the sheep disperse over a larger range for forage, they are less likely to be surveyed with precision. Helicopter surveys are more productive than ground-based surveys, but more expensive. If the population increases to a level that facilitates area-specific permit hunting, more intensive monitoring of the Hall Mountain herd would be required.

Two helicopter surveys of Hall Mountain bighorn sheep were accomplished in the winter of 2013-14. During the first survey on January 31, 5 sheep (3 rams, 2 ewes) were observed. In the subsequent survey on February 6, a total of 21 sheep (11 rams, 7 ewes, 3 lambs) were observed. The second survey included a previously unsurveyed area within the herd's range. (Table 1). Because this area was not surveyed in previous winter's surveys, it is likely that helicopter surveys in the last few years did not count a portion of the herd and survey numbers portrayed a lower sheep population than actually existed on the landscape.

Habitat condition and trend

Northeastern Washington is densely forested and the Hall Mountain bighorn sheep depend upon the steep terrain, open grasslands, and other scattered sub-alpine openings for forage and predator avoidance. Non-forested escape terrain is limited and fragmented within the range of the Hall Mountain herd including Sullivan Mountain, Crowell Ridge, Gypsy Ridge, and Hall Mountain. Sheep migrating between these and other peaks and ridges have to travel through valley bottoms and dense forest where vulnerability to predation by cougars, bears, and more recently, wolves, may increase.

Table 1. Population composition counts of Hall Mountain bighorn sheep, 2001 - 2013. (Note that the last year of winter feeding was in 2003.)

Year	Lambs	Ewes	Rams	Count Total	Ratio Lambs: 100 Ewes: Rams
2001	4	11	8	23	36 : 100 : 73
2002	7	13	4	24	54 : 100 : 31
2003	-	-	-	No Data	No Data
2004	-	-	-	No Data	No Data
2005	7	14	6	27	50: 100: 43
2006	5	7	7	19	71: 100: 100
2007	4	11	7	22	36: 100: 64
2008	9	16	4	29	56: 100:25
2009	5	14	4	23	36: 100: 29
2010	9	11	0	24 (includes 4 unclassified)	82: 100: 0
2011	5*	9*	1	15	56 : 100 : 11 *
2012	2	6	4	12	33: 100: 67
2013	0	5	3	8	0: 100: 60
2014	3	7	11	21	43:100:157

* *Estimated classification due to poor viewing conditions during surveys.*

The U.S. Forest Service owns the vast majority of the land within the range of the Hall Mountain herd. Consequently, there are no immediate threats to habitat quality and quantity. The U.S. Forest Service plans to actively manage winter range habitat with prescribed burns subject to funding (Suarez 2001). There is no domestic livestock grazing within the portion of national forest used by the bighorn sheep.

Augmentation and translocation

Between 1972 and 2000, bighorn sheep at Hall Mountain were captured 18 times. The feeding site at Noisy Creek presented the ability to easily capture sheep for research or translocation. With the closure of the winter feeding site in 2003, annual trapping activities ceased. The last year bighorn sheep were translocated from Hall Mountain was in 1994 with 9 sheep taken to the Asotin Creek area in the Blue Mountains.

Management conclusions

The minimum count for the Hall Mountain herd was 21, the highest count since 2010. The Hall Mountain bighorn sheep herd will continue to be limited, however by suitable habitat within the current herd range. More intensive monitoring and research would help the Department better understand the dynamics of this herd and determine the future potential of sustaining and/or increasing this herd.

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BIGHORN SHEEP STATUS AND TREND REPORT: REGION 1
VULCAN MOUNTAIN

DANA L. BASE, District Wildlife Biologist
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Population objectives and guidelines
California Bighorn Sheep were introduced to the Vulcan Mountain area of northern Ferry County, Washington in 1971. Eight Bighorn Sheep, consisting of 2 rams and 6 ewes, were translocated from the Colockum State Wildlife Area to U.S. Bureau of Land Management land near Little Vulcan Mountain. The population goal for the Vulcan Mountain Bighorn Sheep Herd is to maintain 80-110 animals on the available range. This herd makes considerable use of private rangeland, which has been a contentious issue with cattle ranchers in the past when the population was higher. The population declined dramatically from peak numbers in the early 1990s to 17 bighorn sheep observed in 2001, but rebounded subsequent to that. The herd evidently began declining again around 2009, and the most recent count suggested only 31 animals present.

Sport hunting has been a traditional consumptive use for this herd and an activity that is co-managed with the Colville Confederated Tribes (CCT). Due to the population drop, however, no permits were issued from 2000 through 2004. By 2003 the population was recovering and hunting resumed in 2005 when objectives for managing bighorn sheep harvest as described in the Washington Department of Fish and Wildlife (WDFW) Game Management Plan (WDFW 2008) were attained. No permits were issued in 2013.

Surveys
Since the introduction of the Vulcan Mountain Bighorn Sheep Herd in 1971 the population has been surveyed almost every year to determine composition and trend (Table 1). Beginning in 1990 this survey effort was largely standardized and carried out in the fall months, usually coinciding with rams in rut. The traditional ground-based survey was conducted along an automobile route on the Customs and Kettle River County Roads as well as from private, primitive roads into Moran and Cummings Creek Meadows. We attempt to classify every bighorn sheep on the range, but recognize that this effort likely never results in a complete population census. Poor results were obtained from 2 ground-based counts in the fall of 2011 and there was inadequate time to carry out a ground-based survey in 2012; hence the 2011 and 2012 surveys were accomplished by helicopter. Only 31 bighorn sheep were observed at Vulcan in 2011. Even fewer sheep were observed in the 2012 helicopter survey, 26 total including 13 rams, 9 ewes, and 4 lambs (Table 1). In 2013 a ground-based survey resulted in 31 bighorn sheep observed including 10 rams, 15 ewes, and 6 lambs.

Population status and trend analysis
Originating with a founder herd of only 8 bighorn sheep in 1971, the Vulcan Mountain Herd peaked to 107 observed animals in 1990. Subsequent to 1990 the herd declined to a low of only 17 animals observed in 2001 (Table 1). In the late 1990s, adult mortality was exceptionally high due to poor health (internal parasites, possibly disease, and severe winter stress), several documented road-kills on ewes, and likely cougar predation. Lamb recruitment dropped from 10 in 1995 to 2 in 1996; no lambs were observed in 1998 or 1999.

By the year 2000, there were encouraging signs that the population was beginning to recover as observed animals appeared to be healthy again and at least 2 lambs were recruited that year. Fall surveys in 2003 and 2004 documented at least 9 lambs recruited into the population for each year. In 2005, there were 21 lambs observed in the fall survey. Not all of the sheep comprising the herd in 2004 were observed, as the increase from 46 to 75 animals in 2005 was certainly not by lamb recruitment alone. Nevertheless with the healthy recruitment of lambs since 2005, the population objective for this herd was met and there was a need to actively manage its level so that numbers would not exceed biological and social carrying capacity.

Hunting seasons and harvest trends
Both general public hunters (State) and members of the Colville Confederated Tribes (CCT) hunt bighorn sheep within the Vulcan Mountain Unit. Biologists annually confer prior to developing their respective permit recommendations. Recreational permit-only hunting began in 1981. From 1981 through 1999 there were 49 bighorn sheep legally harvested from the Vulcan Unit including 48 rams and 1 ewe. Due to low herd population and recruitment levels, hunting was suspended by both the State and CCT from 2000 through 2004. In 2005 hunting was resumed with 1 permit each issued by the State and the CCT. From 2005-2013 there were at least 24 bighorn sheep harvested including 12 rams and 11 ewes. The state permit allocation for 2013 was only 1 ram and that permit was not filled (Table 2).

Herd health and productivity

The Vulcan bighorn sheep population declined dramatically in the late 1990s mainly as a result of complications from exceptionally high internal parasite loads. Domestic goats were known to share part of the Vulcan bighorn sheep range. Evidently the parasite *Muellerius capillaris* using slugs and snails as intermediate hosts was able to "jump" from domestic goats to the bighorn sheep. Native bighorn sheep, having less natural resistance than domestic goats to *Muellerius capillaris*, likely succumbed to pneumonia that this parasite brings about (Hall 2002). After 2001 these bighorn sheep appeared healthy and began producing lambs annually, suggesting that the overall health of the herd was acceptable. Nevertheless, we know of at least 1 flock of domestic sheep near the periphery of the traditionally used bighorn range, and we are also concerned about the potential of disease transmission from domestic sheep and goats.

Table 2. Summary of State and Colville Confederated Tribes (CCT) hunter harvest of bighorn sheep from the Vulcan Mountain Unit from 2005 through 2013.

Year	Org.	# Permits	Hunter Harvest
2005	State	1	1 ram
2005	CCT	1	None
2006	State	1	1 ram
2006	CCT	1	None
2007	State	2	2 rams
2007	CCT	2	1 ram
2008	State	3	1 ram, 2 ewes
2008	CCT	2	1 ram
2009	State	4	1 ram, 3 ewes
2009	CCT	4	1 ram, 2 ewes
2010	State	4	1 ram, 3 ewes
2010	CCT	4	1 ewe
2011	State	2	1 ram, 0 ewe
2011	CCT	4	1 ram
2012	State	1	1 ram
2012	CCT	1	None
2013	State	1	None
2013	CCT	1	None

Range use and habitat enhancement

Between April of 2002 and March of 2004, six of the Vulcan Bighorn Sheep (3 rams, 3 ewes) were captured by helicopter net-gun and fitted with radio collars. Five bighorn sheep from Nevada including 1 ram and 4 ewes were radio-collared and released at Vulcan in January of 2003. The purpose of this radio telemetry application was to document range use, especially use of timbered versus open habitats for the U. S. Bureau of Land Management (BLM) and U. S. Forest Service (USFS) habitat managers. Subsequent monitoring revealed little movement outside of the traditionally known bighorn sheep range (Doloughan 2004). In January 2012, the CCT trans-located 4 bighorn sheep including 3 rams and 1 ewe from Cleman Mountain in Yakima County, WA to the Vulcan area to help augment the population. One was outfitted with a Global Positioning System radio-collar to gain insights on bighorn sheep home range and movements. Subsequent monitoring revealed similar results to those obtained from 2003 in which there was little movement outside of the traditionally known bighorn sheep range (Doloughan 2004, Krausz 2012).

Several projects to enhance habitat for the Vulcan Mountain Bighorn Sheep have been carried out. These include broad range weed control, selective logging, forage plant seeding, water source development, and temporary fencing at Moran Meadow to enhance controlled cattle grazing. Partners accomplishing these projects included several local private landowners, the Foundation for North America Wild Sheep (FNAWS), the Safari Club International (SCI), the Inland Northwest Wildlife Council (INWC), the USFS, the BLM, and the WDFW. One recent large-scale project was the completion of a BLM timber sale within the core sheep range in 2004. This helicopter-logging project was partially designed to improve predator avoidance for bighorn sheep by enhancing sight distances within the most densely forested portions of their range, as well as to increase forage production (Doloughan 2004).

Management conclusions

The 2004 fall census results indicated that the Vulcan bighorn sheep population had grown back sufficiently to sustain limited-entry hunting. The population parameters for establishing a permit were met: The population was stable or increasing; had more than 30 adult sheep; and had 8 or more ½ + curl rams of which 2 or more were greater than ¾ curl (Table 1) (WDFW 2008). Since 2005 low numbers of hunting permits have been allocated. In 2012, only 1 State permit was allocated and filled, for a ram only. The evident decline of this herd in recent years is of considerable concern, but declines and disease issues in other herds within the state have taken priority, preventing the efforts required to provide a fuller understanding.

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Table 1. Annual fall population composite counts of the Vulcan Mountain Bighorn Sheep Herd from 2001 through 2013.

			Rams					Proportions
Year	Lambs	Ewes	Yearling	<3/4 curl	>3/4 curl	Total Rams	Total Sheep	Lambs : 100 Ewes : Rams
2001	5	8	0	2	2	4	17	63 : 100 : 50
2002	5	8	3	2	4	9	22	63 : 100 : 113
2003	9	17	3	4	3	10	36	53 : 100 : 59
2004	9	20	5	7	5	17	46	45 : 100 : 85
2005	21	32	4	11	7	22	75	66 : 100 : 69
2006	10	24	3	6	4	13	47	42 : 100 : 54
2007	21	39	5	4	6	15	75	54 : 100 : 38
2008	19	42	5	8	5	18	79	45 : 100 : 43
2009	15	43	2	14	7	23	81	35 : 100 : 53
2010	9	24	7	8	4	19	52	38 : 100 : 79
2011*	7	9	-	-	-	15	31	78 : 100 :167
2012*	4	9	1	3	9	13	26	44 : 100 :144
2013	6	15	1	2	7	10	31	40 : 100 : 67

*These counts conducted by helicopter.

BIGHORN SHEEP STATUS AND TREND REPORT: REGION 1
LINCOLN CLIFFS

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Population objectives and guidelines

The management objective for the Lincoln Cliffs (Sheep Unit 12) herd is to manage bighorn sheep numbers to a self-sustaining population capable of supporting both consumptive and non-consumptive recreation and remain within the local landowners' tolerance. The population objective for the Lincoln Cliffs herd is to reach a population size of 90-100 animals (WDFW 2008).

Bighorn sheep distribution was historically centered on the original 1990 release site on the Lincoln Cliffs, a parcel owned by the Bureau of Land Management (BLM), just south of the town of Lincoln. This was an area jointly selected by WDFW and (BLM) as suitable habitat. Observations of bighorn sheep have been reported as far east as Porcupine Bay on the Spokane Arm of Lake Roosevelt and to the east side of Banks Lake in Grant County. The sheep now regularly occupy two main areas throughout the year: the original Lincoln Cliffs area and the cliffs around Whitestone Rock, about 7 miles downriver from Lincoln. Sheep have also been observed frequently using the cliffs above Sterling Valley, the area between Lincoln Cliffs and Whitestone. Bighorns were released during the springs of 2008-2010 into the Hells Gate area of the Colville Indian Reservation, on the north side of Lake Roosevelt, an area just north of the Lincoln Cliffs area.

Hunting seasons and harvest trends

The first hunting permit for this herd was issued in the 1997 hunting season. Since then, one ram permit has been issued each year and harvest success has remained at 100%. The number of applicants for the Lincoln Cliffs hunt has averaged 1,470 over the past five years. In addition to the annual permit, the statewide 2003 and 2005 auction winners and the 2004 raffle winner all selected Lincoln Cliffs to harvest their rams. In subsequent years, however, auction and raffle winners were not allowed to hunt at Lincoln Cliffs because of the requirement that 2 general draw permits be available for any unit hosting auction/raffle hunts.

Hunters have spent on mean of 5 days hunting per kill. However, days hunted varies widely from 1 to 14 days. The area is primarily composed of private property and days/kill often reflects how much time was spent prior to the hunt gathering permission to access the local properties.

Since 1997, 20 mature rams have been removed by hunting by either the regular permitees or the auction and raffle winners. The number of mature rams seen by hunters has been variable over the years (Table 1) and is highly dependent on hunter effort (time spent in the field) and selectivity (willingness to spend time searching for a ¾-curl ram vs. taking a ½-curl ram). On average hunters have reported seeing 7 mature (¾-curl) rams/year; varying from 0 to 20**.**

Surveys

Aerial surveys are the preferred method for surveying this herd due to the habitat (cliffs) and lack of road access. Ground surveys have been used; however, these are often very limited due to the terrain of Lincoln Cliffs and the access to private property. Despite the problems, ground counts are conducted, whenever possible, to supplement the aerial surveys.

Over the years aerial surveys have been inconsistent due to funding and personnel. However, since 2002 a concerted effort has been made to conduct two aerial surveys per year, one in the spring to assess lamb production, and, one in late fall to assess ram numbers. The lamb to 100 ewe ratio has remained relatively stable over the past 12 years (averaging 43 lambs per 100 ewes), but yearly 90% confidence intervals are large (Table 2). The ram to 100 ewe ratio has been variable over the past 12 years (average 62, range 39-178; Table 3).

Radio collaring thirteen of the 15 sheep translocated in 2003 allowed for quicker location of sheep during aerial surveys, as well locating sheep that would have otherwise been missed. Thus improving survey results and leading to a more stable and accurate lamb and ram to 100 ewe ratios. As of 2008 no collars remain active, making aerial surveys more challenging, however, the district has been able to maintain survey results and accuracy.

Population status and trend analysis

The Lincoln Cliffs population was started with an introduction of 11 California bighorns from Northwest Trek in December 1990. Three additional sheep from Vulcan Mountain were released in March 1991 and 5 from Kamloops, British Columbia in 1996.

Following this release, the population showed a steady increase and eventually tripled in numbers after 4 years. By 1996, the population objective level of 60 to 70 bighorns was reached with 65 animals observed during the fall ground survey. The population reportedly peaked at around 100 animals in June 1998 (ground survey, pers. comm. J.Hickman). This peak in population was further evidenced by hunter report of 60 animals seen in 1998 (Table 1). This remained the greatest number of sheep seen by hunters until 2012 when the permit holder saw 60 sheep as well. However, the hunter reports have been highly variable over the past 16 years, averaging 36 sheep with a range of 1 to 60. Some of this variability is tied to hunter effort, for example the three lowest years 2003, 2006, and 2007 the permit holder only hunted 1 day.

Some of the decline in hunter observation was also due to 27 ewes and 1 ram being removed to other populations in the state over the course of 3 years (1999-2001). In March 1999, 10 ewes and 1 ram lamb from the Lincoln Cliffs herd were captured and translocated to Lake Chelan. In February 2000, 6 additional ewes were captured and translocated to the Lake Chelan release site. In February 2001, 11 more ewes were captured and released on Cleman Mountain.

Following the last capture and translocation the number of sheep observed by the permit hunter in 2001 dropped significantly. Additionally the aerial and ground surveys in 2002 found on average only 40 sheep in the area. The population apparently was not able to recover from the removal of ewes for translocation to other areas. As a result, 15 sheep were translocated from Nevada to the Lincoln Cliffs and Whitestone areas in January 2003 (12 ewes, 1 ram, and 2 lambs). All were marked with numbered yellow ear tags and the adults were all equipped with VHF radio collars. Mortality rates for the radio collared sheep were approximately 10% each year, with a total of 7 mortalities post release (1 ram and 6 ewes). Cougar predation has been the source of at least three of those deaths. The lambs were not found again after release, 2 ewes were never heard again after the November 2003 flight, and the remaining 4 ewes appear to have outlived their radio collars. No radio signals have been picked up since May of 2008, although yellow ear tags on at least two ewes were again seen in 2011.

Since 1997, 39 known sheep mortalities have been documented–20 from hunting, 2 from vehicle collisions, 5 from cougar, and 12 unknowns–a total of 31 rams and 8 ewes.

Minimum population estimates are based on maximum count of rams and ewes from all helicopter surveys in a given year (Fig. 1). They indicate the Lincoln Cliff population to be relatively stable, with an increasing trend the past four years (Fig. 1). There was a decline in ewes in 2005 followed by a decline of rams in 2006. The decline in rams also followed three consecutive years of 2 rams being removed due to the auction and raffle permit holders selecting the Lincoln herd to hunt. Since 2005 the ewe population has steadily increased. The ram population rebounded immediately after 2006 and had, until 2013, remained fairly stable at around 20 animals. In 2013, 32 rams were observed during aerial surveys, which is the greatest number since regular surveys began in 2002. In particular, the number of younger (¼-and ½-curl) age classes showed a considerable increase. The total number of bighorns observed in the November 15, 2013 survey, including lambs, was 118.

Habitat condition and trend

A continuing threat to the sheep at Lincoln Cliffs is the increasing development of recreational and permanent housing in the Lincoln Cliffs area. In the past few years development has accelerated and brought more people and more roads to this sheep site. Habitat within the range of the Lincoln Cliffs herd is in good condition, but limited and decreasing. WDFW and the Bureau of Land Management should attempt to secure and protect the habitat base for this herd by acquiring, either by outright purchase or easements, more land in the immediate area.

Disease and parasites

During capture operations in 2000 and 2001 it was noted that these animals were in excellent physical condition. All of the animals captured were robust with excellent pelage and overall appearance. Disease testing showed low numbers of parasites and no harmful disease.

There are no known large domestic sheep operations in the area at the present time. However, with the current development there is an increased potential for contact with domestic sheep via 4H and small scale operations. For example in 2006 three domestic sheep were discovered to have escaped in the area of Sterling Valley, but follow up observations indicate they did not survive. Information pamphlets outlining the threats domestic sheep pose to bighorn sheep have been mailed to individuals known or believed to own sheep or goats. In the future, information pamphlets should also be made available to the many new residents around the Lincoln Cliffs area and mass outreach attempted through local newspapers and periodicals.

Wildlife damage

We have received only a few damage complaints related to bighorns in the Lincoln Cliffs area. However, growth of this herd will likely lead to an increasing number of issues with local farmers due to the extensive conversion of habitat to agriculture in this area. Growth in the local human population and associated construction of new housing and splitting of parcels has not resulted in any damage complaints to date, but may become an issue in the future.

Management conclusions

The herd is now roughly estimated to be around 85-110 adult animals. This sets the Lincoln Cliff herd near or within the stated goal of 90-100 animals for this population (Game Management Plan, WDFW 2008). This very rough estimate would be improved through the radio collaring of 10-15 sheep to find missing groups during surveys. A capture effort is planned for this purpose in early 2015. Given the apparent permanent expansion of this herd to Whitestone Rock, and sporadic use of Sterling Valley, population goals and available habitat should be reviewed. GPS collared animals will aid in this effort, allowing us to estimate herd range and habitat use.

Two ram permits have been issued for the Lincoln Cliffs herd for the 2014 season. This qualifies the herd to be chosen by auction and raffle permit holders as well. With the increase in human population density in and around Lincoln Cliffs, extra effort will be taken to monitor herd numbers and sex ratios in the next few years.

Literature Cited

(WDFW) Washington Department of Fish and Wildlife. 2008. Game Management Plan July 2009 – June 2015. Wildlife Program, Washington Department of Fish and Wildlife, Olympia, Washington, USA.

Table 1. Bighorn Sheep Harvest Data

		Seen by Permitee		
Year	**Applications Received**	**Sheep**	**Lambs**	**¾ + Curl**
1997	527	38	15	3
1998	451	60	23	8
1999	732	42	5	7
2000	1078	55	0	7
2001	1100	13	0	3
2002	1352	38	4	17
2003	1219	1	0	1
2004	1311	50	10	9
2005	1375	40	12	4
2006	1218	8	3	0
2007	1326	7	1	2
2008	1326	7	1	8
2009	1608	58	16	9
2010	1456	26	5	N/A
2011	1488	50	5	N/A
2012	1206	60	10	20
2013	1596	17	6	4

Table 2. Lincoln Cliffs Herd May Lamb Surveys

Year	Ewes	Lambs	Lambs:100 Ewe	± 90% CI
2002	8	4	50	50
2003	27	13	48	27
2004	35	10	29	17
2005	21	10	48	30
2006	24	8	33	22
2007	18	9	50	34
2008	34	14	41	22
2009	33	11	33	19
2010	37	16	43	21
2011	34	11	32	18
2012	37	12	32	18
2013	34	18	53	25

Table 3. Lincoln Cliffs Herd November Lamb Surveys				
Year	**Ewes**	**Lambs**	**Lambs:100 Ewe**	**± 90% CI**
2002	18	32	178	86
2003	32	18	56	27
2004	36	16	44	22
2005	21	22	105	53
2006	16	9	56	39
2007	25	20	80	39
2008	30	15	50	26
2009	31	18	58	28
2010	41	16	39	19
2011	42	26	62	25
2012	49	21	43	18
2013	55	32	58	21

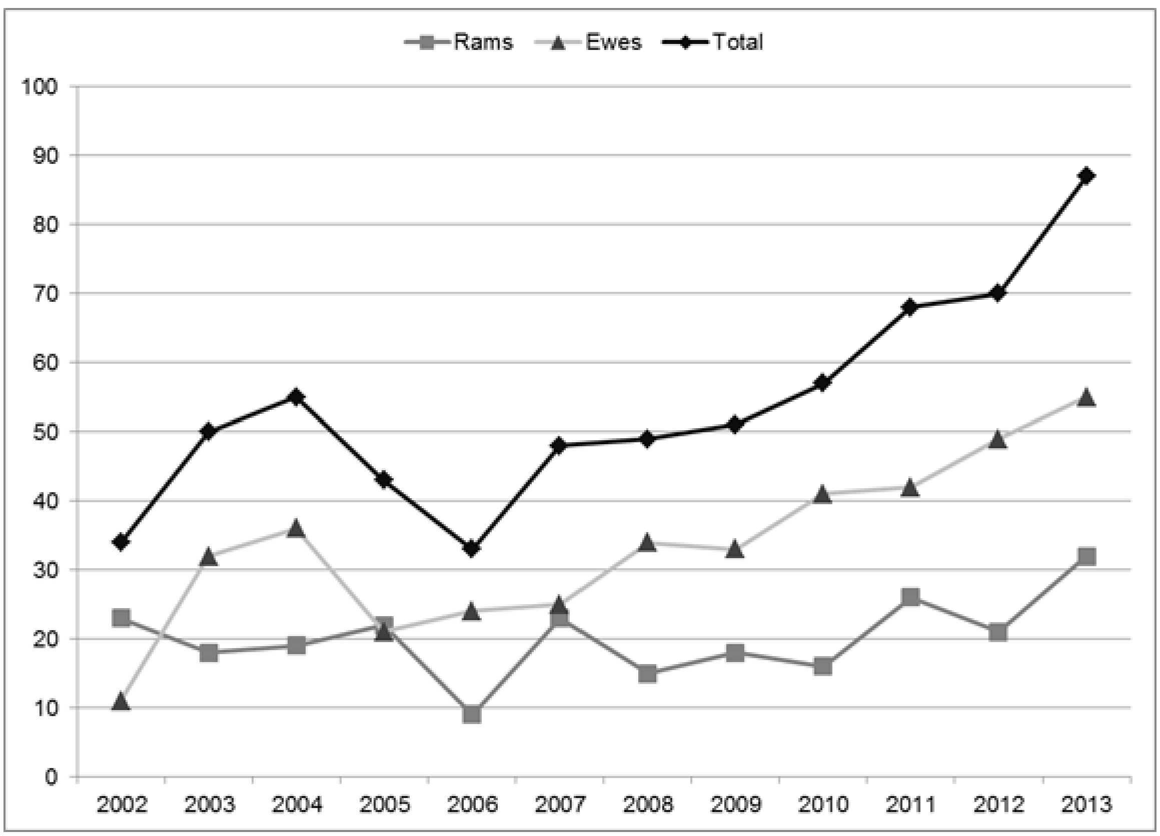

Figure 1. Lincoln Cliffs minimum population estimate by sex for 2002-2013. Estimated as the maximum count from all helicopter surveys conducted each year. Estimates are shown beginning in 2002, the year regular helicopter surveys were initiated.

BIGHORN SHEEP STATUS AND TREND REPORT: REGION 1
BLUE MOUNTAINS

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Population objectives and guidelines
The first bighorn sheep (*Ovis canadensis*) population in the Blue Mountains was established on the W.T. Wooten Wildlife Area (Tucannon River) during the early 1960s, and consisted of bighorns transplanted from the Sinlahekin Wildlife Area. Since that re-introduction, four additional herds of bighorn sheep have been established in the Blue Mountains; Asotin Creek, Black Butte, Mountain View (formerly known as the Cottonwood herd), and Wenaha.

Population management objectives for each herd are based on habitat conditions, habitat availability, and minimizing herd expansion into new habitats that may increase the risk of contact with domestic sheep or goats. The adult population management objective for the Blue Mountains is 500-550 bighorn sheep; Tucannon herd-60, Mountain View herd-60-70, Asotin Creek herd-75-100, Black Butte herd-150-200, and Wenaha herd >90 (WDFW 2008). These herd objectives were identified in 1995, prior to large scale disease die-offs. Updating our herd objectives should be prioritized for future management planning.

The Hells Canyon Initiative (HCI) was established in 1996, with representatives from Washington Department of Fish & Wildlife, Idaho Department of Fish and Game, Oregon Department of Fish and Wildlife, U.S. Forest Service, Bureau of Land Management, and the Wild Sheep Foundation formerly known as Foundation for North American Wild Sheep (FNAWS). HCI coordinates disease research, develops population survey methodology, conducts transplants, coordinates intergovernmental management activities, and implements projects designed to improve bighorn sheep habitat. All five of Washington's bighorn sheep populations are included in HCI; Black Butte, Mountain View, Wenaha, Tucannon, and Asotin Creek.

Hunting seasons and harvest trends
Permit-controlled hunting was terminated in most of the Blue Mountains after the pneumonia die-off of 1995-1996. Permits were terminated in the Tucannon in 1999, after this herd suffered a major population decline. In 2008, a single permit was issued in the Asotin herd. That herd had permit(s) issued through 2012 when a die-off resulted in the cessation of permits. Permits were reinstated in 2014, when population data indicated the herd could support additional harvest.

One raffle permit per year has been authorized by the Fish and Wildlife Commission since 2005 to fund bighorn sheep programs and research in Southeast Washington. Biologists decide each year which units will be open for hunting by the permit holder. In 2013, the Asotin herd, Hall Mountain herd in NE Washington, and a portion of the Black Butte herd were available. The harvest occurred in the Asotin herd. In 2014, the Asotin, Mountain View, and Hall Mountain herds will be available.

Raffle permit holders have been successful in harvesting rams in all years; 2005 – Tucannon, 2006 – Wenaha, 2007 – Mountain View, 2008 – Wenaha, 2009 – Black Butte, 2010- harvest occurred outside the Blue Mountains in the Hall Mountain herd, 2011 - Black Butte, 2012 – Asotin, and 2013 - Asotin. In 2013, only one permit was available in the Asotin herd.

Additional hunting permits will not be implemented in other herds until populations meet criteria established in the Bighorn Sheep Management Plan. Treaty hunting by the Nez Perce tribe (NPT) occurs annually but information on harvest is limited. WDFW has documented some tribal hunting, with 13 rams over the last 11 years being documented.

Since the NPT does not regulate or monitor harvest, these losses should be considered the minimum number taken by tribal members. In 2003, the NPT Wildlife Committee recommended closing the Washington portion of their treaty area to bighorn sheep hunting by tribal members. The current status of this closure is unknown.

Surveys

Aerial surveys are conducted in February and March using a sightability model developed through the Hells Canyon Initiative. These surveys are conducted to determine population estimates, trend, and herd composition at the low point of the annual population cycle. Radio telemetry locations are obtained frequently throughout the year by foot and/or aircraft, supplementing the helicopter surveys.

Aerial surveys were conducted for the Wenaha and Black Butte herds in winter 2014 by WDFW. Ground counts were obtained for the Asotin herd in April 2014. The minimum population estimate for 2014 was 221 bighorn sheep, 131 ewes, 29 lambs, 59 rams for ratios of 45 (90% CI: 33-57) rams and 22 (90% CI: 13-215-309) lambs per 100 ewes (Table 1). A population estimate using the sightability correction has not been developed for 2014 at this time, but biologists estimate that there are approximately 225-250 bighorns in the 5 herds. The population has remained relatively stable over the past year.

Population status and trend analysis

Lamb survival has been limiting population growth since the bronchopneumonia die-off in 1996, with lamb survival varying greatly between years. In 2013, lamb recruitment was again very poor in all Blue Mountains bighorn herds; Black Butte (8 lambs:100 ewes), Tucannon (16:100), Wenaha (31:100), Asotin (31:100), and Mountain View (15:100). The Tucannon herd is the only herd that has not had lambs die from pneumonia during the past 16 years of intensive monitoring, but it is experiencing high lamb mortality, possibly due to predation.

With the recent outbreak of *Mycoplasma ovipneumonia* (*M. ovi*.) induced bronchopneumonia in the Asotin herd, it is predicted that the overall population of bighorn sheep in the Blue Mountains will continue to decline for the next 5 years.

In 2014, a new strain of *Mycoplasma ovipneumonia* was discovered in the Black Butte herd. Spring and summer monitoring within the Black Butte herd during 2014 has documented a 25% decline in adult ewes in less than 3 months, possibly associated with this new strain of *M. ovi.* The population suffered high mortality during the bronchopneumonia die-off in 1995-96. Low lamb survival following the all age die-off resulted in poor recruitment into the population along the Grande Ronde River corridor.

The number of mature rams in the population is currently declining or stable at a reduced level in all herds, and still remains substantially below the number that existed prior to the die-off (Table 1). Poor lamb recruitment due to bronchopneumonia and predation are contributing to the low numbers bighorns in the Blue Mountains.

The Tucannon herd received a transplant of 5 young (1 – 3 years old) ewes from the Asotin herd in February 2011. All five were equipped with ARGOS/VHF collars that allow for remote downloading of locations. All of the collars have either dropped off or ceased functioning as of September 2013.

One 2-year old ram was removed from the population during the 2013-2014 reporting period. This young ram had moved from the Asotin herd towards the town of Asotin. It, along with a yearling ram, was in close proximity to numerous domestic goats when they were discovered. The older ram was chemically immobilized, but died under anesthesia due to a sever lung worm infection. The remaining ram escaped capture efforts and returned to the Asotin herd.

Habitat condition and trend

Habitat conditions are moderate to good in most areas. However, the spread of noxious weeds, mostly yellow star-thistle (*Centaurea solstitialis*), thistle (*Cirsium* spp.), and rush skeleton weed (*Chondrilla juncea*) are threatening ranges in the Blue Mountains. Although the School Fire (2005) had immediate negative effects on the Tucannon bighorn sheep population (direct mortality), it appears the range has recovered. Noxious weeds are not dominating the landscape in the core bighorn range and the grasses and forbs appear to be healthy.

Disease and parasites

M. ovi induced bronchopneumonia continues to plague 4 of the 5 bighorn populations; Asotin, Black Butte, Wenaha, and Mountain View. Bighorn populations in the Blue Mountains have not recovered from the bronchopneumonia die-off as quickly as some herds, possibly from re-infection from neighboring bighorn herds and domestic sheep and goats that exist within the range of multiple herds. The presence of domestic sheep and goats within and adjacent to bighorn sheep range presents a constant and substantial risk of another major epizootic. WDFW actively works with landowners near bighorn sheep herds to make sure accurate disease information is available to stock owners and options to minimize contact between domestics and wild sheep are made available.

Other government agencies have encouraged landowners to use domestic goats for weed control. This type of weed control program presents a substantial risk to bighorn sheep populations in southeast Washington.

The Tucannon herd has not experienced pneumonia caused mortality, but does carry scabies mites (*Psoroptes ovis*), found to varying degrees through all the Hells Canyon herds. The Tucannon herd suffered a major die-off presumed to be caused by scabies when it was infected in 1999. Scabies continues to be present in all five herds, with unknown effects on the populations.

Lamb mortality continues to be high in all 5 herds (Tables 2-6). Lambs that have recently died or are severely incapacitated and have been collected from these herds all indicate that pneumonia was the proximate cause of death. WDFW continues to support Washington State University research into the factors related to pneumonia in Hells Canyon.

Management conclusions

Four of the five bighorn sheep herds in the Blue Mountains are struggling with *M. ovi* induced bronchopneumonia. The Black Butte, Wenaha, and Mountain View herds still experience periodic pneumonia outbreaks, which result in high lamb mortality and sporadic adult mortalities. It is unclear what path the Asotin herd will take with the recent disease infection that occurred there. The Tucannon herd escaped the pneumonia out-break, but suffered a major die-off after being infected with scabies in 1999. This herd has experienced high lamb mortality (not bronchopneumonia related) for the past 2 years. It is suspected that either predation on this small herd or genetic issues related to its chronically small size are limiting its recovery, and that it is unlikely to recover without an additional management action. Each herd suffers from various problems that result in mortality of adults and/or lambs. These mortality factors limit the ability of individual herds to reach the population management objectives.

Domestic sheep and goats continue to be a major threat for bighorn sheep populations in the Blue Mountains. Rural landowners continue to use domestic sheep and goats to control weeds, posing a severe threat to all herds in Hells Canyon. HCI research has shown that a large amount of inter-herd movement occurs (F. Cassirer, IDFG, pers. comm.). Two young rams were lethally removed from the Black Butte herd during the summer of 2005 because they came in contact with domestic goats at a rural residence. In 2006, a single ewe was captured above the town of Asotin, as was a single 3-year old ram in 2007. Two bighorn ewes were observed within 500m of domestic goats above Asotin in 2009 and a yearling ram was originally captured in this same location. The two ewes were not removed at that time because contact had not been documented. Once wandering bighorns have come in contact with domestic sheep/goats, they cannot be allowed to return to the main herd, because the risk of pneumonia is too high. In early 2008, District 3 wildlife management staff authored response guidelines to be implemented when bighorn sheep are located in “high risk” areas, or domestic sheep or goats are located within bighorn range. These guidelines were submitted in February 2008, but have not yet been formally adopted. However, the general practice has been to lethally remove bighorns that move to the lower reaches of Asotin Creek.

The Hells Canyon Initiative updated an informational pamphlet for landowners in 2006, which spells out the risks of contact between domestic sheep/goats and bighorn sheep. The Wild Sheep Foundation has more recently provided informational pamphlets as well. Unless rural residents can be discouraged from acquiring domestic sheep and goats, or provide pens that prevent contact between domestics and bighorn sheep, the risk of continued pneumonia outbreaks in the bighorn populations are very high.

Literature Cited

Washington Department of Fish and Wildlife. 2008. 2009-2015 Game Management Plan. Washington Department of Fish and Wildlife, Olympia, 223 pp.

Table 1. Bighorn Sheep Population Trend and Herd Composition, Blue Mountains, Washington											
			Rams						Population	Ratio (90% CI)	
Year	Lambs	Ewes	C I	C II	C III	CIIIB	C IV	Total	Total	Lambs	Rams
2005	28	105	8	23	24	0	16	71	204	27 (17, 36)	68 (51, 85)
2006	41	104	7	13	6		3	53*	198	39 (27, 51)	51 (38, 64)
2007	50	106	13	16	31		7	66	223	47 (34, 60)	63 (47, 79)
2008	28	125	21	26	24	1	4	76	229	22 (15, 30)	61 (46, 75)
2009	29	131	2	34	23	2	6	67	229	22 (15, 30)	51 (39, 64)
2010	32	136	17	29	33	1	5	85	253	24 (16, 31)	63 (48, 77)
2011	37	129	9	18	37	5	8	77	241	29 (20, 38)	60 (46, 74)
2012	36	113	14	14	29	1	15	73	222	32 (22, 42)	65 (49, 81)
2013	24	114	9	18	37	2	5	71	209	21 (13, 29)	62 (47, 78)
2014	29	131	7	16	28	4	4	59	221	22 (15, 30)	45 (33, 57)

Table 2. Asotin Herd 10-year Survey History											
			Rams						Population	Ratio (90% CI)	
Year	Lambs	Ewes	CI	CII	CIII	CIIIB	CIV	Total	Total	Lambs	Rams
2005	8	26	3	1	6		0	10	44	31 (10, 51)	38 (15, 62)
2006	13	34	6	6	3		1	16	63	38 (18, 59)	47 (24, 71)
2007	18	30	2	8	6		3	19	59	33 (13, 53)	63 (33, 94)
2008	17	40	11	9	6	0	1	27	80	33 (15, 50)	68 (40, 95)
2009	18	48	1	9	6	0	1	17	84	38 (20, 55)	35 (19, 52)
2010	17	46	12	10	12	0	3	37	100	37 (20, 54)	80 (51, 110)
2011	23	40	6	12	16	0	4	38	101	57 (33, 82)	95 (60, 130)
2012	12	26	6	8	10	0	7	31	69	46 (20, 73)	119 (67, 171)
2013	2	22	4	6	15	1	1	27	51	9 (0, 20)	122 (65, 180)
2014	9	29	1	5	16	3	2	27	65	31 (12, 50)	93 (52, 134)

Table 3. Black Butte Herd 10-year Survey History											
			Rams						Population	Ratio (90% CI)	
Year	Lambs	Ewes	CI	CII	CIII	CIIIB	CIV	Total	Total	Lambs	Rams
2005	5	29	1	9	3		1	14	48	17 (4, 31)	48 (22, 74)
2006	3	19	1	2	5		1	9	31	16 (0, 32)	47 (16, 79)
2007	4	24	5	2	9		1	17	45	17 (2, 31)	71 (34, 108)
2008	1	27	2	3	4	0	0	9	37	4 (0, 10)	33 (11, 55)
2009	0	25	1	10	7	2	1	21	47	0 (0, 0)	84 (43, 125)
2010	1	19	0	2	2	1	0	5	25	5 (0, 14)	26 (5, 48)
2011	1	25	1	1	5	2	0	9	35	4 (0, 11)	36 (13, 59)
2012	3	24	0	2	4	0	1	7	34	12 (0, 25)	29 (9, 50)
2013	7	26	1	3	5	0	1	10	43	27 (8, 46)	38 (15, 62)
2014	2	25	3	2	0	0	0	5	32	8 (0, 18)	20 (4, 36)

Table 4. Mountain View Herd 10-year Survey History											
			Rams						Population	Ratio (90% CI)	
Year	Lambs	Ewes	CI	CII	CIII	CIIIB	CIV	Total	Total	Lambs	Rams
2005	4	13	2	5	1		1	9	26	31 (2, 60)	69 (20, 119)
2006	10	16	0	5	1		1	7	33	63 (21, 104)	44 (11, 76)
2007	12	19	4	0	3		0	7	38	63 (25, 101)	37 (10, 64)
2008	0	22	2	0	0	0	0	2	24	0 (0, 0)	9 (0, 20)
2009	0	7	0	4	2	0	0	6	13	0 (0, 0)	86 (7, 164)
2010	2	18	2	6	6	0	0	14	34	11 (0, 25)	66 (32, 123)
2011	2	21	1	1	3	0	3	8	31	10 (0, 21)	38 (12, 64)

Table 5. Tucannon Herd 10-year Survey History											
			Rams						Population	Ratio (90% CI)	
Year	Lambs	Ewes	CI	CII	CIII	CIIIB	CIV	Total	Total	Lambs	Rams
2005	2	5	2	1	2	0	2	7	14	40 (0, 95)	140 (5, 275)
2006	-	-	-	-	-	-	-		7 – 9		
2007	2	2	1	0	0	0	0		5	100 (0, 265)	0 (0, 0)
2008	3	3	1	0	1	0	1	3	9	100 (0, 234)	100 (0, 234)
2009	0	7	0	1	0	0	1	2	9	0 (0, 0)	29 (0, 66)
2010	2	5	0	1	2	0	0	3	10	40 (0, 95)	60 (0, 132)
2011	3	6	1	1	1	0	0	3	12	50 (0, 108)	50 (0, 108)
2012	4	12	3	1	1	0	0	5	21	33 (2, 65)	42 (5, 78)
2013	3	12	3	1	2	0	0	6	21	25 (0, 52)	50 (9, 91)
2014	2	12	1	2	3	0	0	6	22	16 (0, 38)	50 (9, 91)
2012	8	16	1	1	5	0	2	9	33	50 (14, 86)	56 (18, 95)
2013	6	23	0	5	3	0	1	9	38	26 (6, 46)	39 (14, 64)
2014	4	26	1	2	3	0	0	6	36	15 (2, 29)	23 (6, 40)

Table 6. Wenaha Herd 10-year Survey History											
			Rams						Population	Ratio (90% CI)	
Year	Lambs	Ewes	CI	CII	CIII	CIIIB	CIV	Total	Total	Lambs	Rams
2005	9	32	0	7	12		12	31	72	28 (11, 46)	97 (57, 137)
2006	15	35						21	71	43 (21, 65)	60 (33, 87)
2007	22	31	1	6	13		3	23	76	71 (38, 104)	74 (41, 108)
2008	11	33	5	14	13	1	2	35	79	33 (14, 52)	106 (64, 148)
2009	11	44	0	10	8	0	3	21	76	25 (11, 39)	48 (27, 69)
2010	8	32	3	8	4	1	1	17	57	25 (9, 41)	53 (27, 79)
2011	8	37	0	3	12	3	1	19	62	22 (8, 35)	51 (28, 75)
2012	9	35	4	2	9	1	5	21	65	26 (10, 42)	60 (33, 87)
2013	6	31	1	3	12	1	2	19	56	19 (5, 34)	61 (32, 91)
2014	12	39	1	5	6	1	2	15	66	31 (14, 47)	38 (19, 58)

BIGHORN SHEEP STATUS AND TREND REPORT: REGION 2
MT. HULL

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Population objectives and guidelines

Mt. Hull Herd. The population objective for the Mt. Hull California bighorn sheep herd is 55-80 animals. Currently, the estimated herd size is just above this level at 90-100 animals. The current management focus is to maintain current population levels while minimizing the risk of disease and agricultural damage. This population supports a conservative, any ram permit harvest to the extent it is compatible with herd demographics. Starting in 2009 two ewe permits where offered to help achieve herd reduction goals.

Sinlahekin Herd. The population objective for the Sinlahekin California bighorn sheep herd is 50 animals. The population reached a high in 2011 at an estimated 90-95 animals, but has since declined. Current surveys indicate an estimated herd size of 40-45 animals. This decline occurred in association with the discovery of the ectoparasitic mite *Psoroptes ovis* in the herd. The current objective for the Sinlahekin herd is to increase population size.

Hunting seasons and harvest trends

Mt. Hull Herd. One or two ram permits have been consistently offered since 2003 depending on herd size and ram demographics. In 2009, two adult only ewe permits were issued for this herd to help achieve herd reduction goals. Washington Department of Fish and Wildlife (WDFW) permit holders harvested two mature rams and one adult ewe in 2013. Colville Confederated Tribe (CCT) permit holders harvested one ram and one adult ewe (Table 1). WDFW issued two any ram and two adult ewe only permits for 2013, and the CCT issued a similar number of permits for the upcoming season.

Sinlahekin herd. Herd demographics supported the issuance of one ram permit annually from 2010 through 2012, and hunters successfully filled all three permits. Surveys indicate the population is not meeting harvest guidelines, thus no permit has been offered since 2012. Permits will not be available until survey results verify substantial herd growth.

Table 1. Summary of harvest information for bighorn sheep in the Mt. Hull Unit.

Year	WDFW Permits	WDFW Harvest	CCT[a] Permits	CCT Harvest
1995	1 ram	0	1 ewe	0
1996	1 ram	1 ram	1 ewe	0
1997	1 ram	1 ram	1 ewe	0
1998	1 ram	1 ram	1 ewe	1 ewe
1999	1 ram	1 ram	1 any	1 ram
2000	0	--	1 any	0
2001	0	--	1 any	0
2002	0	--	1 any	0
2003	1 ram	1 ram	1 any	1 ram
2004	1 ram	1 ram	1 any	0
2005	1 ram	1 ram	1 any	0
2006	2 rams	2 rams	2 any	1 ram
2007	2 rams	2 rams	1 any	1 ram
2008	2 rams	2 rams	1 any	1 ram
2009	1 ram 2 ewe	1 ram 1 ewe	1 any 2 ewe	1 ram 1 ewe
2010	1 ram 2 ewe	1 ram 2 ewe	1 any 2 ewe	0 ram 2 ewe
2011	1 ram 2 ewe	1 ram 1 ewe	1 any 2 ewe	1 ram 1 ewe
2012	1 ram 2 ewe	1 ram 2 ewe	1 any 2 ewe	0 ram 0/NR* ewe
2013	2 ram 2 ewe	2 ram 1 ewe	2 any 2 ewe	0 ram 1 ewe

[a] CCT=Colville Confederated Tribes

* Not Reported

Surveys

Population surveys are generally conducted annually to determine composition and trend on both the Mt. Hull and Sinlahekin herds (Tables 2 & 3). The surveys are conducted in late fall or early winter and consist of helicopter and/or ground count efforts. An attempt is made to classify every bighorn sheep in each herd, and although a complete count is likely not achieved, the majority of animals are normally seen by observers. This result represents a minimum count from which a population estimate is generated.

Population status and trend analysis

Mt. Hull Herd. Observational data suggests that the Mt. Hull herd grew fairly steadily following reintroduction in 1970. Numbers peaked at 80-90 animals around 1990 following several mild winters. The population declined noticeably in the 1990s, particularly following the severe winter of 1992-93. Herd numbers climbed gradually over the next 10 years until the Rocky Hull fire burned a significant portion of the range in 2000. Robust herd growth has prevailed since, likely due to fire's rejuvenating effect on preferred forage plants. The herd reached its highest observed abundance in 2008 at over 100 animals, and remains above population objectives. The ram cohort fluctuated significantly in the early 2000s in response to fire activity in the US and Canada, but is now quite robust.

In 2001, WDFW augmented the herd with 8 ewes and 3 rams from the Cleman Mountain area. Additional augmentation occurred in 2003 with 5 animals from John Day, Oregon. Augmentation efforts are primarily designed to maintain genetic diversity. Population growth is achieved largely through natural production. Given the limited range and insular characteristic of the sheep range on Mt. Hull, current herd size is likely near or at carrying capacity.

Table 2. Population composition counts from the Mt Hull area. <3/4 = less than 3/4 curl rams, ≥3/4 = greater than or equal to 3/4 curl rams, and L:100:R is lambs (L) and rams (R) per 100 ewes (100).

			Rams				Count	Population	
Year	Lambs	Ewes	<3/4	≥3/4	Total	Unknown	Total	Estimate	L:100:R
1992	0	26	1	7	8	0	34	40-60	0-100-31
1993	0	17	2	7	9	0	26	40-50	0-100-53
1994	5	28	2	8	10	0	53	50-60	18-100-36
1995	11	16	6	11	17	0	44	55	69:100:106
1996	0	5	10	6	16	0	21	40-60	0:100:320
1997	8	25	--	--	8	0	41	55-65	32:100:32
1998	--	--	--	--	--	--	--	--	--
1999	19	24	15	8	23	0	66	70	80:100:96
2000	21	30	9	0	9	0	60	60-65	70:100:30
2001	10	30	15	4	19	0	59	60-70	33:100:63
2002	11	40	6	4	10	0	61	65-70	28:100:25
2003	20	39	9	12	21	0	80	80-90	51:100:54
2004	9	32	7	10	17	0	58	70-90	28:100:53
2005	16	48	16	10	16	0	90	90-100	60:100:33
2006	8	40	25	5	30	0	77	100+	20:100:75
2007	13	54	17	6	23	0	90	100+	24:100:43
2008	18	52	20	13	33	0	103	110-120	35:100:63
2009	17	58	11	10	21	0	96	100+	36:100:29
2010	19	43	6	3	9	0	71	80-100	44:100:21
2011	8	38	13	18	31	0	77	80-100	21:100:82
2012	8	38	26	17	43	0	89	90-100	21:100:113
2013	12	50	17	8	25	3	90	90-100	24:100:50

Mt. Hull Herd. WDFW biologists conducted an aerial survey of the Mt. Hull Unit in December 2013 classifying 90 sheep, including 25 rams, 8 of which were ≥ ¾ curl. Observed lamb recruitment to early winter remained modest at 24 lambs per 100 ewes (Table 2).

Sinlahekin herd. WDFW biologists conducted an aerial survey of the Sinlahekin Unit in December 2013 classifying 38 sheep, including 5 rams and 4 lambs. Observed lamb recruitment to early winter remained low in 2013 at 13 lambs per 100 ewes (Table 3).

The number of bighorn sheep crossing west of Highway 97 and being struck by vehicles has substantially decreased in the last few years. Four bighorn sheep perished each year in vehicle collisions during 2006 and 2007. Vehicles killed only one bighorn sheep in 2008, two in 2009, and none the last three years. Complaints from landowners due to large numbers of sheep foraging in irrigated agricultural fields adjacent to Mt. Hull has also decreased significantly in recent years. This reduction in road kills and complaints may be due to herd reduction actions and adequate natural forage away from the highway and farmland. Changes in private land use have also led to reduced complaints; however, bighorn sheep continue to come down to Highway 97 and forage in the agriculture fields to some degree. These behaviors may still be indicative of forage competition and declining range quality.

During two separate capture efforts (2009 and 2011), agency and CCT biologists captured and translocated 14 ewes and 4 rams from the Mt. Hull herd to the new Hells Gate Reserve herd on the Colville Confederated Tribal Reservation. In addition to the translocation efforts, ewe only permits were issued starting in 2009 to help reduce herd size towards management objectives. Monitoring of the population to determine if these herd reduction efforts have achieved the desired results will continue over the next few years. If surveys indicate the Mt. Hull population remains high and vehicle collisions and agriculture damage increase, further herd reduction efforts may be implemented. If these issues decrease then the ewe only permits would be reduced or removed.

Table 3. Population composition counts from the Sinlahekin area. <3/4 = less than 3/4 curl rams, >3/4 = greater than 3/4 curl rams, and L:100:R is lambs (L) and rams (R) per 100 ewes (100).

			Rams				Count	Population	
Year	Lambs	Ewes	<3/4	>3/4	Total	Unknown	Total	Estimate	L:100:R
1990	--	--	--	--	--	--	--	--	--
1991	--	--	--	--	--	--	--	--	--
1992	6	30	--	--	15	0	41	--	20:100:50
1993	2	17	--	--	4	0	23	--	12:100:24
1994	1	21	--	--	1	0	23	--	5:100:5
1995	9	24	5	6	11	0	44	--	38:100:46
1996	2	20	7	0	7	0	29	30-45	10:100:35
1997	--	--	--	--	--	--	--	25-40	--
1998	--	--	--	--	--	--	--	25-40	--
1999	0	0	0	0	0	0	0	25-40	--
2000	--	--	--	--	--	--	14	20-30	--
2001	6	16	4	0	4	3	29	30-35	38:100:25
2002	8	20	6	0	6	0	34	35-40	40:100:30
2003	--	--	--	--	--	--	--	--	--
2004	--	--	--	--	--	--	--	--	--
2005	2	13	3	2	5	0	20	30-40	15:100:38
2006	3	24	2	3	5	0	32	35-40	12:100:21
2007	2	37	5	7	12	0	51	50-60	15:100:32
2008	7	21	2	3	5	0	33	35-40	33:100:24
2009	15	48	14	9	23	0	86	90-95	31:100:48
2010	15	31	9	5	14	7	67	70-90	48:100:45
2011	4	55	18	5	23	0	82	90-95	7:100:42
2012	2	15	2	0	9	0	26	30-35	13:100:60
2013	4	29	3	2	5	0	38	40-45	14:100:17

Sinlahekin herd. Initially, the herd grew rapidly following reintroduction in 1957. High productivity and continued expansion allowed for translocation of sheep to other ranges in Washington. During the 1990s, the population declined, incurring particularly heavy losses during the winter of 1992-93. In 2003, WDFW augmented the Sinlahekin herd with 10 animals from Oregon to improve genetic diversity and bolster production. Herd demographics had improved with survey results showing an increasing population through 2011. This was likely a function of the herd expanding its range into previously unused habitat to the north, genetic mixing through augmentation, and improved survey accuracy. Since 2012 surveys show a dramatic decrease in the population which likely reflects an actual herd reduction rather than an artifact of survey timing. Causes of this decline are currently unknown; however, psoroptic mange may be a factor as discussed below. Continued annual monitoring will be critical for determining herd status and outlook.

In 2010, WDFW and Washington State University initiated a research project to gather data on herd range expansion, seasonal animal movements, and to evaluate the effectiveness of prescribed fire as a sheep habitat enhancement tool in the Sinlahekin Wildlife Area. Biologists fitted a total of 21 bighorn sheep with GPS radio collars in two separate captures, one in 2010 (10 ewes and 2 rams) and one in 2011 (4 ewes and 5 rams). All data has been collected and is being analyzed by a graduate student enrolled at Washington State University.

During the 2011 Sinlahekin bighorn sheep capture psoroptic mange was discovered within the herd. The reaction to this parasite in a bighorn herd can vary from no signs at all (a few mites in the ears) to fatal infections. It is speculated that psoroptic mange may have contributed to the low observed population size and lamb production since 2012. In 2014 11 bighorn sheep were captured in the Sinlahekin herd and tested for multiple disease vectors and parasites to investigate the cause for the population decline. Nothing was found that would explain the reduction in the herd size. However, Psoroptes mites continued to persist within the herd. Eight of these sheep were fitted with GPS radio collars to increase survey accuracy. Monitoring of the herd will continue.

Habitat condition and trend

Mt. Hull Herd. The Mt. Hull range has generally remained in good shape, but this may be changing. The Rocky Hull fire in 2000 appeared to initially reinvigorate natural forage production, and sheep use became more concentrated in the portion of the range that burned. Since then, increased population and noxious weed invasions may have reduced range quality.

Cheatgrass has flourished in portions of the burn and other new invasive species, including white-top and Dalmatian toadflax, are present. In the past, programs such as the Forest Service’s aggressive weed control effort funded by the Foundation for North American Wild Sheep (now Wild Sheep Foundation), have been helpful, and similar efforts will likely be needed into the future. Recent radio collar data indicates that the current habitat still supports functional connectivity between the Mt. Hull herd and the bighorn sheep herd at Omak Lake on the CCT. Radio collar data showed that a 7 year-old ram left the Omak Lake herd on November 14, 2010, traveling approximately 46 miles before reaching Mt. Hull. This ram returned via the same route to the Omak Lake herd by Christmas day. DNA testing of the Omak Lake herd indicated all animals tested but one, are genetically linked to the Sinlahekin herd. The one remaining individual was genetically linked to the Mt. Hull herd. This connectivity may increase genetic mixing but may also increase the chances of disease transmission between these herds.

Sinlahekin herd. Since the early 2000s, the majority of the Sinlahekin herd has moved north out of its traditional use area on Aeneas Mountain with the exception of a small group that continues to use the area from Aeneas Mountain south to Blue Lake within the Sinlahekin Wildlife Area. Over the years the amount of available sheep habitat on Aeneas Mountain and in the Sinlahekin Wildlife Area had likely declined due to tree encroachment and forest succession. Management activities have been reversing this trend in recent years.

In 2005, an extensive timber thinning and prescribed fire program to reduce tree encroachment and increase forage conditions began on the Sinlahekin Wildlife Area. To date 1,900 acres within the Sinlahekin Wildlife Area has been treated with prescribed fire. Of that, 750 acres were also thinned to reduce conifer stocking levels. The project’s ultimate goal is to thin and/or conduct prescribed fire on 2,700 acres overall. This effort, combined with an aggressive weed control program should improve habitat conditions for sheep and other ungulates on the Sinlahekin Wildlife Area.

Much of the sheep foraging habitat for the Sinlahekin herd is not under WDFW control. The WADNR and US BLM maintain cattle grazing on their permits in sheep range, and most of the adjacent private land is intensively grazed. These pressures are likely to continue.

Road mortality has been a minor issue in the Sinlahekin herd. Vehicles collisions have killed four mature bighorn rams and one lamb in the last few years.

An additional threat to both the Mt. Hull and Sinlahekin herds is the presence of domestic sheep and goats within and adjacent to their range. Wild sheep are often in close proximity to these domestic herds. This interaction may lead to the transfer of disease into these bighorn sheep herds, especially *Mycoplasma ovipneumoniae and Mannheimia haemolytica*, two bacterial pathogens that cause bighorn die-offs. Domestic dogs have also been documented chasing bighorn sheep on Mt Hull and, in one case, causing injury to a lamb.

Management conclusions

Mt. Hull Herd. Generally, the Mt. Hull herd has thrived in recent years, aided by improved post-fire forage conditions, genetic mixing through augmentation, and probable immigration from British Columbia. Changes in sheep behavior over the last few years suggest that the habitat is being strained by the increase in herd size. This herd is currently exceeding the population management objectives of 55-80 animals. Efforts by WDFW to reduce the Mt. Hull population, changes in land use, and favorable weather over the last few years have helped increase range quality, at least in the short term. These factors have also reduced road mortalities and landowner conflicts. WDFW is continuing to work on improving habitat, reducing the factors associated with vehicle collisions, landowner conflicts, and separation of bighorn sheep from domestic sheep and goats.

S*inlahekin Herd*. Continued monitoring is needed to determine the extent and cause of the potentially dramatic herd reduction indicated by survey results. Extensive prescribed fire and thinning treatments in association with weed control strategies are producing improved habitat on the Sinlahekin Wildlife Area. Opportunities for habitat improvement should also be explored for Mt Hull.

In addition, disease prevention, and monitoring should also be a management priority. Maintaining separation between bighorn sheep and domestic sheep and goats is a current focal task.

BIGHORN SHEEP STATUS AND TREND REPORT: REGION 2

SWAKANE, CHELAN BUTTE, MANSON

DAVID P. VOLSEN, District Wildlife Biologist
JON GALLIE, Wildlife Biologist

Population objectives and guidelines

Three herds of California bighorn sheep are found in Chelan County, the products of reintroductions into Swakane Canyon, the north shore of Lake Chelan and Chelan Butte. In addition, bighorn sheep from the Quilomene herd use areas in Chelan County along the Kittitas County border near Tarpiscan Creek, and along Jumpoff Ridge.

Management objectives for the Wenatchee District are: (1) increase the size and range of existing populations; (2) ensure genetic health by augmenting existing populations with bighorns from other areas; (3) minimize risk of disease by eliminating overlap with domestic sheep grazing allotments on public land, and provide information to the public about the importance of separating wild and domestics sheep; (4) reintroduce bighorn sheep into suitable unoccupied historic habitat within the District; and (5) provide recreational opportunities.

There are an estimated 130-140 bighorn sheep in the Swakane herd as of summer 2013. The existing population objective for Swakane is 50-60 adult sheep (WDFW 2008). The north shore of Lake Chelan (Manson) population was estimated at 113-130 as of June 2009, and the current population objective for the herd is 100-150 adult sheep (WDFW 2008). The Chelan Butte herd has expanded from an original release of 35 in 2004, to an estimate of over 160 bighorns. Habitat analysis (Musser and Dauer 2003) suggests sufficient habitat exists for a population of 195-390 sheep.

Hunting seasons and harvest trends

In 1999, the first ram permit was offered for the Swakane herd, followed by one permit per year from 2000-2008. The only additional Swakane harvest was by the 2002 auction tag winner (Table 4). Currently, the bighorn season in the Swakane runs September 15-October 10. All of the hunters have been successful at killing a mature ram (≥3/4 curl). No bighorn permit was offered in the Swakane in 2009 due to the high number of vehicle collision mortalities along SR 97A in 2008. Highway mortalities were effectively stopped with the construction of a wildlife fence along SR 97A. A drawing permit for the harvest of one bighorn ram was reinstated for the 2010 hunting season. The ram harvested in 2010 is the new Washington State record and SCI World record California Bighorn Sheep.

Two permits have been offered in the Manson unit since the permit began in 2005. Both auction tag holders and raffle tag holders have harvested rams from the Manson herd. There will be two drawing permits offered for the north shore of Lake Chelan for 2014.

The Chelan Butte herd was hunted for the first time in 2010, with the permit holder successfully harvesting a ram. Tag holders for 2011, 2012 and 2013 hunts also harvested rams. The Chelan Butte herd met the minimum criteria for offering a permit (WDFW 2008): waiting 5 years post-introduction, population minimum of 50 adults, minimum number of 2 mature rams and ram:ewe ratio of 25:100 (Table 3). Aerial and ground surveys of the area have provided confirmation of an increasing herd and its composition. Another drawing permit for the herd will be offered in 2014.

Surveys

Prior to 2009, herd population data was collected primarily from incidental reports from WDFW personnel, permit hunters, public sightings, and occasionally aerial and ground surveys during the spring and rut periods (Table 1, 2, 3). In March of 2009, 12 sheep were outfitted with telemetry collars in both the Swakane and Lake Chelan herds (18 ewes and 6 rams). VHF collars were placed on 12 ewes and 4 rams, while GPS collars were place on 6 ewes and 2 rams. Collars have improved our ability to locate sheep during ground and aerial surveys, improving survey data, population estimates, and knowledge of home range and habitat use. In 2013, an additional 13 sheep were outfitted with GPS telemetry collars to continue monitoring efforts.

Additionally, Chelan PUD has been recording bighorn sheep observations during their Lake Chelan big game surveys since 2007. Bighorns are still opportunistically observed on Chelan Butte, both on organized ground surveys and by volunteers working in the area. All three herds were surveyed by helicopter in June 2009 to document production and update herd estimates.

Population status and trend analysis

From 1996 to 2000, the Swakane bighorn population increased slowly (Table 1). In 2001 the population was estimated at 51 sheep, representing a 46 percent increase from the 1992-2000 average. The increased count in 2001 resulted after Swakane bands began using the cliffs/breaks along the Columbia River and SR 97A, allowing for better monitoring. The proliferation of residential developments and their associated ornamental plantings along the west shore of the Rocky Reach pool may have enticed bighorns to cross Highway 97A with increasing frequency. For over 30 years, no bighorn mortalities were attributed to vehicle collisions. However, over 25 Swakane bighorns have been killed by vehicles on SR 97A (11 rams, 9 ewes, 5 lambs) since 2002.

In response to these events, multiple agencies and conservation groups including Washington Department of Transportation, State Patrol, WDFW and the Wenatchee Sportsmen's Association convened a working group to address deer and bighorn sheep vehicle collisions on SR 97A, and developed plans for a wildlife fence to reduce wildlife-vehicle collisions. Phase One of the fence was 4 miles long and extends from mile marker 212 on the north end to mile marker 208 on the south, the section where most collisions have occurred. Construction of this first section was completed 2009. Phase Two, completed in 2010, extended the fence roughly two miles to the south. The remaining 3.3 mile section (Phase Three) was completed in 2011. Vehicle collision mortalities have continued since completion of the fence mainly due to sheep finding vulnerable areas during the rut. Collision rates have dropped significantly, with only 3 vehicle collisions in 2013.

Telemetry data from collared sheep has improved our ability to locate sheep and estimate population trends. In 2009, using telemetry collars, we documented the greatest number of sheep observed in the Swakane herd (Table 1), supporting previous population estimates and suggesting that the herd is increasing. Since then, focused ground surveys have increased our minimum counts.

The Manson herd on Lake Chelan exhibited rapid population growth typical of a founder population in excellent quality, unoccupied habitat. In 2004, June survey data were used to calculate 2002-2004 population trends, indicating a 3-year average annual population growth rate of roughly 38%. This increase seems to have slowed, based on decreased observed lamb production/survival. Locations from recent telemetry data show that several bands have moved westward uplake into steeper, rockier, unoccupied habitat. Observed lamb production amongst these groups (17 ewes produced 8 lambs) was much better than the lower lake (42 ewes produced only 3 lambs). Due to the remote nature of the habitat of this herd, and the difficulty in locating sheep from the water, the population estimate of 101-122 is used from 2009, as a conservative estimate. The collars allowed for a productive aerial survey, where we documented the herd's highest observed count (Table 2). With the addition of new GPS collars we hope to have more accurate counts in the near future.

The Chelan Butte herd has also shown rapid growth and is now expanding their range north of Chelan Butte into Deer Mtn. and Howard Flats. We conducted an aerial survey of this herd to assess production and estimate numbers in 2009. A total of 84 sheep were observed in 2009, and the population was estimated at 84-98. In 2010, ground surveys resulted in a minimum count of 101 sheep, in 2011, 93 sheep, and in 2012 129 sheep. In 2013, the minimum count for the herd was 163 sheep, a substantial increase (Table 3). The Chelan Butte herd is easily viewed from the road system and counts occur regularly.

We estimate that less than 20 bighorns seasonally use the Colockum and Jumpoff Ridge areas in Chelan County. These sheep are part of the Quilomene herd. A group of 10-15 rams are regularly seen south of Jumpoff Ridge. Residents report a small group of 5-9 ewes and lambs on Jumpoff Ridge and that these animals reside there from spring to fall. If these are in fact resident, these observations suggest the Quilomene sheep have expanded their range.

Habitat condition and trend

Habitat conditions for Swakane, Lake Chelan and Chelan Butte bighorns are excellent, in part due to the high frequency of fires. Fires reduce tree and shrub cover and increase the abundance of grasses and forbs, which in turn benefit bighorns. During summer 2001, the Rex Creek fire on the north shore of Lake Chelan burned over 53,000 acres. However, only a small portion of this burn was known occupied bighorn habitat. During summer 2002, the Deer Point fire on the north shore of Lake Chelan, and down-lake from the Rex Creek fire, burned over 43,000 acres, including most of the occupied bighorn habitat of grass, bitterbrush, mixed shrubs, and ponderosa and lodgepole pine. In October 2002, at least 25 bighorns moved northerly to the Point-No-Point area of the Rex Creek burn, apparently to take advantage of the new forage; they continue to utilize this area. Forage quantity and quality appear to be excellent, following the release of nutrients from both the fires.

The Dinkelman fire in the Swakane area, which burned in 1988, proved beneficial to the Swakane bighorns. In 2010, 20,000 plus acres burned in a low intensity fire in the Swakane. The Chelan Butte herd continues to utilize many of the fallow agriculture fields and adjacent shrub-steppe habitat. There are further opportunities to enhance bighorn, mule deer and other wildlife habitats in Swakane and on Chelan Butte, but these have been limited due to funding constraints.

Several springs were developed or improved for bighorn sheep within the range of the Swakane herd along the breaks of the Columbia River. Prior to fence construction, ewe bands regularly moved to the river to access native riparian and ornamental forage. Completion of the SR 97A fence excluded sheep from a very small amount of habitat, as they have always spent most of their time in habitats west of the highway.

Telemetry data indicate that sheep have not altered their seasonal use habitat patterns use in response to the newly constructed wildlife fence. The fence eliminated the bighorn's use of a narrow band of habitat between SR 97A and the Columbia River. Due to the observed preference of California bighorns for low elevation habitats, those habitats susceptible to human encroachment, there is long-term impact occurring from conversion and development of native habitat. Maintenance of habitat connectivity at low elevations in Chelan County is vital to the long-term health of all 3 herds.

Wildlife damage

No official reports of agricultural damage attributed to bighorns were received in 2004-2010; however, we did receive calls this year from three orchardists (two in Swakane, one on Chelan Butte) about the presence of bighorns in their orchards. They have expressed concerns of damage to young trees; however no claims for damage have been filed. Observations indicate that the sheep are feeding mainly on grass within the irrigated orchards.

Augmentation

The Lake Chelan herd is likely continuing to grow, and presumably has good genetic diversity due to the variety of founder sources. In the Swakane, augmentation is desirable for the long-term health of this population, given the historic isolated nature of the population and its small founder population. Chelan Butte was selected as an introduction site for bighorns due to its close proximity to the Lake Chelan population. If the recently observed movements of sheep northward from Chelan Butte continue, it is likely that interchange between the Manson herd and sheep on the butte will occur. Reports of bighorn sheep accessing habitat south of Chelan Butte have also increased in the past two years.

The Moses Coulee area in Douglas County offers potential habitat for a bighorn reintroduction. Much of the area is privately owned, but the proportion in public ownership has increased in recent years. In 2005, several landowners were contacted regarding the possibility of introducing bighorns. Response was negative; however, as it appears concerns may have arisen from issues surrounding endangered species in Douglas County, rather than opposition to bighorn sheep. A long-term agreement with landowners to eliminate potential for contact with domestic sheep would be required before reintroducing bighorns in Douglas County.

Management conclusions

The threat of disease from domestic sheep is significant for the Swakane herd. Domestic sheep were documented 6 times within the core habitat of Swakane bighorns from 2000-2007. Domestic sheep were euthanized by WDFW (with permission from owners) in 2003 and 2007.

Bighorn rams were documented in domestic sheep grazing allotments twice during 2000. WDFW and the Okanogan-Wenatchee National Forest have reduced the risk to bighorns from domestic sheep on Forest Service lands, however, no final solutions have been developed. Bighorns in Swakane are still at risk for disease transmission from domestics. In 2013 four bighorn ewes were seen multiple times within occupied domestic grazing allotments in the Entitat Valley. Efforts to locate and remove the bighorn sheep were unsuccessful. WDFW continues to work closely with the USFS to minimize encounters between bighorn and domestic sheep.

The Swakane bighorn population is somewhat unique in that it is highly accessible for viewing during the winter months. Viewing opportunities, in particular large adult rams, are highly valued by the public. Harvest management should be conservative to maintain this viewing opportunity.

The population objective of 150 sheep for the Lake Chelan herd is conservative, based on the low potential for conflicts, US Forest Service management emphasis for bighorn sheep habitat, and the increase in habitat resulting from wildfires. Estimates of available habitat, based solely on the extent of the 2001 and 2002 fires, have suggested there may be habitat to support more than 800 bighorns. With new data, these estimates will be re-addressed based on habitat condition.

Aerial surveys of sheep groups outfitted with telemetry collars present the best opportunity to monitor the status of Swakane, Chelan Butte and Lake Chelan herds. Optimum monitoring would involve 2 helicopter surveys per year, during May, following lambing to monitor production, and during the rut to monitor rams and total numbers. Routine monitoring of the active collars will be done to keep track of herd movements, range, general habitat use and trends, and contribute additional population data.

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Table 1. Observed population composition of the Swakane bighorn sheep herd, 1996-2013

			Rams							
Year	Lambs	Ewes	Yrl	<3/4curl	≥3/4 curl	Total rams	Total sheep	Population estimate	Lambs:100 ewes	Rams:100 ewes
1996	3	19	2	8	6	16	38	38	16	84
1997	2	4			2	2	8	25	50	50
1998	3	9		7	4	11	23	30	33	122
1999	4	20		5	7	12	36	36	20	60
2000	5	14	1	1	8	10	29	35	36	71
2001	9	23	3	6	10	19	51	51	39	83
2002	10	25	2	9	8	19	54	54	40	76
2003	13	26	3*	5*	8*	20*	59	58	50	77
2004	10	15	1	6	6	13	38	50-60	67	77
2005	7	27	1	6	6	13	47	50-60	26	48
2006	11	43	2	6	7	15	69	70-75	26	35
2007							No Survey			
2008	13	24	5	4	12	21	58	70-75	54	88
2009	17	34	5	5	20	30	81	81-90	50	88
2010	17	44		13	13	26	87	87-95	39	59
2011	13	63		14	16	23	107	110-120	22	48
2012	24	58	4	17	19	40	122	130-140	41	67
2013	27	63		12	29	41	131	130-140	43	65

*12 rams classified from the observed 20.

Table 2. Observed population composition of the Lake Chelan bighorn sheep herd, 1999-2009.

			Rams							
Year	Lambs	Ewes	Yrl	<3/4 curl	≥3/4 curl	Total rams	Total sheep	Lambs: 100 ewes	Rams: 100 ewes	Population estimate
1999	2	10	1	2		3	15	20	30	15
2000	6	33	5	6		11	50	18	33	50
2001	12	24	8	4		12	48	50	50	50
2002	17	36	8	6		14	67	47	39	70-75
2003	20	54	0	4	1	5	79	37	9	83-113
2004	16	62	0	11	5	16	94	26	26	98-129
2005	10	28	0	12	5	17	59*	36	61	98-129
2006	5	28	0	1	14	15	79*	18	54	98-129
2007	10	55	3	9	16	28	93	18	51	98-129
2008	6	31	7	4	5	16	98*	19	52	98-129
2009	11	59	5	7	26	43	113	19	73	113-130
2010	11	58		15	17	32	101	19	55	101-122
2011	10	51		6	21	25	86	20	49	101-122
2012	15	52	2	7	13	22	89	29	42	101-122
2013	18	65		6	11	18	100	28	26	101-122

*High count of sheep observed by Chelan PUD during their 12 boat surveys per year.
** Spring 2013 count incomplete.

Table 3. Observed population composition of the Chelan Butte Bighorn sheep herd, 2004-2009.

			Rams							
Year	Lambs	Ewes	Yrl	<3/4 curl	≥3/4 curl	Total rams	Total sheep	Lambs:100 ewes	Rams:100 ewes	Population estimate
2004	10	22		3		3	35	45	13	36-47
2005	5	27	1	1		2	34	19	7	34-53
2006	5	32	2	3	3	8	45	16	25	45-50
2007							No Survey			
2008	10	32				21	63	31	66	60-70
2009	12	48	7	3	14	24	84	25	50	84-98
2010	16	50		17	18	35	101	32	70	101-120
2011	19	46		15	13	28	93	41	61	101-120
2012	13	72	8	10	25	43	128	18	58	130-145
2013	25	97		17	26	41	163	26	42	160-170

.

Table 4A: Summary of Bighorn Ram Harvest for Swakane Herd

Year	Permits	Harvest	Comments
2001	1	1	
2002	1	2	*
2003	1	1	
2004	1	1	
2005	1	1	
2006	1	1	
2007	1	1	
2008	1	1	
2009	0	0	**
2010	1	1	
2011	1	1	
2012	1	1	
2013	1	1	
Total	12	13	

* Includes harvest by Auction tag holder.

** No tag offered due to excessive vehicle mortalities.

Table 4B: Summary of Bighorn Ram Harvest for Lake Chelan Herd

Year	Permits	Harvest	Comments
2005	2	2	
2006	2	2	
2007	2	3	*
2008	2	2	
2009	2	1	
2010	2	4	*
2011	2	4	*
2012	2	3	*
2013	2	3	*
Total	16	21	

* Includes harvest by Auction and/or Raffle tag holders.

Table 4C: Summary of Bighorn Ram Harvest for Chelan Butte Herd

Year	Permits	Harvest	Comments
2010	1	1	
2011	1	1	
2012	1	1	
2013	1	1	
Total	4	4	

BIGHORN SHEEP STATUS AND TREND REPORT: REGION 3

QUILOMENE, CLEMAN MOUNTAIN, UMTANUM/SELAH BUTTE, AND TIETON

JEFFREY BERNATOWICZ, District Wildlife Biologist

Population objectives/guidelines

The statewide goals for bighorn sheep are:

1. Preserve, protect, perpetuate, and manage bighorn sheep and their habitats to ensure healthy, productive populations.

2. Manage bighorn sheep for a variety of recreational, educational and aesthetic purposes including hunting, scientific study, cultural and ceremonial uses by Native Americans, wildlife viewing and photography.

3. Manage for sustained yield.

4. Numerical goals for each herd are provided in Tables 2-5.

Hunting seasons and harvest trends

Region 3 supports three populations of California Bighorn Sheep: Cleman Mountain, Umtanum/Selah Butte, and Quilomene. The Tieton herd was eliminated due to a pneumonia outbreak in 2013. Hunting is by permit, for rams only (except Selah Butte, where five ewe permits were also issued in 2009) and occurs in all units. The number of permits and harvest are given in Table 1. The Yakama Nation issues permits in all herds whereas the Muckleshoot Indian tribe hunts the Cleman Mountain and Umtanum/Selah Butte herds.

Surveys

Quilomene and Umtanum/ Selah Butte had typically been surveyed via helicopter in July. The survey timing was not a good index to actual recruitment or optimal for identifying disease problems. In 2014, surveys were flown in March. Cleman Mountain is surveyed at the feeding station in December/January.

Umtanum and Selah Butte were surveyed from helicopter and the ground numerous times from late 2009 through 2014 due to a disease outbreak/research project. Ground surveys will be conducted in August/September to index early lamb recruitment. Final recruitment surveys are flown in February/March. All available information is used to estimate the total population. Survey results are given in Tables 2- 5.

Population status and trend analysis

Bighorn sheep were native to Region 3, but had been eliminated by over hunting and disease by the early 1900s. All existing populations are the result of reintroductions.

The Quilomene reintroduction was the first in the region (early 1960s) and the population was estimated at over 100 animals by the late 1960s. The population then crashed in the early 1970s. The cause of the decline was unknown but the population had reportedly died out by 1990. Reintroductions were initiated again in 1993. By 1996, 41 bighorns had been released in the area. The Quilomene population quickly grew to over 160 sheep (Table 2). Poor recruitment, observations of coughing sheep, and reports of mortalities indicated a disease problem circa 2004-2006. Adult ewe counts have declined 66% since 2004 and 48% since 2012. In 2013, a large, fast moving fire went through the north portion of the herd area. Post-fire, many sheep citizens who frequently look for bighorns reported a lack of sheep. Aerial and ground surveys by WDFW and guides indicated a substantial portion of the herd was unaccounted for. Lamb recruitment ratios have been good indicating pneumonia has not been an issue recently. The southern portion of the herd, which is spending considerable time in and around the town of Vantage, has been expanding, whereas the remainder of the herd is apparently declining.

The Cleman Mountain population was established in 1967 with the release of eight animals. The herd remained relatively unchanged for over 20 years. A portion of the population was captured, tested, and treated with antibiotics in 1990. Augmentation included 27 animals during 1989-96. Production increased after 1996, and the population exceeded the goal of 150 animals by the year 2000 (Table 2). Over 165 sheep have been captured and translocated from this herd since 2001. Another 127 were harvested during that period and the population is still above objective. The Cleman Mountain herd is considered at fairly high risk of a pneumonia outbreak due to recent disease problems in Tieton, Yakima River Canyon, and nearby domestic sheep grazing allotments. Concerns have led to frequent testing; the most recent testing in January 2013 indicated no evidence of pneumonia or the bacteria associated with it.

The Umtanum herd was established in 1970 with the release of eight bighorns west of the Yakima River. Within 15 years, the population grew to an estimated 200 animals, and some sheep crossed the Yakima River. Originally, sheep on the east side of the river were considered a separate herd (Selah Butte). Surveys have shown large numbers of animals crossing the river in both directions, and it is now considered a single herd. In 2001, 11 sheep were released at the south end of the canyon, near Roza Dam.

Population estimates for Umtanum/Selah Butte varied between 170 and 200 animals until 2002 (Table 4). Dispersal, winter mortality, and the removal of 52 sheep for augmenting other populations probably kept the herd stable. The increase, after 2002, was largely due to the release of 11 animals and a subsequent increase in lamb production. Harvest was being increased during this period to maintain a stable population.

In December 2009, an outbreak of pneumonia was discovered at the north end of Umtanum. Disease loss and culling removed approximately 50% of the Umtanum herd by April 2010. The bacterial pneumonia jumped to the east of the river (Selah Butte) in summer 2010, but no significant adult mortality was noted. By August 2010, low lamb survival was apparent on both sides of the river. Lamb and adult survival was very high in 2011 and 2012. It appeared the herd had recovered and was back at objective. Testing of 30 animals in February 2013 found *Mycoplasma ovipneumoniae* (Movi) in one young ram. Adult survival was high in 2013, but lamb recruitment was fairly low, apparently due to pneumonia. Observations of sick/dying lambs started early in 2014. Samples were collected from sheep on both sides of the river and confirmed pneumonia was present and was due the same strain of Movi as 2010 and 2013.

The Tieton herd was established with the release of 54 sheep during 1998-2002. Subsequent radio-telemetry indicated relatively low mortality and high lamb recruitment. An aerial survey in 2008 confirmed the population was over objective. Sixty-five animals were removed for translocation since 2009-2012. During the capture, crews confirmed population estimates, and the herd was found to be disease free (last capture March 2012). Harvest removed 49 animals during 2009-2012 in an attempt to keep the population near population objectives. In March 2013, a pneumonia outbreak was confirmed. Mortality appeared to be high and a decision was made to euthanize the remaining animals to prevent spread to the nearby Cleman Mountain herd. A total of 57 bighorns were euthanized. Pneumonia and Movi were confirmed in all samples. The strain of Movi in the Tieton herd was different than that found in the Yakima River Canyon sheep.

Habitat condition and trend

Forage resources vary annually with moisture. Precipitation had been near or above average 2010-2012, undoubtedly increasing forage production. Drought conditions returned in 2013 and 2014 in most locations. Small fires on Cleman Mountain regenerated new forage growth that benefited sheep in the last 5-6 years. A significant portion of the north Quilomene range burned in 2013. Long-term, such fires are generally beneficial to bighorn sheep habitat.

Augmentation/habitat enhancement

Major augmentation efforts ended in 2002. Cleman Mountain has been the source for many translocation projects. No habitat enhancement projects have been funded for bighorn sheep in the region. In general, bighorn habitat is difficult to work in and success of any habitat projects would be limited due to shallow soils and dry conditions. Sheep at Cleman Mountain are fed during the winter, mostly for trapping purposes.

The most beneficial projects to bighorn populations would be to reduce/eliminate contact with domestic sheep/goats. In 2006, a large private ranch in Quilomene was purchased by WDFW, and domestic sheep grazing was subsequently eliminated. Similar efforts have secured habitat and reduced risk of domestic/bighorn interactions within the Cleman Mountain herd range.

Management conclusions

The history of bighorn sheep in Region 3 has been one of boom and bust. The declines have likely been associated with disease outbreaks, similar to those documented in the Yakima River Canyon herd in 2009-2010 and the Tieton herd in 2013.

Disease outbreaks are not unexpected as domestic sheep and/or goats have been documented in close proximity to bighorns in every herd in the Region. Reducing/eliminating risk of contact between bighorns and domestics is essential to the long-term viability and health of bighorns. It may be possible to develop Movi free domestics for small herds. This would eliminate some risk. For some herds like Tieton, the larger risk is from domestic sheep grazing on public (USFS) land. Removing that risk is a matter of federal politics/policy and largely out of state control.

Once infected with Movi, herds often never recover. One option is complete removal, as was accomplished in the Tieton herd. Complete removal is time consuming, difficult, and probably would not be supported by the public in a place like the Yakima River Canyon. Research is underway to test theories on management options in chronically infected herds.

The Quilomene herd appears to have recovered from disease issues 2004-2006, but is apparently still declining. The reasons for this are unknown. Radio marking sheep to monitor movements/survival would help answer questions about health/disease risk of bighorns on Cleman Mountain. Research on Yakima River Canyon sheep is underway and continuing.

A concern during the last 3-4 years had been Cleman Mountain and Tieton bighorn sheep licking highways due to attractants in de-icing compounds. It was not uncommon for 40-60 animals to be on the pavement. Center lines have had pits ground into the pavement in recent years. Those pits seem to concentrate the de-icing compounds, and bighorns are often observed on the centerline. The highways also have many blind corners making accidents more likely. Mineral blocks have been placed away from the highways in attempts to attract bighorns away from traffic. Options are being explored to minimize the number of sheep on highways.

The current herd objectives were set based on "professional judgment". Bighorn sheep habitat models have recently been developed and run for all herds in Washington. Comparison of predicted habitat from the models vs. use from GPS collared sheep suggests the models accurately predict habitat use. Herd objectives should be set based on available habitat and productivity.

Table 1. Summary of bighorn sheep harvest in Region 3 since 2000.

Area	Year	Permits	Harvest	Comments
Cleman Mtn.	2000	5	6	Harvest includes auction hunter
	2001	6	8	Harvest includes raffle and auction hunters
	2002	3	3	
	2003	6	7	Harvest includes raffle hunter
	2004	7	8	Harvest includes auction hunter
	2005	9	5	4 no report
	2006	10	11	Harvest includes raffle hunter
	2007	10	10	Harvest includes raffle hunter, 1 no report
	2008	10	11	Harvest includes raffle, auction, tribal
	2009	6	9	Harvest includes tribal
	2010	6	8	Harvest includes raffle hunter, tribal
	2011	6	13	Harvest includes raffle hunter, tribal
	2012	12	24	Harvest includes raffle hunter, tribal
	2013	10	18	Harvest includes raffle hunter, tribal
Umtanum/Selah Butte	2000	3	4	Mt. Hull hunter allowed to hunt area
	2001	8	7	
	2002	7	7	
	2003	7	6	
	2004	7	7	
	2005	7	6	1 no report
	2006	10	10	
	2007	10	9	1 no report
	2008	10	14	Harvest includes Tribal (2 ewes, 2 rams)
	2009	15	18	Harvest includes auction, tribal
	2010	10	15	Harvest includes raffle hunter, tribal
	2011	8	12	Harvest includes tribal
	2012	5	11	Harvest includes tribal
	2013	5	9	Harvest includes tribal
Quilomene	2000	3	4	Harvest includes raffle hunter
	2001	6	5	
	2002	8	9	Harvest includes raffle hunter
	2003	7	6	
	2004	5	5	
	2005	5	5	
	2006	5	4	1 no report
	2007	6	6	
	2008	4	5	Harvest includes Tribal
	2009	4	5	Harvest includes Tribal
	2010	4	4	
	2011	4	5	Harvest includes auction hunter
	2012	3	4	Harvest includes tribal
	2013	3	4	Harvest includes tribal
Tieton	2004	2	2	
	2005	2	2	
	2006	3	4	Harvest includes auction hunter
	2007	3	2	1 no report
	2008	3	4	Harvest includes Tribal
	2009	3	3	
	2010	8	11	Harvest includes Tribal
	2011	10	25	Harvest includes Tribal (3 ewes, 12 rams)
	2012	6	10	Harvest includes tribal

Table 2. Quilomene Population Composition

Year	Lambs	Ewes	Total Rams	Adult Rams	Total Count	Estimated Population	Desired Population
2000	31	59	43	33	133	165	
2001	29	68	34	22	131	165	
2002	11	33	24	16	68	165	
2003	23	63	28	18	114	Unknown	
2004	13	99	32	32	144	Unknown	
2005	16	77	24	21	117	Unknown	250-300
2006	14	89	30	22	133	135	250-300
2007	44	75	32	26	151	160	250-300
2008	33	77	14	11	124	160	250-300
2009	27	86	32	23	145	160	250-300
2010	25	57	20	14	102	160	250-300
2011	11	48	15	15	74	150	250-300
2012	41	65	43	37	149	160	250-300
2014	18	34	28	20	83	100	250-300

Table 3. Cleman Mt. Population Composition

Year	Lambs	Ewes	Total Rams	Adult Rams	Total Count	Estimated Population	Desired Population
2000	40	77	39	33	156	156	
2001	18	63	53	39	134	141	
2002	25	91	55	36	171	171	
2003	32	104	66	35	203	203	
2004	17	83	85		185	185	
2005	28	82	67		177	188	150-160
2006	33	93	67	45		193	150-160
2007	20	100	68	50		198	150-160
2008	40	85	64	40		174	150-160
2009	30	98	70	45		198	150-160
2010	35	83	60	48	201	201	150-160
2011	34	83	88	65	205	205	150-160
2012	30	78	59	59	167	180	150-160
2013	45	101	60	50	206	210	150-160

Table 4. Umtanum/Selah Butte Population Composition

Year	Lambs	Ewes	Total Rams	Adult Rams	Total Count	Estimated Population	Desired Population
2000	30	60	56	46	146	180	
2001	42	82	40	31	174	190	
2002	27	97	43	23	167	200	
2003	26	94	52	38	172	220	
2004	33	87	28		148	240	
2005	61	159	69	54	289	290	250-300
2006	27	106	24	21	157	300	250-300
2007	54	120	68	55	242	300	250-300
2008	63	156	60	51	*279	300	250-300
2009	47	149	62	52	257	300	250-300
2010	23	90	63	60	176	210	250-300
2011	33	109	53	50	195	220	250-300
2012	65	155	68	57	*288	270	250-300
2013	42	80	13		135	270	250-300
2014	14	168	85	58	267	270	250-300

* Probable double count of ewes and lambs

Table 5. Tieton Maximum June Population

Year	Lambs	Ewes	Total Rams	Adult Rams	Total Count	Estimated Population	Desired Population
2000	11	24	11		46	46	
2001	13	35	19		67	67	
2002	10	30	8	8	48	70	
2003	10	40	20	11	70	80	
2004	19	33	5		57	90	
2005	20	88	4	3	112	110	75-150
2006	35	55	40	37	130	135	75-150
2007	23	63	7	0	93	160	75-150
2008	54	81	32	16	167	200	75-150
2009						200	75-150
2010	40	72	89	48		200	75-150
2012	33	66	24	16	125	150	75-150
2013	Herd	Eliminated					

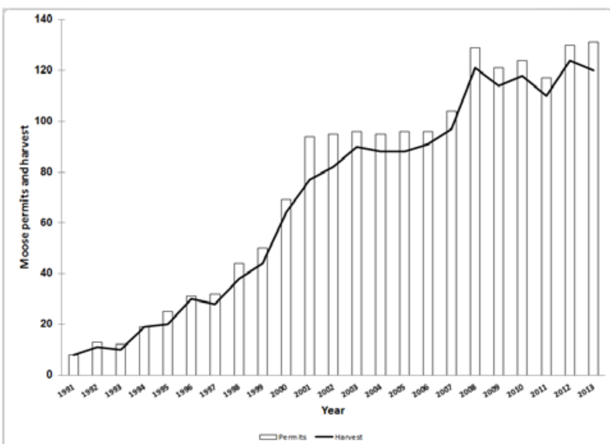
Moose

MOOSE STATUS AND TREND REPORT
STATEWIDE

RICHARD B. HARRIS, Special Species Section Manager

Population objectives and guidelines

Moose in Washington have continued their general upward trend during 2013. Moose have increasingly been reported from beyond their usual haunts in northeastern Washington, with verified reports as far northeast as Rainy Pass in North Cascades National Park, and far southwest as Yakima County. Still, the preponderance of Washington's moose population is located in the northeastern counties of Pend Oreille, Stevens, Ferry, and Spokane. A small moose population also seems to be developing in the Blue Mountains. Hunting seasons have thus far been developed only within the Colville and Spokane districts.



The population monitoring objective for moose is to work toward producing a statistically-valid estimate of abundance within moose habitats in Districts 1 and 2 (Ferry, Pend Oreille, Spokane, and Stevens counties) by 2017, while maintaining our ability to detect short-term changes at the district or GMU level of sufficient importance to merit changes in permit levels. The harvest objective is to provide recreational hunting opportunities consistent with sustainable yield, while also allowing for scientific study, cultural and ceremonial uses by Native Americans, wildlife viewing, and photography. Specific guidelines for managing harvest within sustainable limits are discussed in WDFW (2008), and will soon be updated in the next programmatic Game Management Plan. Current harvest guidelines do not prescribe specific off-take quotas, but suggest that existing permit levels can be liberalized when average bull:cow ratios exceed 75 and median age of harvest bulls exceeds 5.5 years. Permit levels should be restricted when average bull:cows ratio is < 60, and median age of harvested bulls is less than 4.5 years. These guidelines were developed where most hunting occurs via unlimited, over-the-counter license purchasing, and are currently under review.

Hunting seasons and harvest trends

Moose hunting opportunity in Washington is limited by permit. Permit availability (and therefore hunter opportunity) increased substantially beginning in the late 1990s (Figure, showing only hunts reported), and is currently at higher than at any time since moose hunting began in Washington. In 2013, there were a total of 136 moose permits available (not including master hunter permits), of which 127 were reported as being used by hunters, resulting in 120 moose reported harvested. Permits types available were any moose (82), antlerless only (23), youth antlerless (18), 65-and-over antlerless (4), disabled antlerless (4), hunter instructor incentive antlerless (2), raffle (2), and auction (1). Of the 120 moose harvested, 81 were male and 39 were female. An additional 10 damage-hunt permits were issued to master hunters, but none were reported used during 2013. The moose season began on October 1 and ended on November 30. Hunters were able to use any legal weapon.

Surveys

Surveys were conducted using a helicopter and generally occurred between December and February. These surveys assisted district biologists in crafting permit level recommendations, and generally supported information from hunts indicating a continued positive trend in the moose population in northeastern Washington (Harris et al., in press).

A more rigorous aerial survey protocol was initiated in winter 2013-14 that is intended to provide a baseline population estimate from which future trends will be assessed. Initial results from surveys conducted in the Colville and Spokane districts are promising, and a population estimate will be developed following additional aerial surveys during winter 2014-15.

Population status and trend analysis

Moose are newcomers to the state of Washington, having naturally colonized the northeastern portion of the state from neighboring British Columbia and Idaho. Moose were unknown in Washington prior to the 1930s, and rare prior to the 1960s. By the 1970s it was clear that moose had become resident in northeastern Washington; the first hunts occurred in 1977 (Base et al. 2006). Moose populations have increased in Washington, and are now almost certainly at their highest level in history. An estimate of abundance will be developed following the winter 2014-15 surveys. Hunter success has remained high (> 90%), and harvest per days spent afield has tended to decline, despite gradually increasing permit levels. Although imprecise, estimate of the bull component relative to cows remain reasonably high and steady. The age of bulls harvested is acceptable, and higher than in some neighboring states. Vehicle collisions with moose have also increased, and in 2013 were at an all-time high.

The positive trajectory of moose in Washington contrasts with many moose populations in the lower 48 US states (and adjacent areas of southern Canada). Although some moose populations are thriving, many other moose populations are suffering. Causes for declines elsewhere are varied, and include parasite infestation, climate-related stress, habitat changes (e.g., excessive forage loss from recent fires in some locations, forest maturation in others), and predation.

In December 2013, WDFW began collaborating with the University of Montana on a study intended to provide insight into the determinants of vital rates (primarily calf production and recruitment) of moose in northeastern Washington. It seems unlikely that the positive trajectory of moose can be sustained indefinitely. Moose populations face increasingly aged forest conditions (resulting in lower abundance of their preferred browse forage), warmer temperatures (that may be encouraging greater parasite loads), and new predation pressures from recently re-colonizing wolves (adding to existing predation from black bears and cougars). Thus, understanding how moose are faring under the present circumstances will allow us to respond appropriately if and when the population stabilizes or begins to decline.

Habitat condition and trend

Fire suppression policies and natural forest succession continues to degrade moose foraging habitat. Moose are adapted to colonize forested areas post-disturbance. They can persist at low densities in Washington's forested areas without disturbance, but we expect to see a tempering of population increase unless early seral habitats (e.g., shrub-fields) can be sustained in a mosaic with mature forest (needed for thermal regulation). Use of herbicides following timber harvest may also reduce habitat capability for moose. Climate change may pose challenges for moose populations in the future, both from the direct energetic effects (moose are adapted to cold climates and become heat stressed, both in summer and winter, when temperatures exceed their thermo-neutral tolerances), and indirect effects (if parasites typically harbored by moose become excessively numerous). WDFW is also monitoring for the presence and prevalence of the arterial worm *Eleaophora schneideri,* whose typical host is mule deer but has been documented in moose elsewhere in the lower 48 US states. Moose are susceptible to morbidity and mortality from the brain worm *Parelaphostrongylus tenuis*, whose normal host is the white-tailed deer. *P. tenuis* has not yet been documented in or west of the Rocky Mountains, but an inter-agency effort is likely to begin in 2015 to assess whether it has moved into our area.

Management conclusions

In contrast to many areas along the southern extent of their North American distribution, moose have done well in Washington over the past few decades. Hunter demand continues to far exceed supply, however. Thus, even if permit level are increased, moose hunting will be a rare (and generally once-per-lifetime) experience for Washingtonians. Although moose populations are very difficult to quantify, we are increasing our knowledge of their abundance through recently-increased efforts. That said, tracking moose population trends long-term over large areas will likely always be approximate, and prone to time-lags. Moose may continue to increase outside of their base in Northeastern Washington, and it is possible that, in future, hunting opportunities can be developed in other parts of the state. As humans continue to occupy the urban-wildland interface, we expect conflicts with moose to increase. We anticipate seeing a reduction in the rate of growth, or possibly a decline, as the moose population reaches the capacity of available forage to feed it and as other natural factors (e.g., predators, parasites) respond to their abundance.

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MOOSE STATUS AND TREND REPORT: REGION 1
GMUs 101, 105, 108, 111, 113, 117, 121, 124W

DANA L. BASE, District Wildlife Biologist
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Population objectives and guidelines
Statewide goals for managing moose include the following: 1) preserve, protect, perpetuate, and manage moose and their habitats to ensure healthy, productive populations; 2) manage moose for a variety of recreational, educational, and aesthetic purposes, including hunting, scientific study, cultural and ceremonial uses by Native Americans, wildlife viewing, and photography; and 3) manage statewide moose populations for a sustainable hunting quota (Washington Department of Fish and Wildlife 2008).

Hunting seasons and harvest trends
Moose hunting in Washington is regulated through a permit system. Return of a hunter report is required to the Washington Department of Fish and Wildlife (WDFW). Permit availability, and therefore moose hunting opportunity, has increased in Washington in the last 10 years (Figure 1). In 2013, there were 59 any moose permits available in 5 moose management units within the Colville District, including the Kettle Range, Threeforks, Selkirk Mountains, 49 Degrees North, and Huckleberry Range (Game Management Units 101/105/204, 108/111, 113, 117, and 121/124 West respectively). In 2013, 9 antlerless only permits for youth, senior, or disabled hunters were offered in 49 Degrees North and the Huckleberry Range. In addition, 2 hunter education incentive permits, 3 raffle permits (one via a multi-species raffle), and 1 auction permit were offered in 2013. General permit season dates remained October 1st through November 30th. All moose units were open for the use of any legal hunting method (archery, muzzleloader, or modern firearm).
A total of 65 moose, consisting of 58 antlered bulls and 7 cows, were harvested within the Colville District units in 2013 (Tables 1 and 2). Hunter success calculated over all hunts was 90% and mean days/kill was 4.3. For “any moose” permits only, hunter success rate was 98% and hunters averaged 5.8 days of hunting per moose harvested. Permit hunters for Youth, Senior, and Hunters with Disabilities, which includes the 49 Degrees North B, C, and Youth Only and the Huckleberry Range B permits, harvested 8 antlerless moose from the 9 permits issued. Hunters averaged 2.5 days of hunting per moose harvested in those permit hunts. Four additional moose were harvested (3 bulls, 1 cow) during the other special permit opportunities (incentive, raffle, auction).

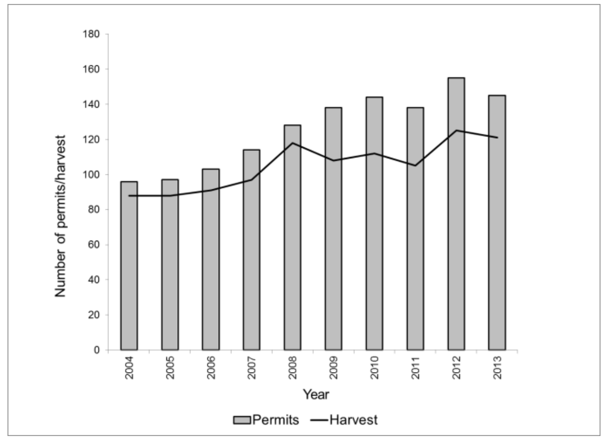

Figure 1. Statewide moose permit quota and harvest, 2004-2013.

Surveys
Early winter composition survey flights have been accomplished every year for the last 19 years. However, survey methods have varied. In winter 2013-14, we initiated a pilot project for surveying moose that incorporates more intensive and rigorous sampling approaches; surveys were conducted under a multiple-observer distance (MRDS) sampling framework. This approach will allow estimation of moose density in a statistically rigorous way, and should be applicable to other areas with moose should funding allow for its expansion. In addition to the new survey protocol, a research project using radio-collared cow moose was initiated during winter 2013-14. This research study was initiated in cooperation with the University of Montana to gain a better understanding of moose population dynamics with respect to bottom-up (habitat) and top-down (predation) factors.

Density estimates from the 2013-14 winter surveys are not finalized. However, we were able to calculate bull to cow and calf to cow ratios for the current year and years past (Figures 2 and 3). With the exception of 2011, bull: cow ratios were similar for all survey years. Calf:cow ratios also were similar for all survey years.

Population status and trend analysis

Age and antler spread of harvested bull moose are monitored to detect trends in structure of the bull population, which in turn provides information on the mortality rate of the bull population (Figure 4). For the Colville District in 2013, the mean antler spread of harvested bull moose was 40 inches. The average age of bull moose taken in 2013 was 6.1 years. Of the 35 bull moose sampled for aging in 2013, 67% were age 5 years or older, 31% were age 2-4, and 3% were yearling. More adult bulls than sub-adults or yearlings were harvested in 8 of the 10 years from 2003 through 2012 (Table 3). The limited hunter harvest has likely had a low impact on the overall population of moose within the Colville District.

Table 1. Colville District (GMUs # 101/105/204, 108/111, 113, 117, and 121/124 West) moose harvest and hunter effort, 2004 – 2013. This table does not include hunter education incentive, raffle, or auction permits.

Year	Permit Quota	Success	Bull	Cow	Total	Total Days	Days / kill
2004	56	91 %	45	6	51	291	5.7
2005	57	89 %	47	4	51	271	5.3
2006	60	96 %	48	8	56	338	6.0
2007	74	82 %	50	11	61	325	5.3
2008	78	95 %	63	11	74	457	6.2
2009	68	94 %	51	13	64	415	6.5
2010	68	96%	55	10	65	414	6.4
2011	68	85%	53	7	60	427	7.1
2012	68	92%	51	11	62	254	4.1
2013	68	90%	58	7	65	376	4.3

Habitat condition and trend

Moose commonly select 15-25 year-old regenerating forests or pre-commercially thinned forest stands on moist sites. Forest regeneration in these areas tends to produce dense stands of willow and other shrubs which are preferred browse. Logging in northeast Washington has been substantial since 1980, especially on private industrial forests. In the past, forest successional stages have been excellent for moose browse production. Recently, however, large tracts of private industrial forests have been treated with herbicides to control shrubs to reduce competition for regenerating coniferous trees. The broad-scale-application of herbicides may cause a reduction in forage for moose in northeastern Washington. Moose population trends, however, do not indicate a lack of quality moose habitat. Current research by the University of Montana, may evaluate both the quality and quantity of moose habitat in NE Washington.

Human safety and nuisance problems

Moose occasionally create potential safety concerns in small towns or other areas of human occupation within the Colville District. These conflicts are usually handled by hazing the moose away or by stopping traffic long enough for the animals to move away on their own accord. A more serious issue in rural areas of the Colville District is the increasing rate of motor vehicle collisions with moose. Moose, especially cows with calves, have also been known to attack snowmobilers, hikers, and other humans as a defensive reaction.

Disease

The WDFW is beginning to collect baseline health data on Washington's moose. Moose populations in Washington remain robust, but are declining in many other states and provinces. Obtaining baseline data on moose health now will help us manage and conserve moose in Washington. Some suspected causes of moose declines around the United States include: arterial worm, brain worm, winter ticks and liver flukes. In 2013, WDFW began sampling hunter harvested moose for parasites. The arterial worm (*Eleaophora schneideri*) was not detected, but sample size from hunter-supplied carcasses was low (n=12, Colville and Spokane Districts combined). WDFW hopes to increase sample size in future years.

Management conclusions

Moose survey and harvest data indicated continue to suggest a robust moose population, with high quality hunting opportunity and reasonable numbers of mature bulls. At some point, we anticipate that the increase in moose abundance observed over the past decades will level-off, but we have not seen clear evidence of that yet. Hunter success remains high.

New survey techniques and research projects will give WDFW a better understanding of the demographics of the NE Washington moose population.

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Washington Department of Fish and Wildlife. 2008. Game Management Plan. Washington Dept. of Fish and Wildlife, Olympia, WA. 136 p.

Table 2. Moose quotas, harvest, and days per kill in the Colville District for the 2013 season.

Area	Permit quota	Total moose Harvested	Average number of days per kill
Kettle Range	10	9	4.0
Three forks	6	6	9.8
Selkirk Mtns.	15	15	10.3
49 Degrees N	28	26	3.9
Huckleberry Mtns.	9	9	2.8
Total :	68	65	Weighted mean = 5.8

Table 3. Antler spread (inches) and moose age (years) for harvested bull moose in the Colville District, 2004 – 2013.

Year	Antler Spread		Age		Yearling	2-4 years	$\geq$ 5 years
	Mean (in)	Sample Size	Mean (yrs)	Sample Size			
2004	38	44	5.4	39	5%	41%	54%
2005	39	46	4.5	43	5%	56%	39%
2006	38	48	4.8	40	2%	65%	33%
2007	38	50	5.0	26	0%	46%	54%
2008	39	58	5.0	46	0%	39%	61%
2009	39	51	5.6	43	5%	33%	63%
2010	39	60	6.0	49	4%	35%	61%
2011	40	56	5.9	72	4%	32%	64%
2012	40	55	6.1	41	2%	27%	71%
2013	40	60	6.1	35	3%	31%	67%

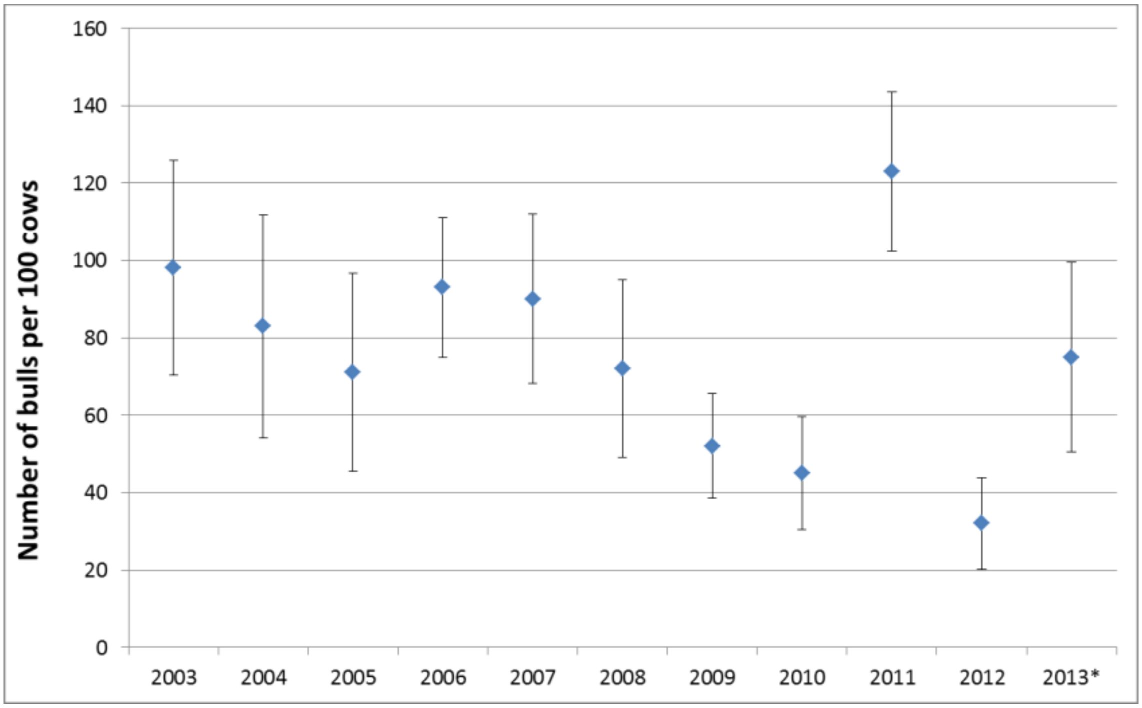


Figure 2. Bull: cow ratios of moose observed during winter helicopter surveys, WDFW Colville District, 2003-2013, showing point estimates (diamond symbol) and 90% confidence intervals. Areas surveyed vary annually. Year 2013 (denoted with asterisk) was the first year that MRDS transects were flown; surveys occurred later in winter than during earlier years, but gender was determined from the presence of vulvar patches rather than antlers.

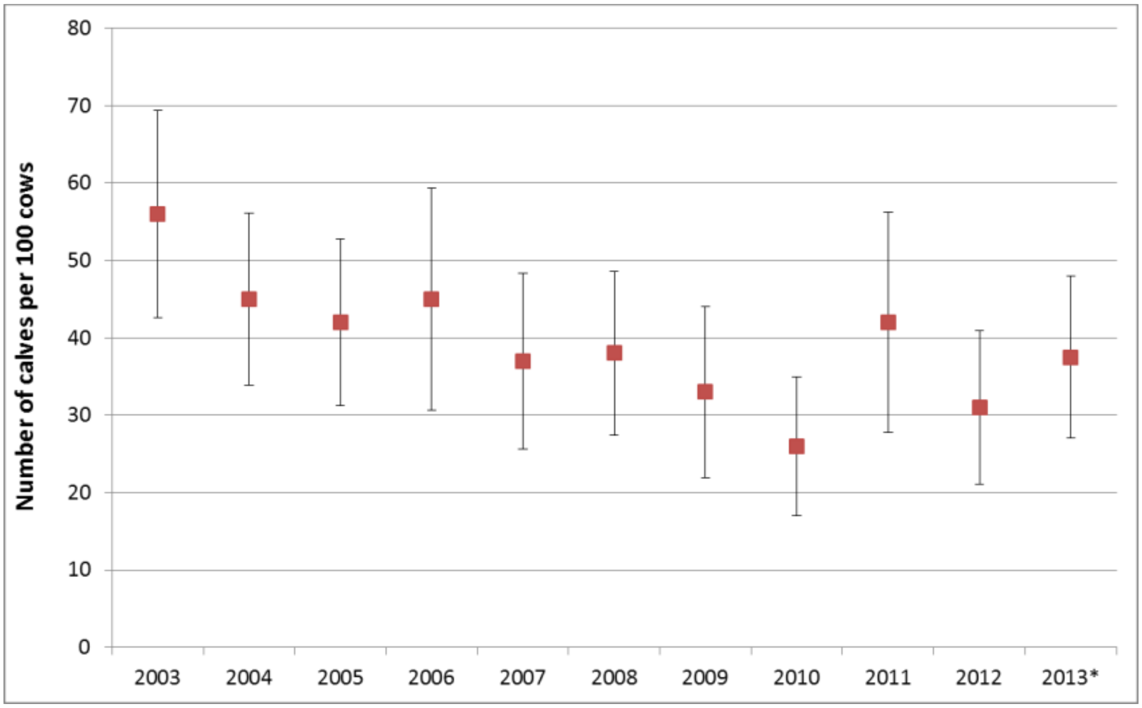


Figure 3. Calf to cow ratios of moose observed during winter helicopter surveys, WDFW Colville District, 2003-2013, showing point estimates (square symbol) and 90% confidence intervals. Areas surveyed vary annually. Year 2013 (denoted with asterisk) was the first year that MRDS transects were flown.

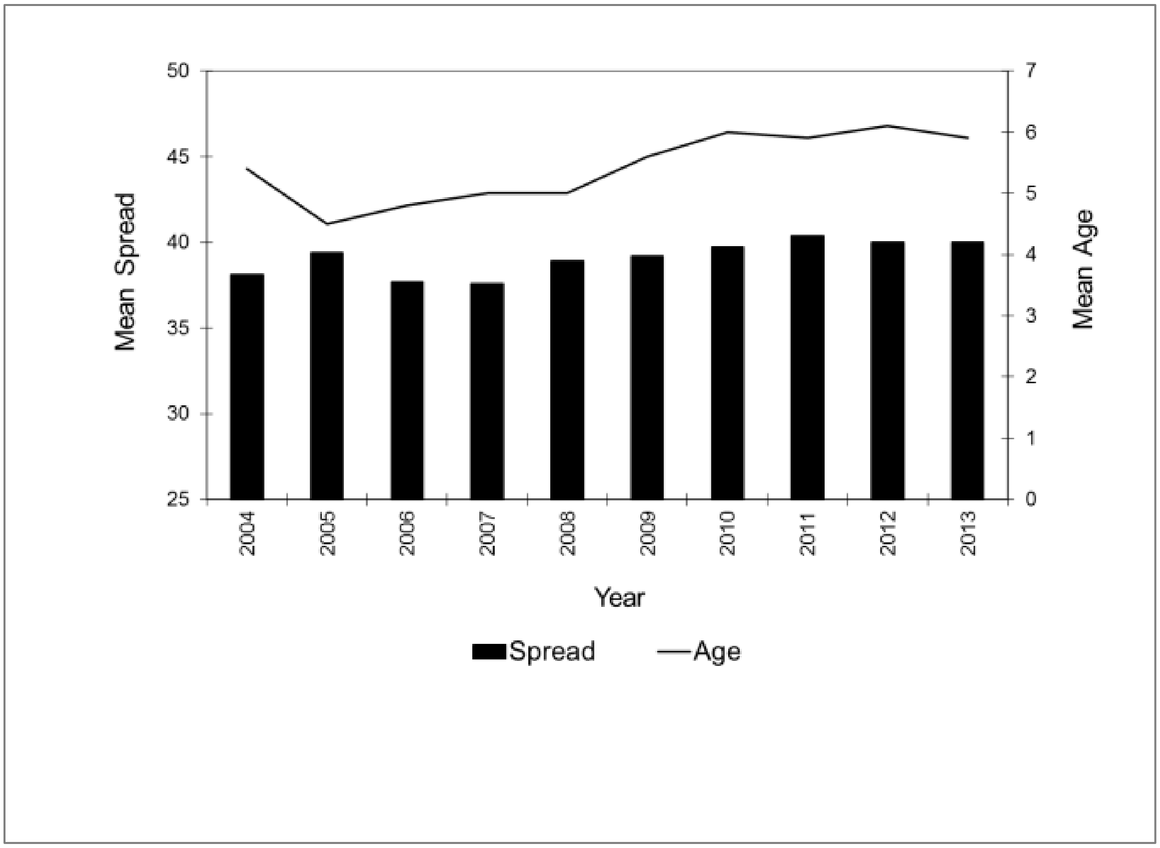


Figure 4. Mean age (line, in years) and antler spread (bars, in inches) of bull moose harvested in the Colville District, 2004-2013.

MOOSE STATUS AND TREND REPORT: REGION 1
GMUS 124E, 127, AND 130

MICHAEL ATAMIAN, District Wildlife Biologist
CARRIE LOWE, Wildlife Biologist

Population objectives and guidelines
Statewide moose management goals are to: 1) Preserve, protect, perpetuate and manage moose and their habitats to ensure healthy productive populations; 2) Manage for a variety of recreational, educational and aesthetic purposes; and 3) Manage statewide moose populations for a sustained yield. Harvest management emphasizes quality hunting opportunities through a limited entry permit process. The proximity of an expanding moose population to the Spokane metropolitan area adds the challenge of balancing population objectives with community's tolerance of moose.

Hunting seasons and harvest trends
Moose hunting opportunities in Washington are by permit only. This is a once in a lifetime permit with the exception of antlerless, raffle and auction hunts. Permit season dates remained October 1 - November 30. Moose hunts are open to the use of any legal weapon in order to provide eligibility to all hunters for all units and to maintain hunter weapon choice.

Total permits in 2013 (not including Master Hunter, raffle, or auction) offered remained at 62, up from the 50 offered from 2008-2011. The 12-permit increase was entirely within the Mt. Spokane unit and associated with splitting the unit into North and South Mt. Spokane units. The unit was split in order to promote better use of the entire area and to help distribute hunter pressure more evenly across the population. These subunits are described in a new map in the Big Game Regulations pamphlet and online at http://wdfw.wa.gov/hunting/regulations/moose_units. Permits were split evenly: 24 each for both the North and South Mt. Spokane areas. For the Hangman units permits remained at 14.

There has been an almost 3-fold increase in the number of applications for these permits over the past ten years (12,990 in 2004 to 33,622 in 2013). Both the Hangman and the two Mt. Spokane units had an either-sex moose hunt and antlerless-only hunt. The two Mt. Spokane units also had youth-only antlerless hunts with 8 permits each. One Disabled Hunter antlerless permit was offered in the Mt. Spokane North area.

In addition, 10 Master Hunter damage permits were offered for the entire area. These permits are not activated until damage has occurred and a need for a hunt has been determined by the Department. This year no permits were used, and over the 4-year history of this hunt only 3 have been used. Note that the following data does not include this damage hunt.

Sixty permittees out of the 62 potential hunters reported in 2013, with only 3 reporting they did not hunt. A total of 52 moose were killed this year, 5 less than last year, but 11 more than the previous 10-year average. The decline in harvest was primarily due to lower harvest in the Antlerless Only hunt (Table 1). The mean numbers of days hunted per kill increased slightly this year, but has remained relatively stable the last 10 years for both hunt types (Table 1). The success rate for all hunts combined (using number of actual hunters) this year was 91%, down from the 96% average for the previous 10 years. The Any Moose permit hunters (i.e., "once in a lifetime" hunts) have had a 98% success rate over the last 10 years when hunted, whereas the antlerless moose hunters have had a 10-year success rate of 94%.

The mean antler spread for bulls harvested in the Mt. Spokane units were 35 inches, the same as last year for the South unit and one inch shorter than the average for the North unit (Table 2). The all-time record individual antler spread for Mt. Spokane was 53 inches in 2003. The mean antler spread for the Hangman unit was 37 inches, compared to 36 inches last year. The all-time high for Hangman is 52 inches in 2012 (Table 2).

Surveys
The first standardized aerial surveys for moose in Washington (and adjacent management units of Idaho) were flown during the winter of 1999-2000. These surveys were conducted by WDFW's Wildlife Science Division, in cooperation with Idaho Fish and Game.

From 2002-2012, annual aerial surveys were flown every winter (December/January) by district biologists, covering some of the same survey units as those flown in 1999 except for those units extending into Idaho. In 2008, survey units were decreased in size and standardized to around 15 km^2, and additional survey units were established in the northern end of the Mt.

Spokane unit and in the Hangman unit around Tekoa Mtn. In 2012, survey units were added in the Tower Mtn. area of the Hangman unit.

Upon review, District 1 and 2 survey methodologies were found to not meet management needs. Thus in 2013 a joint project began for surveying moose in both Districts that incorporates more intensive and rigorous sampling approaches. Once refined, this technique should produce more statistically defensible population density estimates and allow for expansion to other parts of Washington. In addition to the new survey protocol in 2013, a research project using radio-collared cow moose was initiated in cooperation from the University of Montana. The projects goal is to assess and compare population demographics parameters in two study areas that differ in land management methods and predator composition.

Population status and trend analysis

The number of moose observed during aerial surveys varies from year to year (Figure 1). Some of the variation can be attributed to survey effort, and some is likely due to the movement of moose back and forth across state lines (all units border Idaho) and weather conditions, specifically snow. Snow depths have a strong influence not only on the distribution of moose across survey unit, but also on the ability of the surveyors to detect moose. Heavy snowfalls tend to push moose down into the lowlands, while in low snow years they remain at higher elevations. The low count in 2013 is due to the survey methodology change. Though fewer moose are being seen in individual units using the new survey methodology, it allows for a greater proportion of northeast Washington to be covered.

Calf to cow ratios (Figure 2) and bull to cow ratios (Figure 3) have also varied from year to year. However, there is no discernable trend in the data, and 90% Confidence Intervals indicate that there is no significant difference across the years. Calves to 100 cow ratios have averaged 50 for Hangman and 47 for Mt. Spokane over the past 10 years. The low calf to 100 cow ratio in 2013 in the Hangman unit may be due to the new survey methodology and low number of moose observed. This will be closely watched over the next couple of years, as calf to 100 cow ratios below 30 are of concern.

Information gathered by the Washington Department of Transportation (DOT) has revealed an increasing trend in the number of moose being killed on Interstate-90 west of Spokane, indicating a resident population in the area. The only moose data we have from this area come from moose observed while performing elk surveys in and around Turnbull National Wildlife Refuge. These sightings have indicated low moose numbers that have been slowly increasing. Moose observations continue to increase in outlying areas, including southern Spokane, Whitman, Lincoln, and Adams counties, and reports of moose within the Spokane urban area continue.

The harvest data, aerial survey data, DOT carcass reports, and sighting reports combine to indicate a stable to increasing population in Mt. Spokane and a stable population in Hangman.

Habitat condition and trend

Moose prefer 10-20 year old clear-cuts or thinned stands on mesic sites, and forested cover is important during summer heat and deep winter snow (Costain 1989). Generally, in both the Mt. Spokane and Hangman units, it appears conditions for moose production will be optimal for the next few decades. Private timberlands provide a large portion of moose range in these units, and management practices on these lands over the past 15 years are providing excellent forage areas for moose.

The higher elevation portion of the Mt. Spokane unit is primarily composed of large private timberlands in some stage of succession that is of benefit to moose, especially in winter range. Clear-cut logged habitats with abundant high quality forage and good hiding cover are thought to be important to moose in all seasons. Lands owned by Washington State Parks provide ample security habitat but little forage in the Mt. Spokane unit.

Other than the lands immediately surrounding Mica Peak, Dishman Hills, and Turnbull National Wildlife Refuge, the Hangman Unit is mostly private agricultural land, with moose concentrations highest in the northeast portion of the area. The limited forage areas for moose in the Hangman Unit restrict the opportunity for moose to expand greatly there. Where moose do occur in the Hangman unit, habitat quality appears high and able to support high densities of moose. Many of these moose may spend part of the year in Idaho where moose habitat appears to be less limited.

Human safety and nuisance problems

Individual moose can create human safety or nuisance concerns within the metropolitan area of Spokane. The procedure for addressing moose within the urban/suburban area is outlined in the WDFW Dangerous Wildlife Policy. WDFW's Enforcement Program takes the lead on moose incident reports in and near the city. Incidents range from single moose sightings with no associated WDFW response, to moose in dangerous situations requiring immobilization and translocation. The number of moose incidents per year has been as high as 87 and 83 in 2001 and 2005 respectively, and as low as 16 in 2009. A Master Hunter moose damage/nuisance hunt was initiated in 2009 and has continued through 2013. This hunt is a limited entry hunt (10 master hunters only) and runs from August 1 through March 31. Only three animals have been harvested thus far. Dealing with urban/suburban moose will continue to be a priority for WDFW in the Spokane area.

Management conclusions

Moose are apparently expanding their distribution in the district, and the greatest increases appear to be occurring on private lands and at lower elevations where hunter access is limited. Although there is tremendous interest in moose hunting in Washington, permit levels will remain relatively low to insure these "once in a lifetime" hunts retain their high success rate and quality. Permittee satisfaction with the quality of the hunt will continue to be monitored.

Literature Cited

Costain, B. 1989. Habitat Use Patterns and Population Trends Among Shiras Moose, MS degree, U. of Montana. 1989.

Table 1. Moose Harvest and Hunter Effort for GMUs 124E, 127 and 130 "Any Moose" and "Antlerless Only" Hunts. Does not include Master Hunter, Auction, or Raffle Hunt Data.

Hunt Type	Year	Permits Offered	Actual Hunters	Success %	Bulls	Cows	Total	Avg Days/Kill
Any Moose	2004	15	14	100	13	1	14	6.0
	2005	15	15	93	14	0	14	5.9
	2006	15	13	100	13	0	13	5.6
	2007	15	14	100	14	0	14	4.0
	2008	19	18	100	17	1	18	5.2
	2009	19	19	95	18	0	18	3.2
	2010	19	19	100	19	0	19	4.3
	2011	19	18	94	15	2	17	5.5
	2012	23	22	100	22	0	22	3.1
	2013	23	23	91	20	1	21	4.1
Antlerless Only	2004	23	22	95	0	21	21	7.0
	2005	23	22	95	3	18	21	3.6
	2006	25	20	100	1	19	20	5.3
	2007	25	21	100	0	21	21	2.6
	2008	31	31	84	0	26	26	3.4
	2009	31	30	87	0	26	26	3.0
	2010	31	29	86	0	25	25	4.5
	2011	31	28	96	0	27	27	3.7
	2012	39	35	100	0	35	35	3.6
	2013	39	34	91	1	30	31	4.4

Table 2. Average and Maximum Moose Antler Spread by Year and Hunt Unit

	Hangman			Mt. Spokane			Mt. Spokane North			Mt. Spokane South		
Year	Num	Avg	Max	Num	Avg	Max	Num	Avg	Max	Num	Avg	Max
2004	4	33	43	9	35	47						
2005	5	35	43	9	36	40						
2006	4	34	39	9	31	35						
2007	5	32	42	9	39	44						
2008	6	33	41	11	32	41						
2009	7	37	47	11	36	50						
2010	7	43	50	12	39	46						
2011	6	39	44	9	32	42						
2012	7	36	52				8	36	45	7	35	46
2013	5	37	45				7	35	44	8	35	40
Average	56	36	52	79	35	50	15	36	45	15	35	46

Figure 1. Raw counts of observed moose in the Mt. Spokane (Mt. Spokane North and South combined for 2012-2013) and Hangman units, from December/January aerial surveys 2003-2013. 2013 data is from the new survey methodology and should not be directly compared with previous years.

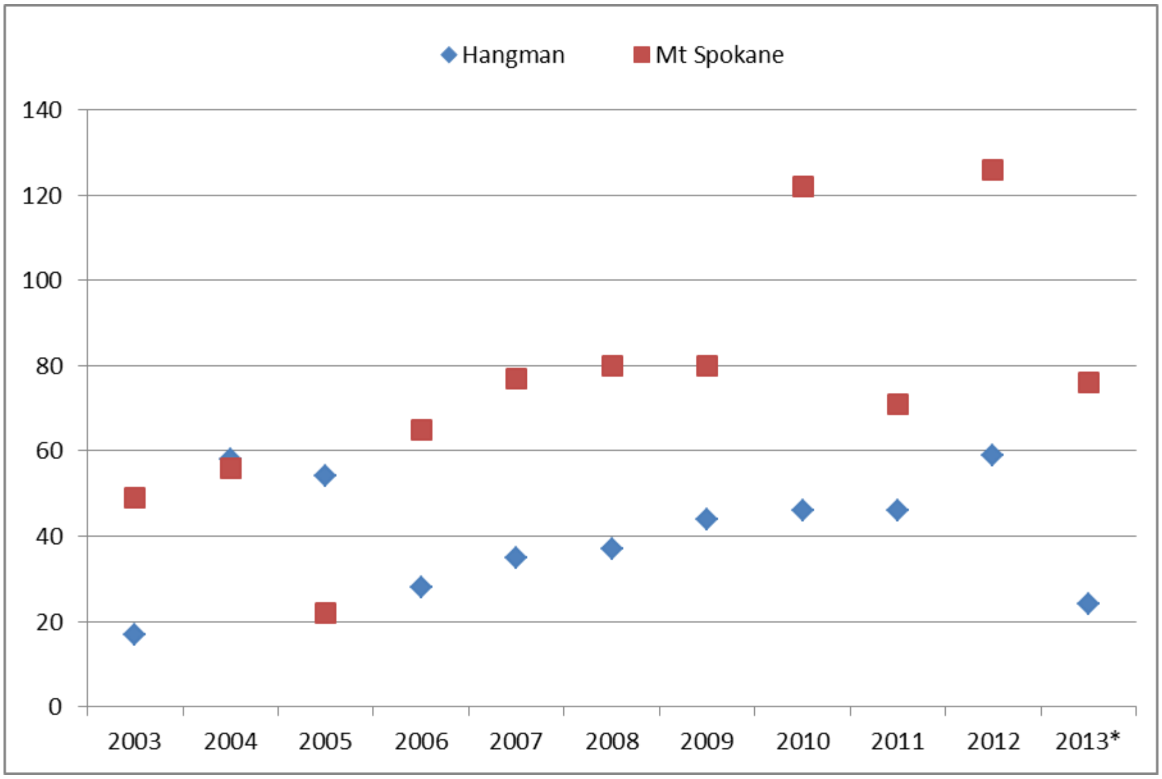


Figure 2. Moose calf:100 cow ratios for Mt Spokane (Mt. Spokane North and South combined for 2012-2013) and Hangman units, showing point estimates (square symbols) and 90% confidence intervals, from December/January aerial surveys 2003-2013. 2013 data is from the new survey methodology.

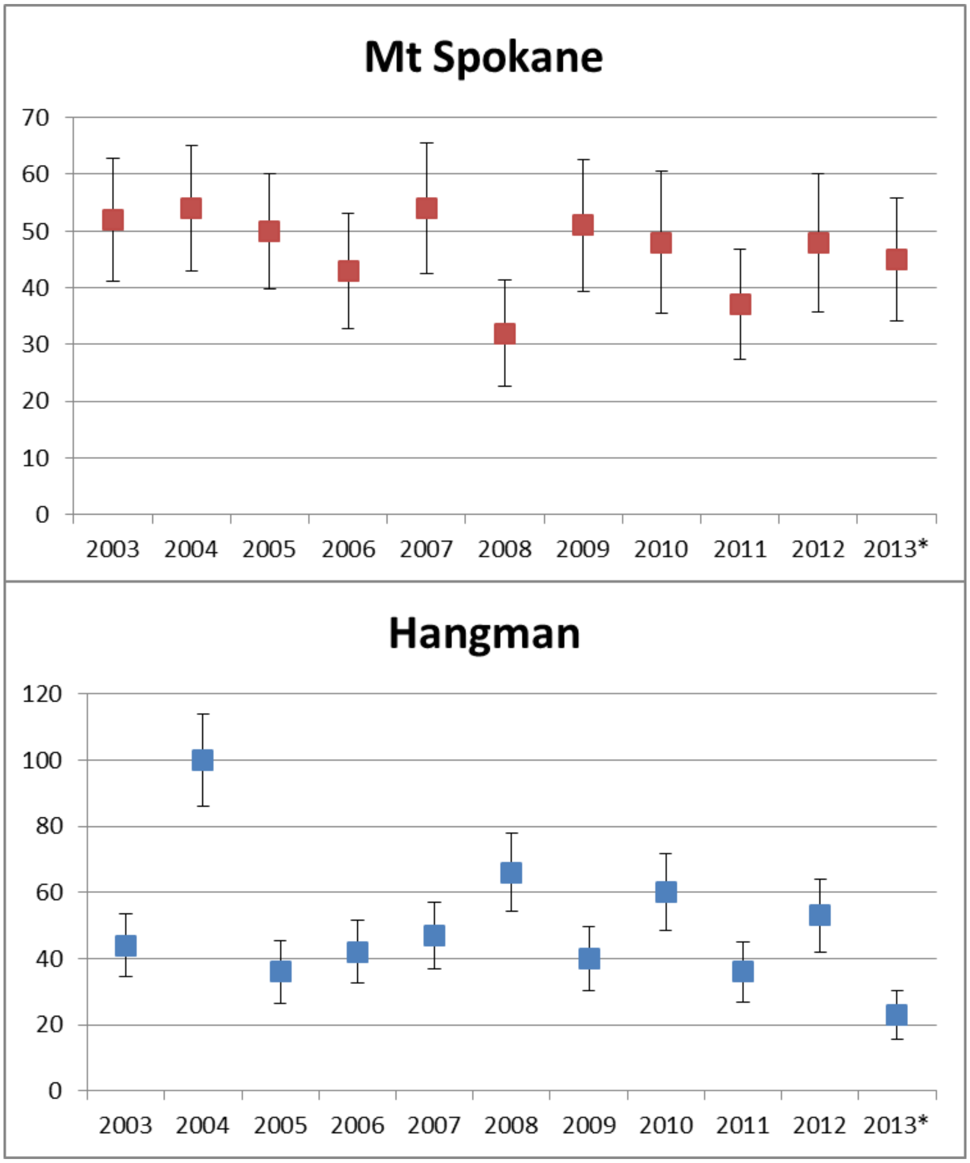
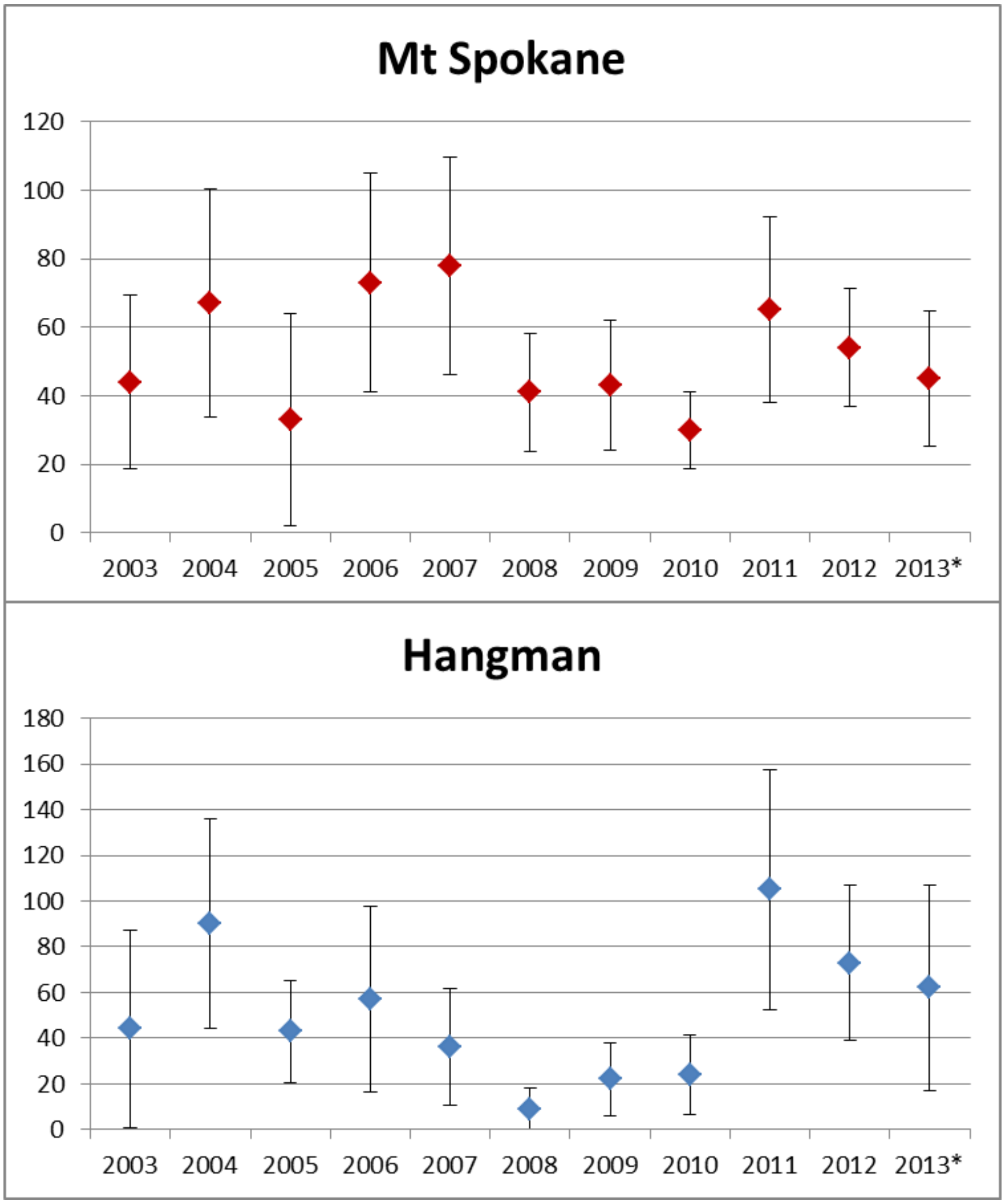


Figure 3. Moose bull:100 cow ratios for Mt Spokane (Mt. Spokane North and South combined for 2012-2013) and Hangman units, showing point estimates (diamond symbols) and 90% confidence intervals, from December/January aerial surveys 2003-2013. 2013 data is from the new survey methodology.



Cougar

COUGAR STATUS AND TREND REPORT
STATEWIDE

DONALD A. MARTORELLO, Carnivore Section Manager

Distribution and abundance
Cougar *(Puma concolor)* occur throughout most of the forested regions of Washington State, encompassing about half of the State (Fig. 1). There is no reliable estimate of statewide cougar abundance. However, cougar population size has been estimated in three project areas in eastern Washington; extrapolation from those projects corresponds to roughly about 1,900 to 2,100 animals (excluding yearlings and kittens) statewide.

Population objectives and status
The statewide cougar management goal is to maintain healthy, self-sustaining cougar populations within each cougar management unit (CMU; except CMUs 2 & 9; see 2009 Game Management Plan), while minimizing the number of negative human-cougar interactions. The methods for assessing cougar populations are improving in Washington, largely due to better scientific data becoming available. The status of cougar populations in Washington are assessed using cougar demographic data from living cougar populations in five study sites. The department invests most of our monitoring efforts on adult female cougar survival (because of its importance to population growth) and population size. Ancillary data on litter size, cub survival, and adult male survival are collected on an opportunistic basis. Washington State University and University of Washington also have provided valuable data on population growth rates from cougar research projects in Washington. These data suggest that cougar populations appear to be stable throughout most of Washington.

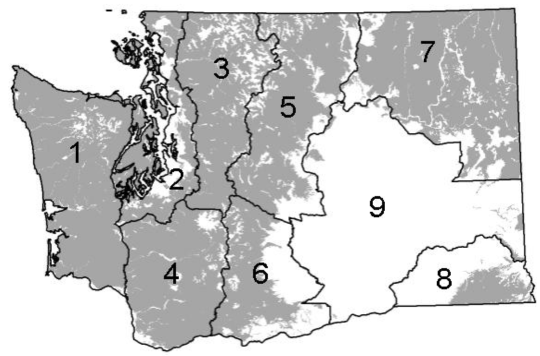


Figure 1. Distribution of cougars (gray) and cougar management units in Washington.

Hunting seasons and harvest trends
With the completion of several cougar research projects and the findings from those studies, the Department conducted a comprehensive assessment of cougar hunting season structure in 2011 with research partners from University of Washington and Washington State University. Following a science review the proposed re-vamped cougar season framework was circulated with the public for input through the Fish and Wildlife Commission process and Game Management Advisory Council. The scientific rational and new cougar season framework was also recently published (Beausoleil et al. 2013).

Table 1. Cougar population objectives for each cougar management unit in Washington, 2009.

CMU	Geographic Area	Population Objective
1	Coastal	Maintain a stable cougar population
2	Puget Sound	Manage cougar population at a level that increases public safety and protection of property
3	North Cascades	Maintain a stable cougar population
4	South Cascades	Maintain a stable cougar population
5	East Cascades North	Maintain a stable cougar population at 2007 level
6	East Cascades South	Maintain a stable cougar population
7	Northeastern	Maintain a stable cougar population at 2007 level
8	Blue Mountains	Maintain a stable cougar population
9	Columbia Basin	Unsustainable; not considered suitable cougar habitat

Under the new framework, the Department manages for stable cougar populations in all areas of the state (except the Columbia Basin and Puget Sound areas where the habitat is not suitable for cougar; Game Management Plan 2008). To achieve that objective, the state is divided into 49 cougar population management units (PMUs) and applied a 12-16% harvest guideline to each (not applied to Columbia Basin and Puget Sound PMUs).

During the 2013-2014 cougar seasons, the Department implemented two any weapon general seasons: an early season from September 1 to December 31, 2013 followed by a late season from January 1 to March 31, 2014. Each PMU has a harvest guideline that corresponded to the 12-16% harvest rate. Only general season harvested cougar counted toward the harvest guideline. If a PMU harvest guideline was reached during the late season, the Director (under existing Director Authority) considered closing the season. During the late season cougar hunters could hunt in any PMU until the harvest guideline was reached and the Director closed the seasons or March 31, whichever occurred first.

Based on the summation of the harvest guidelines for all 49 PMUs, the total allowable cougar harvest statewide was 205-277. The total statewide cougar harvest was 182 in 2013 (Table 2).

Human conflict

The trend in confirmed human safety incidents, and pet and livestock depredations has decreased since the recorded high of 936 in 2000 and is now at the lowest documented level (Figure 2). However, the levels of interactions continue to be problematic in some areas. It's important to point out that the management actions the Department takes to manage human-cougar conflict don't necessarily equate to the observed trends in confirmed interactions. Several factors likely impact the rate of human-cougar interactions, such as changing public attitudes, significant media events, cougar population size, etc.

Management conclusions

Washington has experienced wide fluctuations in cougar harvest methods, cougar population size, and even cougar management objectives. With such a dynamic management arena, the importance of scientific data for guiding management decisions cannot be overstated.

Literature Cited

Beausoleil, R. A., G. M. Foehler, B. T. Maletzke, B N. Kertson, and R. B. Weilgus. 2013. Research to regulation: cougar social behavior as a guide for management. Wildlife Society Bulletin 37(3): 680-688.

Table 2. Cougar harvest guideline and total harvest by hunt area, 2012-2013 and 2013-2014 seasons.

		2012-2013 Hunting season		2013-2014 Hunting season		
Hunt Area	Harvest Guideline	Hunt Mortality	Hunt area closed during late season?	Hunt Mortality	Hunt area closed during late season?	2-year Mean harvest
GMU 101	7-9	1	No	5	No	3
GMU 105	2	2	Yes	2	Yes	2
GMU 108, 111	5-6	6	Yes	6	Yes	6
GMU 113	4-6	3	No	5	Yes	4
GMU 117	6-8	9	Yes	12	Yes	11
GMU 121	5-6	7	Yes	5	Yes	6
GMUs 124, 127, 130	7-9	8	Yes	5	Yes	7
GMUs 133, 136, 139, 142, 248, 254, 260, 262, 266, 269, 272, 278, 284, 290, 330, 334, 371, 372, 373, 379, 381	none	11	No	13	No	12
GMUs 145, 166, 175, 178	3-4	7	Yes	6	Yes	7
GMU's 149, 154, 157, 162, 163	4-6	10	Yes	10	Yes	10
GMUs 169, 172, 181, 186	3-4	4	Yes	4	Yes	4
GMU 203	4-6	0	No	0	No	0
GMU 204	6-8	4	No	5	No	5
GMUs 209, 215	4-5	4	Yes	2	No	3
GMUs 218, 231	4-6	2	No	3	No	3
GMUs 224	2-3	1	No	2	Yes	2
GMUs 233, 239	3-4	2	No	0	No	1
GMUs 242, 243	4-6	4	Yes	4	Yes	4
GMUs 244, 246, 247	5-6	3	No	3	No	3
GMUs 245, 250	5-6	2	No	0	No	1
GMUs 249, 251	5-6	6	Yes	6	Yes	6
GMUs 328, 329, 335	6-8	10	Yes	9	Yes	10
GMUs 336, 340, 342, 346	5-7	8	Yes	5	Yes	7
GMUs 352, 356, 360, 364, 368	5-7	6	Yes	5	Yes	6
GMUs 382, 388	3-4	4	Yes	10	Yes	7
GMU 407	none	2	No	1	No	2
GMUs 418, 426, 437	11-15	1	No	2	No	2
GMUs 448, 450	9-13	0	No	0	No	0
GMU 454	none	0	No	2	No	1
GMU 460	5-7	2	No	1	No	2
GMUs 466, 485[a], 490	2-3	0	No	2	Yes	1
GMUs 501, 504, 506, 530	7-10	1	No	1	No	1
GMUs 503, 505, 520, 550	6-8	0	No	2	No	1
GMUs 510, 513	3-4	0	No	1	No	1
GMU 516	3-5	1	No	3	Yes	2
GMUs 522, 524, 554, 556	3-4	1	No	0	No	1
GMU 560	5-6	1	No	4	No	3
GMU 564, 568	3-4	2	No	4	Yes	3
GMU 572	3-4	1	No	2	No	2
GMUs 574, 578	3-5	3	Yes	5	Yes	4
GMUs 601, 602, 603, 612	5-7	1	No	3	No	2
GMUs 607, 615	4-5	0	No	1	No	1
GMUs 618, 636, 638	4-5	2	No	4	Yes	3
GMUs 621, 624, 627, 633	none	2	No	5	No	4
GMUs 642, 648, 651	6-8	10	Yes	6	Yes	8
GMUs 652, 666	none	2	No	1	No	2
GMUs 653, 654	4-6	1	No	1	No	1
GMUs 658, 660, 663, 672, 673, 681, 684, 699	9-12	1	No	1	No	1
GMU 667	3-4	1	No	3	Yes	2
		159		182		

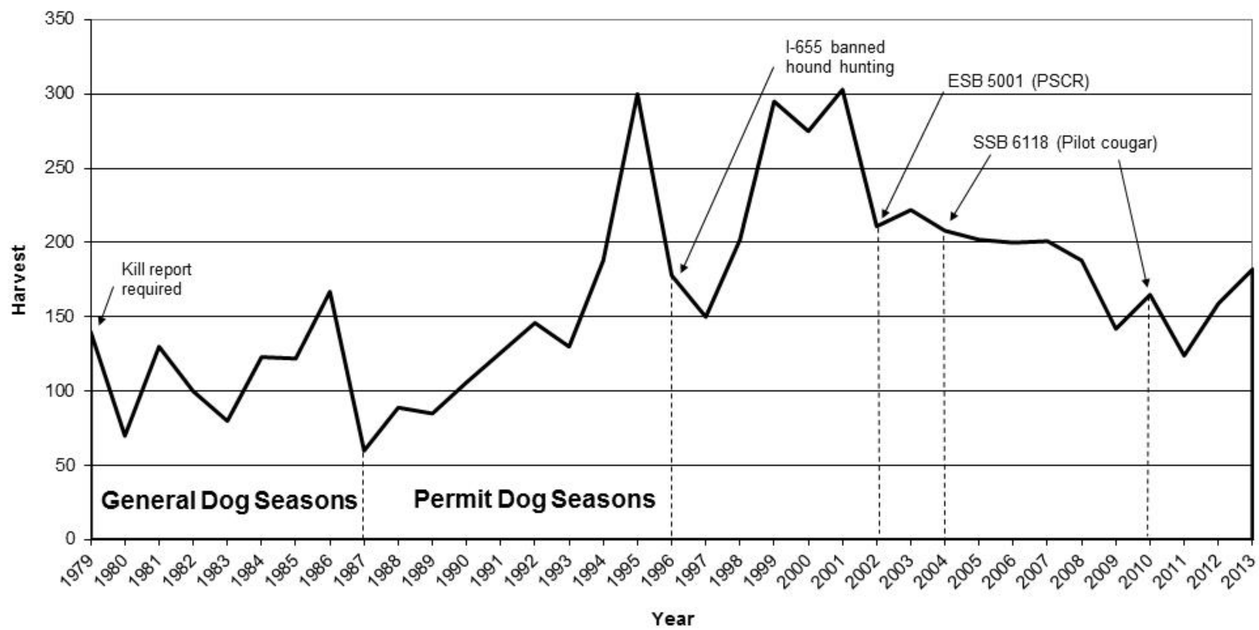


Figure 1. Trend on cougar harvest and hunting season structure, 1979-2013.

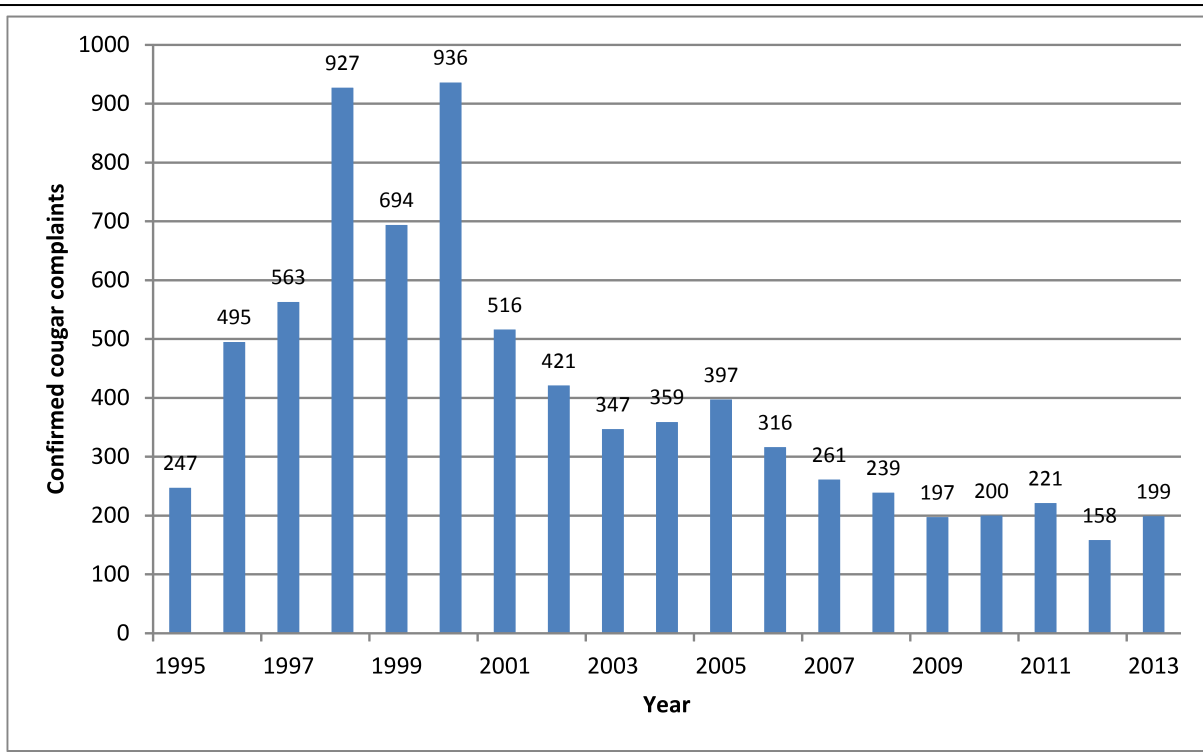


Figure 2. Statewide confirmed cougar complaints, 2000-2013, WDFW.

Black Bear

BLACK BEAR STATUS AND TREND REPORT
STATEWIDE

DONALD A. MARTORELLO, Carnivore Section Manager

Distribution and abundance
In Washington, black bears (*Ursus americanus*) inhabit 31 of 37 counties, occupying all forested habitats within western Washington, the Cascade Mountain Range, the Okanogan Region, the Selkirk and Blue Mountains ranges. Only two island counties within the North Puget Sound area and the shrub-steppe habitat of the Columbia Basin do not support resident black bear populations.

Although population surveys are not being conducted on a statewide basis, all indications are that Washington State has an abundant and healthy black bear population. Rough population estimates based on population reconstruction and computer modeling suggest the statewide black bear population is around 25,000-30,000 animals.

Management guidelines and objectives
The goals for black bear management in Washington are to: 1) preserve, protect, perpetuate, and manage black bear and their habitats to ensure healthy, productive populations; 2) minimize threats to public safety from black bears, while at the same time maintaining a sustainable and viable bear population; 3) manage black bear for a variety of recreational, educational and aesthetic purposes including hunting, scientific study, cultural and ceremonial uses by Native Americans, wildlife viewing and photography; and 4) manage populations statewide for a sustained yield (Washington Department of Fish and Wildlife, 2002).

For management purposes, the state is divided into 9 black bear management units (BBMUs) (Figure 1). Harvest levels vary between BBMU depending on local population dynamics and environmental conditions. To maintain stable bear populations, modifications to harvest levels are made on a three-year rotation through the Fish and Wildlife Commission process. The Department uses the percentage of females in the total harvest and median ages of males and females as indicators of exploitation (Beecham and Rohlman 1994) (Table 1). However, sex and age structure data of harvested bears may provide misleading interpretations (Caughley 1974, Bunnell and Tait 1981, Garshelis 1991, Clark 1999).

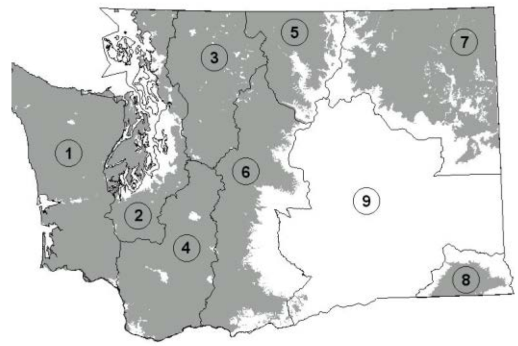


Figure 1. Black bear distribution and black bear management units.

For example, the age structure of a declining bear population can be the same as the age structure in an increasing population. In addition to this shortcoming, there is often a time lag between when a population begins to decline and when that decline is evident in sex and age structure data (Harris 1984). In some cases, by the time a decline is detected, bear numbers may have been reduced to a point where it could take longer than a decade to recover the population. However, detecting a decline early can enable managers to make a quicker recovery or retain stability.

Table 1. General black bear harvest guidelines used in Washington (Game Management Plan 2002).

Parameter	Liberalize	Harvest Acceptable	Restrict
% Females in harvest	< 35%	35-39%	> 39%
Median age of harvested females	> 6 years	5-6 years	< 5 years
Median age of harvested males	> 4 years	2-4 years	< 2 years

Sensitivity analyses of bear populations indicate that adult female and cub survival are the most influential parameters to population growth rates (Clark 1999). As such, WDFW monitored bear survival in Thurston County from 2004 to 2011, and initiated a project in new bear demographics project in Chelan and King Counties in 2013.

Hunting seasons and harvest trends

The use of bait and hounds for hunting black bear has been illegal in Washington since the 1996 season. Since that time, bear seasons were lengthened, bag limits increased from 1 to 2 in some areas, and spring seasons have been expanded to 20 of Washington's 136 Game Management Units (GMUs). Legislation also passed that provided authority to the Fish and Wildlife Commission to reduce costs for black bear transport tags. In the following years, 1998-2000, the result was an increased number of bear hunters, and therefore, bear harvest. In 2013, 1,234 bears were harvested during recreational seasons, which is below the long-term average of about 1,477 bears per year (Tables 2 & 3).

Depending on location, black bear hunting season begin between August 1st and September 1st and continue through November 15th. In GMUs where a spring hunt occurs, the dates are early to mid April through late May to mid-June. While there is no physical mandatory sealing requirement for bear, successful hunters must report harvest statistics and the first upper premolar of their kill for aging via a tooth envelope provided by WDFW.

Research

The Department has conducted important scientific research with regards to black bears. From 1963 to 1969, the Department studied black bear damage to coniferous forests and gathered basic demographic information that was used to establish management guidelines (Poelker and Hartwell 1973). The next study occurred from 1994-1999 and documented habitat use, home range size, and survival in three ecoregions in Washington (Koehler and Pierce 2003). Finally, from 1996-1997, WDFW conducted bait station surveys as a measure of relative bear abundance. However, an analysis of statistical power indicated that at the level of survey intensity, the Department would not be able to detect a change in bear abundance using bait stations (Rice et al. 2001). For that reason, the survey technique was discontinued.

From 2004-2011, research efforts focused on adult female survival in selected areas of western Washington with spring bear damage seasons to better assess bear population status and impacts of hunting (see Coastal Black Bear Management Unit report 2010). New research efforts are being initiated in Chelan and King Counties to assess bear demographics, tree damage, and tools for addressing problem bears.

Table 2. Statewide black bear harvest, hunter effort, and median age information, 1996 - 2013, Washington Department of Fish and Wildlife.

Year	Male	Female	Total Harvest	# of Hunters	% Success	# Hunter Days	# Days per kill	Median Age Males	Median Age Females	% Females
1996	951	359	1,310	12,868	10%	104,431	80	4.5	5.5	27%
1997	546	298	844	11,060	8%	97,426	115	4.5	5.5	35%
1998	1,157	645	1,802	20,891	9%	216,456	120	4.5	5.5	36%
1999	757	349	1,106	37,033	3%	481,319	435	4.5	5.5	32%
2000	777	371	1,148	37,401	3%	296,849	259	3.5	5.5	32%
2001	919	512	1,431	25,141	6%	230,431	161	3.5	4.5	36%
2002	800	427	1,227	24,844	7%	219,428	127	3.5	5.5	35%
2003	989	583	1,556	22,510	7%	192,544	123	3.5	4.5	37%
2004	1,093	561	1,654	21,573	8%	186,626	113	3.5	5.5	34%
2005	940	333	1,333	20,724	6%	172,527	129	3.0	5.0	25%
2006	1,061	581	1,642	21,801	8%	168,237	103	3.0	4.0	35%
2007	1,096	489	1,585	23,667	7%	168,237	106	3.0	5.0	31%
2008	1,450	758	2,208	26,347	8%	215,032	102	3.0	5.0	34%
2009	931	465	1,396	23,767	6%	192,347	147	3.0	6.0	33%
2010	1,254	718	1,972	24,118	8%	185,389	98	2.9	4.7	37%
2011	NA	NA	1,503	21,852	7%	166,814	111	NA	NA	NA
2012	1,054	499	1,633	21,656	7%	161,459	104	NA	NA	32%
2013	799	355	1,234	21,489	6%	164,954	144	NA	NA	29%

Human-black bear conflict

The total number of black bear-human interactions over the past decade has range from a low of 294 in 2009 to a high of 890 just a year later in 2010 (Figure 2). Generally, complaints have remained relatively stable during the last 10 years. Spikes in complaint levels, such as 2010, are associated with reduced summer-fall berry production statewide. This in turn causes bears to increase their search range for food and often puts them in close proximity to people. In Washington, negative black bear/ human conflict overwhelmingly involves garbage issues (i.e. poor storage), but tree peeling, livestock, orchard and apiary depredations are also experienced. Human population growth and development has only compounded these issues. The Department completed a statewide policy on the handling of black bear/human conflicts by field personnel. The policy specifies circumstances in which animals will be monitored, captured and relocated, or captured and destroyed. The Department has also worked proactively to prevent these conflicts by conducting “Living with Wildlife” workshops annually to schools and local communities, distributing educational materials to stakeholders and in key locations, purchasing and installing bear-proof containers, and supplying regional WDFW offices with bear education materials.

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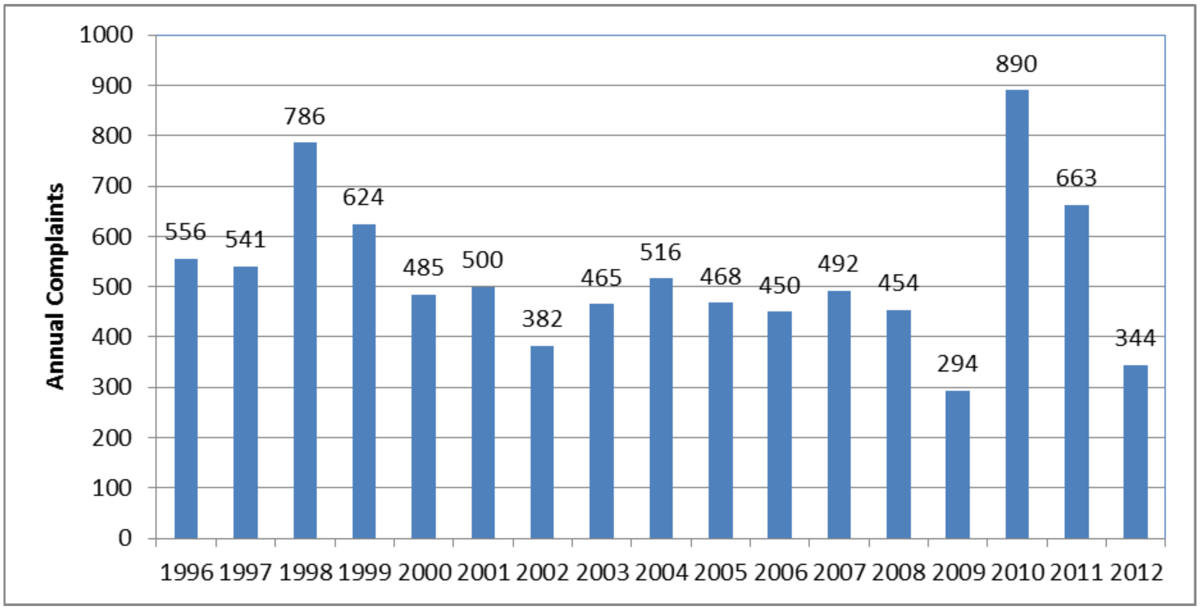

Figure 2. Trend in confirmed human-black bear interactions in Washington.

Table 3. Statewide black bear harvest and hunter effort by Black Bear Management Unit for 2013.

BMU	Bear Management Unit Name	Total Harvest	Number Hunters	Hunter Success Rate	Hunter Days	Days/Kill
1	Coastal	211	3,347	6.30%	28,977	137.3
2	Puget Sound	99	1,910	5.20%	15,913	160.7
3	North Cascades	111	1,754	6.30%	13,093	118
4	South Cascades	102	3,892	2.60%	30,558	299.6
5	Okanogan	103	1,503	6.90%	8,820	85.6
6	East Cascades	184	4,549	4%	31,226	169.7
7	Northeastern	248	4,141	6%	27,721	111.8
8	Blue Mountains	85	1,267	6.70%	8,142	95.8
9	Columbia Basin	5	82	6.10%	438	87.6
General Hunting Season Total		1,148	21,052	5.50%	164,954	143.7
Spring Bear Permit Hunt		86	437	19.70%		
Recreational Harvest Total		1,234	21,489			

Band-Tailed Pigeon and Mourning Dove

BAND-TAILED PIGEON / MOURNING DOVE STATUS AND TREND REPORT
STATEWIDE

DON KRAEGE, Waterfowl Section Manager

Introduction
Pacific Coast band-tailed pigeons and mourning doves are managed cooperatively with the U.S. Fish and Wildlife Service (USFWS) and western states through the Pacific Flyway Council (PFC). The PFC has developed management plans for these populations, and in 1994 established a population objective for band-tailed pigeons in Washington based on the WDFW call-count survey (PFC 1994). Since that time, PFC has revised the population objective and established closure thresholds based on a new mineral site survey (PFC 2010). Population objectives for mourning doves are being developed as part of the national mourning dove harvest strategy.

Hunting season regulations
The band-tailed pigeon season was closed in Washington from 1991-2001. A limited season was reopened in 2002 and has continued since then, with season dates of September 15-23 and bag/possession limits of 2/4. The mourning dove season was September 1-15 from 1980 through 2007, and September 1-30 since 2008. Bag/possession limits have been 10/20 since 1980.

Methods
Band-tailed pigeon call-count survey
The WDFW band-tailed pigeon call-count survey was initiated in 1975, and was patterned after the mourning dove survey. A total of 50 routes, 5.7 miles in length comprised the survey, conducted in western Washington below 1,000 ft. elevation. Surveys were completed during a 16-day period beginning the Saturday closest to June 21, as designed by Jeffrey (1989). Data were sent to USGS in Laurel, MD (Bill Kendall) for analysis using route regression programs developed for the mourning dove survey (Sauer *et al.*, 2003). The WDFW call-count survey was discontinued after 2003, but is presented in this report for comparison to the mineral site survey.

Band-tailed pigeon mineral site survey
In 2001, USGS-BRD (California Science Center) received a grant from USFWS to design a population index survey for use throughout the range of the Pacific Coast population of band-tailed pigeons. USGS conducted mineral site surveys at 8 western Washington locations in 2001-03 (Overton and Casazza 2004). These included two in Region 4 (Oyster Creek - Pigeon Point and Sumas Springs), one in Region 5 (Cedar Creek), and five in Region 6 (Lilliwaup, McAllister Creek, Mud Bay, Potlatch, and Red Salmon Creek). As part of an earlier grant, USGS-BRD evaluated several population survey techniques, and found that an optimally timed mineral site survey offered statistical advantages over other surveys, including the WDFW call-count survey.

A final report on the mineral site survey was completed in 2004, and coastal states adopted the new mineral site survey as the official index for this population. In 2004, WDFW expanded surveys to 15 sites, as specified under protocols developed for the Pacific Flyway (Overton and Casazza 2004). The 15 sites included the 8 locations established in 2001, along with two in Region 4 (Lake Cavenaugh Rd.-Pefley and Warm Beach), four in Region 5 (Altoona, Newaukum River, St. Martin's Hot Springs, and Upper Kalama) and one in Region 6 (Willapa Estuary). Since 2004, the site list has been modified due to access restrictions or other changes in status. Cooperators from WDFW and USFWS completed 11 surveys during the July 10-20, 2014 survey period.

Mourning dove call-count survey
The mourning dove survey was discontinued by USFWS after the 2013 survey (Seamans and Sanders 2014). WDFW staff in Districts 4 and 17 participated in evaluation of a new point-distance sampling method during 2014, but results are not yet available.

Band-tailed pigeon harvest survey
Band-tailed pigeon harvest is estimated annually using mandatory harvest reporting. Written authorization and harvest reports have been required of band-tail hunters in western Washington since the season reopened in 2002. Hunters must return a harvest report card to be included in the permit mailing the following year. Harvest reports returned by the deadline are included in the analysis as the 'first wave' of respondents and reminders are sent out following the deadline. Responses from the reminders are included as the 'second wave' and then the harvest estimates are computed accounting for the non-response bias (Dillman 1978). Hunters were required to report harvest by species and county with mandatory harvest report cards by September 30, 2013.

Mourning dove harvest estimation
Mourning dove harvest was estimated as part of the statewide hunter survey conducted by WDFW (WDFW 2014).

Results

Band-tailed pigeon call-count survey
Past call-count survey results are presented in Table 1 and Figure 1.

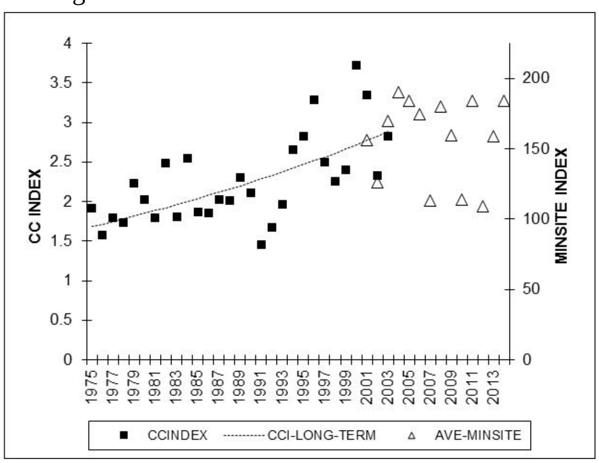

Figure 1. Band-tailed pigeon call-count results and mineral site raw data summaries.

Band-tailed pigeon mineral site survey
Mineral site survey raw data summaries are presented in Table 2 and Figure 1. Complete 2013 survey results are available through USFWS (Sanders 2014), but the 2014 analysis will not be available until 2015.

Band-tailed pigeon harvest
Harvest and hunter activity for the 2002-2013 seasons are summarized in Figures 2-3 and Table 3.

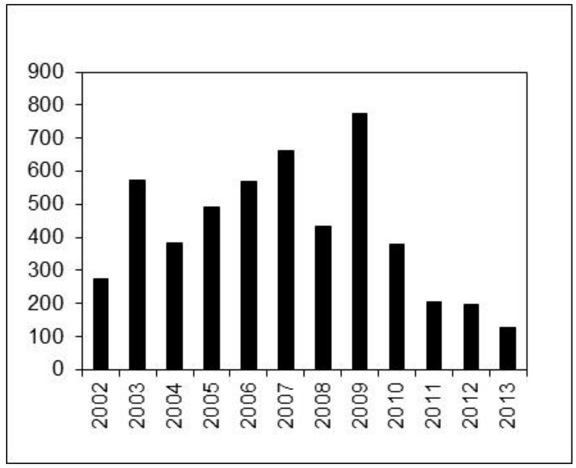

Figure 2. Band-tailed pigeon harvest.

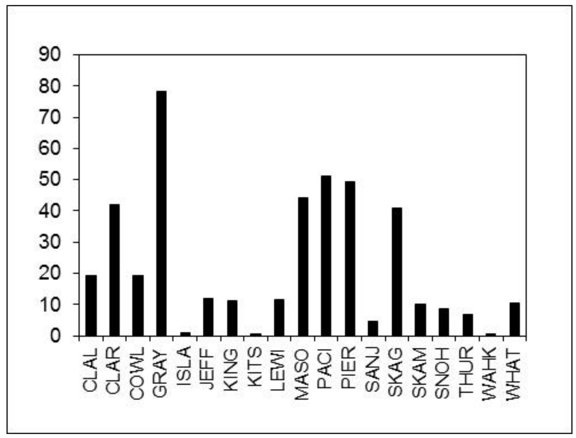

Figure 3. Band-tailed pigeon 2002-13 average annual harvest by county.

Mourning dove harvest
As measured by WDFW (2014) surveys, harvest in 2013 was estimated at 50,358 doves, down 1% from 2012 (Figure 4). Hunter numbers were estimated at 4,313, up 4% from 2012. Number of days hunted was 13,421, up 6% from 2012.

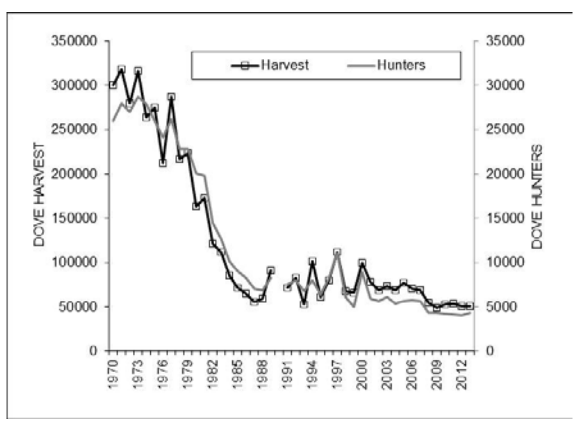

Figure 4. Mourning dove harvest and hunter numbers

Population status and trend analysis

Figure 1 and Table 1 show that based on the call-count survey, the band-tailed pigeon population generally increased from 1975-2003. The route regression method is less precise in determining short-term trends than long-term trends, as evidenced by the large confidence intervals for the two-year trends in Table 1. The large spans of these intervals are caused by low sample size due to changing observers from year to year.

The mineral site survey in 2001-2003 exhibited the same general trend as the call-count survey when the two surveys were run concurrently (Figure 1). This rough correlation can be used in the future to develop population objectives for WA consistent with the PFC management plan (PFC 2010).

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Table 1. Band-tail call-count survey results - route regression method.

Start Year	End Year	Change	Lower 90% CI	Upper 90% CI	Routes Used	Sig. level
1975	1992	-7.8%	-14.0%	-2.0%	63	p<0.05
1991	1992	10.1%	-50.0%	75.0%	11	n.s.
1975	1993	-6.0%	-11.0%	-1.0%	65	p<0.05
1992	1993	44.0%	-49.0%	152.0%	13	n.s.
1975	1994	-3.4%	-8.2%	1.4%	69	n.s.
1993	1994	71.0%	1.4%	141.0%	24	p<0.05
1975	1995	-2.7%	-9.8%	4.5%	70	n.s.
1994	1995	12.1%	-31.3%	55.3%	12	n.s.
1975	1996	-0.8%	-6.5%	4.9%	59	n.s.
1992	1996	24.3%	10.4%	38.2%	30	p<0.01
1995	1996	36.4%	-35.9%	108.7%	18	n.s.
1975	1997	-0.8%	-6.0%	4.3%	62	n.s
1993	1997	8.9%	0.2%	17.6%	32	p<0.10
1996	1997	-14.3%	-35.4%	6.7%	18	n.s.
1975	1998	-1.5%	-5.5%	2.4%	65	n.s.
1994	1998	2.1%	-8.7%	13.0%	34	n.s.
1997	1998	-11.0%	-45.8%	23.9%	11	n.s.
1975	1999	-0.1%	-4.1%	3.8%	67	n.s.
1995	1999	-3.3%	-11.5%	4.9%	38	n.s.
1998	1999	26.7%	-19.7%	73.1%	14	n.s.
1975	2000	-0.3%	-6.2%	5.5%	70	n.s.
1996	2000	5.9%	-2.3%	14.1%	41	n.s.
1999	2000	21.1%	-12.5%	54.8%	24	n.s.
1975	2001	1.7%	-2.3%	5.7%	70	n.s.
1997	2001	15.8%	8.0%	23.6%	44	p<0.01
2000	2001	1.8%	-16.6%	20.2%	36	n.s.
1975	2002	0.7%	-3.7%	5.0%	71	n.s.
1998	2002	9.4%	2.6%	16.2%	45	P<0.05
2001	2002	0.9%	-27.5%	25.8%	32	n.s.
1975	2003	1.8%	-1.7%	5.4%	71	n.s.
1999	2003	0.6%	-4.8%	5.9%	48	n.s.
2002	2003	5.2%	-30.5%	40.8%	25	n.s.

Table 2. WDFW band-tail pigeon mineral site survey – raw data summary.

SITE	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Altoona				64	0	5	0							
Cedar Cr.	328	215	157	215	185	231	191	312	163	154		142	181	267
L. Cavenaugh - Pefley				108	172	76	71	117	70	89	113	146	156	110
Lilliwaup	60	77	108	199	143	273	141	89	110	123	167	74	210	197
McAllister	82	118	174	124	174	87	25	136	46	134	107	102	77	78
Mud Bay	164	154	222	134	371	294	95	203	130	70	175	87	214	136
Oyster Cr. – Pigeon Pt.	362		455	474	542	293	157	331	314	190	344	121	51	39
Newaukum				634	167	335	309	219						
Potlatch	135	147	90	297	285	306	168	295	480	129	297	288	333	254
Red Salmon	52	103	121	179	103	64	33	107	41		0	47	5	
Soda Springs												58	112	
St. Martins				220	128	191	189	141	210	214	439	180	308	354
Sumas	67	71	31	46		68					78	17	82	74
U. Kalama				110	225	327	120	350	317	111	368	258	245	187
Totten -Oyster Bay										119	53	101	192	332
Warm Beach				48	58	62	83	36	29	29	72	10	60	
Willapa				3	24	10	3	0	5	5		2		
Mean	156	126	170	190	184	175	113	180	160	114	184	109	159	184

Table 3: WDFW band-tailed pigeon harvest report summary.

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	'02-13 AVE.
# PERMITS ISSUED	522	657	766	809	909	894	917	567	632	178	237	244	611
TOTAL DAYS (SUCCESSFUL)	357	337	209	382	315	364	247	548	362	151	195	85	296
TOTAL HARVEST	273	574	383	492	569	661	434	776	381	205	196	129	423
HARVEST BY COUNTY													
CLAL	37	35	14	25	35	37	5	0	39	0	0	6	19
CLAR	29	45	29	35	60	51	56	94	18	48	29	12	42
COWL	28	54	4	2	3	32	24	39	12	18	15	0	19
GRAY	47	53	104	76	71	145	103	129	83	47	55	26	78
ISLA	0	0	0	0	9	0	0	0	0	0	1	0	1
JEFF	10	16	31	26	14	29	6	4	6	3	0	0	12
KING	4	23	13	6	11	14	9	43	12	0	0	0	11
KITS	0	1	0	0	0	0	0	0	0	1	0	5	1
LEWI	7	13	11	34	5	22	13	19	15	0	1	0	12
MASO	26	38	48	62	63	84	59	126	19	2	2	0	44
PACI	13	21	37	35	73	80	82	136	56	1	47	33	51
PIER	20	82	30	62	85	63	32	85	43	14	34	42	49
SANJ	0	0	12	0	0	0	0	0	0	45	0	0	5
SKAG	33	99	15	97	74	65	31	30	42	3	2	2	41
SKAM	5	16	0	10	16	21	11	27	7	3	3	0	10
SNOH	15	29	3	12	11	3	4	4	10	13	2	0	9
THUR	0	13	8	2	24	10	0	5	13	7	0	0	7
WAHK	0	0	0	0	0	0	0	7	0	0	0	0	1
WHAT	0	34	24	6	14	4	0	28	6	0	5	3	10

Waterfowl

WATERFOWL: BREEDING POPULATIONS AND PRODUCTION STATUS AND TREND REPORT
STATEWIDE

MATTHEW T. WILSON, Waterfowl Specialist

Introduction
This report summarizes waterfowl productivity data collected during 2014 in Washington State, including information on breeding waterfowl populations, duck broods, and goose nest surveys. Washington Department of Fish and Wildlife (WDFW), U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service (USFWS), Yakama Indian Nation, Colville Confederated Tribes, Washington Waterfowl Association, and Chelan County Public Utility District contributed data.

Duck Breeding Population Survey
Methods
Historical surveys to estimate breeding duck populations in eastern Washington were conducted annually within seven strata in eastern Washington: West Okanogan Potholes, Omak-Douglas Potholes, Far East Potholes, Northeast, and Palouse Streams, Columbia Basin Irrigated, and Yakima Valley Irrigated (Fig. 1). Surveys were conducted by ground counts of transects or sections, except helicopter counts were used for the 1/4-sections in the Desert Wildlife Area (Frenchman and Winchester Wasteways) within the Columbia Basin Irrigated strata (Fig. 1). Samples were multiplied by weighting factors to provide an index to the total number of breeding ducks and coots within the defined areas (Tables 1-3). Weighting factors were determined from the proportion of areas within the strata that were sampled. Observations were treated as complete counts within sampling units (transects or quadrats) with no corrections for visibility bias.

Due to concerns about design of past surveys (lack of random sample selection and variance estimates), WDFW began the process of redesigning the eastern Washington waterfowl breeding population survey in 2008, in conjunction with staff from the Pacific Flyway office in Portland, OR and the USFWS Branch of Population and Habitat Assessment in Laurel, MD. The new design consists of randomly selected ¼ mile helicopter transects to replace the past survey design. The goal of the new survey is to provide breeding population indices (with variance estimates) comparable to surveys conducted in other parts of the Pacific Flyway, for inclusion in the western mallard management protocols adopted by USFWS in 2008.

The new and old survey designs were run concurrently for three years (2009-11), and the old design was discontinued after the 2011 survey. The new survey design (including the Irrigated, Potholes, and Northeast Highlands strata) was modified in 2012 to address continued safety and efficiency concerns for the Northeast Highlands stratum (Fig. 2). As a result, transects in this stratum were placed at 10 mile intervals on an east-west orientation across major river valleys. In addition, minor boundary adjustments were made to other stratum boundaries, including elimination of Saddle Mountain from the Irrigated stratum. Overall, in eastern Washington, observers surveyed approximately 1,041 transect miles over a 5 day period between May 6–13, 2014.

Beginning in 2010, line-transect surveys, similar to the new eastern Washington survey, were developed and flown for the new western Washington breeding waterfowl population survey (Fig. 3). Observers surveyed approximately 610 transect miles between April 28–May 2, 2014.

The modifications to survey design and areas during the initial years of the aerial survey created difficulties in comparing results across years. To address this issue, survey results from 2009-2012 were reevaluated and standardized by matching strata boundaries to the surveys boundaries used in 2013. Transects and observations from 2009-12 that fell outside 2013 strata boundaries were dropped from analyses. Data from the Highlands in 2010 and 2011 were also excluded from analyses due to different survey methods.

Methods for estimating total number of breeding ducks follow the Standard Operating Procedures of Aerial Waterfowl Breeding Ground Population and Habitat Surveys in North America (USFWS & CWS 1987). Breeding populations are estimated by multiplying the number of pairs, lone drakes, and flocked drakes (<5 male birds) by 2, and grouped birds (mixed or >5 males) by 1. Lone hens are multiplied by 1 for redhead, scaup, ring-necked duck, and ruddy duck only. These diver species are known to be late nesters and males significantly outnumber females.

Results

Total breeding duck counts numbered 128,284 (*SE* 13,750) within 3 eastern Washington strata (Table 4). Total mallards numbered 60,724 (*SE* 8,469). Gadwall was the second most numerous species on the survey (19,380, *SE* 3,621), followed by ruddy duck (14,224 *SE* 9,594), cinnamon teal (9,198 *SE* 2,474), and redhead (6,065 *SE* 1,549, Fig. 4).

The Potholes stratum comprised 48% of the total duck count in 2014, followed by the Irrigated stratum (31%) and the Highlands stratum (21%). Compared to the 2013 survey, 2014 total breeding duck counts increased 22% in eastern Washington (Fig. 5, Table 4).

The revised survey design for western Washington estimated the total breeding duck population at 48,869 *SE* 4,964). Mallards numbered 25,742 (*SE* 2,604), followed by American green-winged teal (4,584 *SE* 3,022), northern shovelers (3,470 *SE* 1,036) and buffleheads (3,015 *SE* 750; Fig. 6, Table 5). The North Puget Lowlands stratum held the majority of breeding ducks in 2014 (40%), followed by the South Puget Lowlands (24%), Dungeness (16%), Chehalis River Valley (11%), and Hood Canal (9%; Fig. 7, Table 5).

Statewide, the total breeding duck counts increased 11.7% compared to last year and are up 12.1% over the 3 year average. Mallards increased 14%, American wigeon 15%, and gadwall nearly 16%. Wood ducks have increased 39% since last season and 43% over the 3 year average (Fig. 8). Northern shovelers have declined sharply from 2013 (-19%) and over the long term (-33%), as well as bufflehead (-34%), American green-winged teal (-62%), and Redheads (-84%, Fig. 8). These decreases may be due to detection difficulties and typically lower annual breeding effort in the state.

Duck Production Survey (Brood Survey)

Methods

The same sampling transects used for historic breeding duck surveys are used for brood surveys in the Potholes, Palouse, and Northeast strata (Fig. 1). These surveys are conducted in late June to early July. All broods observed are recorded by species. The numbers of broods observed are multiplied by the weighting factors for each stratum to provide an index to duck production. Average brood size is very difficult to estimate. Historic surveys in the Irrigated strata were designed to estimate average brood size. As a result the survey effort varied somewhat among years. To provide more consistency, the surveys in the Columbia Basin were redesigned in 1995 by using six sample sites to provide an index to production.

Broods for most species are highly secretive and difficult to observe. The current year's growth of emergent vegetation is more developed than during breeding population surveys in May. Production surveys should be viewed as a rough estimate of production with greater value for long-term trends than for year-to-year changes.

Results

The 2014 duck brood production survey index for the Potholes, Palouse, and Northeast strata was up 40% from 2013 and 11% above the long-term for all combined duck species (Fig. 9, Table 6). Brood production increased 19% in the Okanogan strata and 12% in the Northeast, and 62% in the Columbia Basin, but declined 32% in the Channeled Scablands; the Palouse stratum remained unchanged (Table 7).

Canada Goose Breeding Population Survey

Methods

Canada goose breeding populations are indexed by nest searches conducted within four major geographic areas, mainly along the Snake and Columbia rivers (Table 8). Surveys are conducted annually, biennially, or periodically. Total number of goose nest attempts is used as an index of the goose breeding population, and surveys are focused on areas with high densities of nesting geese. Some areas with relatively recent goose population expansions are not surveyed. Total geese observed during historic and new aerial breeding duck surveys also provide an index to the goose population in those areas not surveyed during nest searches.

Results

The 2014 goose nest index decreased (-2%) statewide compared to last year but remains 15% above the 1974-2013 average. The total eastern Washington index was slightly lower (-1%) compared to last year, remaining 17% above the 1974-13 average (Fig. 10, Table 9). Nest indexes decreased in the upper Columbia (-7%), lower Columbia (-9%), and Columbia Basin strata (-8%, Fig. 11, Fig. 12, Table 9). Counts increased in the Snake River strata (32%), and are 41% above their long-term average (Fig. 11). The mid-Columbia River estimates increased slightly (1%) from last year (Fig. 11, Table 9). One section of this stratum is only surveyed every 5 years and was last surveyed in 2012. The other section was only partially surveyed. Therefore, counts from the previous year were used. Ten out of 21 surveys were conducted according to the variable survey schedule. Most strata in the state are above their long-term averages (1974-13) with the exception of the Upper Columbia River stratum, which began a steep decline starting in 2003 (Fig. 11, Table 9).

The number of geese observed during the breeding duck surveys is presented in Fig. 13 and Table 9. This index provides information about the expansion of Canada geese into areas of Washington outside of our traditional goose nest index areas, and shows an increasing trend over the long term.

Potential Improvements to Waterfowl Breeding and Production Surveys

- Compare new duck survey results with traditional survey results during concurrent years to project long-term trends.
- Evaluate the duck productivity and goose nest surveys for accuracy, frequency, and completeness of surveys.
- Evaluate ways to combine goose nest surveys and aerial surveys into a more representative goose breeding population index survey.

Literature Cited

U. S. Fish and Wildlife Service and Canadian Wildlife Service. 1987. Standard operating procedures for aerial waterfowl breeding ground population and habitat surveys in North America; revised. Unpublished report.

Figure 1. Historic waterfowl breeding survey areas.

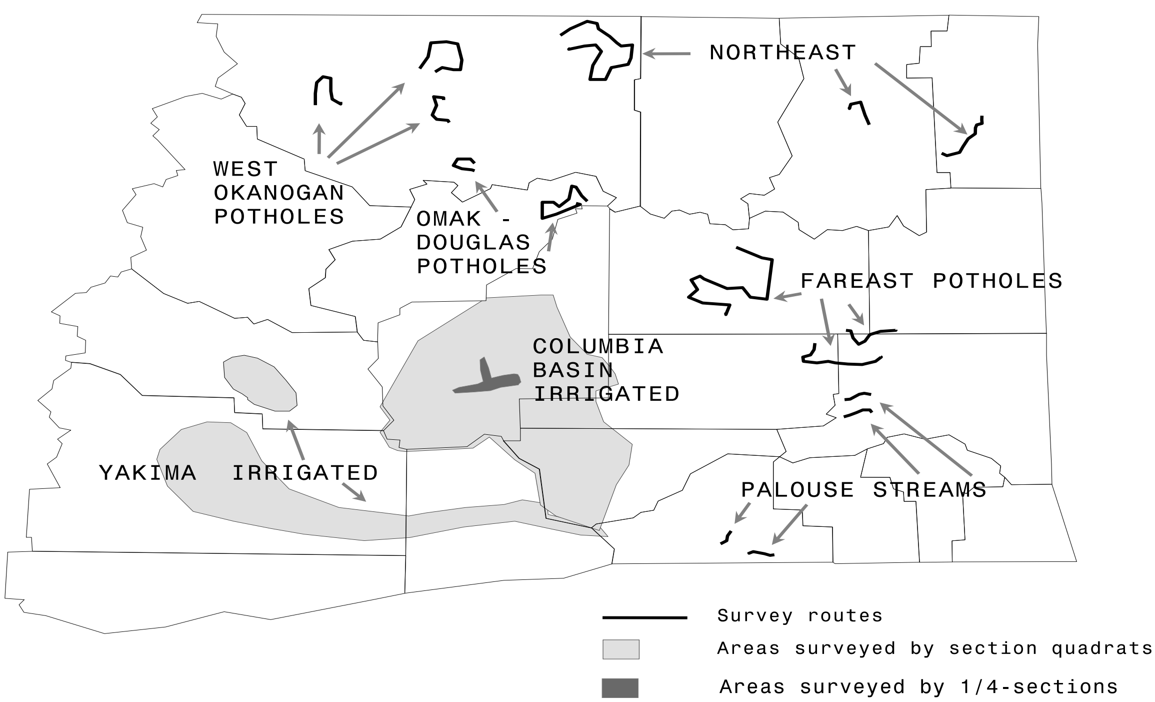

Figure 2. Eastern Washington aerial breeding waterfowl survey transects flown in 2014.

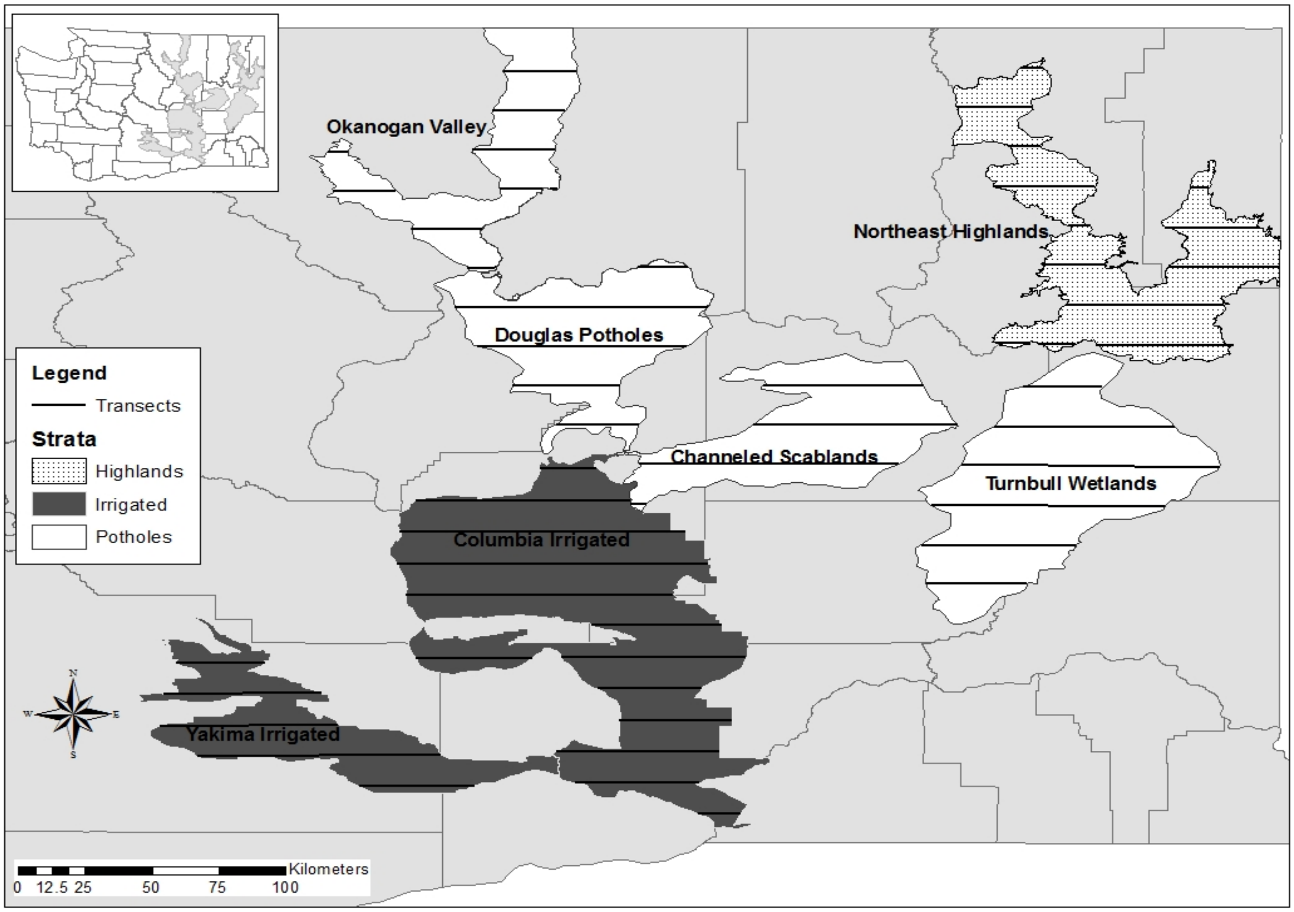

Figure 3. Western Washington aerial breeding waterfowl survey transects flown in 2014.

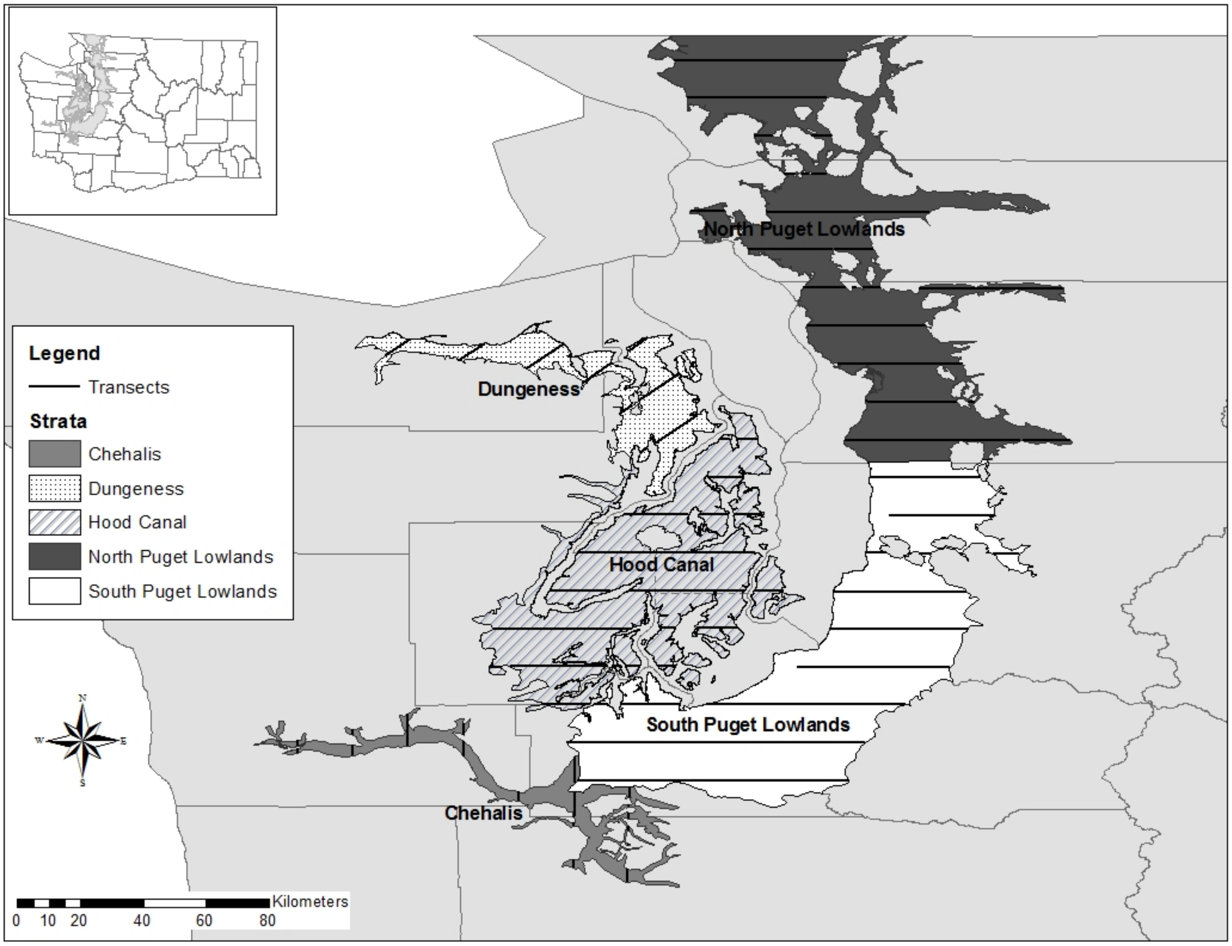

Figure 4. Eastern Washington duck breeding population survey results by species, 2009-14.

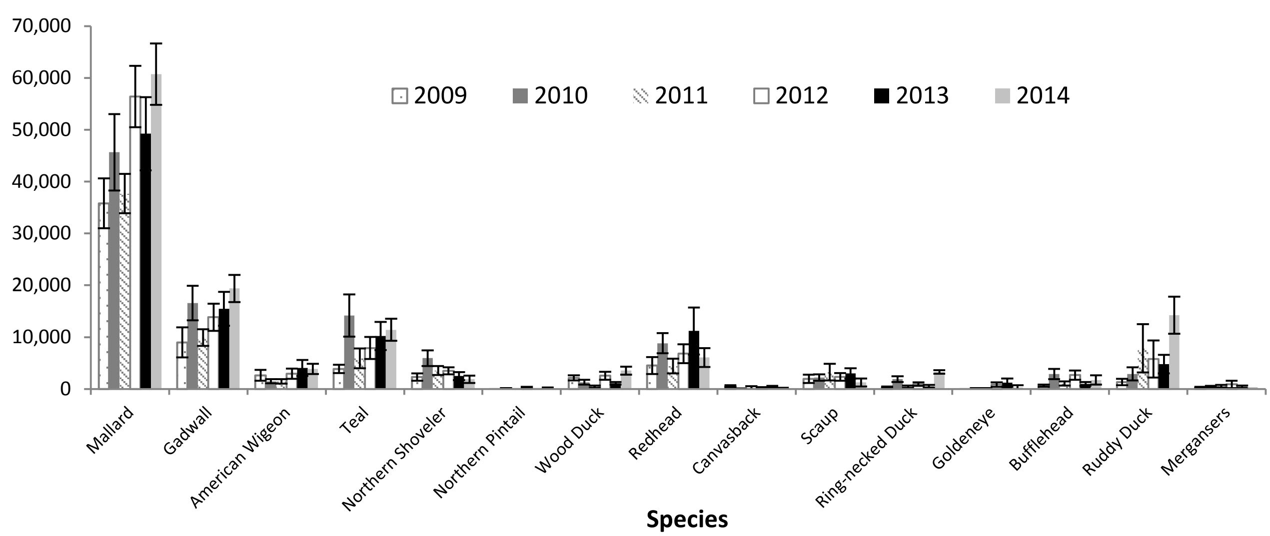

Figure 5. Eastern Washington duck breeding population survey results by species and strata, 2014.

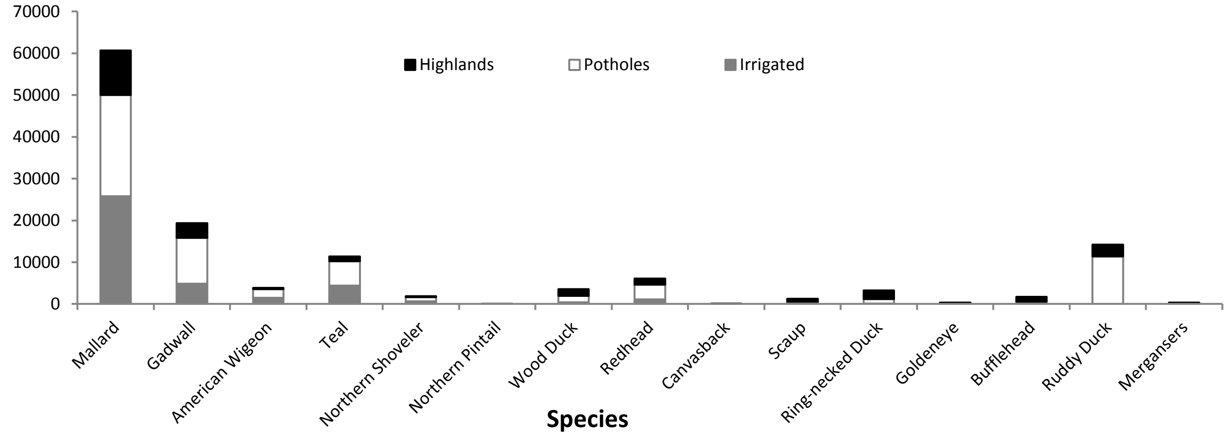

Figure 6. Western Washington duck breeding population survey results by species, 2010-14.

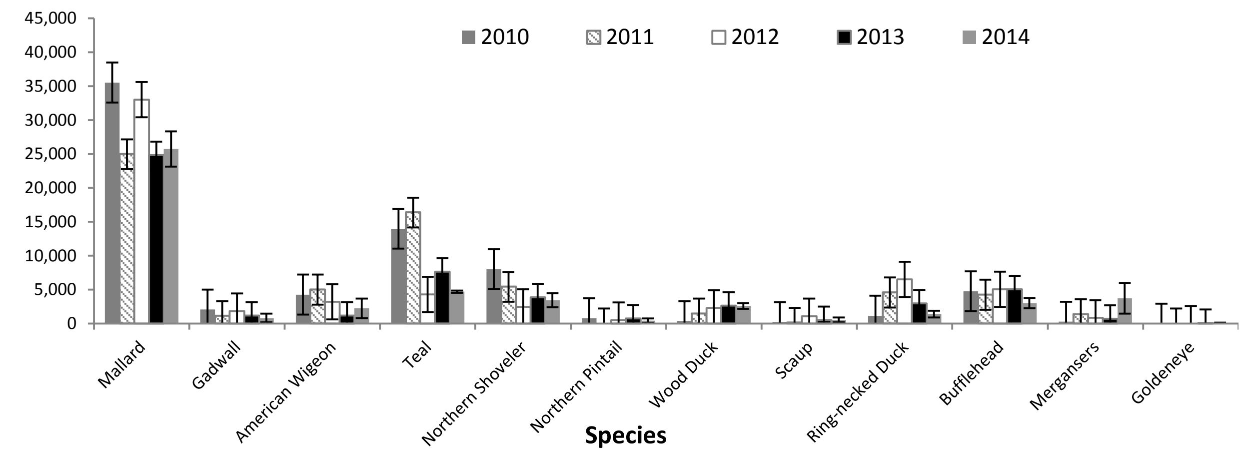

Figure 7. W. Washington duck breeding population survey results by species and strata, 2014.

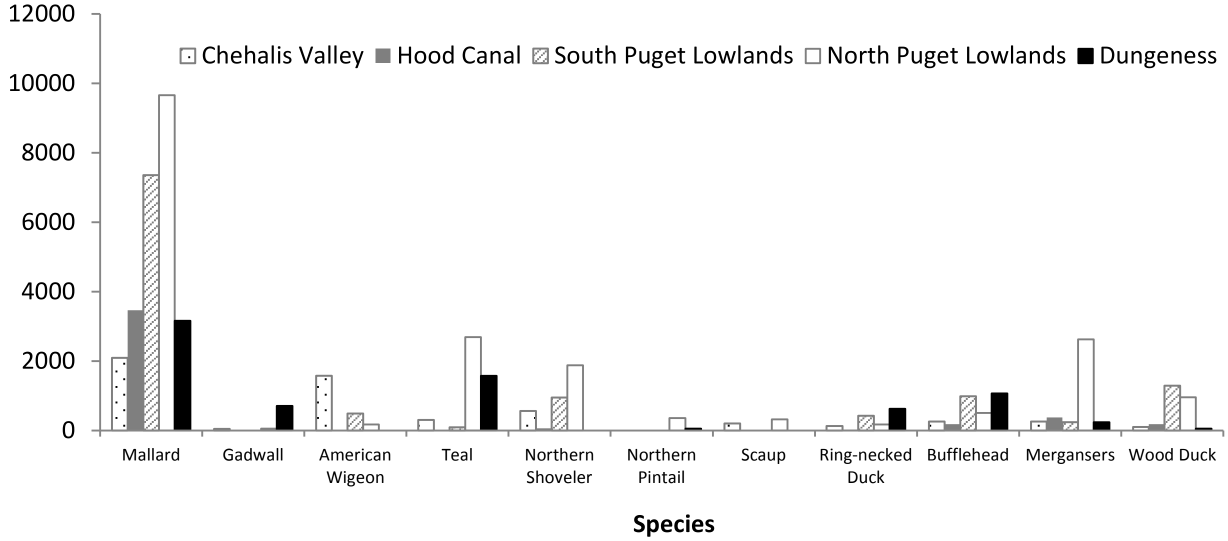

Figure 8. Statewide duck breeding population survey results by species, 2010-14.

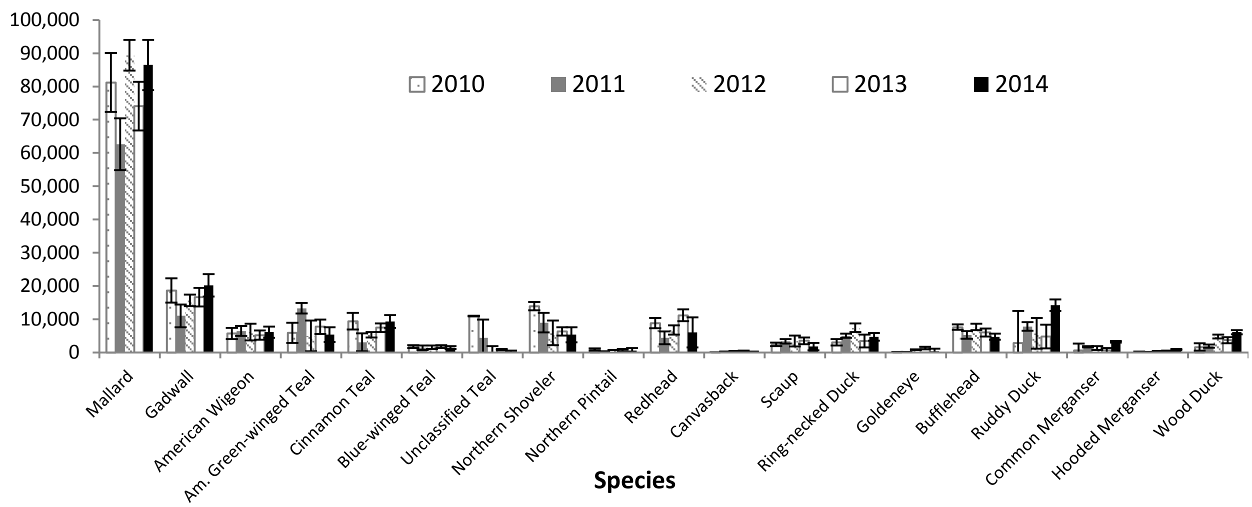

Figure 9. Brood index: Potholes, Palouse, Northeast Strata

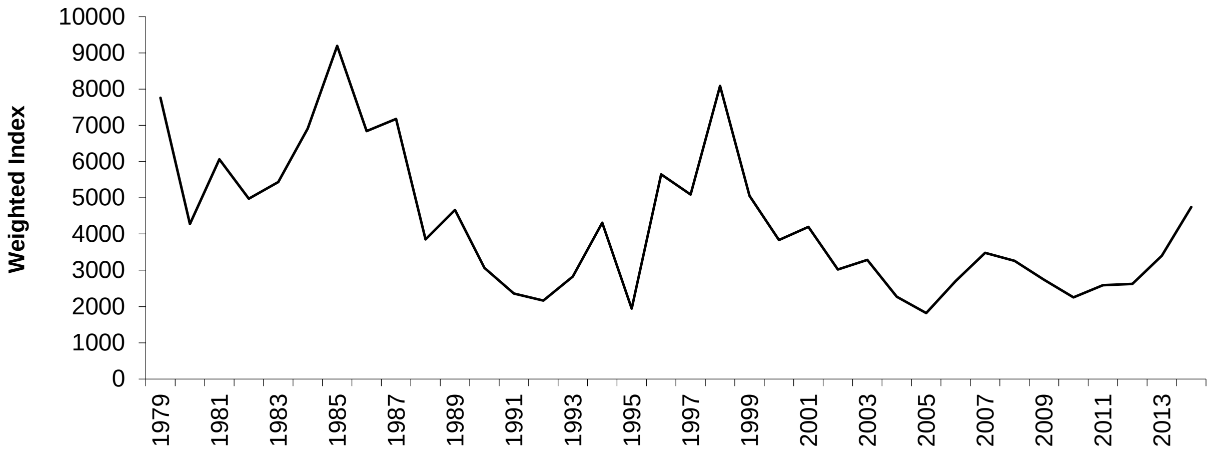

Figure 10. Total Canada goose nests counted in in eastern Washington, 1982-2014.

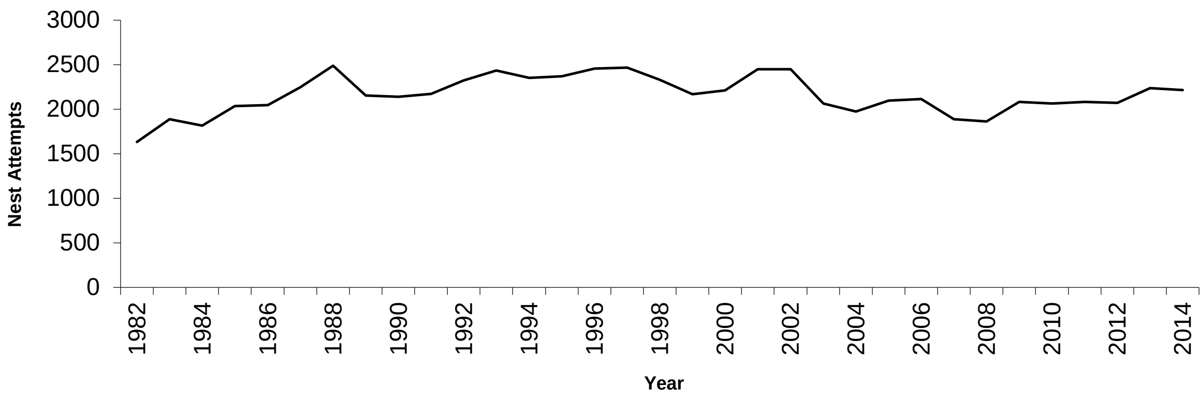

Figure 11. Canada goose nest survey trends in eastern Washington, 1982-2013. UCR = Upper Columbia River; MCR = Middle Columbia River; SR = Snake River; CB= Columbia Basin

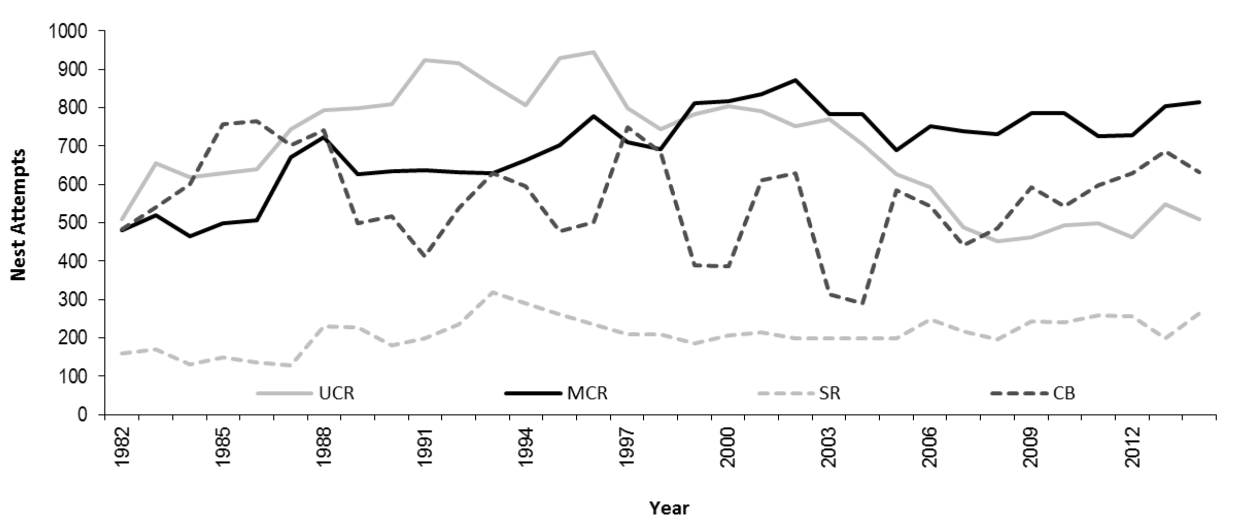

Figure 12. Total Canada goose nests in the lower Columbia River stratum, 1987-2014.

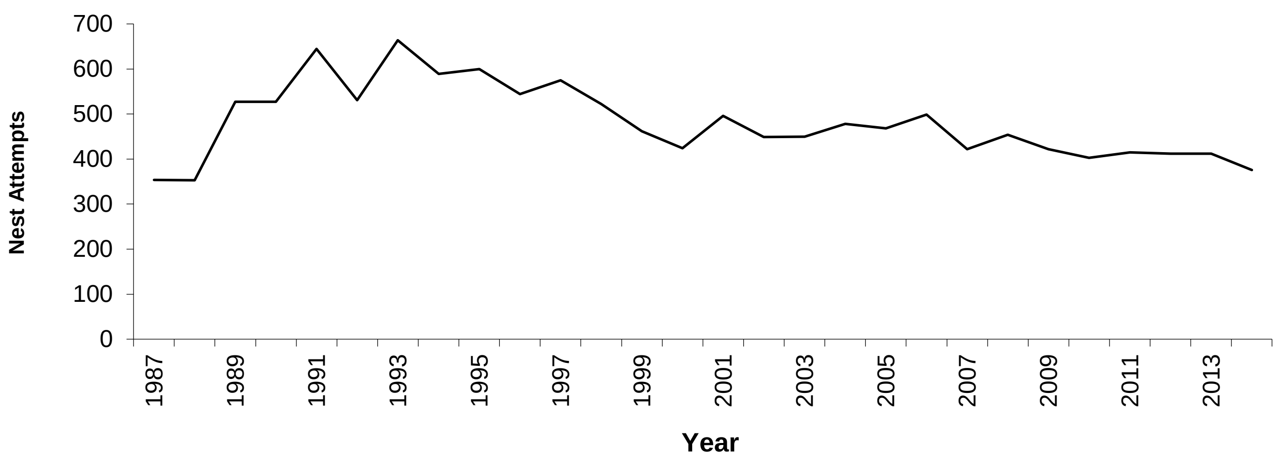

Figure 13. Breeding Canada goose index from breeding duck surveys.

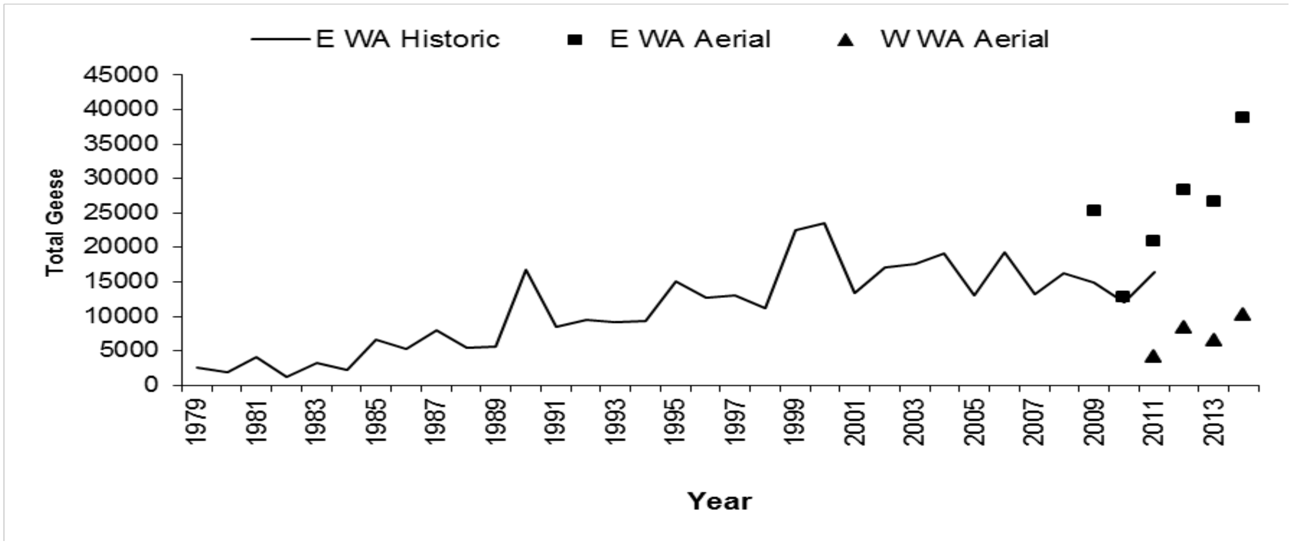

Table 1. Areas and subareas historically surveyed with weighting factors for pond indices, and duck and goose breeding surveys.

Area	Subarea	Survey	Weighting Factor	% of Total Area Sampled
Potholes	West Okanogan		14.06	7.1
		Methow Valley		
		Salmon Creek		
		Sinlahekin		
	Omak Lake		9.83	10.2
	Douglas County		15.26	6.5
	Far East Potholes		18.69	5.3
		Ewan-Revere		
		Sprague-Lamont		
	Lincoln County		47.59	2.1
Highland				
	Northeast		25.53	3.9
		Colville		
		Cusick		
		Molson-Sidley		
	Palouse Streams		32.52	3.1
		Union Flat		
		Palouse River		
		Walla Walla River		
		Touchet River		
Irrigated				
	Columbia Basin – 65 sections		37.25	2.7
	Wasteways[a] – 19 ¼ -sections		10.05	9.9
	Yakima – 35 sections		24.49	3.9

[a] Surveyed by helicopter beginning in 1994

Table 2. Weighted breeding duck population indices by species for eastern Washington historic survey areas (2002-2011).

Species	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2002-2011 average
Mallard	44676	39843	39958	40794	45485	46053	50647	47977	49160	54940	45953
Gadwall	18527	15353	15185	15665	17995	17165	14065	10277	10277	11735	14624
Am. Wigeon	6501	5028	5442	3439	6012	6240	2618	4283	2844	3248	4566
Am. green-winged teal	2673	1749	1477	2406	4095	4060	1590	1612	1844	1905	2341
Blue +cinnamon teal	13717	11274	14619	12404	9544	11999	11921	9282	8657	6645	11006
Northern shoveler	5968	7794	6293	4477	6581	5409	4898	5555	4199	6249	5742
Northern pintail	395	608	1096	644	1089	723	450	1198	542	2489	923
Wood duck	1863	616	1553	1375	1549	1870	1781	1327	2409	1527	1587
Redhead	11831	8117	8365	4978	8492	8265	7757	7156	6466	6072	7750
Canvasback	1507	919	618	610	1460	756	1132	873	385	765	903
Scaup spp.	9289	12722	4807	5741	9709	6530	4244	5982	2484	3429	6494
Ring-necked duck	1405	3063	850	2525	3640	2732	2995	2521	2381	2136	2425
Goldeneye spp.	4036	4713	3255	3567	2847	2837	3841	3686	3495	3121	3540
Bufflehead	1606	3034	1280	2425	6361	2809	3728	949	2701	6838	3173
Ruddy duck	9023	12175	9624	10150	10464	9538	8262	8378	6400	9306	9332
Merganser spp.	327	757	463	304	121	1279	969	1095	794	1848	796
Total ducks	**133343**	**127764**	**114883**	**111503**	**135442**	**128265**	**120897**	**115663**	**105036**	**122254**	**121505**
American coot	18171	19328	19085	12346	22151	33763	22069	25521	20511	16834	20978
Canada goose	17179	17596	19137	13022	19253	13244	16342	16023	12014	16511	16032

Table 3. Weighted breeding duck population indices by area for eastern Washington historic surveys (1979-2011).

Year	Irrigated	Potholes	Palouse	Northeast	Total
1979	28948	57784	1951	9960	98643
1980	36870	58752	3057	15063	113742
1981	74711	58026	2341	13173	148252
1982	66161	63150	4455	12663	146429
1983	84969	48044	3545	12969	149527
1984	101486	73478	4618	16697	196278
1985	94789	95463	5984	19990	216226
1986	97901	79899	3837	22135	203771
1987	72503	80100	5073	25887	183564
1988	78137	103452	7068	53143	241799
1989	73411	50663	2341	35908	162323
1990	77838	56462	5138	29474	168912
1991	65698	50293	3382	21420	140793
1992	69547	22581	3252	20884	116264
1993	75969	42335	3577	27955	149836
1994	64537	43502	2699	13173	123912
1995	71513	46068	2472	26934	146987
1996	73364	62221	1691	25658	162933
1997	68589	85137	2667	16058	172451
1998	65503	96982	2341	20424	185251
1999	72697	101140	3089	23283	200210
2000	61126	70072	2537	22594	156328
2001	47438	70106	2537	26321	146402
2002	52341	59958	1106	19939	133342
2003	52648	49794	1170	24151	127764
2004	55098	39393	1041	19351	114883
2005	58339	35014	585	17564	111503
2006	72138	46672	1626	15650	135442
2007	63349	42119	2211	20271	128265
2008	62230	38710	1756	17999	120109
2009	50846	44020	1496	19301	115078
2010	55631	30351	1106	17948	105036
2011	71399	36352	1048	13454	122254
1979-2011 ave.	67204	58730	2812	21133	149834

Table 4. Summary of eastern Washington helicopter surveys for breeding waterfowl (2009-2014).

		Species																				
Region	Year	Mallard	Gadwall	American Wigeon	Green-winged Teal	Cinnamon Teal	Blue-winged Teal	Northern Shoveler	Northern Pintail	Redhead	Canvasback	Scaup	Ring-necked Duck	Goldeneye	Bufflehead	Ruddy Duck	Common Merganser	Hooded Merganser	Wood Duck	TOTAL DUCKS	American Coot	Canada Goose
Irrigated	2009	29,216	5,958	2,390	255	1,848	127	1,593	0	1,274	64	1,943	32	0	510	191	64	0	1,083	**46,739**	7,296	4620
	±SE	4,720	2,815	1,033	82	383	67	718	0	686	49	802	24	0	186	97	47	0	421	**5,770**	3,384	975
	2010	27,372	3,129	198	560	4,809	264	3,953	0	1,746	66	1,647	659	0	2,240	231	264	0	1,054	**48,190**	7,016	4644
	±SE	5,879	698	73	292	2,213	127	1,417	0	547	52	574	155	0	903	126	116	0	432	**6,614**	2,802	1141
	2011	20,791	1,749	583	453	648	259	583	0	648	0	1,231	0	0	259	194	259	0	194	**27,916**	1,749	8452
	±SE	2,415	517	169	89	253	117	351	0	433	0	524	0	0	126	89	136	0	159	**2,621**	1,015	2270
	2012	25,192	1,943	96	287	2,229	127	955	64	955	0	1,656	287	605	2,102	573	64	0	510	**37,644**	1,369	7102
	±SE	4,275	454	76	188	1,113	101	475	53	406	0	679	122	388	860	279	50	0	354	**4,663**	439	1502
	2013	17,188	4,520	1,432	191	1,114	859	446	0	509	0	923	223	1,146	573	0	64	0	127	**29,316**	3,342	5507
	±SE	2,633	1,129	600	106	388	303	223	0	154	0	349	175	804	277	0	49	0	106	**3,128**	1,139	1672
	2014	25,815	4,902	1,464	764	3,247	382	637	127	1,114	0	382	127	0	382	0	127	0	446	**39,915**	7,830	7639
	±SE	5,350	1,707	469	349	1,768	254	454	69	420	0	175	59	0	181	0	71	0	171	**5,963**	3,075	1696
Potholes	2009	4,363	1,995	249	0	997	249	499	0	3,241	249	0	125	0	125	1,060	0	0	249	**13,401**	2,992	3366
	±SE	858	574	156	0	310	110	161	0	1,501	158	0	79	0	79	617	0	0	175	**1,982**	871	1151
	2010	18,295	13,422	1,278	2,397	4,634	1,518	1,997	80	7,070	0	559	1,238	80	639	2,676	160	0	240	**56,284**	7,110	7829
	±SE	4,436	3,261	393	712	1,481	636	497	83	1,861	0	276	529	86	355	1,280	122	0	142	**6,281**	2,310	2261
	2011	16,888	8,160	873	1,527	2,356	611	2,967	0	3,753	262	2,007	436	87	785	7,637	262	0	262	**48,874**	7,288	14139
	±SE	2,920	1,545	400	643	763	393	788	0	1,342	257	1,530	217	90	379	4,663	192	0	146	**6,249**	1,920	4420
	2012	20,622	11,054	2,598	454	2,887	1,155	2,145	165	5,486	206	660	454	82	330	5,197	660	0	330	**54,691**	2,887	13487
	±SE	3,609	2,580	978	168	596	412	500	164	1,749	167	337	278	81	250	3,560	646	0	238	**6,164**	600	3616
	2013	21,564	9,854	2,515	495	5,937	536	2,062	0	8,494	247	1,855	165	82	165	3,876	165	82	247	**58,424**	15,709	11462
	±SE	5,468	3,028	1,416	265	1,852	249	738	0	4,292	173	901	170	85	160	1,660	161	85	133	**8,205**	7,924	3661
	2014	24,212	10,952	2,098	0	5,119	755	1,007	0	3,525	0	168	1,091	0	168	11,372	0	84	1,511	**62,061**	13,721	17246
	±SE	5,842	2,805	708	0	1,696	334	527	0	1,267	0	111	634	0	114	9,417	0	86	871	**11,715**	7,770	5354
Highlands*	2009	2,245	1,020	0	0	0	204	204	0	0	204	0	204	0	0	102	0	204	816	**5,204**	2,551	5919
	±SE	383	294	0	0	0	47	59	0	0	59	0	59	0	0	29	0	71	142	**521**	736	1136
	2012	10,582	832	238	79	238	238	396	0	357	0	0	198	159	238	0	79	79	1,704	**15,417**	436	8719
	±SE	1,896	250	112	50	112	157	127	0	149	0	0	122	105	66	0	46	50	621	**2,042**	148	2810
	2013	10,482	1,112	79	516	238	238	0	0	2,184	159	238	119	0	238	913	0	79	715	**17,311**	6,909	9608
	±SE	3,617	514	53	176	107	112	0	0	1,449	105	146	51	0	146	606	0	49	209	**3,997**	3,939	4274
	2014	10,697	3,526	317	0	832	317	238	0	1,426	79	713	2,060	317	1,189	2,853	158	0	1,585	**26,308**	10,539	13946
	±SE	2,994	1,527	160	0	341	210	157	0	785	52	362	560	121	249	1,831	61	0	494	**4,031**	6,230	4323
Total - Eastern Washington	2009	35,824	8,973	2,639	255	2,845	581	2,296	0	4,516	517	1,943	361	0	634	1,353	64	204	2,149	**65,344**	12,839	13904
	±SE	4,813	2,888	1,044	82	493	137	739	0	1,650	176	802	101	0	202	626	47	71	478	**2,049**	3,571	1888
	2010*	45,667	16,551	1,476	2,957	9,443	1,781	5,950	80	8,816	66	2,206	1,897	80	2,879	2,907	423	0	1,294	**104,473**	14,126	12474
	±SE	7,364	3,335	400	770	2,663	649	1,501	83	1,940	52	637	551	86	970	1,286	168	0	455	**6,281**	3,631	2532
	2011*	37,679	9,909	1,456	1,981	3,004	870	3,550	0	4,401	262	3,238	436	87	1,045	7,831	521	0	456	**76,790**	9,036	22591
	±SE	3,789	1,629	435	649	804	410	862	0	1,410	257	1,618	217	90	400	4,664	235	0	216	**6,249**	2,172	4969
	2012	56,396	13,829	2,932	820	5,354	1,520	3,496	229	6,798	206	2,316	938	846	2,670	5,770	803	79	2,544	**107,752**	4,693	29308
	±SE	5,908	2,632	988	257	1,267	453	701	173	1,802	167	758	327	410	898	3,571	649	50	754	**6,493**	758	4820
	2013	49,234	15,486	4,027	1,202	7,289	1,634	2,507	0	11,187	406	3,017	507	1,228	976	4,789	229	162	1,089	**105,051**	25,960	26577
	±SE	7,065	3,273	1,539	336	1,895	408	771	0	4,533	202	977	250	808	352	1,767	169	98	270	**9,127**	8,922	5870
	2014	60,724	19,380	3,879	764	9,198	1,454	1,881	127	6,065	79	1,263	3,279	317	1,738	14,224	286	84	3,541	**128,284**	32,091	38832
	±SE	8,469	3,621	864	349	2,474	469	713	69	1,549	52	417	848	121	328	9,594	93	86	1,016	**13,750**	10,423	7088

Table 5. Summary of western Washington breeding waterfowl population survey, 2010-2014.

Region	Year	Mallard	Gadwall	American Wigeon	Green-winged Teal	Cinnamon Teal	Blue-winged Teal	Unclassified Teal	Northern Shoveler	Northern Pintail	Redhead	Canvasback	Scaup	Ring-necked Duck	Goldeneye	Bufflehead	Ruddy Duck	Common Merganser	Hooded Merganser	Wood Duck	**TOTAL DUCKS**	American Coot	Canada Goose
Chehalis Valley	2010	1,670	0	835	0	0	0	1,035	67	0	0	0	0	200	0	67	0	0	0	0	**3,875**	0	3708
	±SE	511	0	777	0	0	0	776	62	0	0	0	0	99	0	50	0	0	0	0	**1,217**	0	3166
	2011	1,569	58	291	1,104	0	232	494	58	0	0	0	58	1,511	0	349	0	349	0	58	**6,131**	0	174
	±SE	705	59	294	372	0	231	318	59	0	0	0	59	1,040	0	170	0	346	0	45	**1,455**	0	148
	2012	2,156	485	1,967	2,263	0	0	0	701	216	0	0	54	1,455	0	701	0	162	0	189	**10,347**	0	458
	±SE	1,349	470	729	1,954	0	0	0	515	209	0	0	52	1,349	0	379	0	162	0	148	**2,952**	0	261
	2013	1,652	103	0	1,678	52	155	52	155	0	0	0	0	52	0	361	0	0	0	310	**4,569**	129	929
	±SE	675	70	0	1,304	54	112	42	149	0	0	0	0	50	0	257	0	0	0	92	**1,509**	146	736
	2014	2,091	52	1,575	310	0	0	0	568	0	0	0	207	129	0	258	0	258	0	103	**5,550**	0	826
	±SE	473	50	1,400	182	0	0	0	476	0	0	0	234	98	0	125	0	89	0	65	**1,593**	0	382
Hood Canal	2010	2,296	0	574	0	0	0	0	287	0	0	0	0	0	0	430	0	0	0	96	**3,683**	0	813
	±SE	179	0	349	0	0	0	0	190	0	0	0	0	0	0	250	0	0	0	58	**505**	0	369
	2011	2,779	0	0	0	0	0	192	0	0	0	0	0	511	0	447	0	0	0	128	**4,057**	0	511
	±SE	629	0	0	0	0	0	114	0	0	0	0	0	189	0	171	0	0	0	127	**700**	0	287
	2012	2,619	0	607	192	0	0	0	0	0	0	0	0	831	0	256	0	0	256	415	**5,175**	0	735
	±SE	694	0	564	176	0	0	0	0	0	0	0	0	477	0	119	0	0	112	142	**1,051**	0	280
	2013	2,080	63	0	63	0	0	126	0	0	0	0	0	63	0	851	0	126	126	126	**3,624**	0	851
	±SE	494	58	0	59	0	0	129	0	0	0	0	0	59	0	435	0	116	116	67	**701**	0	152
	2014	3,466	0	0	0	0	0	0	63	0	0	0	0	32	63	189	0	0	378	189	**4,380**	0	1008
	±SE	1,022	0	0	0	0	0	0	64	0	0	0	0	30	58	120	0	0	153	127	**1,052**	0	423
Dungeness	2010	2,649	0	0	0	0	0	294	1,030	0	0	0	0	0	0	0	0	0	0	0	**3,974**	0	37
	±SE	378	0	0	0	0	0	169	502	0	0	0	0	0	0	0	0	0	0	0	**650**	0	24
	2011	1,661	181	60	1,963	0	0	0	0	0	0	0	0	453	0	453	0	60	0	0	**4,832**	30	272
	±SE	527	185	62	1,859	0	0	0	0	0	0	0	0	318	0	426	0	65	0	0	**2,014**	31	192
	2012	2,053	755	0	1,027	0	0	0	60	0	0	0	272	0	0	302	0	0	0	30	**4,499**	0	423
	±SE	885	737	0	840	0	0	0	65	0	0	0	252	0	0	99	0	0	0	33	**1,452**	0	300
	2013	2,971	119	238	1,218	59	0	0	743	0	0	0	505	386	0	713	0	0	0	59	**7,011**	0	861
	±SE	1,241	121	162	843	64	0	0	759	0	0	0	471	205	0	292	0	0	0	57	**1,796**	0	893
	2014	3,162	716	0	1,581	0	0	0	0	60	0	0	0	627	0	1,074	0	0	239	60	**7,518**	149	1581
	±SE	908	611	0	1,541	0	0	0	0	61	0	0	0	381	0	527	0	0	230	64	**2,014**	110	1128
South Puget Lowlands	2010	8,691	0	325	0	0	0	372	186	0	0	0	232	511	0	2,974	0	186	0	186	**13,664**	46	1859
	±SE	1,549	0	215	0	0	0	175	148	0	0	0	163	282	0	424	0	131	0	121	**1,678**	40	390
	2011	8,926	509	2,067	1,438	60	120	779	3,175	0	0	0	0	1,048	0	1,917	0	0	120	659	**20,818**	150	1647
	±SE	1,307	538	1,635	596	55	76	629	3,193	0	0	0	0	380	0	554	0	0	78	466	**4,037**	91	397
	2012	15,127	60	449	300	0	0	0	899	60	0	0	120	3,295	0	2,426	0	60	30	539	**23,364**	30	3684
	±SE	3,569	61	283	218	0	0	0	589	61	0	0	125	1,153	0	585	0	56	28	221	**3,868**	28	1163
	2013	10,274	734	499	2,495	0	0	59	2,789	0	0	0	0	2,407	59	2,671	0	59	176	822	**23,043**	29	2436
	±SE	1,520	777	528	1,365	0	0	62	1,977	0	0	0	0	1,098	54	624	0	62	93	288	**3,265**	27	880
	2014	7,359	0	493	0	0	0	92	954	0	0	0	0	431	0	985	0	185	62	1,293	**11,854**	31	3664
	±SE	932	0	392	0	0	0	95	600	0	0	0	0	227	0	417	0	109	61	182	**1,291**	28	878
North Puget Lowlands	2010	20,220	2,087	2,534	2,981	0	0	9,290	6,459	795	0	0	0	447	0	1,292	0	99	0	99	**46,303**	99	696
	±SE	1,760	710	1,117	1,353	0	0	5,424	2,446	351	0	0	0	130	0	429	0	66	0	66	**6,513**	46	253
	2011	10,026	375	2,592	6,820	0	239	2,933	2,183	0	0	0	68	1,057	0	1,091	0	784	68	614	**28,850**	0	1364
	±SE	2,061	205	1,804	4,074	0	236	1,490	1,674	0	0	0	68	600	0	476	0	388	68	215	**5,479**	0	430
	2012	11,034	532	199	399	0	66	66	798	266	0	0	665	931	0	1,363	0	332	0	1,130	**17,781**	0	2626
	±SE	1,515	321	194	250	0	67	68	645	198	0	0	648	478	0	346	0	204	0	439	**1,991**	0	571
	2013	7,869	150	449	1,107	60	0	539	180	748	0	0	0	60	60	479	0	209	0	1,316	**13,224**	0	1316
	±SE	1,692	74	306	695	60	0	478	176	753	0	0	0	42	56	244	0	110	0	463	**2,137**	0	348
	2014	9,664	60	180	2,693	120	0	0	1,885	359	0	0	329	180	0	509	0	2,513	120	957	**19,567**	30	3022
	±SE	1,955	59	92	2,594	75	0	0	695	312	0	0	266	147	0	283	0	1,956	114	344	**3,908**	28	1238
Total - Western Washington	2010	35,526	2,087	4,268	2,981	0	0	10,992	8,029	795	0	0	232	1,159	0	4,763	0	285	0	381	**71,498**	146	7112
	±SE	2,436	710	1,421	1,353	0	0	5,485	2,510	351	0	0	163	326	0	655	0	146	0	149	**6,884**	61	3221
	2011	24,961	1,124	5,010	11,325	60	591	4,397	5,416	0	0	0	126	4,581	0	4,257	0	1,193	188	1,459	**64,688**	180	3969
	±SE	2,670	607	2,454	4,533	55	339	1,652	3,606	0	0	0	90	1,312	0	879	0	524	103	530	**7,279**	96	695
	2012	32,989	1,832	3,223	4,180	0	66	66	2,457	541	0	0	1,110	6,511	0	5,047	0	554	285	2,303	**61,166**	30	7925
	±SE	4,256	933	983	2,160	0	67	68	1,017	294	0	0	708	1,899	0	793	0	266	115	533	**5,555**	28	1384
	2013	24,845	1,169	1,185	6,561	171	155	775	3,866	748	0	0	505	2,968	119	5,075	0	394	302	2,634	**51,470**	158	6394
	±SE	2,722	795	632	2,182	103	112	501	2,130	753	0	0	471	1,120	78	889	0	171	148	560	**4,607**	149	1503
	2014	25,742	828	2,247	4,584	120	0	92	3,470	419	0	0	536	1,398	63	3,015	0	2,956	798	2,603	**48,869**	210	10101
	±SE	2,604	616	1,457	3,022	75	0	95	1,036	318	0	0	354	478	58	750	0	1,961	305	419	**4,964**	117	1975

Table 6. Weighted duck brood indices by species for the Potholes, Palouse, and Northeast strata, 2004-2014.

Species	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	79-13 Ave.	% change from 2013	% change from Average
Mallard	1284	1221	1200	1786	1419	1416	1035	1042	1010	1650	2706	1639	39%	65%
Gadwall	116	15	107	132	292	87	87	379	314	323	204	359	-28%	43%
Wigeon	95	146	54	54	48	43	10	35	26	26	0	232	-100%	-100%
Green-winged teal	14	26	118	94	151	183	176	233	272	224	204	152	-16%	35%
Blue-winged teal	92	26	15	0	42	48	0	30	47	91	26	493	-75%	-95%
Cinnamon teal	24	40	14	103	91	14	138	30	82	0	102	89	25%	14%
Northern shoveler	63	0	29	15	59	44	49	19	19	19	0	149	-100%	-100%
Northern pintail	20	0	0	0	0	0	0	0	14	0	0	108	-100%	-100%
Wood duck	42	33	82	107	28	28	42	33	112	141	153	45	9%	237%
Redhead	40	0	121	211	252	154	94	184	210	195	383	395	87%	-3%
Canvasback	26	15	65	26	90	0	32	0	77	14	51	33	263%	56%
Scaup	0	0	20	14	21	94	17	34	0	26	102	46	300%	123%
Ring-necked duck	85	0	108	26	50	14	86	23	14	26	51	47	100%	8%
Goldeneye	266	163	438	444	412	331	275	391	221	138	332	180	140%	84%
Bufflehead	0	26	0	40	14	24	43	14	26	179	0	16	-100%	-100%
Ruddy duck	86	110	201	222	219	183	104	86	208	26	332	51	11%	50%
Merganser	15	0	128	204	77	77	65	56	40	82	102	51	25%	100%
TOTAL BROODS	3166	1819	4085	3477	3265	2741	2253	2588	2689	3049	4749	4263	40%	11%

Table 7. Weighted duck brood indices for E. Washington strata and total unweighted brood counts for the Columbia Basin.

Year	Channeled Scablands	Okanogan	Northeast	Palouse	Total Broods	Columbia Basin
1979	6274	420	868	195	7757	
1980	2598	936	715	33	4281	
1981	4435	1041	485	98	6059	
1982	2296	1131	1123	423	4973	
1983	3349	1080	715	293	5437	
1984	4806	1123	791	195	6915	
1985	6133	1614	1123	325	9196	
1986	4743	965	842	293	6843	
1987	4574	1206	1072	325	7177	
1988	1557	1112	749	434	3851	
1989	2395	1023	894	358	4669	
1990	1099	946	894	130	3068	
1991	246	472	1506	130	2355	
1992	317	434	1021	390	2163	
1993	1232	590	613	390	2825	
1994	2587	672	928	130	4316	
1995	555	504	689	195	1943	160
1996	3922	554	945	228	5649	218
1997	1703	1345	1864	184	5095	179
1998	5193	1837	894	163	8086	279
1999	2816	1362	715	163	5055	170
2000	2898	239	536	163	3836	192
2001	2993	423	715	65	4196	167
2002	2360	139	460	65	3024	137
2003	2011	295	919	65	3291	164
2004	440	905	791	130	2266	147
2005	328	482	945	65	1819	178
2006	450	986	1200	65	2701	178
2007	435	984	1864	195	3477	160
2008	945	1413	842	65	3265	61
2009	860	1160	689	33	2741	64
2010	703	854	664	33	2253	51
2011	1155	890	511	33	2588	61
2012	1018	731	842	98	2626	78
2013	1111	1376	817	98	3402	47
2014	759	1633	918	98	3310	76
LTA	2301	893	893	181	4263	140
2014 vs. 2013	-32%	19%	12%	0%	-3%	62%
2014 vs. LTA	-67%	83%	3%	-46%	-22%	-46%

Table 8. Goose nest survey areas in Washington

Survey Area	Year Survey Initiated	Agency Conducting Survey	Frequency of Survey
UPPER COLUMBIA			
Hanford	<1974	WDFW	Biennial
Priest Rapids	<1974	WDFW	Biennial
Wanapum	<1974	WDFW	Periodic
Rocky Reach	1975	Chelan Co. PUD	Annual
Rock Island	<1974	Chelan Co. PUD	Annual
Wells	1980	WDFW	Annual
F.D.R.	1981	WDFW	Periodic
Rufus Woods	1981	Army Corps	Annual
Mouth of Yakima	<1974	WDFW	Biennial
SNAKE RIVER			
Snake River	1975	Army Corps	Annual
Snake River Cliff	1979	Army Corps	Discontinued
MID COLUMBIA			
McNary	<1974	USFWS	Discontinued
John Day	<1974	Umatilla NWR	Biennial
Dalles	<1974	Army Corps	Periodic
Bonneville	1982	Army Corps	Periodic
Tri-Cities	1982	WDFW	Biennial
COLUMBIA BASIN			
Moses Lake	1981	WDFW	Biennial
Potholes Res.	1981	WDFW	Biennial
Lenore, Alkali, Park	1981	WDFW	Periodic
LOWER COLUMBIA			
I-5 to Bonneville	1981	Army Corps	Periodic
I-5 to Puget Island	1981	WDFW	Annual, Biennial starting in 2012

Table 9. Number Canada goose nest counted per region (1974-2014), and total Canada geese observed on duck surveys.

	Canada Goose Nests							Total Geese observed during breeding duck surveys		
Year	Upper Columbia	Snake River	Mid Columbia	Columbia Basin	E WA Total	Lower Columbia	TOTAL	E WA Ground	E WA Aerial	W WA Aerial
1974	279		363		642		642			
1975	297	50	344		691		691			
1976	310	51	345		706		706			
1977	358	51	384		793		793			
1978	329	51	330		710		710			
1979	303	87	292		682		682	2570		
1980	393	112	339		844		844	1925		
1981	500	145	318	249	1212		1215	4053		
1982	509	160	480	484	1633		1637	1203		
1983	656	171	520	541	1888		1892	3225		
1984	618	132	466	601	1817		1817	2305		
1985	630	150	500	757	2037		2037	6674		
1986	641	136	507	765	2049		2049	5225		
1987	745	130	670	702	2247	354	2601	7938		
1988	794	229	723	742	2488	353	2841	5426		
1989	799	227	627	500	2153	527	2680	5605		
1990	808	180	634	518	2140	527	2667	16695		
1991	923	199	637	414	2173	645	2818	8483		
1992	916	236	633	538	2323	531	2854	9483		
1993	858	319	629	628	2434	664	3098	9190		
1994	806	290	662	595	2353	589	2942	9396		
1995	929	261	702	477	2369	600	2969	15017		
1996	944	236	777	501	2458	544	3002	12758		
1997	798	210	711	676	2395	575	2970	13019		
1998	744	210	693	610	2257	522	2779	11199		
1999	783	187	811	315	2096	462	2558	22598		
2000	797	207	816	313	2133	424	2557	23449		
2001	790	214	835	539	2378	496	2874	13307		
2002	751	199	872	629	2451	449	2900	17179		
2003	793	199	782	374	2148	450	2598	17596		
2004	728	199	782	350	2059	478	2537	19137		
2005	626	199	689	584	2098	468	2566	13022		
2006	593	248	753	544	2138	499	2637	19253		
2007	489	217	734	442	1882	422	2304	13244		
2008	451	197	727	485	1860	454	2314	16342		
2009	461	243	749	594	2047	422	2469	14858	25364	
2010	493	241	750	544	2028	403	2431	12014	12782	
2011	499	259	725	599	2082	415	2497	16511	20993	4045
2012	462	255	728	628	2073	412	2485		28347	8231
2013	549	199	803	687	2238	412	2650		26577	6394
2014	508	263	814	632	2217	376	2593		38832	10101
2013 vs. 2014	-7%	32%	1%	-8%	-1%	-9%	-2%			
Long Term Avg.	637	187	623	551	1887	405	2208			
2014 vs. LTA	-20%	41%	31%	15%	17%	-7%	15%			
2014 vs. 20 yr	-24%	18%	7%	18%	1%	-21%	-2%			

WATERFOWL: WINTER POPULATIONS AND HARVEST STATUS AND TREND REPORT
STATEWIDE

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Introduction

This report summarizes the 2013-14 Washington winter waterfowl surveys, waterfowl hunting regulations, waterfowl harvest, and waterfowl hunter trends. This summary compares current data with data collected over the past 30 years in the state as well as the Pacific Flyway. These data are part of a long-term database archived by the Washington Department of Fish and Wildlife (WDFW) Waterfowl Section. Several of the data sets extend back to the late 1940s.

Population surveys

Methods

The primary survey to determine status of wintering waterfowl throughout the Pacific Flyway is the January Midwinter Waterfowl Survey (MWS). This is a coordinated, comprehensive survey of the most important waterfowl wintering areas, using a combination of standardized surveys from fixed-winged aircraft and ground observation locations. The MWS is a combined effort among several agencies, including WDFW, ODFW, Yakama Nation, USFWS, and Canadian Wildlife Service.

WDFW also conducts special winter surveys focused on sea ducks during December and January, as part of the Puget Sound Ecosystem Monitoring Program (PSEMP). Consistent winter aerial surveys of greater Puget Sound began in 1993-94, and have been conducted each year since then (except for 2006-07, due to funding limitations). Survey methods have been peer reviewed by a science panel as part of PSEMP. These surveys sample the entire marine shoreline and open water areas using six depth strata. The transects annually cover 7% to 8% of the marine waters in Puget Sound and the Strait of Juan de Fuca, totaling between 6,400-7,100 km of transects. Population estimates from these surveys represent minimum estimates because observers are not able to detect all birds present within the transect strip, due to environmental conditions (e.g. glare, waves) and reactions of some species to aircraft (e.g. diving, flight).

Because the MWS does not capture migration peaks or patterns of habitat use throughout the fall/winter, additional fixed-wing and ground surveys take place in key wintering areas from October–March. Specific age structure surveys also take place in the north Puget Sound area for snow geese, brant, and swans, along standard ground observation routes.

Midwinter Waterfowl Survey Results

WDFW, tribal, and U.S. Fish and Wildlife Service (USFWS) personnel completed the MWS in January 2014. Washington's midwinter index for total waterfowl was estimated at 1,052,823, an increase of 45% from the previous year and 14% above the 10-year average (2004-2013; Table 1).

The 2014 Pacific Flyway midwinter index for total waterfowl was 5.75 million. This represents a 2% decrease from 2013 (5.88 million), and was 17% below the long-term average (1955-2013).

Ducks--The 2014 midwinter indices for total ducks in the 12 Pacific Flyway states was 4.5 million (Fig. 1), an increase of 7% from the 2013 count (4.2 million) and 25% below the long-term average (1955-2013).

In Washington, the 2014 total wintering duck population was 868,723, up 53% from 2013 levels and 22.2% above the 10-year average (Fig. 2). The Washington total duck count represented 19.2% of the Pacific Flyway wintering population, 14% higher than the state's 10-year average (Fig. 3). The 1991 MWS represents the highest ratio of Washington ducks to total Pacific Flyway (28.6%).

The 2014 mallard total for the Pacific Flyway was 891,871, up 53% from 2013 and 42% below the long-term average (1955-2012). The total number of mallards counted in Washington in 2014 was 529,671, a 108% increase from the previous year, and 46% above the 10-year average (Table 1). Washington typically holds a high percentage of the Pacific Flyway mallard population with a 10-year average of 40% (Fig. 4). In 2014, Washington held 59% of the Pacific Flyway mallards during the MWS.

Results for special Puget Sound winter surveys are presented in Table 2. The current 3-year average for scoters is 53,248, which has declined significantly from the 1994-96 average of 107,214.

Canada geese--Canada geese are often not well represented in midwinter surveys as they forage in widespread agricultural areas, making them difficult to locate during aerial surveys. Wintering Canada goose numbers began to build in the 1990s, when the MWS first indexed over 400,000 geese. The 2014 MWS total for Canada geese in the Pacific Flyway was 614,738. The count increased 85% from 2013, and was 75% above the long-term average.

The number of Canada geese wintering in Washington has been variable over the past 20 years. Canada geese numbered over 90,000 during the winter of 1998-99 and 2000-01. The 2014 total of 82,347 was up 93% from 2013 and 92% above the 10-year average (Table 1, Fig. 5).

Snow geese--The northern population of snow geese that over-winter in Skagit, Snohomish, and Island counties of NW Washington and the Fraser River Delta, B.C. nest primarily on Wrangel Island, Russia. Juvenile snow geese comprised 22.4% of the wintering population in the Fraser and Skagit River Deltas in December 2013. MWS snow goose aerial photo counts by WDFW in late December 2013 numbered 69,685. This represents a 3% increase over the January 2013 count of 67,198 and 2.5% below the 10-year average (Table 1, Fig. 6). There was no report this year regarding nesting conditions at Wrangel Island's Tundra River colony.

Brant--The number of brant counted in Washington during the 2014 midwinter survey was 17,485, a 6% increase from 2013, and 1% below the 10-year average (Table 1, Fig. 7). The number of brant counted during the northern Puget Sound midwinter aerial survey on December 30, 2013 was 10,442; a decrease of about 9% from 2012. The largest concentrations of brant were in Lummi, Padilla, and Samish bays.

Breast color measurements were taken from brant at Skagit County check stations. In 2013-14, 48% of harvested birds (n=84) were gray-bellied (WHA) brant (Mansell 4-8). Since 2006, the WHA harvest composition has ranged from 21-75%.

Swans--The 2014 northern Puget Sound (Skagit, Whatcom, Snohomish, King, and Island counties) trumpeter swan MWS totaled 11,352 (Table 3), a 6% increase from the 2013 count of 10,698. Juveniles accounted for 11.0% of the trumpeters observed (Table 3).

The 2014 northern Puget Sound tundra swan midwinter index was 959, down 55% from the 2013 index (1,491). Juveniles represented 14.2% of the population (Table 3).

Since 1999, trumpeter swans and, to a lesser degree, tundra swans wintering in northwestern Washington and southwestern British Columbia have experienced high rates of mortality due to ingestion of lead shot pellets. Of the 2,332 carcasses collected from 2000-2011, the majority of deaths were lead-related (66%). An average of 18 lead and 7 steel pellets were recovered per gizzard of lead-exposed swans (n=1,736 gizzards, 43,767 pellets). From 2001-2005, a total of 315 trumpeter and tundra swans were trapped and blood samples collected for lead residue analysis. Trumpeter swans were outfitted with VHF radio transmitters (n=243) or satellite transmitters (n=6); 61 tundra swans were fitted with neck collars. Locations of radio-tagged swans were used to identify primary forage and roosting areas. Judson Lake, a major roost site on the Washington/British Columbia border, was identified as a potential source of lead shot ingestion. During the winters of 2006-2009, active hazing activities were used to discourage swans from using the lake. The successful hazing of swans from Judson Lake coincided with an approximate 70% reduction in lead-caused swan mortalities during the first 3 winters (average 67 lead-related mortalities in 2006-09) when compared to the average of 227 lead-related mortalities per year over the previous five years (2001-06). Starting in 2009 hazing at Judson Lake focused on the area of highest lead shot concentration. Bamboo poles and fencing prevented swans from landing in the exclusion area, while allowing them use of about 50% of the lake. The barrier system was successful in excluding swans without an appreciable increase in lead related swan mortality or any swan injuries due to the barrier system. Necropsy results are pending.

Periodic Aerial Survey Results

Aerial waterfowl surveys in northern Puget Sound were accomplished by WDFW. Surveys in the Columbia Basin were conducted cooperatively between USFWS and WDFW (Table 3).

North Puget Sound--The North Puget Sound January 2013 aerial survey totaled 154,585 dabbling ducks. The record high count for this area took place in December 2006 (n=974,180). Waterfowl frequently move between the Fraser River Delta and Boundary Bay, B.C. depending on weather conditions, resulting in high variability in the North Puget Sound survey.

Eastern Washington—MWS results for eastern Washington totaled 497,608 waterfowl. Results of other periodic surveys in the Columbia and Yakima basins are presented in Table 3.

Long-term monitoring of small Canada geese (Lesser and Taverner's) staging on Stratford (Brooke) Lake and Round Lake has taken place since the early 1970s. These lakes are located near the town of Stratford in central Grant County. Both lakes are on private property and are not hunted. Population trends of Washington's small Canada geese have not been well documented because they forage in widespread agricultural areas and are mixed with other subspecies, making them difficult to survey from the air. October staging surveys were originally aerial counts but switched to ground counts in 2006. Survey results (1976-2014) are presented in Figure 8, with 20,500 counted in 2013. The highest historical count was 80,050 in 1984. This population is of concern due to past high harvest return rates of geese in the Columbia Basin that were banded in Alaska. Biologists in WDFW Region 2 have made an effort in recent years to capture and band staging small Canada geese using rocket nets. Additionally, the staging area at Stratford Lake is likely to be impacted by a new alternate feed route for irrigation water through Stratford Lake. The most likely scenario will result in widespread loss of mudflats on the lake that are heavily utilized by geese. The new feed route may be instituted during the 2014-15 season.

Hunting Season Regulations

The 2013-14 waterfowl harvest was regulated under Washington State regulations (Table 4). The federal framework allowed the maximum (107 days) number of days under the Migratory Bird Treaty Act. Washington's season length was 105 days statewide with two additional days for the statewide Youth Hunt on Sept. 21-22. The daily bag-limit was 7 ducks, to include not more than 2 hen mallard, 2 pintail, 3 scaup, 2 canvasback, and 2 redhead statewide; and to include not more than 1 harlequin (season limit), 2 scoter, 2 long-tailed duck, and 2 goldeneye in western Washington (Table 4).

Substantial waterfowl populations in the Pacific Flyway over the last 15 years have allowed for liberal seasons and bag limits (Table 5). The season lengths between 1988-89 and 1993-94 were the most restrictive since 1950. Current regulations are among the most liberal ever offered in Washington and beginning last season hunters could retain three times the daily bag in their possession for most waterfowl (Table 5).

WDFW instituted a new license format for the 1999-00 hunting season. A small game license and big game license replaced a general hunting license. For people who hunted a variety of small game species, there was little change in total costs. For people who hunted waterfowl exclusively, the new format resulted in an increase in cost. Before the 2002-03 hunting season, the cost of a migratory bird validation increased from $6.00 to $10.00 (excluding transaction and dealer fees). A 10% surcharge was added to all WDFW licenses in 2009-10 and 2010-11. The validation was replaced with a migratory bird permit in 2011, and the cost was raised to $15.00. Beginning in 2011-12, hunters of brant, snow geese in Goose Management Area 1, sea ducks in western Washington, and all geese in SW Washington were required to purchase a special $13 migratory bird authorization to obtain harvest record cards for these species (harvest record cards were free before then). The federal migratory bird stamp remained at $15.00 (Table 5).

Goose hunting regulations are structured to protect declining populations of Canada goose subspecies, increase recreational opportunities on expanding populations of Canada geese, simplify regulations, and address damage/nuisance complaints. The number of goose management areas remained at 5 for 2013-14 (Fig. 9).

Prior to 1984, the goose season length in southwest Washington was 93 days, with bag/possession limits of 3/6. Since that time, the season has evolved to 1) conserve the dusky goose subspecies, which has declined in numbers since the 1970s; 2) provide control of agricultural damage resulting from higher numbers of other Canada geese in the area; and 3) provide recreational opportunity. Historic season regulations for SW Washington are presented in Table 6. A special late season damage control hunt initiated in 1995-96 was continued in Area 2A during 2013-14. The season was open Saturdays and Wednesdays during February 1 – March 5, 2014 with a season quota of 5 dusky geese for the area. The season was open to WDFW Master Hunters and youth hunters.

For the 2013-14 season, the Aleutian goose daily bag limit was 1 in Area 2B, but 4 in all other areas. Previously listed as both a federal and state endangered species, Aleutian Canada goose populations have experienced strong population growth in recent years and have caused crop and pasture depredation complaints in coastal agricultural areas, mainly in Oregon and California.

Agricultural depredation by snow geese in Skagit County led to the development of the Snow Goose Quality Hunt Program on Fir Island. Thousands of acres were available as Feel Free to Hunt or Register to Hunt. Numerous complaints of public safety concerns due to unethical snow goose hunting led to special restrictions in Skagit County. Hunters were restricted from discharging a firearm within 100 feet of any paved public road for the purpose of hunting snow geese anywhere in Skagit County. Violation of these rules, trespass, exceeding the snow goose bag limit, or shooting across a paved road resulted in invalidation of the hunter's snow goose authorization for 2013-14 and the subsequent season.

The January-only brant season again took place in 2014, with 8 hunt days allowed in Skagit County and 10 days in Pacific County (Table 4). The Skagit County brant hunt is dependent on a pre-season January count of at least 6,000 brant. In 2014, the Skagit County MWS estimated 6,486 brant (Table 3).

Harvest surveys

Methods

Harvest estimates were based on the Small Game Harvest Questionnaire sent to 10% of the hunting license buyers. Hunters were asked to report the numbers of ducks and geese they harvested by county. The species composition of the waterfowl harvest was derived from a Daily Waterfowl Harvest Report Card Survey. In this survey, cards were sent to 2,500 waterfowl hunters prior to the start of the season to record the species of the birds they bagged. These data were used to tabulate the species composition of the waterfowl harvest.

Because statewide surveys are not accurate enough to measure harvest of several priority waterfowl species, special surveys have been developed that utilize written hunting authorizations and mandatory reporting. The sea duck (harlequin, scoter and long-tailed duck), brant, and snow goose harvest is estimated annually using a mandatory harvest report card for each species. Written authorization and harvest reports have been required of sea duck hunters in all of western Washington since 2004, brant hunters in all hunt areas since 1990, and snow goose hunters in the primary harvest area (Skagit, Island, Snohomish counties) since 1993. Hunters must return a harvest report card in order to be included in the permit mailing the following year. Starting in 2012-13, hunters failing to turn in their harvest reports were charged a $10 administrative fee to obtain a harvest report card the following year. Harvest reports returned by the deadline are included in the analysis as the 'first wave' of respondents. Reminder notices are sent out to hunters with email addresses available, reminding them to return reports. Responses received after the reporting deadline are included as the 'second wave', and then the harvest estimates are computed accounting for non-response bias. Hunters were required to report harvest by species and county with mandatory harvest report cards by February 15, 2014.

The harvest of dusky Canada geese is determined at mandatory hunter check stations in southwest Washington. During 1991-95, WDFW used a key developed by USFWS (Ridgefield NWR) to estimate dusky harvest based on culmen, total tarsus, age, and sex. Beginning in 1996, WDFW used standardized criteria for classifying duskys, where a dusky was classified as a dark-breasted Canada goose (Munsell $\leq$5) with a culmen length of 40-50 mm. Cacklers were classified at the check stations using culmen measurements of $\leq$32 mm. Total tarsus, age, and sex were taken from other geese with culmen >32 mm and <50 mm. The key was then applied via subsequent data analysis to determine subspecies for geese other than duskys and cacklers. Dark geese (Munsell $\leq$5) with culmen >50 mm were classified as Vancouver Canada geese.

WDFW continued enhanced goose hunter training for people who wish to hunt geese in areas 2A and 2B. The training program was initially developed in 1996, and revised in 1997 in conjunction with Oregon DFW. In this program, hunters study a goose identification workbook and are advised to view a training videotape. The study materials, including the video, are available from the WDFW website. The workbook is also available through regular mail from WDFW and the video can also be purchased from a vendor. Originally, hunters took a 40 question written test at one of eight testing locations and could choose from several testing dates. In 2007-08, WDFW provided the opportunity to take tests online, and by appointment at WDFW offices. Hunters are required to pass the test with a minimum score of 80%. Hunters who fail the test are required to wait 28 days before retesting.

Waterfowl Harvest Survey Results

The 2013-14 Washington duck harvest of 407,925 decreased 18.6% from the 2012-13 harvest of 501,094. The duck harvest in Washington declined steadily from over 1,000,000 in the late 1960s, to a low of 242,516 in 1993-94 (Fig. 10). Duck harvest rates in Washington have stabilized over the past 10 years, averaging approximately 424,000 birds annually.

Mallards comprised 47% of Washington's 2013-14 harvest, followed by American wigeon (14%), American green-winged teal (9%), and northern pintail (7%; Table 7).

The total Canada goose harvest for 2013-14 was 53,349, down <0.01% from the 2012-13 harvest of 53,595. A record low harvest of 26,479 occurred in 2004-05; the record high harvest (72,721) occurred in 2006-07. During recent years, the presence of resident large Canada geese has increased in Washington, which has contributed to an overall increasing trend in harvest (Fig. 11). The 2013-14 large Canada goose harvest (33,385) was up 27.8% from the previous year and 30% above the long-term average.

The harvest of small Canada geese in 2013-14 (19,964) decreased 27% from the previous year, but was 6% above the long-term average (Fig. 11). The highest recorded harvest of small Canada geese in Washington was 47,270 in 1979-80. The lowest harvest (8,880) took place in 2003-04. The reasons for the dynamic small goose harvest are uncertain.

Waterfowl harvest is summarized by WDFW administrative regions in Table 8 and Fig. 12. Region 2 has traditionally represented the highest percentage of the state's waterfowl harvest. However, for the 2013-14 season, Region 4 accounted for 25% of the harvest followed by Regions 2 (22%) and 3 (19%). The proportion of duck harvest was highest in Region 4 (26%), followed by Regions 2 (21%) and 3 (19%). Region 2 accounted for the highest proportion of goose harvest (29%), followed by Regions 3 (21%), and 1 (19%).

Mandatory Harvest Reporting Results

Restrictive bag limits for most sea ducks were maintained for western Washington in 2013-14. Concerns about low recruitment rates in sea ducks, increasing interest in sea duck hunting, and the unknown impact of reduced sea duck bag limits on compensatory species, particularly Barrow's goldeneyes, led to the measure. The harvest survey indicated a total harvest of 1,303 scoters, 242 long-tailed ducks, 164 harlequin ducks and 461 goldeneyes (Fig. 13, Table 9). The reported goldeneye harvest included 45% common goldeneye. From a total of 1,961 authorizations, an estimated 544 hunters were successful and hunted a total of 1,177 days. Primary harvest areas included Island, Mason, Skagit, Clallam, and Whatcom counties.

The 2013-14 pre-season count of brant in Padilla/Samish/Fidalgo Bays was above the threshold of 6,000, allowing a January brant season in Skagit and Pacific counties. The statewide harvest of brant was 505, 20% below the 2012-13 estimate of 604 (Fig. 14, Table 10).

The 2013-14 snow goose harvest was estimated at 5,721, down 2% from the 2012-13 harvest of 5,859. Snow goose harvest in Washington is historically variable (Table 11, Fig. 15) depending on several factors including age and production of the Wrangel Island snow goose flock. In addition, the harvest of snow geese in northern Puget Sound is weather dependent, with high wind events leading to greater harvest. This factor, as well as proportion of juveniles, may be of greater importance to harvest than total abundance, because the erratic annual harvest (Fig. 15) does not follow the number of geese counted in Washington during the MWS (Fig.6). These geese have recently expanded their wintering range in northeastern Washington to portions of Snohomish and King Counties.

In the southwest Washington goose season, hunters who passed the identification test in 1996-2013 and didn't take a dusky in 2012-13 were authorized to hunt in 2013-14. New hunters and those harvesting duskys in 2012-13 were required to take a new test to obtain an authorization. A total of 1,463 permits were issued in 2013-14. The number of harvested duskys remained below the quotas, allowing Zones 1-5 to remain open throughout the regular seasons. The percentage of duskys in the harvest was 1%, unchanged from 2012-13. A total of 1,990 geese were checked during the regular season, an 8% decrease from last year and 10% below the 3-year average of 2,213 (Table 12, Fig. 16). A total of 401 individuals checked birds at check stations during the 2013 regular season. The 2013 late season had 58 Master Hunter program participants, of which 42 checked geese at check stations, similar to the 2013 season. Total late season harvest was 245 geese, which was 20% above the 2012-13 late season estimate and 8% above the 3-year average. A combination of uniformed and undercover officers documented hunter compliance through individual field checks throughout the regular and late seasons.

Compliance with regulations was estimated to remain within acceptable levels as determined by past emphasis patrols.

Hunter Numbers and Success

The Washington small game hunter survey was used to estimate the number of waterfowl hunters in the state. During the 2013-14 season, an estimated 25,967 hunters participated in the Washington waterfowl season, down 1.6% from 2012-13 (Fig. 17). The decline in waterfowl hunters followed a slight increase of hunters through the 1990s, although waterfowl stamp and permit sales have been stable since the early 1990s. Prior to that, there was a steady decline in hunters through the 1980s (Fig. 17). The 2004-05 estimate of Washington waterfowl hunters (23,078) was the lowest on record.

The estimated average number of ducks harvested per hunter in 2013-14 was 15.7. Hunter success, based on ducks harvested per hunter per year, has been on an upward trend since the mid-1990s (Fig. 18). Therefore, it appears the downward trend in duck harvest (Fig. 10) is more related to hunter numbers (Fig. 17) than decreased annual hunter success. The high success rate may indicate that the state has retained many avid and successful waterfowl hunters.

Members of the hunting public often believe the decline in hunter numbers is a result of the restrictive regulations that began in the mid-1980s (Table 5). This may have contributed to the reduced hunter participation (Fig. 17), but the downward trend in hunter numbers began in the early 1980s when there was a 7 duck daily bag limit, no special restrictions on mallards and pintails, and season lengths were 93 west and 100 east (Table 5). The decline in hunter numbers is likely a result of changes in social views on hunting and lack of recruitment of new hunters.

The quality of waterfowl hunting opportunities in Washington is good. Decreased hunter numbers result in lower hunter densities in the field and success has remained stable to increasing. In addition, the state is holding a large percentage of the Pacific Flyway's ducks. Urban encroachment in traditional hunting areas will be one of the biggest challenges faced by waterfowl hunters and managers. Regardless, the value of Washington’s waterfowl resources remains high and provides quality hunting recreation for the state’s hunting population.

WDFW has recognized a decline of quality hunting opportunities found on public hunting areas. In response, WDFW has developed initiatives to address public hunting opportunities on public and private lands. In 2013-14 there were 5 regulated access areas (RAA) on WDFW lands, including Winchester Ponds and Frenchman Ponds in Region 2, and Bailie Youth Ranch, Mesa Lake, and Windmill Ranch in Region 3. WDFW also continued the Fir Island Snow Goose Quality Hunt in Region 4 and maintained and expanded a private lands access program for waterfowl hunting in Regions 2, 3, and 4. Some of these programs featured limited access designed to reduce hunter crowding and/or limit waterfowl disturbance (Fig. 19).

RECOMMENDATIONS

- Monitor and evaluate success of quality hunt areas and snow goose quality hunt.
- Provide summary of mallard and Canada goose band returns.

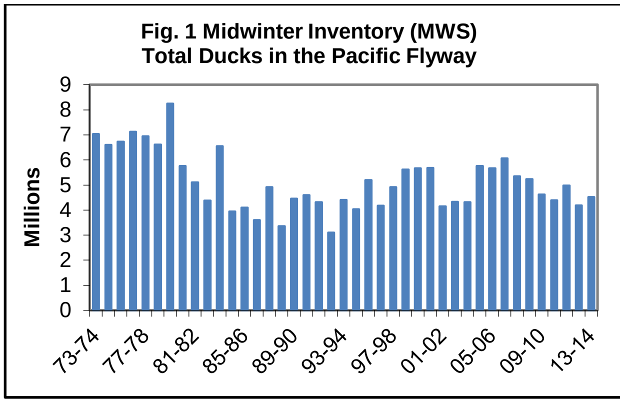


Fig. 1 Midwinter Inventory (MWS)
Total Ducks in the Pacific Flyway
Millions
0
1
2
3
4
5
6
7
8
9
73-74
77-78
81-82
85-86
89-90
93-94
97-98
01-02
05-06
09-10
13-14

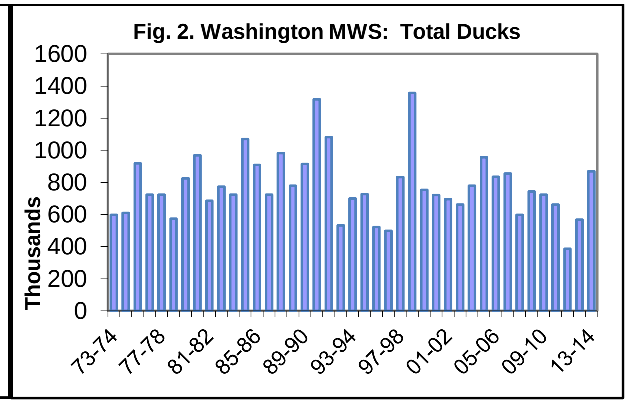


Fig. 2. Washington MWS: Total Ducks
Thousands
0
200
400
600
800
1000
1200
1400
1600
73-74
77-78
81-82
85-86
89-90
93-94
97-98
01-02
05-06
09-10
13-14

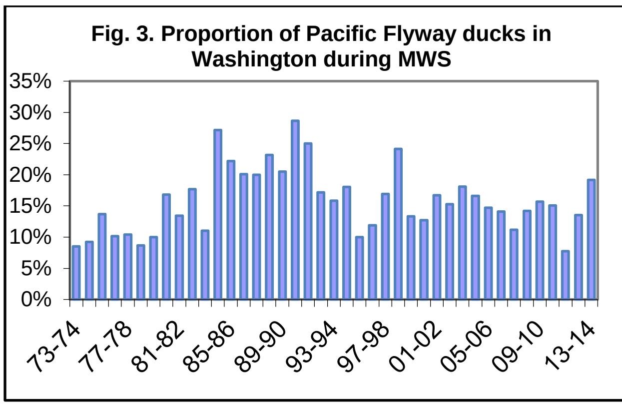


Fig. 3. Proportion of Pacific Flyway ducks in
Washington during MWS
0%
5%
10%
15%
20%
25%
30%
35%
73-74
77-78
81-82
85-86
89-90
93-94
97-98
01-02
05-06
09-10
13-14

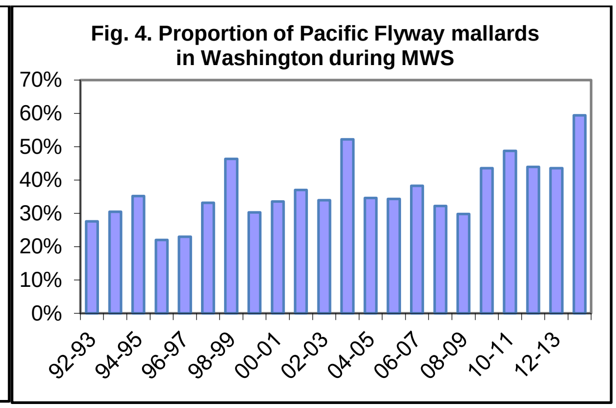


Fig. 4. Proportion of Pacific Flyway mallards
in Washington during MWS
0%
10%
20%
30%
40%
50%
60%
70%
92-93
94-95
96-97
98-99
00-01
02-03
04-05
06-07
08-09
10-11
12-13

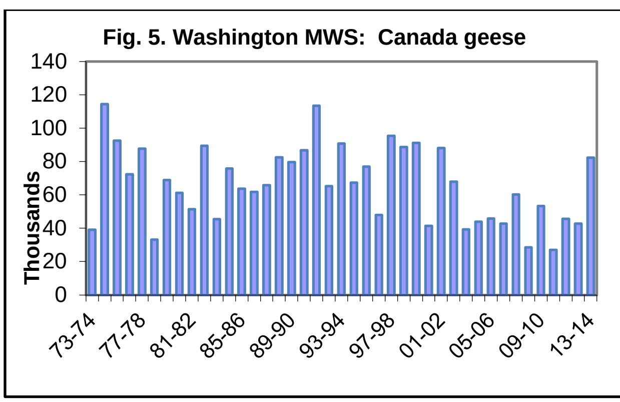


Fig. 5. Washington MWS: Canada geese
Thousands
0
20
40
60
80
100
120
140
73-74
77-78
81-82
85-86
89-90
93-94
97-98
01-02
05-06
09-10
13-14

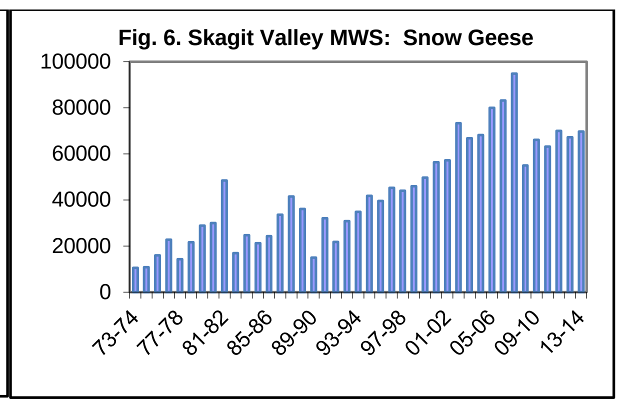


Fig. 6. Skagit Valley MWS: Snow Geese
0
20000
40000
60000
80000
100000
73-74
77-78
81-82
85-86
89-90
93-94
97-98
01-02
05-06
09-10
13-14

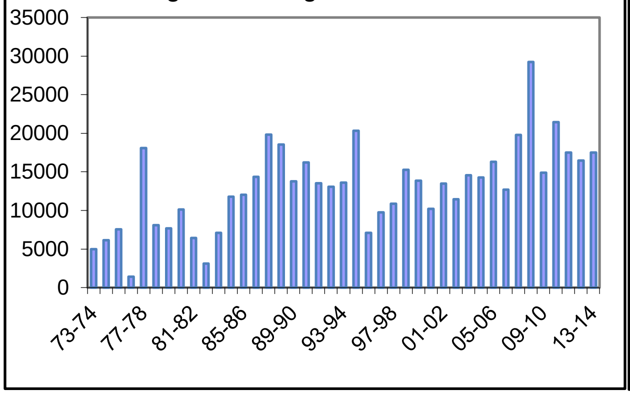


Fig. 7. Washington MWS: Brant

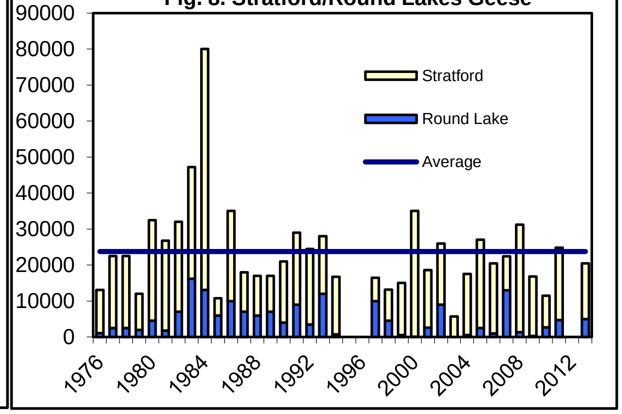


Fig. 8. Stratford/Round Lakes Geese

Figure 9. Washington Goose Management Areas

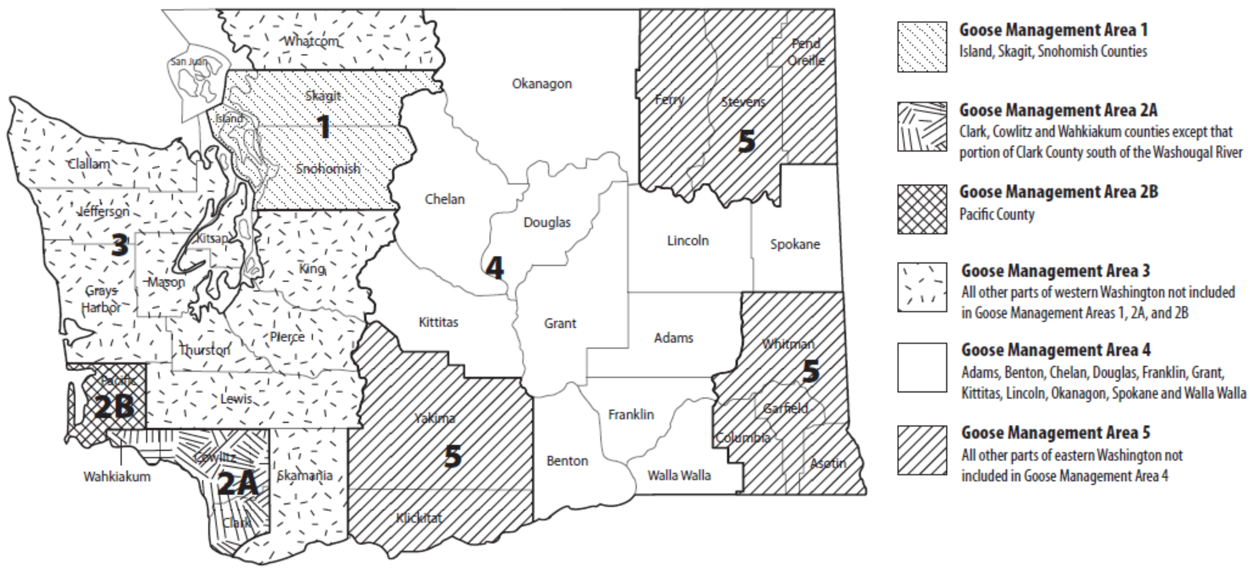


Figure 10. Total harvest of ducks in Washington (1962 – 2013)

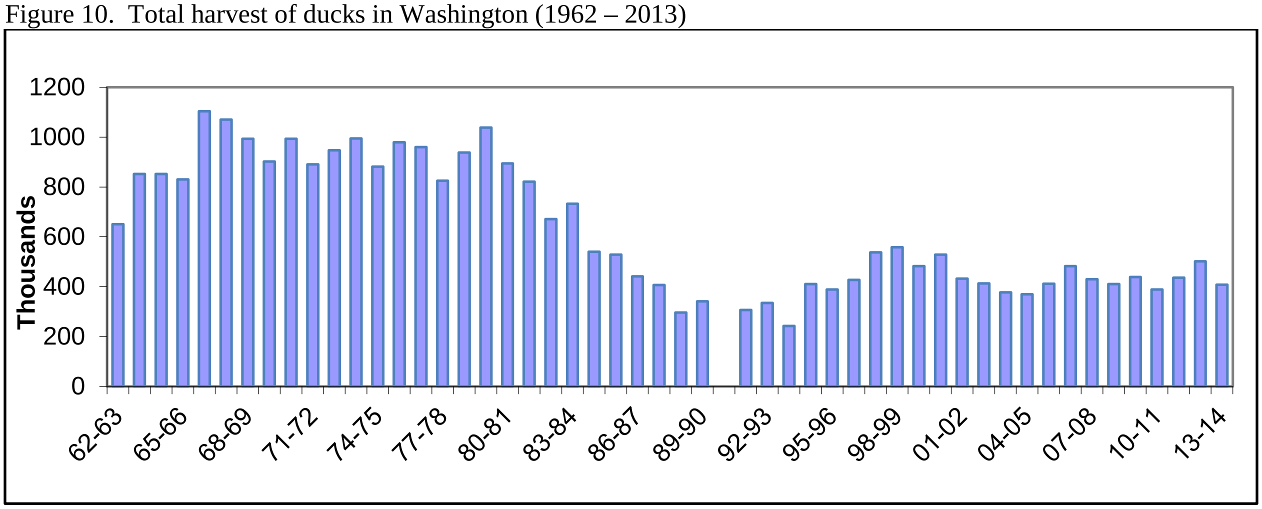
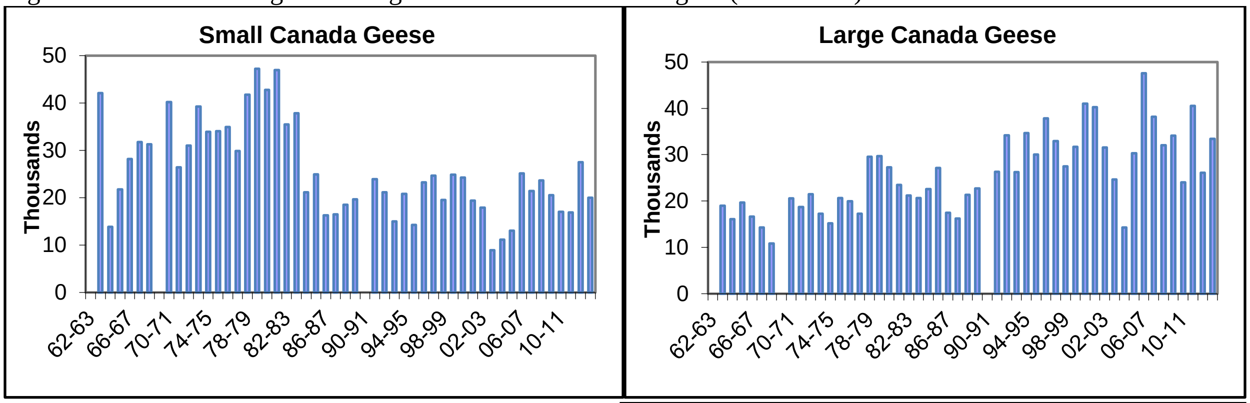
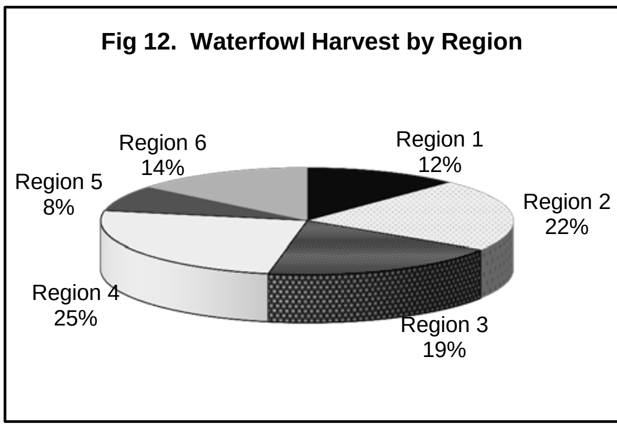
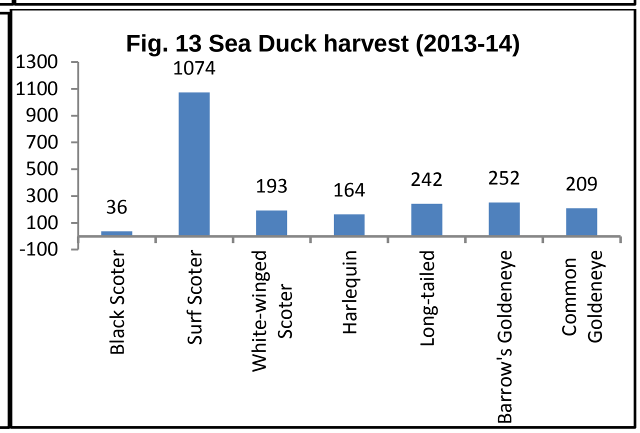
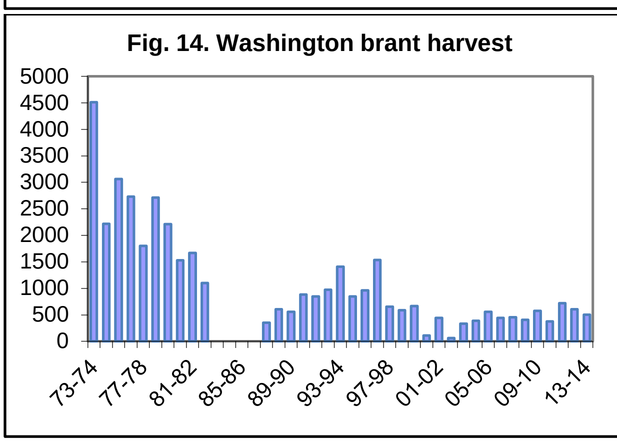


Figure 11. Small and large Canada goose harvested in Washington (1962-2013)









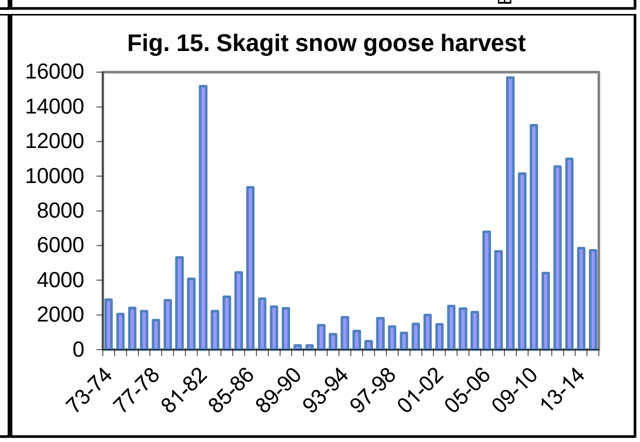
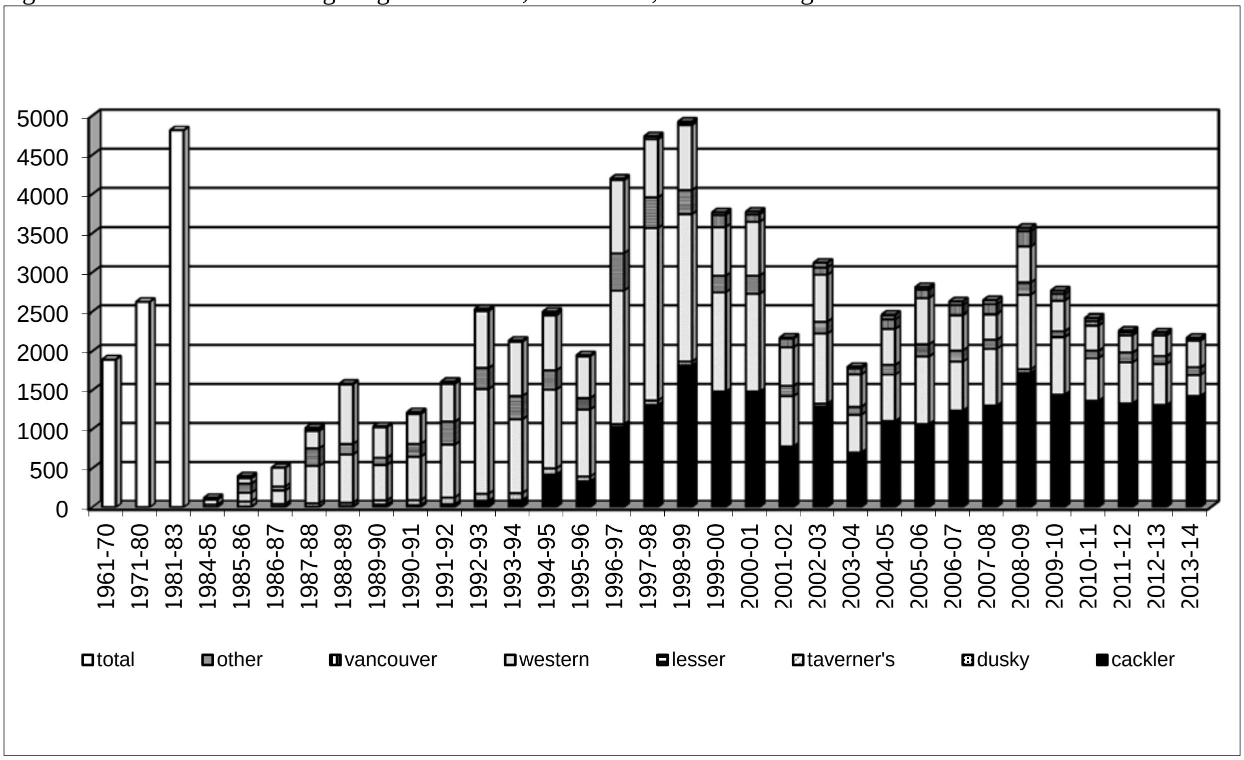


Figure 16. Southwest Washington goose harvest, 1970-2014, Goose Management Areas 2A and 2B



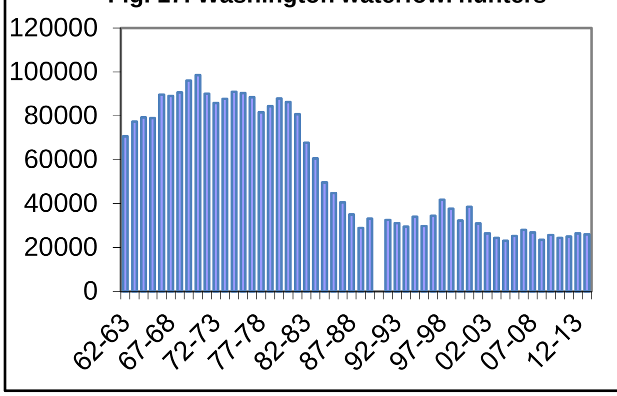


Fig. 17. Washington waterfowl hunters

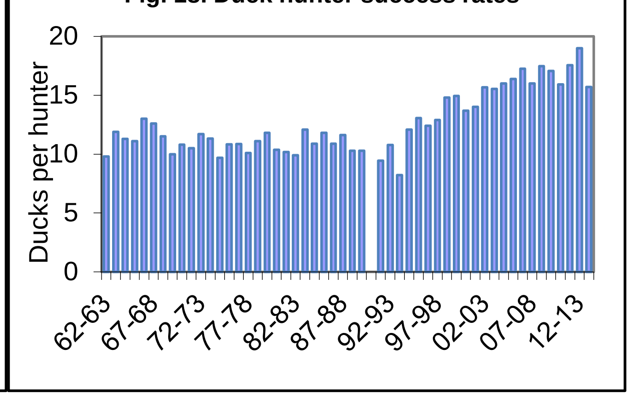


Fig. 18. Duck hunter success rates

Figure 19. The regulated access program promotes quality hunting opportunities by reducing hunting pressure.

Table 1. Washington Department of Fish and Wildlife Midwinter Waterfowl Survey (MWS) – January 2014.

Species	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	14 vs 13	14 vs. 10yr	04-13 avg.
Mallard	432570	470186	374881	494597	313871	254655	405604	349790	282601	254057	529671	108%	46%	363281
Gadwall	9252	10904	5780	5314	5854	5324	6877	4149	3790	4236	2209	-48%	-64%	6148
Wigeon	151981	195798	170491	90734	89614	207236	126059	106149	101072	102264	112831	10%	-16%	134140
Green-winged Teal	14565	33358	29492	30947	15506	15175	11554	18795	16225	8559	14196	66%	-27%	19418
B.W. & Cinn. Teal	11	4	5	272	2	12	20	335	9	3	4	33%	-94%	67
Shoveler	3445	2553	4130	8763	2210	2671	2474	919	5419	2793	3872	39%	9%	3538
Pintail	49567	117296	94327	113949	45848	117235	40787	71083	73635	66024	71339	8%	-10%	78975
Wood Duck	132	472	173	99	378	309	1406	501	380	150	9796	6431%	2349%	400
Redhead	2621	4795	13026	3645	2443	4668	3550	4015	2501	3226	1132	-65%	-75%	4449
Canvasback	3350	2929	2504	1501	3790	3239	3789	3148	2157	1528	462	-70%	-83%	2794
Scaup	40744	34884	52519	29711	35052	40306	43003	31118	49304	52394	41984	-20%	3%	40904
Ringneck	4583	8358	8507	12642	16568	19740	8763	5192	5415	3937	5327	35%	-43%	9371
Goldeneye	14035	15941	19184	13973	15106	15976	14578	14457	11599	13570	10700	-21%	-28%	14842
Bufflehead	20009	23293	21857	17511	21230	25510	21609	19451	24019	19830	29131	47%	36%	21432
Ruddy Duck	2936	1937	1718	2179	3096	1508	1428	1180	2026	1744	2353	35%	19%	1975
Eider	0	0	0	0	0	0	0	0	0	0	0	0%	0%	0
Scoter	15876	16753	18265	15307	16742	12585	10445	11944	13432	13677	13287	-3%	-8%	14503
Long-tailed Duck	478	654	927	804	504	547	439	663	652	722	867	20%	36%	639
Harlequin	963	793	1015	733	902	670	839	692	1067	918	961	5%	12%	859
Merganser	10495	10202	8355	7443	6377	6523	7894	8775	8302	8262	8771	6%	6%	8263
Unidentified Ducks	2660	5869	7458	4731	2515	9981	13440	5507	0	2765	9180	232%	67%	5493
Snow Goose*	66801	47111	80060	75141	82583	55016	66176	38976	49699	56973	50354	-12%	-19%	61854
White-fronted Goose	5	27	17	82	42	119	22	113	36	47	24	-49%	-53%	51
Canada Goose	39301	43908	45857	42759	60131	28629	53259	26999	45641	42686	82347	93%	92%	42917
Brant	14544	14286	16305	12712	19775	29243	14895	21457	17502	16454	17485	6%	-1%	17717
Tundra Swan**	1447	2778	3422	3548	3570	3380	3211	2544	2247	1652	1171	-29%	-58%	2780
Trumpeter Swan**	3996	5508	7904	9104	7747	9852	9457	9984	7603	11043	11623	5%	41%	8220
Unknown Swan**	2432	2381	232	842	292	1100	540	221	1775	2381	3609	52%	196%	1220
Total Waterfowl	**908799**	**1072978**	**988411**	**999043**	**771748**	**871209**	**872118**	**758157**	**728108**	**691895**	**1034686**	**50%**	**19%**	**866247**
Coot	91387	105522	119856	72265	69305	101951	84543	54017	48978	51996	43827	-16%	-45%	79982
B.C. Snow Geese	0	21030	0	8007	12276	2495	7788	24285	22265	10225	19633	92%	81%	10837

**Comprehensive western Washington swan surveys in 1989, 1991, 1996, 2001, 2006, 2011

Table 2. Puget Sound winter survey estimates

	Scoters				Goldeneye				Bufflehead				Harlequin Duck				Long-tailed Duck				Mergansers			
Year	Pop	SE	95CL	90CL	Pop	SE	95CL	90CL	Pop	SE	95CL	90CL	Pop	SE	95CL	90CL	Pop	SE	95CL	90CL	Pop	SE	95CL	90CL
1994	*99953*	*11826*	23180	19395	42884	3636	7127	5963	42884	3636	7127	5963	3328	432	846	708	2823	586	1149	961	12176	1287	2522	2110
1995	*125287*	*8390*	16445	13760	53273	3005	5890	4928	81124	5964	11689	9781	3323	502	984	823	15872	2288	4484	3752	20367	2823	5533	4629
1996	*96403*	*5686*	11144	9324	32460	2639	5172	4328	62021	7551	14800	12384	4112	653	1279	1070	6935	1194	2340	1958	16592	1159	2271	1900
1997	*101186*	*6775*	13279	11111	32084	4074	7984	6681	54498	2925	5734	4797	3946	493	967	809	7898	1557	3051	2553	13452	1186	2325	1946
1998	*81967*	*6023*	11805	9877	23206	1866	3657	3060	39218	1872	3670	3071	3544	629	1234	1032	5676	1420	2783	2329	7739	574	1125	941
1999	*90088*	*6961*	13643	11416	27307	2029	3976	3327	46245	2538	4974	4162	3114	377	739	618	5057	590	1156	967	13024	1830	3586	3001
2000	*85942*	*4898*	9599	8032	28370	2955	5791	4846	41502	2101	4118	3446	4009	671	1315	1100	3530	371	727	609	10510	677	1327	1111
2001	*76720*	*4698*	9209	7705	31201	2270	4449	3722	57338	3559	6976	5837	3150	591	1159	970	9399	1867	3658	3061	17247	1226	2403	2011
2002	*68348*	*4402*	8628	7220	26789	2222	4355	3644	38512	2353	4612	3859	2887	450	882	738	4052	519	1018	852	11937	1005	1971	1649
2003	54673	3021	5921	4955	32384	2390	4684	3919	68485	2902	5688	4760	3082	294	576	482	5583	579	1135	950	16953	1215	2381	1992
2004	67820	4573	8963	7500	28526	2253	4416	3695	52427	2254	4418	3697	3709	512	1004	840	4006	817	1601	1339	11361	704	1381	1155
2005	66506	3801	7450	6233	25094	1496	2933	2454	46674	1994	3907	3269	2915	301	590	494	5651	568	1114	932	15318	903	1770	1481
2006	67169	4556	8929	7472	25321	2016	3950	3306	50588	2332	4570	3824	3073	312	612	512	4601	541	1061	888	13629	1052	2062	1726
2007																								
2008	66694	5353	10492	8779	25348	2001	3922	3282	50797	2278	4466	3737	3350	377	739	618	4832	632	1239	1037	11079	956	1874	1568
2009	47781	3081	6039	5053	24593	2151	4215	3527	42344	1750	3430	2870	2325	267	524	439	4041	593	1163	973	13087	891	1746	1461
2010	42318	2731	5352	4478	24618	2545	4987	4173	50507	2414	4730	3958	2844	242	475	397	4754	649	1272	1065	16547	1420	2783	2329
2011	44584	1984	3889	3254	20461	1639	3213	2688	41208	1853	3632	3039	1853	205	401	335	4992	560	1097	918	10703	685	1342	1123
2012	51451	2569	5035	4213	21719	1435	2813	2354	54874	2475	4852	4060	3250	296	581	486	4373	462	906	758	15891	1113	2181	1825
2013	54190	3214	6300	5271	25938	2526	4952	4143	48017	2007	3934	3292	2970	292	572	478	5021	476	933	780	17875	2217	4344	3635
2014	54103	5891	11547	9662	24574	1656	3246	2716	67187	2972	5824	4873	2913	342	671	561	6138	631	1237	1035	20763	1797	3522	2947

Table 3. 2013-14 waterfowl surveys conducted in the Columbia Basin; waterfowl surveys, snow goose photo counts, aerial brant surveys, age-ratio counts conducted in North Puget Sound.

North Columbia Basin	**Oct.**	**Nov. 21**	**Dec.**	**Jan. 7,9**
Mallards		100,574		85,804
Total Ducks		146,878		93,765
Total Geese	No	32,816	No	4,152
Total Swans	Survey	96	Survey	57
Total Coots		42,215		6,850
SURVEY TOTAL		221,722		97,974
South Columbia Basin	**Oct.**	**Nov. 23**	**Dec.**	**Jan. 7,9**
Mallards		89,914		236,432
Total Ducks		107,539		261,414
Total Geese	No	32,049	No	39,905
Total Swans	Survey	116	Survey	20
Total Coots		60,187		17,438
SURVEY TOTAL		199,891		318,777
Yakima Basin	**Oct.**	**Nov.**	**Dec.**	**Jan. 7,9**
Mallards				45
Total Ducks				8,408
Total Geese	No	No	No	0
Total Swans	Survey	Survey	Survey	0
Total Coots				670
SURVEY TOTAL				9,078
Northern Puget Sound	**Oct.**	**Nov. 11**	**Dec. 11**	**Jan. 3**
Mallards		37,900	114,125	88,285
Northern pintail		22,550	37,225	48,630
American wigeon	No	26,650	35,585	38,979
Green-winged teal	Survey	3,250	4,025	8,110
TOTAL DABBLERS		90,350	190,960	184,004

Snow Goose Aerial Photo Counts	**Date**	**Skagit/ Snohomish/ Island Co.**	**Fraser**	**Total**	**% Young**
	12/4/13	44,410	30,903	75,313	
	12/23/13	50,052	19,633	69,685	23.8%

Brant Aerial Surveys	**Date**	**Skagit Co.**	**Whatcom Co.**	**Total**	
	12/30/13	6,486	3,956	10,442	

Swan Age Ratios - North Puget Sound MWS

Species	**Sample size**	**Juveniles**	**% Young**	
Trumpeter Swan	11,352	1,125	11.0%	
Tundra Swan	959	136	14.2%	

Table 4. 2013-14 Washington migratory bird season regulations

Species	Area	Season Dates (inclusive)/Restrictions	Daily Bag Limit	Possession Limit
Duck	Statewide	Sept. 21-22 (Youth Hunting Only[a])	7[b]	14[b]
		Oct. 12-16 & Oct. 19 - Jan. 26	7[b]	21[b]
Coot	Statewide	Sept. 21-22 (Youth Hunting Only[a])	25	50
		Oct. 12-16 & Oct. 19 - Jan. 26	25	25
Snipe	Statewide	Oct. 13-17 & Oct. 19 - Jan. 26	8	24
Canada Goose Early Seasons	Goose Mgmt Areas 1 & 3	Sept. 10-15	5	10
	Goose Mgmt Area 2A	Sept. 10-15	3	6
	Goose Mgmt Area 2B	Sept. 1-15	5	10
	Goose Mgmt Areas 4 & 5	Sept. 14-15	3	6
	Statewide (except Goose Mgmt Areas 2A & 2B)	Sept. 21-22 (Youth Hunting Only[a])	4	8
Goose (except Brant)	Goose Mgmt Area 1	Snow, Ross', or Blue Goose : Oct. 12 - Jan. 26[c]	4	12
		Other geese: Oct. 12-24 & Nov. 2 - Jan. 26		
	Goose Mgmt Area 2A	All areas except Ridgefield National Wildlife Refuge: 8 a.m. to 4 p.m., Saturdays, Sundays, & Wednesdays only Nov. 9- Dec. 1, & Dec. 11 - Jan. 26, except closed Dec. 25 & Jan. 1	4[d]	12[d]
		Ridgefield National Wildlife Refuge: 8 a.m. to 4 p.m. Tuesdays, Thursdays, & Saturdays only Nov. 9-30 & Dec.12 - Jan. 25 except closed Nov. 28	4[d]	12[d]
	Goose Mgmt Area 2B	8:00 a.m. to 4:00 p.m., Saturdays, & Wednesdays only Oct. 12-23 and Nov. 2 - Jan. 18	4[d]	12[d]
	Goose Mgmt Area 3	Oct. 12-24 & Nov. 2 - Jan. 26	4	12
	Goose Mgmt Area 4	Saturdays, Sundays, & Wednesdays only: Oct. 12 – Oct. –Jan.19; Nov. 11, 28, 29 ; Dec. 26, 27, 30, 31; & every day Jan. 20-26	4	12
	Goose Mgmt Area 5	Oct. 12-14 & Oct. 19 - Jan. 26	4	12
Brant	Skagit County	Jan. 11, 12, 15, 18, 19, 22, 25, 26 **Note:** If Skagit County pre-season. brant population is below 6,000 (determined by early January survey), this season will be canceled.	2	6
	Pacific County	Jan. 4, 5, 7, 9, 11, 12, 14, 16, 18, 19	2	6

a. Special youth hunting season open to hunters under 16 years of age (must be accompanied by an adult at least 18 years old who is not hunting).

b. Daily bag limit: to include not more than 2 hen mallard, 2 pintail, , 1 canvasback, and 2 redhead statewide; and to include not more than 1 harlequin, 2 scoter, 2 long-tailed duck, & 2 goldeneye in western Washington. Possession limit: to include not more than 4 hen mallard, 4 pintail, 2 canvasback, and 4 redhead statewide; and to include not more than 1 harlequin, 4 scoter, 4 long-tailed duck, and 4 goldeneye in western Washington. Season limit: 1 harlequin in western Washington. Scaup season closed Oct. 12- Nov. 1.

c. Skagit County Special Restrictions: While hunting snow geese, if a hunter is convicted of 1) trespass, 2) shooting from across or along the maintained part of any public highway, 3) discharging a firearm for the purpose of hunting waterfowl within 100 feet of any paved public road on Fir Island or discharging a firearm for the purpose of hunting snow geese within 100 feet of any paved public road in other areas of Skagit County, or 4) exceeding the daily bag limit for snow geese, written authorization will be invalidated for the remainder of the current snow goose season and an authorization will not be issued for the subsequent snow goose season.

d. Daily bag limit: to include not more than 1 dusky Canada goose and 3cackling geese in Areas 2A & 2B; and to include not more than 1 Aleutian goose in Area 2B. Possession limit: to include not more than 1 dusky Canada goose and 6 cackling geese in Areas 2A & 2B; and to include not more than 2 Aleutian geese in Area 2B. Season limit: 1 dusky Canada goose. A dusky Canada goose is defined as a dark breasted (Munsell 10 YR, 5 or less) Canada goose with a culmen (bill) length of 40-50 mm. A cackling goose is defined as a goose with a culmen (bill) length of 32 mm or less.

Table 5. Significant historical changes in duck hunting regulations.

	Season		Bag Limit		Special Limits		Stamp Fees		Hunting	Steel shot
Year(s)	East	West	East	West	Mallard	Pintail	State	Federal	License	Regulation
73-74	100	93	6	5	-	2 extra	-	$5.00	$6.50	-
74-75	100	93	6	5	-	-	-	5.00	6.50	-
75-76	100	93	7	7	-	-	-	5.00	6.50	-
76-77	100	93	7	7	-	-	-	5.00	7.50	-
77-79	100	93	7	7	-	-	-	5.00	7.50	3 zones[1]
79-80	100	93	7	7	-	-	-	7.50	7.50	" "
80-82	100	93	7	7	-	-	-	7.50	7.50	1 zone[2]
82-84	100	93	7	7	-	-	-	7.50	10.50	" "
84-85	100	93	7	7	-	4	-	7.50	10.50	" "
85-86	84	79	5	5	5 (1 ♀)	5 (1♀)	-	7.50	12.00	" "
86-87	86	79	5	5	4 (1 ♀)	4 (1♀)	5.00	7.50	12.00	Large zones[3]
87-88	86	79	5	5	4 (1 ♀)	4 (1♀)	5.00	12.00	12.00	" "
88-91	66	59	4	4	3 (1 ♀)	1	5.00	12.00	12.00	" "
91-94	66	59	4	4	3 (1 ♀)	1	6.00	15.00	15.00	Steel statewide
94-95	76	69	4	4	3 (1 ♀)	1	6.00	15.00	15.00	" "
95-96	100	93	6	6	6 (1♀)	2	6.00	15.00	15.00	Bismuth-tin added
96-97	100	93	7	7	7 (1 ♀)	2	6.00	15.00	15.00	" "
97-98	106[5]	106[5]	7	7	7 (2 ♀)	3	6.00	15.00	15.00	Tungsten-iron added
98-99	106[5]	106[5]	7	7	7 (2 ♀)	1	6.00	15.00	15.00	Tungsten-polymer added
99-00	106[5]	106[5]	7	7	7 (2 ♀)	1	6.00	15.00	30.00[4]	Tungsten-matrix added
00-01	105[6]	105[6]	7	7	7 (2 ♀)	1	6.00	15.00	30.00	" "
01-02	105[6]	105[6]	7	7	7 (2 ♀)	1	6.00	15.00	30.00	Tungsten-nickel-iron added
02-03	105[6]	105[6]	7	7	7 (2 ♀)	1[7]	10.00	15.00	30.00	TINT[8] added
03-04	105[6]	105[6]	7	7	7 (2 ♀)	1[9]	10.00	15.00	30.00	" "
04-05	105[6]	105[6]	7	7	7 (2 ♀)	1[10]	10.00	15.00	30.00	Tungsten-bronze, and tungsten-Tin-bismuth added
05-06	105[6]	105[6]	7	7	7 (2 ♀)	1	10.00	15.00	30.00	" "
06-07	105[6]	105[6]	7	7	7 (2 ♀)	1	10.00	15.00	30.00	Tungsten-iron-copper-nickel, Tungsten-tin-iron added
07-08	105[6]	105[6]	7	7	7 (2 ♀)	1	10.00	15.00	30.00	Tungsten-tin-iron-nickel added
08-09	105[6]	105[6]	7	7	7 (2 ♀)	1	10.00	15.00	30.00	
09-10	105[6]	105[6]	7	7	7 (2 ♀)	2	11.00	15.00	36.00	
10-11	105[6]	105[6]	7	7	7 (2 ♀)	2	11.00	15.00	36.00	
11-12	105[6]	105[6]	7	7	7 (2 ♀)	2	15.00	15.00	38.00	
12-13	105[6]	105[6]	7	7	7 (2 ♀)	2	17.00	15.00	40.50	
13-14	105[6,a]	105[6,a]	7	7	7 (2 ♀)	2	17.00	15.00	40.50	

[1]Non-toxic shot zones were established at Barney Lake, Skagit Bay, and the Columbia River flood plain.
[2]Only Barney Lake was retained as a non-toxic shot zone.
[3]Steel shot in progressively larger zones from 86-87 through 91-92 when steel shot was required statewide.
[4]New small game license format.
[5]Youth hunt one additional day
[6] Youth hunt two additional days
[7]pintail season limited to 62 days (Sept. 21-22; Oct.5-11; Oct 26-Dec. 17)
[8]tungsten-iron-nickel-tin shot
[9] pintail season limited to 62 days (Sept. 20-21; Oct. 11-15, Dec. 2-Jan. 25)
[10]pintail season limited to 62 days (Sept. 18-19; Oct. 16-20; Dec. 7-Jan. 30)
[a] scaup (lesser and greater) season limited to 86 days (Nov. 2-Jan. 26)

Table 6. History of southwest Washington Canada goose season regulations

Year	Season	ID Class	Quota	Scheduled Dates (# days)	Closure (# Days Hunted / Sched.)
<1984	Regular	No	No	mid-Oct. to mid-Jan.	None (93)
1984-85	Regular	No	No	Nov. 17-Dec. 16 (30)	Dec. 4 (18/30)
1985-86	Regular	All	40	Nov. 17-Dec. 29 (43)	Nov. 22 (6/43)
1986-87	Regular	All	90	Nov. 15-Jan. 4 (15)	No (15/15)
1987-88	Regular	All	90	Nov. 14-Jan. 10 (17)	No (17/17)
1988-89	Regular	New	90	Nov. 13-Jan. 7 (16)	No (16/16)
1989-90	Regular	New	45	Nov. 26-Jan. 13 (8)	Jan. 2 (6/8)
1990-91	Regular	All	45	Nov. 25-Jan. 12 (8)	Dec. 27 (5/8)
1991-92	Regular	New	90	Nov. 23-Jan. 11 (15)	CC(4/15),RF(11/15),PW(15/15)*
1992-93	Regular	New	90	Nov. 29-Jan. 16 (15-23)	CSC(6/15),RF(8/15), PWNC(23/23)*
1993-94	Regular	New	90	Nov. 27-Jan. 23 (17-25)	CSC(8/17),RF(11/17), PWNC(23/25)*
1994-95	Regular	New	90	Nov. 26-Jan. 22 (16-24)	CSC(8/16),RF(12/16), PWNC(24/24)*
1995-96	Regular	New	67	Nov. 25-Jan. 21 (8-21)	C(8/16),SC(2/9),RF(5/8), P(5/21),WNC(21/21)*
	Late	New	5	Feb. 5-Mar. 10 (12) – CSC only	No (12/12)
1996-97	Regular	All	67	Nov. 23-Jan. 19 (23-25)	C(25/25),SC(25/25),RF(19/25), P(23/23),WNC(23/23)*
	Late	All	5	Feb. 5-Mar. 10 (15)	No (15/15)
1997-98	Regular	New	80	Nov. 22-Jan. 17 (25)	No (all zones 25/25)
	Late	New	5	Jan. 24-Mar. 9 (20)	No (20/20)
1998-99	Regular	New	80	Nov. 25-Jan. 17 (37)	RF (32/37)*, Others (37/37)
	Late	New	5	Jan. 23-Mar. 10 (22)	No (22/22)
1999-00	Regular	New	80	Nov. 24-Jan. 16 (38)	No (38/38)
	Late	New	5	Jan. 22-Mar. 10 (21)	No (21/21)
2000-01	Regular	New	80	Nov. 22-Jan. 14 (21-29)	RF (9/21)*, Others (29/29)
	Late	New	5	Jan. 20-Mar. 10 (23)	No (23/23)
2001-02	Regular	New	80	2A: Nov. 21-Jan. 13 (23-29) 2B: Nov. 10-Dec. 30 (23)	2A: RF (12/23)*, Others (29/29) 2B: No (23/23)
	Late	New	5	Jan. 19-Mar. 10 (23) – 2A* only	No (23/23)

* 2A=Clark, Cowlitz, Wahkiakum; 2B=Grays Harbor, Pacific; C=Clark Private; CC=Clark-Cowlitz Private Lands; CSC=Clark/S. Cowlitz Private Lands; P=Pacific; WNC=Wahkiakum/N. Cowlitz; PW=Pacific-Wahkiakum; PWNC=Pacific/Wahkiakum/N. Cowlitz; RF=Ridgefield; SC=S. Cowlitz

Table 6. History of southwest Washington Canada goose season regulations (continued)

Year	Season	ID Class	Quota	Scheduled Dates (# days)	Closure (# Days Hunted / Sched.)
2002-03	Regular	New	80	2A: Nov. 27-Jan. 26 (25-27) 2B: Nov. 9-Dec. 29 (23)	2A: RF (9/25)*, Others (27/27) 2B: No (23/23)
	Late	New	5	Feb. 1-Mar. 9 (17) – 2A* only	No (17/17)
2003-04	Regular	New	80	2A: Dec. 9-Jan. 24 (19) 2B: Nov. 15-Jan. 4 (15)	2A: RF (9/19)*, Others (19/19) 2B: No (15/15)
	Late	New	5	Jan. 31- Mar. 10 (12) – 2A* only	No (12/12)
2004-05	Regular	New	80	2A: Nov. 27-Jan. 22 (15, RF 25) 2B: Oct. 16-Jan. 15 (14)	2A: No (15/15, RF 25/25) 2B: No (14/14)
	Late	New	5	Feb. 5 - Mar. 9 (10) – 2A* only	No (10/10)
2005-06	Regular	New	80	2A: Nov. 12-27, Dec. 7-Jan. 29 (30, RF 25) 2B: Oct. 15-Jan. 14 (27)	2A: No (30/30, RF 25/25) 2B: No (27/27)
	Late	New	5	Feb. 5 - Mar. 9 (10) – 2A* only	No (10/10)
2006-07	Regular	New	80	2A: Nov. 11-26, Dec. 6-Jan. 28 (32, RF 25) P: Oct. 15-Jan. 14 (27)	2A: No (32/32, RF 25/25) P: No (27/27)
	Late	New	5	Feb. 3 - Mar. 7 (10) – 2A* only	No (10/10)
2007-08	Regular	New	80	2A: Nov. 10-25, Dec. 5-Jan. 27 (32, RF 25) P: Oct. 13-Jan. 12 (27)	2A: No (32/32, RF 25/25) P: No (27/27)
	Late	New	5	Feb. 2 - Mar. 5 (10) – 2A* only	No (10/10)
2008-09	Regular	New	80	2A: Nov. 8-23, Dec. 3-Jan. 25 (32, RF 26) P: Oct. 11–Jan. 10 (27)	2A: No (32/32, RF 26/26) P: No (27/27)
	Late	New	5	Feb. 7 – Mar. 7 (9)	No (9/9)
2009-10	Regular	New	40	2A: Nov. 14-20, Dec. 9-Jan. 31 (31, RF 28) P: Oct. 17–Jan. 16 (27)	2A: No (31/31, RF 28/28) P: No (27/27)
	Late	New	5	Feb. 6 – Mar. 10 (10)	No (10/10)
2010-11	Regular	New	40	2A: Nov. 13-28, Dec. 8-Jan.30 (30, RF 27) P: Oct. 16–Jan 15 (26)	2A: Yes (30/30, RF 5/27) P: No (26/26)
	Late	New	5	2A: Feb. 5 – Mar. 9 (10)	No (10/10)
2011-12	Regular	New	40	2A: Nov. 12-27, Dec. 7-Jan.29 (30, RF 29) P: Oct. 15–26 and Nov. 5-Jan 21 (26)	2A: Yes (30/30, RF 16/29) P: No (26/26)
	Late	New	5	2A: Feb. 4 – Mar. 7 (10)	No (10/10)
2012-2013	Regular	New	40	2A: Nov. 10-25, Dec. 5-Jan. 27 (30, RF 28) P: Oct. 13-24, Nov. 3-Jan. 19 (27)	2A: No (30/30, RF 28/28) P: No (27/27)
	Late		5	2A: Feb. 2-Mar. 6 (10)	No (10/10)
2013-2014	Regular	New	40	2A: Nov. 9 – Dec. 1, Dec. 11-Jan. 26 (30, RF 29) P: Oct. 12-23, Nov. 2-Jan. 26 (31)	2A: No (30/30, RF 28/28) P: No (28/28)
	Late		5	2A: Feb. 1-Mar. 5 (10)	No (10/10)

* 2A=Clark, Cowlitz, Wahkiakum; 2B=Grays Harbor, Pacific; C=Clark Private; CC=Clark-Cowlitz Private Lands; CSC=Clark/S. Cowlitz Private Lands; P=Pacific; WNC=Wahkiakum/N. Cowlitz; PW=Pacific-Wahkiakum; PWNC=Pacific/Wahkiakum/N. Cowlitz; RF=Ridgefield; SC=S. Cowlitz

Table 7. Waterfowl harvest by species in Washington (2013-14)[1]

Species	Harvested	Composition (%)
Mallard	191,342	47
Northern pintail	28,192	7
American wigeon	55,726	14
Green-winged teal	37,679	9
Total ducks	407,925	
Large Canada	33,385	54
Small Canada	19,964	32
Total geese	61,504	
Total waterfowl	469,429	

[1]The number of each species harvested is estimated from the Daily Waterfowl Harvest Report Card Survey. The total number of ducks and geese harvested is estimated from the more extensive Small Game Harvest Questionnaire.

Table 8. Waterfowl harvest by region (2013-14)

Region	Ducks Harvested	% of State Total Ducks Harvested	Geese Harvested	% of State Total Geese Harvested
Region 1	45,678	11%	11,464	19%
Region 2	85,249	21%	17,841	29%
Region 3	75,782	19%	12,912	21%
Region 4	106,439	26%	10,620	17%
Region 5	33,288	8%	4,098	7%
Region 6	61,489	15%	4,569	7%

Table 9. Estimated number of sea ducks harvested in 2013-14[1]

Species	Harvest
Scoters	1,303
Black Scoter	36
Surf Scoter	1,074
White-winged Scoter	193
Harlequin	164
Long-tailed	242
Barrow’s Goldeneye	252
Common Goldeneye	209
TOTAL	2,170

[1] These figures are based on analysis of mandatory report returns, corrected for non-response bias.

Table 10. Brant harvest report summary[1]

YEAR	MONTH	PERMITS ISSUED	SUCCESSFUL HUNTERS	HUNTER DAYS	SEASON DAYS	SKAGIT CO. HARVEST	WHATCOM CO. HARVEST	PACIFIC CO. HARVEST	TOTAL HARVEST
1990	DEC	490	338	763	11	808	0	73	881
1991	DEC	654	330	647	11	790	3	52	845
1992	DEC	747	319	709	11	950	9	18	977
1993	DEC	1194	496	765	11	1347	7	53	1407
1994	DEC	1069	287	484	9	825	0	23	848
1995	DEC	1207	343	552	11	918	0	44	962
1996	DEC	1445	254	549	11	1493	0	41	1534
1997	JAN	1331	197	326	5	597	0	59	656
1998	JAN	1348	243	350	5	570	0	18	588
1999	JAN	1336	218	386	9	581	0	86	667
2000	JAN	1295	39	59	5*	0	0	108	108
2001*	NOV				5	56	0	20	76
2001*	JAN				5	347	0	17	364
2001*	ALL	1436	187	277	10	403	0	37	440
2002*	NOV				5	18	0	9	27
2002*	JAN				5*	0	0	33	33
2002*	ALL	1387	27	277	10	18	0	42	60
2003*	NOV				5	22	0	13	35
2003*	JAN				5	235	0	64	299
2003*	ALL	1187	152	200	10	257	0	77	334
2004*	NOV				5	36	0	11	47
2004*	JAN				5	308	0	34	342
2004*	ALL	1612	126	209	10	344	0	45	389
2005	JAN	1707	220	336	5	504	0	53	557
2006	JAN	1793	199	272	7	367	0	74	441
2007	JAN	1795	166	243	7	341	0	112	453
2008	JAN	2116	191	262	7S/10P	328	0	81	409
2009	JAN	1681	232	510	8S/10P	545	0	31	576
2010	JAN	1030	200	387	8S/10P	253	0	125	378
2011	JAN	1232	214	502	8S/10P	638	0	80	718
2012	JAN	1362	254	604	8S/10P	541	0	63	604
2013	JAN	1364	192	651	8S/10P	479	0	26	505

*Skagit closed

[1] Figures are based on mandatory report returns, corrected for non-response bias. [2] Days hunted estimate from 1990-2008 included successful hunters only.

Table 11. Snow goose harvest report summary[1]

YEAR	PERMITS ISSUED	SUCCESSFUL HUNTERS	DAYS HUNTED*	HARVEST**			
				ISLAND CO.	SKAGIT CO.	SNOHOMISH CO.	TOTAL
1993	2298	572	1096	58	677	1124	1859
1994	2588	433	664	60	496	522	1078
1995	2313	221	373	57	99	331	487
1996	2363	427	996	39	381	1400	1820
1997	2795	424	812	38	545	749	1332
1998	3086	341	585	29	678	262	969
1999	3061	445	777	71	815	598	1484
2000	3076	460	1039	18	1058	919	1995
2001	3144	407	953	4	753	696	1453
2002	3196	442	1217	18	1419	1084	2522
2003	3013	530	1155	20	1465	889	2374
2004	3333	474	1075	37	1267	893	2160
2005	3546	895	2665	50	4588	2154	6792
2006	4068	1061	2566	7	3780	1876	5663
2007	4859	1662	5528	53	11462	4175	15690
2008	5583	1253	2912	117	6295	3743	10155
2009	4015	1370	9840	8	9979	2959	12946
2010	4830	770	5078	0	3388	1032	4420
2011	2776	1113	6011	0	6924	4079	11003
2012	2811	966	4359	0	3903	1956	5859
2013	2884	861	4013	126	4016	1579	5721

*days hunted estimate from 1993-2008 included successful hunters only

**harvest estimates do not include estimated wounding loss

Table 12. Southwest Washington Canada goose harvest summary

Season	Period	Aleutian	Cackler	Dusky	Lesser	Taverner	Vancouver	Western	Other	Total CAGO	Snow	Whitefront	Total
1961-70	10 Year Ave.									1894			
1971-80	10 Year Ave.									2624			
1981-83	10 Year Ave.									4814			
1984-85	Season Total		0	37	0	63	0	20	0	120			
1985-86	Season Total		11	66	116	113	0	67	25	398			
1986-87	Season Total		8	36	51	172	0	241	0	508			
1987-88	Season Total		7	45	225	478	4	224	35	1018			
1988-89	Season Total		17	43	136	617	0	763	7	1583			
1989-90	Season Total		37	52	92	455	9	391	0	1036			
1990-91	Season Total		28	65	165	555	20	383	3	1219			
1991-92	Season Total		39	88	295	675	14	483	15	1609			
1992-93	Season Total		84	91	270	1340	25	722	2	2534			
1993-94	Season Total		93	90	299	944	8	697	4	2135			
1994-95	Season Total		422	77	246	1011	31	704	6	2497			
1995-96	Regular Season		321	57	134	787	12	515	1	1827			
	Late Season		13	2	10	75	0	21	0	121			
	Season Total		334	59	144	862	12	536	1	1948			
1996-97	Regular Season		1001	32	327	1678	9	808	2	3857			
	Late Season		29	3	148	27	9	124	1	341			
	Season Total		1030	35	475	1705	18	932	3	4198			
1997-98	Regular Season		1158	56	376	2042	31	672	5	4340			
	Late Season		153	2	16	155	2	70	0	398			
	Season Total		1311	58	392	2197	33	742	5	4738			
1998-99	Regular Season		1588	44	292	1736	28	724	9	4421			
	Late Season		232	2	14	141	6	109	0	504			
	Season Total		1820	46	306	1877	34	833	9	4925			
1999-00	Regular Season		1255	24	205	1150	140	540	32	3346			
	Late Season		200	3	4	115	15	83	1	421			
	Season Total		1455	27	209	1265	155	623	33	3767			
2000-01	Regular Season		1310	30	130	1236	82	583	34	3405			
	Late Season		140	2	105	6	13	104	1	371			
	Season Total		1450	32	235	1242	95	687	35	3776			
2001-02	Regular Season		664	22	130	601	87	430	11	1945			
	Late Season		94	1	0	43	25	66	0	229			
	Season Total		758	23	130	644	112	496	11	2174			
2002-03	Regular Season		1183	37	152	836	88	551	60	2907			
	Late Season		108	1	1	60	5	40	1	216			
	Season Total		1291	38	153	896	93	591	61	3123			
2003-04	Regular Season		598	24	102	470	73	372	19	1658			
	Late Season		76	4	2	13	5	41	0	141			
	Season Total		674	28	104	483	78	413	19	1799			
2004-05	Regular Season		989	25	123	576	105	424	49	2291			
	Late Season		90	0	0	21	17	37	4	169			
	Season Total		1079	25	123	597	122	461	53	2460			
2005-06	Regular Season		948	30	155	823	106	558	28	2648			
	Late Season		89	1	2	40	2	26	4	164			
	Season Total		1037	31	157	863	108	584	32	2812			
2006-07	Regular Season	8	1085	26	141	580	110	410	44	2404			
	Late Season		127	1	2	48	14	40	1	233			
	Season Total	8	1212	27	143	628	124	450	45	2637			
2007-08	Regular Season	2	1160	21	108	684	113	292	49	2429			
	Late Season		122	1	5	45	12	31	2	218			
	Season Total	2	1282	22	113	729	125	323	51	2647			
2008-09	Regular Season	4	1636	43	154	887	195	406	41	3366	88	27	3481
	Late Season		87	2	4	59	3	52	0	207			207
	Season Total	4	1723	45	158	946	198	458	41	3573	88	27	3688
2009-10	Regular Season	13	1301	28	73	706	75	358	41	2595	8	19	2622
	Late Season		111	4	3	30	12	25	1	186			186
	Season Total	13	1412	32	76	736	87	383	42	2781	8	19	2808
2010-11	Regular Season	4	1245	17	94	525	57	297	37	2276	26	65	2367
	Late Season	1	100	3		22	2	25		153			153
	Season Total	5	1345	20	94	547	59	322	37	2429	26	65	2520
2011-12	Regular Season	1	1150	25	121	505	35	180	21	2038	16	60	2114
	Late Season		154	3	4	20	3	43		227			227
	Season Total	1	1304	28	125	525	38	223	21	2265	16	60	2341
2012-13	Regular Season	16	1168	17	101	503	25	231	1	2062	33	64	2159
	Late Season		125		1	23	13	33		195	2		197
	Season Total	16	1293	17	102	526	38	264	1	2257	35	64	2356
2013-14	Regular Season	4	1247	18	96	257	17	287	8	1934	35	17	1990
	Late Season		160	2	1	12	12	54		241	1	3	245
	Season Total	4	1407	20	97	269	29	341	8	2175	40	20	2235

Note: Mandatory check stations initiated in 1984-85 season, prior estimates from USFWS harvest survey.

Wild Turkey

WILD TURKEY STATUS AND TREND REPORT:
STATEWIDE

BRIAN M. CALKINS, Small Game/Furbearer Section Manager

Population objectives and guidelines
Wild Turkeys were first successfully introduced in Washington in 1960. Population augmentation in the 1980s and 1990s expanded their distribution (Figure 1) and increased hunting and wildlife viewing opportunities (Washington Department of Fish and Wildlife, 2005).

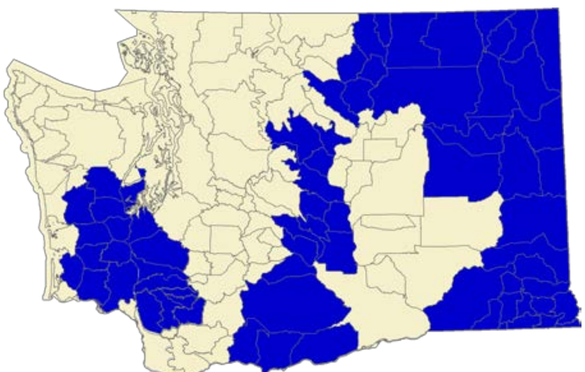


Figure 1: Primary current distribution of wild turkeys in Washington based on Game Management Units

Very few translocation activities have occurred in recent years. The WDFW management plans identify, trapping and translocation as a potential response to damage and nuisance complaints, however, none occurred during the 2013-14 reporting period.

In January 2006, the Department adopted a statewide turkey management plan as a supplement to the Game Management Plan in response to increasing populations and issues related to turkey managment. Population management strategies are included in the plan and will be included and updated in future Game Management Plans.

Hunting seasons and harvest trends
Estimated harvest of wild turkeys is based on analysis of mandatory hunter reporting of turkey tags. Hunters must report all turkey tags, even if they didn't go hunting. Successful hunters are required to submit a harvest report with date, location, sex, and age of harvested birds. This mandatory reporting system has produced more accurate estimates of harvest and hunter participation than those made prior to the reporting requirement.

Hunting seasons for wild turkeys have varied from a 2-day, fall season in 1965 to the current 47-day spring season with additional fall season opportunities.

Beginning in 2004, GMUs 105-124 had a weeklong general early fall season instead of permit-based hunting. In 2005, this was extended to 2 weeks, and in 2006, GMU 101 was included. In 2008, the early fall seasons in GMUs 105-124 were changed to "beardless turkeys only" with the intent to decrease the fall season male harvest. This strategy was successful as male turkey harvest decreased from approximately 55% to less than 20% in the target area.

In 2006 a late fall permit hunt (November 20-December 15) in NE Washington was also added for GMUs 101-124. This permit hunt was changed to a general season hunt in 2009 because hunting pressure did not exceed management goals for that population. GMU's have since been added to where the late fall general season includes almost all 100 series GMUs. In 2008 a late fall permit hunt was added for Game Management Units in Okanogan County (218-231 and 242) and in 2012 a permit hunt was added in GMU 335 in Kittitas County. All late fall seasons are either sex.

In 2009, the early fall general season was extended to Mica Peak (GMU 127), Roosevelt (GMU 133), and Blue Mountains Game Management Units (GMUs 145, 149-16, and 172-186). Klickitat County (GMUs 382, 388, 568-578) remained permit only hunting.

Beginning in 1995 and ending in 2000, hunters could kill one bearded turkey per day from each of three subspecies for a total of three per year during spring seasons. County of kill defined subspecies. Multiple tags could only be purchased prior to the spring hunting season. After the spring season started, only one turkey tag could be purchased. Since the 2001 spring season, hunters have been able to harvest 2 bearded turkeys in most eastern Washington counties and purchase tags throughout the season. In 2005, regulations changed to allow hunters to take two turkeys in one day in areas that allowed harvest of two spring turkeys.

Turkey hunting is open to shotgun and archery hunting during the spring and fall seasons. Dogs, baiting, electronic decoys, and electronic calls are not legal in Washington. Non-electronic decoys are permitted. In 2006, the Fish and Wildlife Commission adopted a regulation permitting falconers to hunt turkeys during the fall and winter. Hunting hours are one-half hour before sunrise to sunset.

Current regulations are considered relatively conservative. Spring season timing results in harvest of gobblers after peak breeding. The season ends before most nests hatch, so disturbance is minimized. Records show that prior to turkey augmentation activity in the late 1980s, turkey hunter numbers fell to a low of 428 (1987) and turkey harvest averaged 65-birds per year (1983-1987). In 2013, an estimated 11,771 individuals hunted turkeys during the spring general season, taking an estimated 3,768 birds. The harvest above was 7% below 2012 estimated harvest of 4,068 and 21% below the ten year average (Figure 2 at end of report).

2,773 individuals hunted during the 2013 fall general seasons in PMU 10 and 15 where harvest was estimated at 1,054 birds. This represents a 1.5% decline in harvest and a 4.7% increase in hunter participation from 2012 seasons. The combined fall permit season harvest was estimated at 108 turkeys from portions of PMUs 20, 30 and 35.

Game Management Units have been grouped to define turkey populations into Population Management Units (PMUs). Washington State is divided into 7 PMUs: Northeast (P10), Southeast (P15), North Central (P20), South Central (P30), Klickitat (P35), Northwest (P40), and Southwest (P50) (Table 1). Changes in harvest, as an indicator of population status, have been tracked at the PMU level. Although harvest years 2011 through 2013 are consistent, differences have occurred in how PMU estimates were calculated in the past, which may cause slight differences when comparisons are made to prior years or ten year averages.

In 2013, spring turkey harvest decreased in all PMUs except PMU 40 where harvest was unchanged. Harvest in all PMUs was below prior ten year averages except PMU 35 which was 5% above the average. All PMUs have seen harvest declines following record, or near record, harvests in 2010 and 2011. Prior to this time increasing trends were clearly evident (Figure 3 at end of report).

PMU	GMUs Included
P10	101-136
P15	139-186
P20	All 200 GMUs
P30	All 300 GMUs EXCEPT GMU 382 & 388
P35	GMUs 382,388,578,574,572,568
P40	All 400 GMUs PLUS GMUs 601-627
P50	All 500 GMUs EXCEPT 568-578 PLUS GMUs 633-699

Table 1: Game Management Units included in each Population Management Unit

Surveys

Between 2004 and 2010 the Colville District carried out an annual winter survey of wild turkeys in northeastern Washington (PMU 10). The primary objective of this survey was to initiate the development of an annual harvest-independent population index for wild turkeys as called for in the agency Game Management Plan. The pilot project tested methodology, including using volunteers to help collect data. A corollary benefit has been that district biologists gained valuable experience from running a few of transects, which contributed to knowledge of local turkey range, movements, habitat availability, and usage. The results of the surveys combined with an evaluation of Christmas bird count (CBC) data in the vicinity indicated a population decline from 2006-2010 (Base and Shepherd, 2011).

The survey protocol above was modified in 2011 which included standardized route lengths, a higher number of routes, and each transect is now run once rather than multiple times. The number of turkeys observed per mile declined slightly from 4.0 in 2012-13 to 3.3 in 2013-14. The Christmas bird count numbers increased substantially on three of the four routes monitored and were relatively unchanged on the other route. Attributing changes in population to these surveys should be done with some caution due to the recent change in methodology and variability associated with the CBC. Because of the protocol change, the data collected from 2011 to 2014 may not be directly comparable to previous surveys but in the future should be more reliable in detecting trends in distribution and abundance (Base and Prince, 2014).

PMU	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
P10	3401	3445	3571	3660	2677	2845	2861	3695	2512	2400
P15	471	480	730	605	578	761	731	866	642	533
P20	209	215	220	258	232	228	412	231	203	188
P30	178	182	169	221	172	245	417	234	162	143
P35	301	345	362	487	370	447	863	473	514	474
P40	15	10	8	9	3	5	13	8	5	5
P50	54	53	77	62	50	65	68	41	30	25
Total	4629	4730	5137	5302	4082	4596	5365	5548	4068	3768

Table 2: Estimated spring turkey harvest in each turkey Population Management Unit (PMU) 2004-2013

District 7 utilizes citizen science volunteers for wintering site surveys to track turkey numbers in Chelan County. Counts have been conducted at 33 sites on three separate dates to obtain a minimum count and sex ratio for the past six years. The counts appear to track with harvest changes but a formal analysis has not been done. The 2014 counts (at locations where consecutive year counts were obtained) when pooled at the GMU level were 28% higher than during the winter of 2012-13. In addition, total adult tom count was 57% higher than the previous year as well (Jon Gallie personal communication).

Population Status and Trend

Using a combination of winter survey results and harvest estimates, turkey numbers in P10 appear to be stable or declining. The population level in parts of this PMU has grown to the point where agricultural and nuisance conflicts with humans have become a larger concern. The most liberal fall general seasons are in place here to help address this issue.

Based on harvest trends (Table 2, Figure 3), the Blue Mountains population (P15) has expanded substantially over the past 15 years but may be leveling off or declining. The Blue Mountain foothills seem to provide excellent habitat conditions for Rio Grande turkeys as does the northern half of Lincoln County.

While the harvest trends in PMU 20 and 30 indicate some stability, local hunters continue to report concern over decreasing populations. Harvest in PMU 20 and 30 increased substantially in 2010 but was back near previous levels from 2011-13 (Table 2). Additional fall hunting opportunity will continue be available on a limited permit only basis.

With the exception of 2010, when harvest was unusually high, Turkey harvest in PMU P35 has been relatively stable over the past six years (Table 2, Figure 3). The population here is believed to be stable and provides most of the hunting opportunity in Southwest Washington.

Determining population trends for the wild turkey population in PMU P50 is difficult. Sightings of wild turkey continue to be reported in locations away from the original release sites. In addition, turkeys continue to be harvested throughout the season. Harvest in southwest Washington has declined over the last four years (Table 2, Figure 3). These factors, considered together, suggest wild turkeys have been reproducing at low levels and perhaps maintaining a viable population in PMU P50. Declines in harvest in this area may be due in part to more restrictive aceess policies recently put in place by large private landowners.

Habitat condition and trend

Most of the turkey range in Region 1 is in close proximity to agricultural lands that provide abundant food in the form of waste grain as well as some berries and fruits through winter months. The Blue Mountains area provides good habitat for the Rio Grande subspecies. Stevens, Pend Oreille, Ferry, and northern Spokane counties contain excellent habitat for the Merriam's subspecies.

Ponderosa pine nuts are probably the most important winter food source for turkeys in eastern Washington. In Chelan, Kittitas, and Okanogan counties, the density and distribution of ponderosa pines is less than in Ferry and Stevens counties where the largest population of turkeys is found in the State.

In general, occupied turkey habitat in Okanogan County is less productive than some other areas of the state, due to a lack of extensive mast or berry crops. Much of the habitat is intensively grazed, and turkeys may compete with livestock for certain plant foods. In addition, the lack of grain farming in the area may limit population expansion.

Most of PMU 30 is probably marginal turkey habitat. The forested zone is on the edge of higher elevations and receives significant snowfall. Deep snows in 1992-93 and 1996-97 may have impacted turkey survival in the region. Mild winters and feeding is probably why the most recent transplants have been successful.

Winter conditions in Klickitat County (PMU P35) can impact the resident turkey population. Severe weather in 1996 impacted turkey harvest in 1997 and 1998. Mild winters since 1996 have helped to increase the turkey population and hunting has improved to current levels.

Although we do not specifically monitor habitat conditions related to turkeys in PMU 50, conditions should continue to be adequate, as there were no major changes in habitat management or weather conditions that would have changed turkey survival.

Augmentation and habitat enhancement

There were no new releases of turkeys in any PMU across the state in 2012 or 13 and none are planned in the future. Turkeys are already present in most of range that would be considered suitable and concerns related to human/wildlife conflict have precluded introductions in the past. Occasionally turkeys are trapped in response to conflicts and are relocated to other occupied areas.

Habitat enhancement priorities are identified in the Game Management Plan. Of special interest are habitat improvements that increase habitat values for a variety of wildlife species in addition to turkeys. The Klickitat Oak Habitat Initiative began in May, 2009 focusing on improving oak stand health and understory habitat improvement on the Klickitat Wildlife Area and surrounding lands in Klickitat County. Other efforts have focused in northeast Washington to provide enhanced food resources through weed control, agricultural manipulation and forest improvements. WDFW works closely with the National Wild Turkey federation on efforts to promote and fund habitat enhancement work.

Management conclusions

Although harvest was lower in 2012 and 2013 than the preceeding ten years, it is not currently believed to necessarily represent a downward trend. As turkeys were introduced and expanded their range and population, an eventual leveling off and decline was expected as the capacity of the habitat was reached. The lower harvest can probably also be attributed to a decline in hunter numbers which appears to be associated with a past change in turkey tag fees. Turkey populations across the state appear to be relatively stable with the largest concentrations in Region 1. Spring hunter success rate, another statistic with implications of population status has remained fairly stable since 2002, at around 30%, with higher success in some years. Management decisions will seek to maintain good hunter success rates in the spring, while also addressing human conflict issues.

Habitat enhancement activities for wild turkeys will continue to focus on winter food enhancements by increasing available grain, clovers, fruiting shrubs, and mast producing trees. The Klickitat Oak Habitat Initiative and efforts in northeast Washington will continue to strive to improve winter habitat for turkeys.

Spokane County has seen an increase of turkeys despite the suburban nature of the area. Turkey nuisance complaints are being received from areas within PMU P10 as well as a few reports from north-central and western Washington. Additional hunting opportunities were created in the Spokane County area to help address these nuisance complaints. WDFW will be seeking ways to focus hunter effort in areas with private lands experiencing damage.

The turkey population along the eastern Cascade range may have reached or is the long-term carrying capacity of the habitat. The population will likely fluctuate due to wet springs, dry summers, or harsh winter conditions. Conflicts with turkeys had been escalating in the Methow and Okanogan watersheds of Okanogan County. Expansion of turkeys in the Methow area has been exacerbated by illegal releases of domestic turkeys. These birds end up as problem animals, particularly in winter when little natural forage is available. A fall permit season has been created for the Methow watershed to help manage conflicts with turkeys.

In 1994, regulations were changed to allow the harvest of up to 3 turkeys during spring seasons. Harvest and hunter participation estimates are now based on reports received from hunters who are reporting their hunting activity in compliance with the mandatory hunter-reporting requirement. Future estimates will also be made using these data.

Between 1998 and 2000, WDFW released over 600 eastern wild turkeys in PMU P50. There are no plans for further translocations in the near future.

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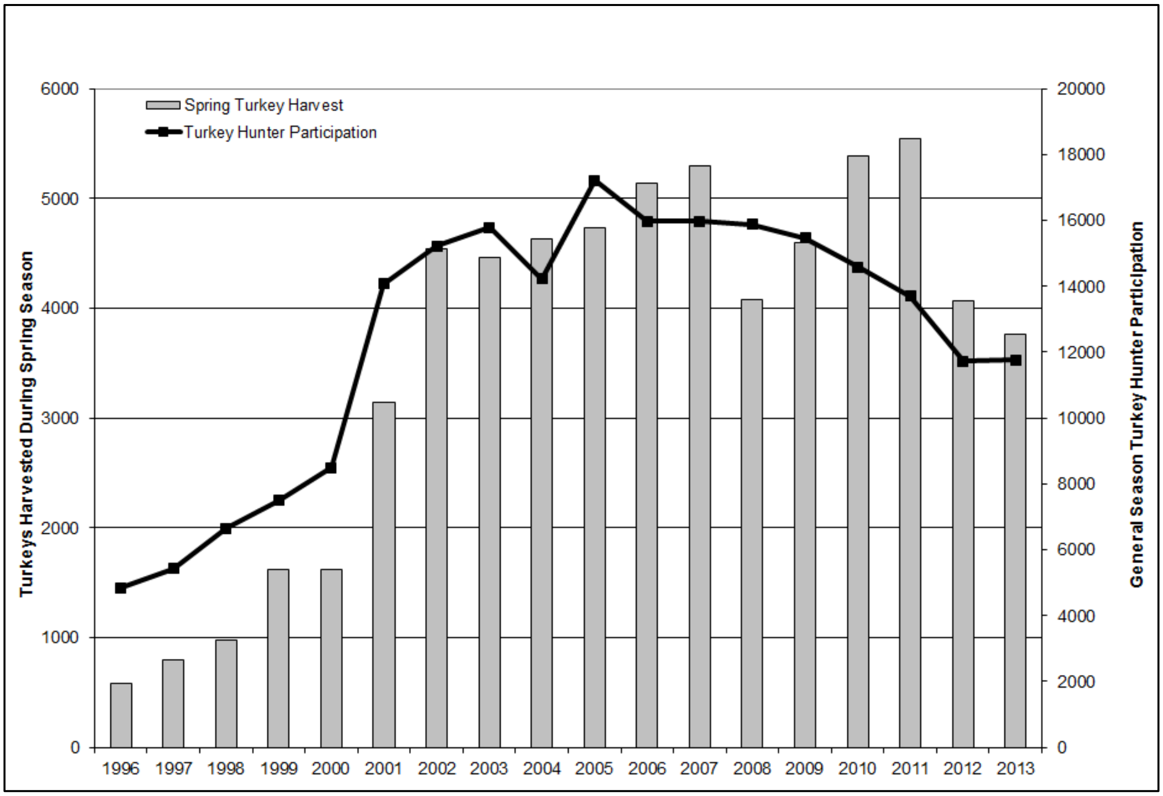

Figure 2: Estimated statewide spring turkey harvest and hunter participation 1996-2013.

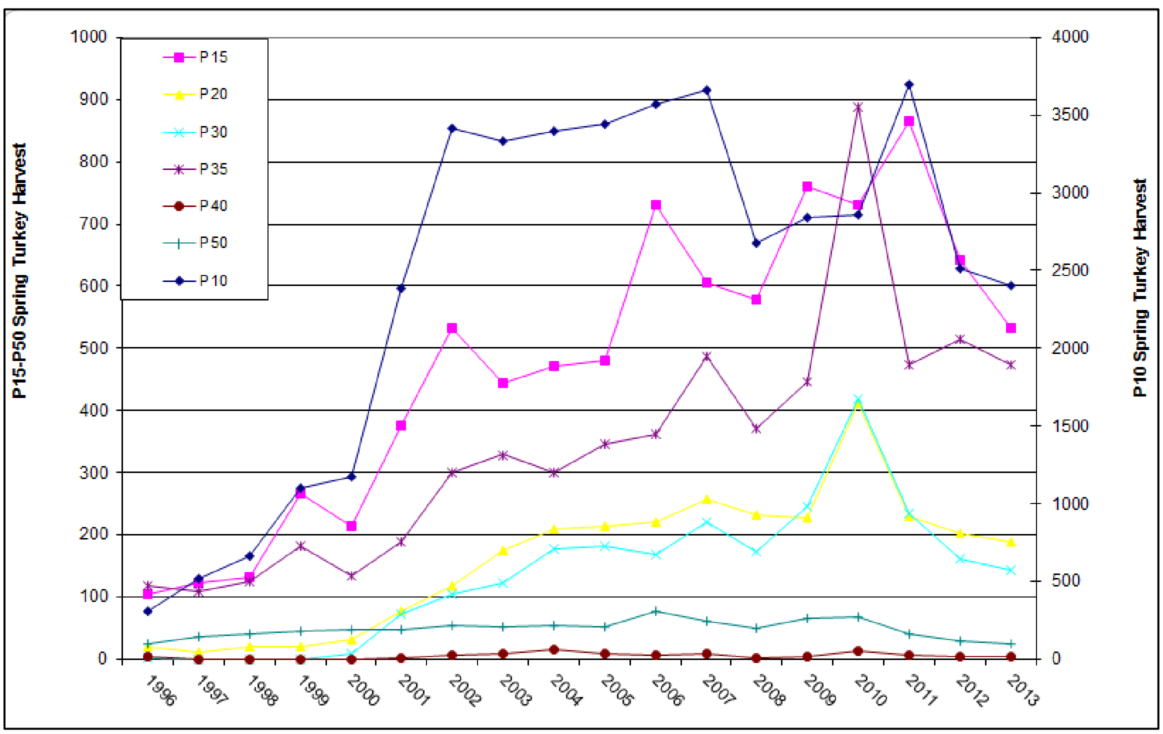

Figure 3: Estimated spring turkey harvest in each turkey Population Management Unit (PMU), 1996-2013

Pheasant

PHEASANT STATUS AND TREND REPORT
STATEWIDE

BRIAN M. CALKINS, Small Game/Furbearer Section Manager
JOEY J. MCCANNA, Region 1 Private Lands Supervisor and Upland Game Bird Specialist

Population Objectives and Guidelines

Management objectives for upland birds, including pheasant, are outlined in the Washington Department of Fish and Wildlife's (WDFW) Game Management Plan (WDFW 2008). Goals are to preserve and perpetuate pheasants and their habitats to ensure healthy productive populations for a sustainable harvest and other recreational opportunities. A specific strategy to enhance Washington pheasant populations is described in the recently completed National Wild Pheasant Conservation Plan (Midwest Pheasant Study Group 2013) which focuses on maximizing the values of permanent herbaceous cover to enhance brood success.

In March of 2003, WDFW held a workshop that collected information to help identify key management strategies that would give the greatest chance of successfully increasing naturally occurring pheasant populations in Washington. Experts in the field of pheasant management discussed research findings and management strategies that may help address population declines in areas where pheasant populations have been historically high. Perhaps the most significant recommendation from the workshop was to focus efforts in select areas and to give priority to habitat enhancements that address limiting factors for pheasant populations. A complete 2003 Pheasant Workshop meeting summary can be found at **http://wdfw.wa.gov/publications/pub.php?id=00414**.

Population Status

Pheasant harvest has varied widely over the past 50 years. Statewide harvest was at its highest during the mid-to-late 1960s with another peak in the late 1970s when over 500,000 pheasants were harvested. Since that time, pheasant harvest has steadily declined. Using harvest as an index to population status, pheasant populations in Washington are currently much lower than they were in the 1960s and 1970s. Surveys (crowing count and brood index) conducted between 1982 and 1998 also indicated a decrease in pheasant numbers in eastern Washington (Rice 2003).

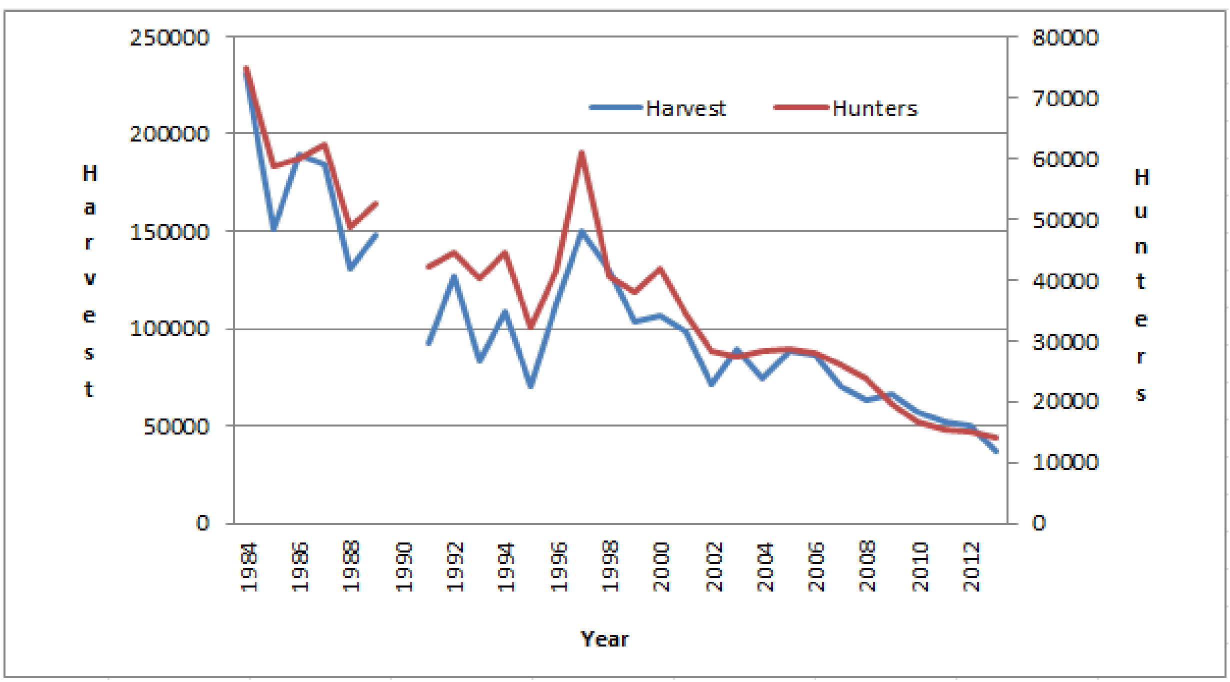

Figure1 :. Estimated annual pheasant harvest and annual hunter participation in Washington 1984-2013

Harvest estimation between 1984 and 2014 indicates a decline in pheasant numbers (Figure 1). It is important to note that in 2001 the Department changed the small game survey protocols by sampling 25,000 small game hunters to increase the precision of harvest and participation estimates.

Since nearly all wild pheasant (i.e., not pen-raised) populations occur in eastern Washington, estimates of harvest and hunter participation for this report include the following counties: Adams, Asotin, Benton, Chelan, Columbia, Douglas, Ferry, Franklin, Garfield, Grant, Kittitas, Klickitat, Lincoln, Okanogan, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman, and Yakima. Due to previous methods of calculation, figures presented for statewide, and basinwide hunter numbers in years prior to 2009 are probably at least slightly higher than the actual participation at the time. Harvest estimates however, are believed to be accurate.

A primary pheasant management zone was established in Washington where populations have been high historically. Within this primary zone, WDFW has delineated a southeast Washington pheasant focus area that includes portions of Columbia, Garfield, Walla Walla, and Whitman Counties to focus pheasant management efforts where adequate rainfall (i. e., 14 inches and over) is most conducive to supporting desirable, appropriate plant communities (Figure 2).

Rooster pheasants have been released in the fall as part of the state-funded Eastern Washington Pheasant Enhancement Program (EWPEP) since 1997. Harvest estimates have included both released and wild birds and therefore the harvest of wild pheasants would be lower than depicted in Figure 1. WDFW has attempted to estimate the contribution of released birds to total harvest but recently it became evident that inconsistency with marking released birds in the past may have compromised these estimates.

In 2009, the EWPEP was audited upon request of the legislature and found the department was fulfilling its legislatively mandated strategy of releasing pheasants. Auditors also concluded that pheasant populations continued to decline primarily due to loss of habitat. Releasing pen-raised pheasants has not been effective at sustaining or improving pheasant populations and hunting opportunities throughout eastern Washington. The 2009 legislature rescinded the requirement for the program to use 80 percent of EWPEP funding on releasing pheasants. Since that time, the department has been reducing the number of birds purchased for release to eventually reach a point where the majority of the fund income is devoted to habitat enhancement. In 2013 the department released 11,350 pheasants which was a reduction from the 2012 releases of 11,820 pheasants. Funding now allocated to habitat enhancements will help address Objective 98 in the 2009-2015 Game Management Plan (WDFW 2008); to double the number of acres of quality pheasant habitat in the pheasant focus area by 2014.

Harvest estimates for the Columbia, Snake River, and Yakima Basins have been used to track trends within the primary pheasant management zone. The number of pheasants harvested each year reflects decreasing trends in overall populations from 2004 to 2013 (Figure 3), similar to the statewide harvest trend (Figure 1).

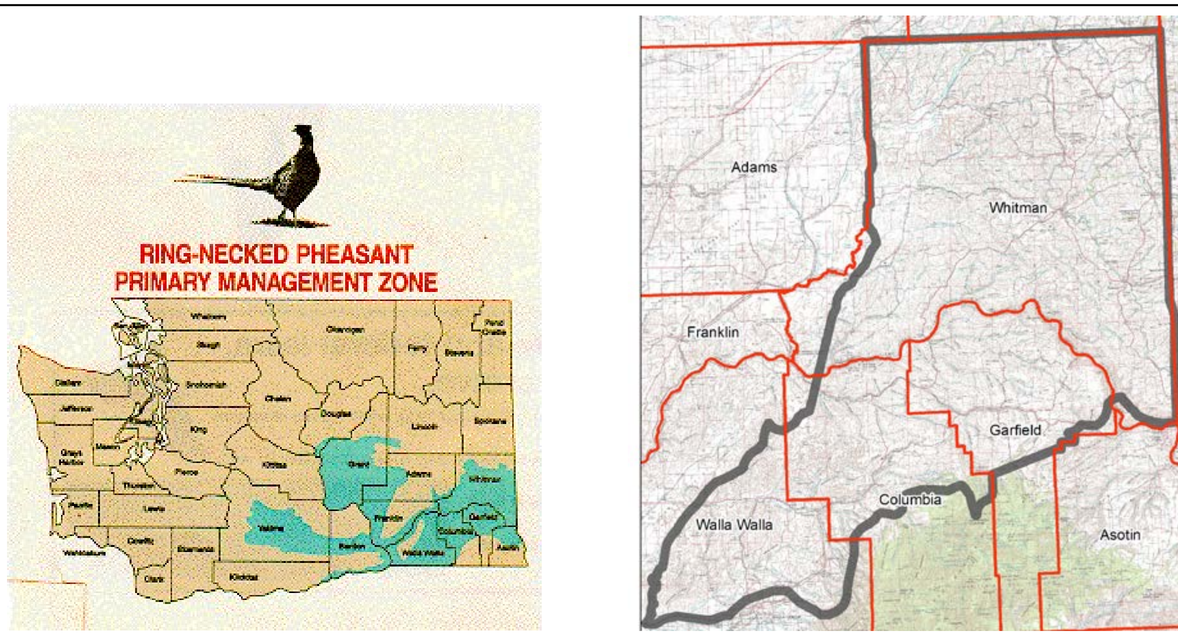

Figure 2: Washington State ringed neck pheasant primary management zone (left) and the southeast Washington Pheasant Focus Area (right)

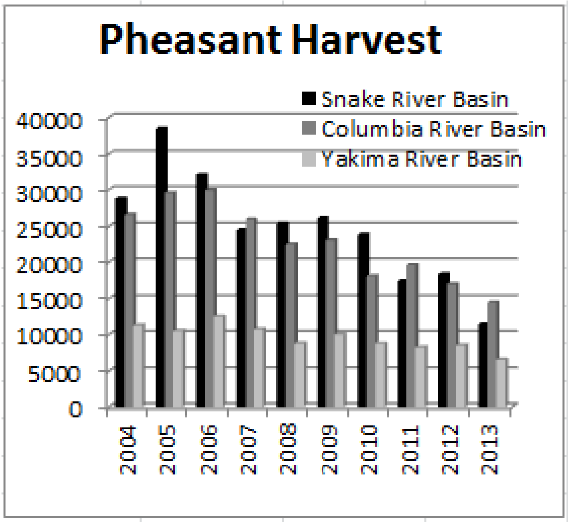

Figure 3. Estimated annual pheasant harvest for eastern Washington river basins between 2004-2013.

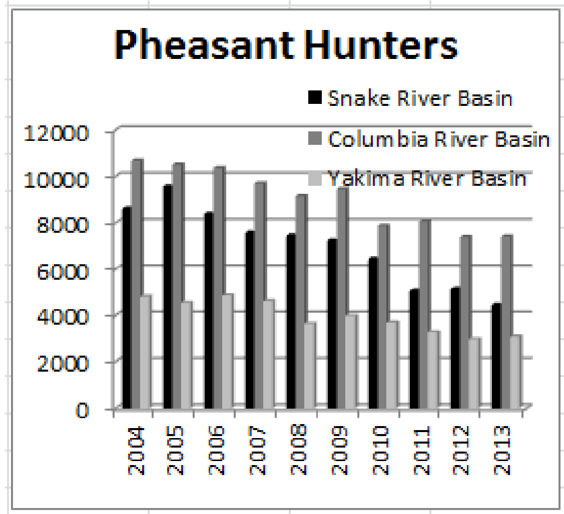

Figure 4: Estimated annual pheasant hunters for eastern Washington river basins during the period 2004-2013.

For this report, the "Yakima River Basin" consists of Yakima and Benton counties, the "Snake River Basin" is made up of Asotin, Garfield, Columbia, Walla Walla, and Whitman counties, and the "Columbia River Basin" includes Lincoln, Adams, Grant, Douglas, and Franklin counties.

In addition to long term declines in quality habitat, poor spring conditions probably influenced pheasant production in 2013 which was reflected in harvest. The 2013 estimated harvest in the Snake River Basin of 11432 was a 38% decrease from 2012, and 59% below the previous ten year average of 27,609. A 15% decrease in harvest was estimated in the Columbia River Basin with 14523 pheasants bagged, which was 40% below the ten year average of 24,067. The Yakima River Basin harvest decreased by 23% to 6,583 pheasants which was 35% below the ten year average of 10,165 (Figure 3).

Hunter Participation

Hunter numbers have also dropped steadily since 1984 (Figure 1). A commonly held upland game philosophy is that hunters will participate in relation to the abundance of the targeted species. In the case of pheasant hunting in Washington, variations in harvest closely mirror hunter participation (Figure 1). Even though pheasant population declines are apparent, it is not fully understood whether other factors such as limitations on hunting access, economic changes, or other factors, might be playing a role in declining participation. Over the past five years, eastern Washington pheasant hunters spent an average of 5.7 days afield and averaged 3.2 birds per hunter at a harvest rate between 0.5 and 0.6 birds per day.

The estimated hunter participation in the Snake River Basin in 2013 decreased by 14% and was 41% below the prior ten year average of 7,578 hunters. Columbia River Basin pheasant hunter numbers remained essentially unchanged but were 23% below the ten year average of 9,608. The estimated Yakima River Basin hunter participation increased by 4% but was 26% below the ten year average of 4,160 (Figure 4).

Habitat Trend

Permanent cover is critical to pheasant production particularly where the stands consist of a diverse mix grasses and broadleaf plants (forbs) that in turn produce the most suitable nesting and brood rearing habitat (Midwest Pheasant Study Group, 2013). According to Farm Service Agency (FSA), a large percentage of Eastern Washington Conservation Reserve Program (CRP) acreage is expiring (USDA 2011). If not retained in permanent cover, conversion of CRP back to agricultural use could create further losses of pheasant nesting and brood rearing habitat. In an effort to reduce these losses, WDFW worked with FSA to develop criteria for the new CRP State Acres for Wildlife Enhancement (SAFE) program for private landowners to develop, restore, and enhance wildlife habitat in priority areas of Washington State. Several of the WDFW private lands biologist staff in eastern Washington completed the Natural Resources Conservation Service (NRCS) Planning Certification which will provide better access and easier integration with our conservation partners. Private lands biologists provide technical assistance to landowners consulting about wildlife habitat and review exceptions from FSA for the nesting season management of CRP. Private lands staff also plant or coordinate planting of high-diversity mixes of grasses and forbs, shrub cover plots, and food plots across eastern Washington to benefit upland birds and other wildlife.

WDFW received two grants through FSA's Voluntary Public Access and Habitat Improvement Program. portions of these grants were directed at improving pheasant habitat and hunting access within the pheasant focus area. The intensive effort enrolled over 3,000 acres in contracts to improve brood rearing habitat by diversifying CRP stands in addition to providing public hunting access on over 53,000 acres of private land. WDFW continued this effort in 2013 adding an over 700 acres of additional habitat enhancements and bringing the access acreage enrolled to near 100,000 acres. Through these efforts it is hoped to begin to reverse the declining trend in pheasant populations in the area.

In the Columbia River basin, WDFW has been leveraging federal EQUIP funding to increase cover in the largely irrigated landscape where permanent cover is very limited. The focus here involves planting unfarmed corners with grasses and/or shrubs in center pivot irrigated areas that generally are not used for agriculture. 5 new plots were installed in 2013 bringing the total number of these areas to 99. Plans are already in place for expansion in 2014. An additional large, similar project was installed on the Columbia Basin Wildlife Area and ground prep was completed for 200 acrees of native grass seeding next year.

Cause of Decline

The cause of the decline in pheasant populations in Washington is not specifically defined, but it likely results from several causes. Research in many parts of the United States indicates that loss of habitat is the primary reason pheasant populations have declined (Labisky 1976, Warner et al. 1984). Of particular importance is breeding habitat (including nesting and brood rearing habitat), habitat for wintering and habitat that provides escape cover from predators (Warner 1979).

Farming practices are evolving and most changes have had a negative impact on pheasants. During the 1970s, genetically modified wheat was beginning to be used due its high yielding capabilities and its dwarf stubble stalk. Herbicide application to wheat stubble and reduced stubble height are considered major causes of the long-term decline of pheasants on the central High Plains (Rodgers 2002) and may also play a role in Washington. Wheat stubble, and its associated waste grain, (an important food source for farmland pheasants) are commonly tilled under and re-cropped in higher rainfall or irrigated areas of Washington.

Upland game bird fall population densities, and related harvest, also depend on spring weather conditions. Spring rains are needed to provide early plant growth for nesting cover while consistent warm early summer rains create an insect rich environment for pheasant chicks. Chicks depend on calorically dense, high protein insects as a major portion of their diet (Savory, C. J. 1989). Early spring drought conditions, even with normal temperatures, may decrease insect availability. Lowered temperatures in experiments impacted pheasant chicks more than pheasant eggs in any stage of incubation (MacMullan, R. A. and L. L. Eberhardt 1953). Washington has experienced cold wet springs in some recent years which may have contributed to poor nest and brood success.

In addition to the factors listed above, pesticide and herbicide use and urban sprawl are also believed to be contributors to the decline in pheasant populations. The use of pesticides removes important food resources (De Snoo, G. R. and J. De Leeuw 1996). Some pesticides, organophosphates for example, can also have a direct effect on individual pheasants (Blus, L. J. and C. J. Henny 1997). Herbicides impact plant diversity, which is an important component to quality pheasant habitat. Pesticides and herbicides appear to be used on a broader scale in Washington now than thirty years ago. Houses now occupy many of the areas that pheasants have utilized in the past. In areas of Southeastern Washington and in the Columbia Basin, many new housing developments have replaced valuable pheasant habitat.

Surveys

Upland bird surveys in Washington were discontinued in the late 1990s due to limited time and funding for district biologists. When survey data is routinely collected, it is possible to combine with available state and national land use databases to link wildlife population changes to land use (Nusser et al., 2004).

Two different pheasant surveys were established in the pheasant focus area with nine survey routes in 2010. The spring pheasant crowing survey has been conducted twice each spring for the past five years between April 15 and May 25 to develop a spring male pheasant breeding population index and track land use changes over time. Although raw data suggest a decline, analysis of the data has not produced strong statistical evidence of a change in the population of male pheasants in the survey area. As the surveys continue in the future, trends may become more evident. The fall pheasant brood survey was discontinued in 2011 due to lack of survey days to meet the survey protocol. The spring pheasant crowing surveys are expected to continue in the pheasant focus area and may be extended throughout the primary management zone as staff time allows in the future.

Research

WDFW, in conjunction with Washington State University, is conducting research related to improvement of brood rearing conditions in the pheasant focus area. Insect availability, as a critical component of the chick diet, is believed to be a primary limiting factor for pheasant populations in the area. The work entails evaluating insect production in CRP stands enhanced with different mixes of forb species. Twenty different farms enrolled in CRP will have a five acre native forb planting, five acre non-native forb planting, and a five acre control of present CRP. The desired outcome is improved prescriptions and methods for enhancements to CRP stands that will, in turn, benefit upland birds. The raw data from this research will be provided to WDFW in October, 2014.

A component was added to the research in 2013 that involves placing human imprinted pheasant chicks in these various stand types to forage on insects and then evaluating their diet while on site. Fifty four pheasant chicks survived the imprinting process then the four to nine day old pheasant chicks were used to perform foraging trials within each treatment on four farms to measure diet composition, travel rates, and mass change while foraging. The diets of the pheasant chicks did not differ between plots with an average of 2% arthropods, and the remainder consisting of seed, soil, and foliage. The pheasant chicks traveled twice as far while foraging in the control treatment than the native and non-native plots. This is assumed to be due to more food availability within the two forb plots (Koepke 2014). This information may allow for further refinement of enhancement recommendations if a certain stand type is found to produce more abundant preferred insect populations.

Management Conclusions

Reductions in hunter interest and harvest are clear evidence of a declining population of pheasants in eastern Washington. Diligent monitoring and efforts to improve habitat will be key in improving the situation. Long term figures indicate that pheasant populations declined dramatically in the 1980s and currently remain at low levels when compared to historical highs. Causes of the decline are not known definitively, but habitat loss and alteration is thought to be the primary cause. Suitable habitats are increasingly fragmented and isolated or have declined in quality with changes in farming practices. In order to address this situation, the following action items have been developed to guide WDFW's efforts to improve habitats for more productive pheasant populations:

1) Continued support for an Upland Game Bird Specialist within the southeast Washington pheasant focus area.

2) Use of Geographic Information System (GIS) technology to evaluate existing and potential pheasant habitat areas within the pheasant focus area.

3) Continue pheasant crowing surveys in the pheasant focus area to monitor trends and relationships to habitat conditions.

4) Continue partnerships with Pheasants Forever and Quail Forever.

5) Complete the study in coordination with science division to investigate insect response to planting native and non-native forbs and legumes in strips or blocks within existing CRP stands.

6) Utilize a variety of funding sources to place habitat technicians in the pheasant focus area to provide habitat implementation assistance to farmers.

7) Ensure biologists and technicians have full knowledge of all state and federal habitat programs available to assist farmers in improving pheasant habitats.

8) Utilize mid-contract management for existing CRP contracts to improve habitat conditions.

9) Create and restore nesting cover and brood-rearing habitat.

10) Release rooster pheasants only as put-and-take enhancement of hunting opportunity, not as a population management tool.

11) Work closely with FSA to promote development of habitat for pheasants and other upland wildlife. This is critical as large numbers of CRP contracts expire.

12) Continue efforts with Washington State University and the Pacific Northwest Direct Seed Association to retain stubble height.

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Chukar

CHUKAR AND GRAY PARTRIDGE STATUS AND TREND REPORT: STATEWIDE

BRIAN M. CALKINS, Small Game/Furbearer Section Manager

Population objectives and guidelines

Management objectives for upland birds, including chukar partridge (Alectoris chukar) and gray partridge (Perdix perdix), are outlined in the Game Management Plan (WDFW 2008). Harvest management is designed to provide maximum recreation opportunity without negatively impacting populations.

Hunting seasons and harvest trends

The hunting season for chukar and gray partridge has varied in length over the years by regions. In the early 1960s and 1970s Region 1 had a split early and late season while the rest of eastern Washington was regulated with one general season. In 1997, the implementation of one, standardized season was set to start October 1 and end the second Sunday in January. The season was changed again in 2003 starting on the first Saturday of October extending to mid-January.

The 2013-14 season opened on October 5th and closed on January 20th. The opportunity to harvest both species was also included in the September 22-23 youth hunting weekend. Daily bag limits are 6 chukar and 6 gray partridge with 18 of each in possession during the general season.

The 2013 Chukar harvest of 5,741 was a 41.4% decrease from 2012 and 63% below the ten year average of 15,444 birds (Figure 1). Gray partridge harvest which had increased steadily in the prior four years dropped to 3,256 in 2013 which was the second lowest level in recent records. This represents a 59.3% decrease from the prior year and a level 53% below the prior 10 year average. Chukar hunter numbers have been on a steady decline over the last decade. The 2,920 hunters who hunted Chukar in 2013 represent a 2.8% drop from 2012 and was 34% below the ten year average of 4,456 (Figure 1). The most productive counties for Chukar were Yakima (1,643), Asotin (927), and Kittitas (886). Whitman (420), Okanogan (370) and Douglas (370) Counties led the state in Gray Partridge harvest.

Chukar hunting was a major recreational pursuit in southeastern Washington during the 1970s when harvest averaged more than 66,000 birds in Region 1 alone. Estimated chukar and gray partridge harvest for the past ten years in regions 1, 2, and 3 is illustrated in Figure 2. Estimated chukar hunter numbers decreased in Regions 1 and 2 by 23, and 5% respectively. Hunter numbers in Region 3 showed a modest 1% increase. Harvest decreased in all three regions from 2012, as follows: Region 1, -51%; Region 2, -56%, and Region 3, -21%. Region 1 harvest was 60% below the prior ten year average (3,533), Region 2, 79% below the average (7,108) and Region 3, 39% below average (4,474).

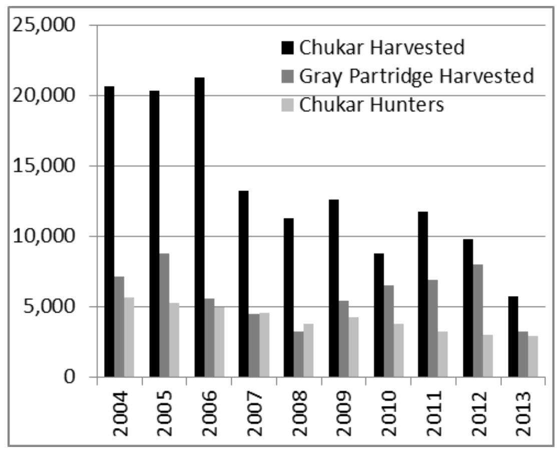

Figure 1. Chukar hunters, chukar and gray partridge harvest statewide for the period 2004 – 2013.

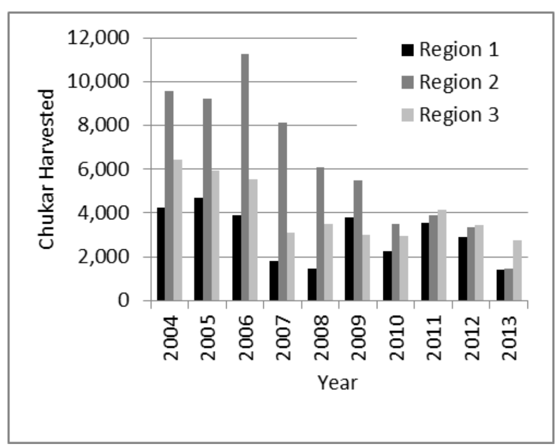

Figure 2. Estimated chukar harvest for Regions 1, 2 and 3 for the period 2004 – 2013.

Hunter participation peaked in the late 1970s and early 1980s, but has declined dramatically since then. Today, approximately 2,900 hunters pursue chukar throughout their habitats in the state of Washington (Figure 1). The estimated 2013 harvest per hunter (1.97) was 46% below the 25 year average of 3.63 and the lowest since at least 1984. The dismal success of hunters in 2013 is most likely attributed to unfavorable conditions for nesting and brood rearing in the spring and early summer months that appears to have negatively affected all upland birds in eastern Washington.

Surveys

Chukar populations were surveyed by helicopter from 1987 to 1997, when aerial surveys were terminated due to budget constraints. In Region 2, three routes are driven (Colockum-Tarpiscan, Swakane-Nahahum, and Chelan Butte) by volunteers and staff in early August to count chukar and other game birds. Each route is approximately 20 miles long, and replicated three times. An average of 2.7 chukars was observed on the Colockum survey route in 2011, an average of 4 chukar was observed on the Swakane route in 2012 and an average of 4 chukar was observed on the Chelan Butte route in 2013 (12 birds on one of the three replications). The Colockum survey route was not completed in 2013 due to a wildfire in the area. In the four years prior to 2011, no chukars were observed during the driving routes. The lower incidence of chukars observed in recent years might be partially attributed to the reduced mileage of the driven routes from road closure occurring in 2007. Averages of 5.6 chukars were observed on each route from 1998-2008. In other regions, field personnel note the abundance of broods during regular field operations and other surveys.

Population status and trend

Absent field survey information, harvest and hunter effort have been used as an index to population trends. These data are estimated through a post-season survey of hunters. Harvest trends suggest that the chukar population remains well below long term averages. However, reduced harvest may also be, at least partially, a function of lower hunter participation, which was at its lowest level in decades in 2013, or loss of hunting access to chukar habitat. Gray Partridge harvest which had been at its highest level in seven years in 2012 dropped to near record lows in 2013. The steep drops in harvest for both species are believed to be due to the impacts of poor weather during the nesting and brood rearing period.

A cursory view of Breeding Bird Survey (BBS) information (Sauer et al., 2012) for Washington suggests a stable or slowly increasing population of chukar since 1966 but data credibility is at a moderate level for this species due to low sample size or other factors. The BBS data for Gray Partridge illustrate a long term decline with the same moderate level of confidence. The BBS information for Chukar may indicate that chukar harvest per hunter, which has remained relatively stable, until this year, may be a better measure of population trends than total harvest, but further analysis would be required to verify this.

The chukar population crashed in the early 1980s and appears to have continued a long-term decline based on harvest trend. The annual population is primarily dependent upon recruitment and over-winter survival influenced by weather and insect productivity. Persistent snow cover during the winters of 1992-93 and 1996-97 may have influenced the dramatic declines recorded in areas of the state. Populations rebounded rapidly following these rough years with assumed favorable nesting and brood rearing conditions, but spring drought conditions in some recent years has likely been detrimental.

Habitat condition and trend

Chukar habitat includes arid areas with steep slopes, deep valleys, and rocky outcrops. Chukar habitat is found where topography, combined with shallow soils, prevented extensive agriculture and/or development. Cheatgrass is a staple of the chukar diet in spring and fall, and the availability of cheatgrass can have a significant impact on chukar populations.

In Region 1, some of the better chukar habitat has been overtaken by yellow star-thistle (Centaurea solstitialis) during the last 20 years. Thousands of acres of habitat along the breaks of the Snake River south of Clarkston are covered with yellow star-thistle. This loss of habitat likely hinders population recovery, but is not the likely ultimate cause of the regional population decline. The problem of star-thistle is now so wide spread, that several counties have halted control programs, leaving it up to the private landowners.

Chukar habitat is relatively stable in Region 2 because of the precipitous nature of the terrain. However, development is increasing (especially in the Wenatchee Valley) near chukar habitat, which could impact chukar populations.

In Region 3, WDFW and Department of Defense (DOD) manage the majority of chukar habitat. Since 1995, the DOD has excluded cattle grazing. Substantial sections of both WDFW and DOD lands have burned in the last few years, reducing shrub cover. Biologists report that chukar in these areas tended to utilize shrub cover during the winter and breeding times of the year, so losing this habitat type to fires likely impacted habitat quality.

Management conclusions

The continued apparent long term decline in the chukar population is most likely due to diminishing habitat quality. For example, the invasion of yellow star-thistle has taken over thousands of acres of quality habitat in southeastern Washington with no quick solution to stop the spreading of this noxious weed. Habitat quality in some portions of the state may have actually improved over time with the abundance of wildfires that influenced the spread of cheatgrass. However, the concurrent loss of shrub habitat due to fires may be detrimental. Residential development, irrigated agriculture, and wind energy facilities are concerns creeping into chukar habitat that may reduce the quality or amount of habitat available in the future. Chukar populations can also be expected to fluctuate annually in response to weather variability and other factors which influence habitat and reproduction. Improving chukar populations may require extensive research into what currently may be a suppressed population.

It is certain that chukar and gray partridge populations in Washington have experienced long term declines. However, the recent changes in harvest, which have continued to be used as the primary population indicator, merit further investigation to determine whether they represent a reliable picture of population status or are influenced more heavily by other independent factors.

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Quail

QUAIL STATUS AND TREND REPORT
STATEWIDE

BRIAN M. CALKINS, Small Game/Furbearer Section Manager

Population objectives and guidelines

Objectives for quail in Washington include maintaining healthy populations in all suitable habitats within the state. At the same time, WDFW seeks to maximize recreational opportunities consistent with population management objectives outlined in the Game Management Plan (WDFW 2008). In the case of mountain quail (*Oreortyx pictus*) the primary objective is to recover populations in the Blue Mountains and potentially other parts of eastern Washington where significant declines have occurred and seasons are closed to protect this species.

Hunting seasons and harvest trends

The general hunting season for California quail and northern bobwhite (Colinus virginianus) in eastern Washington was October 5, 2013 through January 20, 2014. A special youth only hunting weekend occurred on September 21-22. As in previous years, the general season bag limit was 10 per day of a mixed bag, with a possession limit of 30. The general season for California, bobwhite and mountain quail (Oreortyx pictus) in western Washington ran from September 28th through November 30th. Bag limits were the same as eastern Washington with the exception of mountain quail with a daily bag limit of 2 and a possession limit of 4. Mountain quail hunting was closed throughout eastern Washington.

Quail harvest was clearly on a declining trend following a peak of 190,062 in 2003 but has not been dropping as steeply over the past several years (Figure 1). 2013 was a down year for all upland birds in eastern Washington and quail were no exception. The estimated statewide harvest of 72,699 represents a 12% decline from the 2012 harvest of 82,218 birds. Quail harvest in eastern Washington accounts for approximately 98% of the statewide total.

The 2013 harvest estimate of 10,400 quail in Region 1 represents a 34% decrease from the 2012 harvest of 15,792 and was 59% below the prior ten year average of 25,188 (Figure 2). Harvest in Region 2 increased by 3% with 31,127 quail harvested, which was 38% below the prior ten year average of 50,571 birds per year. The estimated harvest of 29,728 quail was 15% below the 2012 harvest of 35,111 for Region 3 and 34% below the region's ten year average of 45,351. The combined harvest estimate for Regions 4, 5 and 6 was up by 47% at 1,444 quail, with 80% of that harvest occurring in Klickitat County, which is the only eastern Washington county included.

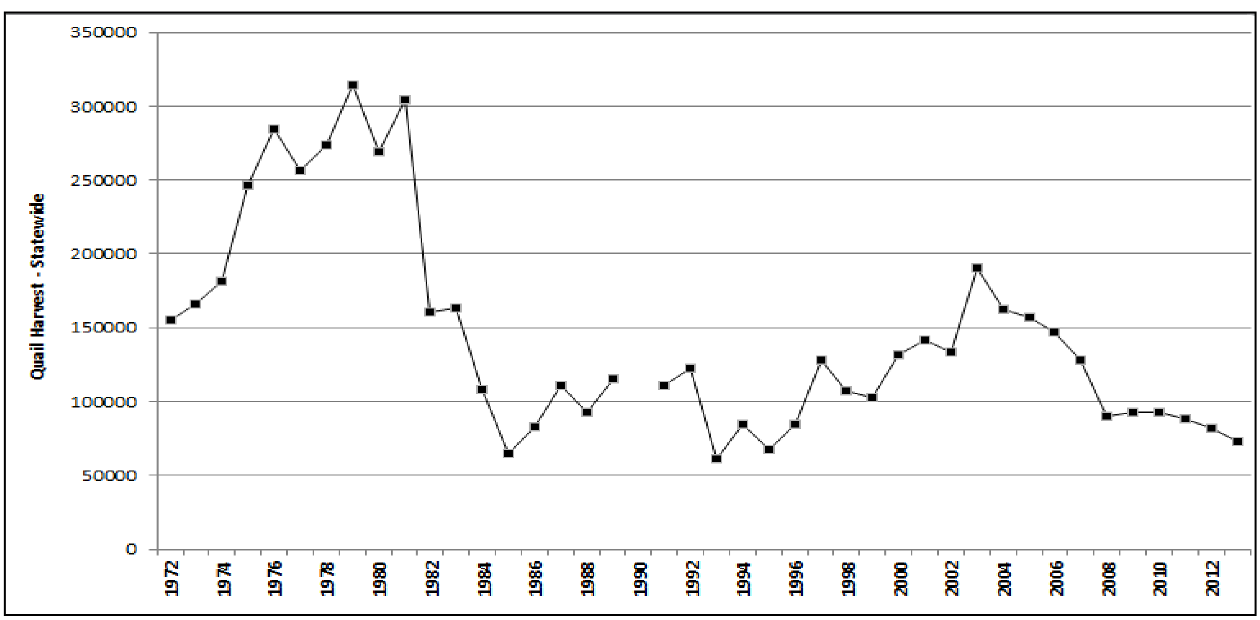

Figure 1: Estimated Washington State quail harvest for the period of 1972 - 2013

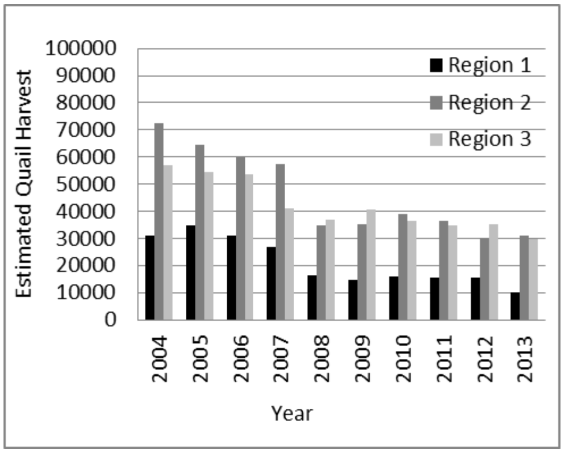

Figure 2: Region 1, 2, 3 quail harvest 2004 - 2013

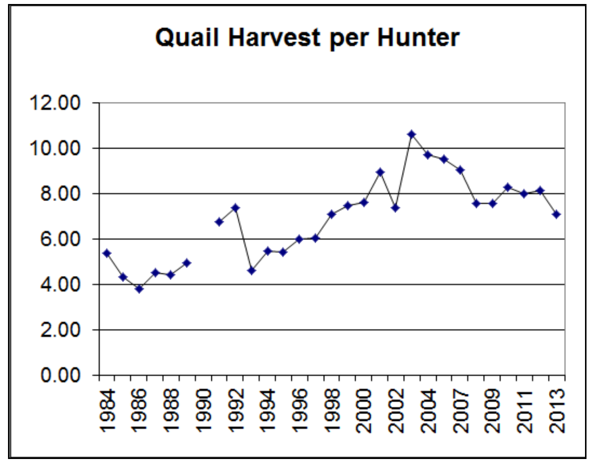

Figure 3: Washington Quail harvest per

Population status and trend

Because field surveys are not conducted to estimate or track populations, harvest estimates have been used as an index to population status. Based on harvest, it appears that quail populations in Washington are currently much lower than they were in the late 1970s and early 1980s (Figure 1). This decline is most likely related to "clean" farming practices introduced in the early 1980s that encouraged the removal of shrubby cover along fence lines and in draws. In contrast, US Geological Survey breeding bird survey information for Washington suggests an increase in California quail populations since the 1970s but is less clear for bobwhite due to a limited number of observations (Sauer et al 2012).

There is no clear cause for the decline in quail harvest and presumed population since 2003. Farming practices have not changed substantially during this time but the breeding bird survey (Sauer et al 2012) does suggest that California quail have declined during this period. Another indicator of population, harvest per hunter, has also declined since 2003. This measure, which was fairly stable from 2008 to 2012 at around 8 birds per hunter, dropped to 7.05 in 2013 probably reflecting poor spring conditions for nesting and brood rearing (Figure 3). Quail can be very productive if conditions are good, which may have been the key to the 2003 peak, and may rebound with a period of favorable winter and spring conditions. Based on harvest indicators, the current quail population may be similar to population numbers 20 years ago (Figure 1).

Habitat condition and trend

Similar to other agriculturally associated wildlife, quail habitat quantity and quality has declined for decades. Of particular importance is breeding habitat (including nesting and brood rearing habitat), habitat for wintering and habitat that provides escape cover from predators. Land development and "clean farming" practices have dramatically reduced and fragmented suitable habitat for all upland game birds including quail.

A food habits study conducted in southeastern Washington performed an analysis on 157 California quail crops from March – September in which male and female quail were selective in their feeding habitats with jagged chickweed the major food item during the spring months (23 and 34 percent, respectfully), among other plants considered as weeds (Anthony 1970). Advances in weed control technology in modern agriculture tend to reduce the prevalence of forbs upon which some wildlife depend upon.

The Conservation Reserve Program (CRP) has benefited quail with diverse riparian plantings, field corner shrub plantings, and general CRP signup plantings. Since the inception of CRP, contracts have received new ten year contracts, one to five year extensions, or were rejected and farmed again. Dense vegetation, litter accumulation, and decreased species composition of older CRP fields may limit the habitat value for some species (Rodgers 1999). Recently however, new state or federal programs such as State Acres for Wildlife Enhancement (SAFE) are offering incentives to encourage landowners to diversify their CRP lands. Of particular importance to upland birds are requirements to maintain forbs within the stands.

Continuation of programs such as these is considered vital to enhancing upland bird habitat in eastern Washington.

The highest California quail densities are typically associated with brushy riparian areas and shrub-steppe habitat near riparian areas; however quail have adapted well to urban neighborhoods. Residents enjoy watching quail and often feed them throughout the winter months. Urban quail populations with high survival may act as population reservoirs by providing brood stock to adjacent non-urban populations where survival may be lower.

Augmentation and habitat enhancement

Occasionally, Private Lands Biologists and Wildlife Area staff trap California quail from urban populations to augment populations that appear to be reduced or to enhance recreational opportunity.

A three-year project to enhance mountain quail populations in southeast Washington was implemented in March 2005. Mountain quail were trapped in southwest Oregon for release in Idaho and Washington. Washington released 73 birds in March 2005 and 89 in March 2006 in the Asotin Creek watershed. Monitoring of the released birds was accomplished by fitting 50 of the birds with necklace-style radio collars each year. Of the 50 marked birds in 2005, 34% survived to 6 months post release. In 2005, 8 nests had 100% nest success. Average clutch size was 9.25, with average hatch date of July 2. Six of the eight successfully nesting birds had chicks present at 28 days post-hatch, the other 2 failed to have successful flush counts. In March 2006, 89 birds were released with 49 being fitted with necklace-style radio transmitters. By August 2006, 82% of the radio-marked birds had died. Five of the 8 birds attempting to nest during 2006 successfully hatched their nests. Male mountain quail incubated sixty percent of the nests over the 2 years, with 47% of all successful nests raising chicks to 28 days of age. (Stephenson 2008). Unfortunately, birds captured from southwestern Oregon during the winter of 2006/2007 all died in captivity in a holding facility in south-central Washington.

In 2012, the mountain quail augmentation effort was reinitiated which included the construction of a new holding facility and the release of 94 birds from western Oregon. However, the survival of the birds from this release was not monitored closely as was done with the initial earlier releases.

In 2013, 49 mountain quail trapped in western Oregon were released in the Asotin Creek drainage. 25 of these birds were marked with necklace type transmitters for monitoring. As with previous releases, the initial mortality was high and as of the end of June, eight live collared birds were being monitored, two of which were known to be attending nests neither of which hatched successfully.

Since population level surveys on a small dispersed population such as this are impractical, the effect of the augmentation effort in terms of reestablishing a viable population is difficult to assess. Work to answer this question will most likely precede any further releases to assess success or the need to adapt to other methods to restore the population.

Surveys

Population/production surveys were discontinued in 1999 due to limited time and funding for district biologists. The post-hunting season questionnaire is used to estimate harvest and currently provides the best index of population status.

Five calling survey routes specifically designed to detect the presence of mountain quail were re-established in the Asotin Creek drainage in the spring of 2009. Mountain quail were either heard or observed on 2 of the 5 survey routes that year. University of Idaho had originally established the routes with WDFW in 2005 using the protocol from "Validation of a Mountain Quail Survey Technique" (Heekin and Reese 1995). These surveys have not been conducted over the past few years.

Management conclusions

Washington quail are major upland game bird species and of significant interest to wildlife viewers as well. Habitat improvements, including the various Farm Bill programs are key to WDFW's ongoing efforts to enhance upland game bird populations including quail. Riparian programs that include a mixture of shrubs, grasses, and forbs will be particularly beneficial.

An evaluation of the mountain quail augmentation project in southeastern Washington is needed to determine whether the methods are helping to reestablish a viable population or whether changes to the current strategy are needed. A first step in this evaluation should be a search for similar evaluations in the neighboring states of Oregon and Idaho where similar augmentation has been occurring concurrently. If a review of those efforts is inconclusive, field surveys may be necessary in Washington to examine the current status of mountain quail in our reintroduction area. Habitat enhancements may be needed in combination with future releases or as a next step in the recovery effort.

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Grouse

FOREST GROUSE STATUS AND TREND REPORT:
STATEWIDE

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MICHAEL SCHROEDER PHD, Grouse Biologist

Population objectives and guidelines

Forest grouse in Washington include dusky grouse (*Dendragapus obscures),* sooty grouse (*Dendragapus fuliginosus),* and ruffed grouse (*Bonasa umbellus*), which occur throughout the forested lands in Washington, as well as spruce grouse (*Falcipennis canadensis*), which are closely tied to higher elevation spruce/fir habitats. Dusky and Sooty Grouse were once collectively classified as Blue Grouse. Forest grouse management objectives are:

1. Preserve, protect, perpetuate, and manage forest grouse and their habitats to ensure healthy, productive populations.

2. Manage for a variety of recreational, educational and aesthetic purposes including hunting, scientific study, wildlife viewing, cultural and ceremonial uses by tribes, and photography.

3. Manage statewide populations for sustained harvest.

Brewer (1980) stated that ruffed grouse could sustain harvest of up to 50% of the fall population without threat of decline and our objective is to avoid a take that exceeds that number. Present harvest is thought to be well below 50% although exact population and harvest levels are not known.

Hunting seasons and harvest trends

A statewide harvest estimate (determined by using a mailed hunter questionnaire) is the main indicator for long-term population trends. Developing estimates of forest grouse hunter numbers and harvest is challenging because of a licensing structure that allows harvest with a big game license as well as a small game license. Forest grouse harvest survey methods were modified in 1998 and 1999 because of 1) difficulty in separating effort among the 3 grouse species, 2) inaccuracy in species identification by some hunters, and 3) changes in hunting license structure that impacted hunter sample stratification. Because of this change in survey technique, comparison of forest grouse harvest information before and after this time should be done with some caution.

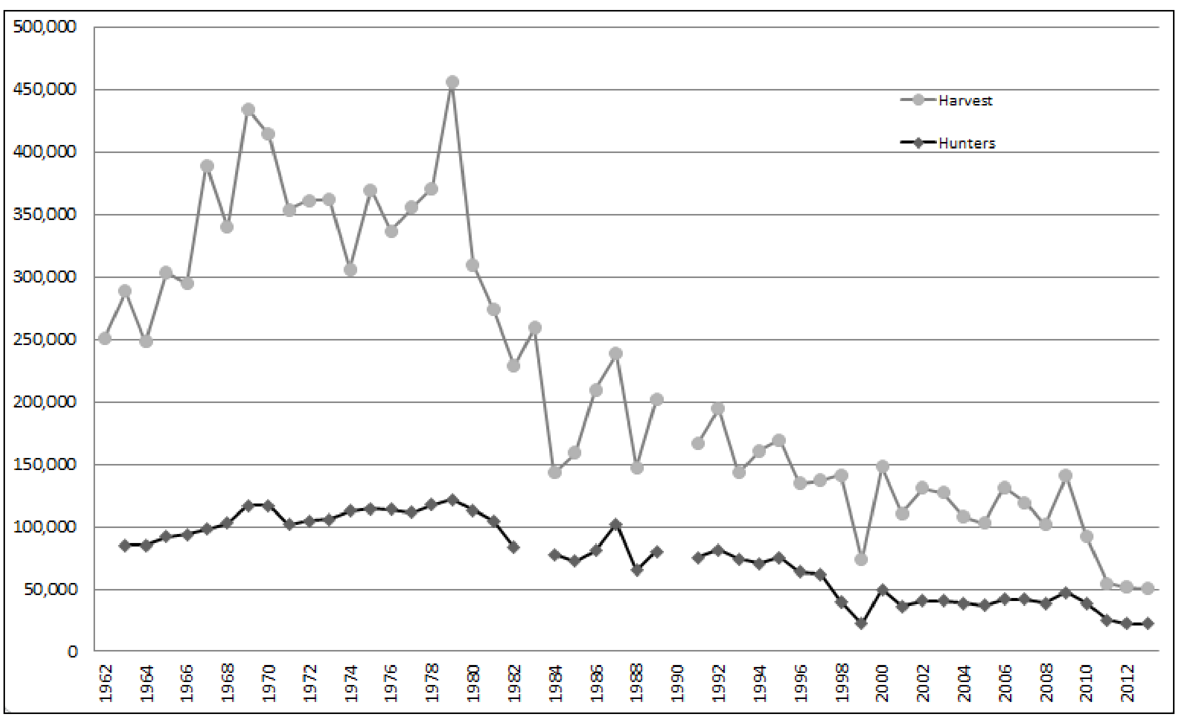

Figure 1: Long-term trend in grouse harvest and hunter numbers, 1963-2013.

The current Sep. 1 to Dec. 31 hunting season structure has been in place since 1987. A daily bag limit of 3 of any of the three species was in place from 1952 to 2009 when the bag limit was raised to four. This increase in the bag limit was not made in response to increasing populations, but rather in response to a desire to increase opportunity. Since hunters had been taking approximately 0.4 grouse per day hunted, which had been the case for over 50 years, it was believed that increasing the bag limit would not impact overall populations. Interestingly, the harvest per day has been approximately 0.3 birds per day since the bag limit was increased.

Estimated hunter numbers and harvest have declined from the historic highs of the 1970s and dropped sharply in 2010 and 2011 (Figure 1) but have been fairly stable over the past three years. The statewide hunter harvest of 50,335 in 2013 was down 3% from 2012 and was 51% below the prior ten year average. Harvest estimates continue to be closely tied to hunter participation which was essentially unchanged from the previous season (Figure 1). Increased restrictions in motorized travel and new fee permit access programs within industrial timberlands may influence hunter participation as much as grouse numbers and contribute to the downward trends. Harvest monitoring since 1999 should provide comparable data. In addition, improvements in data collection and analysis should provide a better understanding of harvest both regionally and statewide.

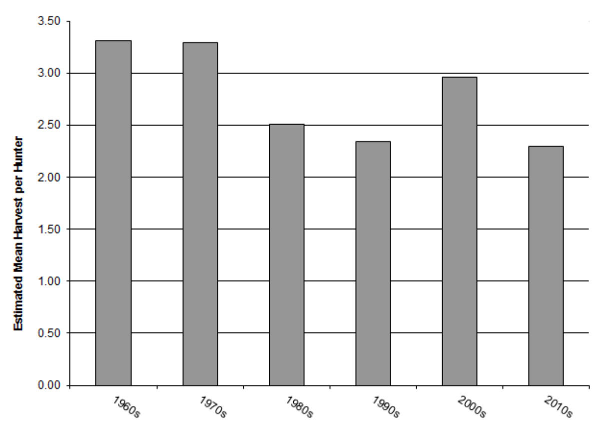

Figure 2: Estimated grouse harvested per hunter in Washington 1963-2013.

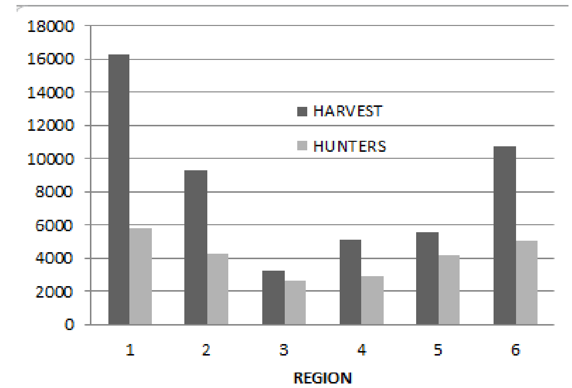

Figure 3: 2013 Forest grouse harvest and hunters by WDFW region

Although grouse hunter and harvest estimates have varied substantially over time, annual estimates of harvest per hunter (an indicator of hunter success) have not declined as dramatically. Estimates of hunter success since 2000 have been higher than, or similar to, the 1980s and 1990s (Figure 2).

The estimated harvest and hunter numbers by region in 2013 are depicted in Figure 3. The estimated harvest in Region 4 increased by 90% and Region 1 harvest increased by 19% compared to 2012 levels. Region 5 harvest declined by 34% and Regions 2, 3 and 6 had declines ranging from 10 to 15%. While the effect of spring weather on chick production and survival is a well-known factor influencing variation in population, the wide range of variation between regions is difficult to explain. Changes in access for hunting may play a role or it may be attributed to variation within the sample of hunters surveyed from one year to the next.

The cause of the long term and recent harvest declines are not definitively known, but reductions in hunter participation is a likely contributor. Loss or changes in forest habitat and vehicular or other access restrictions may also be affecting populations and harvest opportunities.

Region 1 typically has the highest number of both forest grouse hunters and birds harvested and accounted for 32% of the grouse harvested in the state. Okanogan and Stevens Counties produced the highest numbers of Grouse in eastern Washington and Skagit and Lewis Counties were the top producers west of the Cascades.

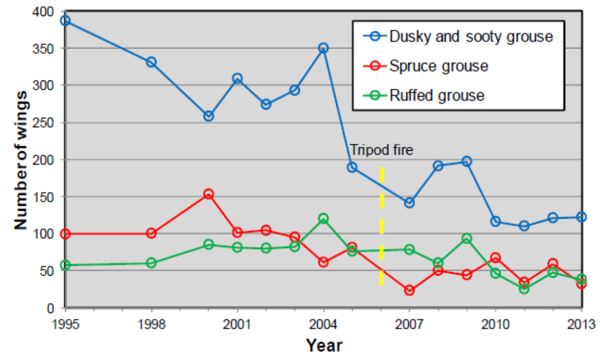

Figure 4: Forest grouse harvest represented by wing barrel collections by species in north-central Washington 1995-2012 (Schroeder, 2013)

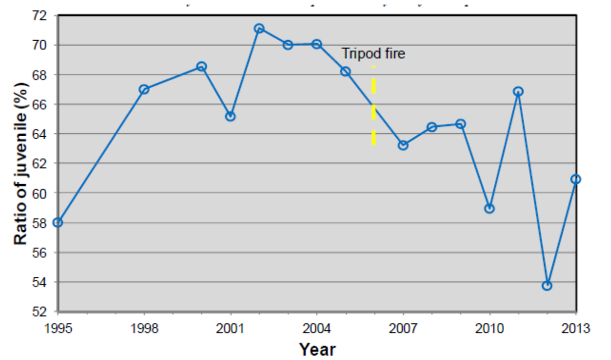

Figure 5: Ratio of juvenile to breeding aged grouse represented by wing barrel collections in north-central Washington 1995-2013 (Schroeder, 2013)

Surveys

Statewide population surveys for forest grouse are not conducted; however, some surveys have continued in north-central Washington. Forest grouse wings are collected in the same areas as previous years by placing barrels in strategic locations where hunters voluntarily deposit one wing from each grouse killed. Wings are classified as to species, sex, and age. Analysis of this north-central Washington data shows harvest to be split between the three forest grouse species and how the distribution of harvest has changed over time (Figures 4, 5). The data also suggest that changes may be influenced by major landscape change due to fire but the results are not clear in this regard.

Statewide wing collections from 1993-95 provided several pieces of important information, such as, more than 70% of forest grouse harvest occurs in September and early October, before modern firearm deer seasons. Therefore, current seasons that extend through December probably have very little impact on grouse populations. In addition, there is a tendency for hunters to misidentify grouse species, which has resulted in forest grouse species being combined for current harvest estimation purposes.

The Little Pend Oreille National Wildlife Refuge has conducted wing barrel collections each year. Total numbers of wings collected has varied over time but the number of wings deposited by hunters was above average in 2011 and 2012. Species here include Dusky, Spruce and Ruffed Grouse with Ruffed Grouse accounting of most of the total harvest. (Michael Munts, USFWS, personal communication)

Population status and trend analysis

Based on long-term harvest trends, it appears that forest grouse populations may be declining. However, it is difficult to draw concrete conclusions due to the fact that harvest estimating methods have changed over time and hunting access and other factors may influence harvest independently from population size. The fact that harvest per hunter has not varied much over time (Figure 2) may indicate that the number of grouse available to hunters has not changed as dramatically as harvest suggests. Since hunters are not able to consistently identify the species of forest grouse harvested, evaluating population trends for individual species is even more difficult.

Annual production is greatly influenced by weather conditions during the peak of hatching (late May early June). Wet and windy weather reduces chick survival due to over-exposure as well as reducing insect populations at the time when young grouse need a high protein diet. Weather patterns in the spring are often a good predictor of fall harvest and population.

Habitat condition and trend

Although long term habitat losses have occurred, forest management and wildfire are the most significant factors statewide for influencing habitat condition and forest grouse population trends. Historically, timber harvest activities have been considered beneficial for most species of forest grouse. Recent changes to silvicultural techniques such as control of broadleaf species that are important food resources, with herbicides may play a significant role in the degree to which commercial forests provide benefits.

Future benefits from timber harvest will depend on the manner in which regenerating forests are managed. Regeneration techniques that include extensive broad leaf tree and shrub control, reduced stocking rates and cover density through thinning and pruning, and replanting with tree species that provide fewer habitat benefits may negatively impact grouse populations.

In eastern Washington, recent timber market changes have resulted in some timber stands becoming more valuable than they were ten or twenty years ago. Specifically, lodgepole pine forests have increased in value so there is increased interest in harvesting the timber. In addition, mature lodgepole pine forests have become infested by pine beetles, killing the trees. Forest managers want to harvest those trees before they decay or burn in wild fires. Whether changes such as these will significantly affect forest grouse may be difficult to determine definitively.

Wild fires are an important factor influencing grouse habitat in eastern Washington. Several large fires have occurred in forested areas of Region 2 since the late-1980s. These areas are currently in early successional shrub communities, which should be beneficial to grouse for several years to come but this may be offset by loss of mature forest stands important to winter survival.

There is significant potential to reduce spruce grouse habitat if regeneration techniques are intensive. From a habitat standpoint the better lodgepole and spruce/fir sites may be converted to more merchantable species of trees and harvested stands may end up at much lower stocking rates than are currently present. Both of these outcomes could reduce value of the habitat for spruce grouse.

Augmentation and habitat enhancement

Supplementation of forest grouse populations is generally considered unnecessary in Washington State. No large-scale efforts have been made to enhance habitat for forest grouse. WDFW Habitat Program staff, however, frequently respond to Forest Practice Applications with recommendations to mitigate forest management impacts on wildlife. These recommendations commonly include the following: leaving large down logs in timber harvest areas as drumming logs for ruffed grouse; retaining large, “wolf-tree” Douglas-fir trees on ridge tops for blue grouse winter foraging and roosting, and seeding skid roads and log landings with clover and other grouse forage plants.

Management conclusions

Many factors may be influencing forest grouse harvest which historically has been used as the primary population status indicator. While harvest has declined, hunter success rates have been reasonably consistent which might suggest that grouse availability to hunters has not changed as significantly as total harvest suggests. In recent years, the finest level of harvest tracking has been at the regional level which has not necessarily been adequate to help identify how a variety of factors might be influencing harvest. To this end, future monitoring should include assembling existing data at the county level or identifying geographic assemblages of counties across the state to track changes.

Exploring a variety of survey based population monitoring techniques may also be necessary as well as studying the affect of hunter harvest and changing silvicultural practices on populations.

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Private Lands Access

PRIVATE LANDS ACCESS

BRIAN M. CALKINS, Small Game/Furbearer/Private Lands Section Manager

Purpose:

WDFW's Private Lands Access Program works with landowners to provide public access to private property for the purposes of outdoor recreation with an emphasis on hunting. Program goals include assisting and encouraging landowners to provide public hunting access and addressing the costs that landowners incur when allowing the public on their property (WDFW 2014). The program, funded primarily by Pittman Roberson funds distributed by the U.S. Fish and Wildlife Service, relies heavily on partnerships with private landowners, sportsman's groups and volunteers.

During Fiscal Year 2014, WDFW had active formal hunting access agreements with 580 landowners encompassing more than 1.3 million acres of private land in eastern and western Washington (Table 1 at end of this report). While WDFW prefers to work within the context of formal agreements, in some parts of the state where the emphasis is on access to industrial timberlands field staff work closely with large landowners on a less formal basis to help facilitate improved access for hunters. Work of this type is more difficult to measure and is not included in Table 1.

The formal agreements, noted above, fall into one of the following five hunting access types:

- *Feel Free to Hunt* –Lands where WDFW has a management agreement with the owner to provide public access for hunting in exchange for cash payments and/or services and materials (signs) for the posting and enforcement of regulations on these lands on an open and non-restrictive basis.

- *Register to Hunt* –Lands on which WDFW has a management agreement with the owner or organization and hunting is regulated by on-site registration. Typical work includes: the annual sign-up of farmers, posting and changing signs as crops are harvested, monitoring of hunter use and pick up and analysis of registration forms. This is typically used on large circle-irrigation corporate farms and in some cases, may include cash incentive payments to landowners.

- *Hunt by Reservation* –This new component in the private lands program, launched in 2013, has been attractive to some landowners. Signs, staff monitoring and other services are provided and in some cases landowners also receive cash incentives for their participation in high priority areas. The program requires hunters to make advance reservations via an automated on-line system prior to arriving at the site to hunt. Landowners have access to hunter names that will be on their land and may specify that hunters contact them prior to hunting.

- *Written Permission Program* – This includes private lands where WDFW provides information signs to those property owners who voluntarily open their land to public hunting on a contact-for-permission basis. Typical signs provided to cooperating farmers are: Hunting by Written Permission, Watch for Livestock, Close the Gate, and Don't Litter. Typical work in this sub-program is continual personal communication with farmers and farm groups explaining the availability and variety of signs offered. Permission slips for access are provided by WDFW and are collected at the end of the year.

- *Landowner Hunting Permit (LHP) Program* – This program includes private lands where WDFW negotiates public hunting access to unique and/or high quality hunting opportunities. Landowners are allowed to work with the Department to set special hunting season dates on their property and have hunting opportunities on their lands be customized.

Regional Information and Trends

Objectives and priorities within the Private lands Access program vary by region depending on the nature of the landscape and hunter access needs. The number of landowner contracts and acres under contract are summarized by region in Table 2 along with changes since the last reporting period. However, these figures do not necessarily represent the full scope of access opportunities provided by the work of private lands biologists as many of their

	FY 2014		Change from 2013		% change	
Region	Cooperators	Acres	Cooperators	Acres	Cooperators	Acres
1	277	552,371	49	173,728	21%	46%
2	129	311,419	-16	-20,737	-11%	-6%
3	75	246,732	-4	-14,185	-5%	-5%
4	65	161,829	29	156,419	81%	2891%
5	16	109,522	1	-174	7%	0%
6	18	2,884	8	1,264	80%	78%
State Total	**580**	**1,384,757**	**67**	**296,315**	**13%**	**27%**

Table 2: FY 14 Cooperators, Acreage, and Change from 2013

efforts do not necessarily fall into the realm of formal agreements.

Declines in acreages and contracts in some parts of the state are, in part, due to landowners, who had enrolled in conjunction with past Federal Conservation Reserve Program (CRP) agreements, returning lands to agricultural use. With reductions in the CRP program acreage available and changes in the economic value of certain crops, some landowners have chosen to return to farming previous CRP ground and often prefer not to have hunters on areas where crops are being grown.

There were 277 cooperators and 552,371 acres enrolled in access agreements in Region 1. The increases were due to a continued emphasis on enrolling lands within the Southeast Washington Pheasant Focus Area where cash incentives were offered to landowners and one contract with a private timber company to manage access on a large acreage in the northern part of the region. The program in the focus area has been well received and most of the landowners, who enrolled, chose the new Hunt by Reservation option. Although not reflected in the increased totals, Region 1 experienced loss of some cooperators who converted CRP cover back to agricultural uses. In addition to the hunting programs the region also has several landowners enrolled in a Feel Free to Fish program that allows stream bank fishing access in Walla Walla County.

For this reporting period there were 311,419 acres including 129 landowners enrolled in access agreements within Region 2. These figures represent a decline which is heavily influenced by the reduction in available CRP acreage and economic factors drawing more land back into crop production. One of the region's popular programs with waterfowl and upland bird hunters offers landowners cash incentives to allow access on croplands where stubble is left undisturbed to provide an enhanced food resource. Some of the corn stubble sites were managed through the new reservation system during the 2013 hunting season.

There were 75 cooperators in the access program in Region 3 encompassing 246,732 acres available to the public. A large portion of the acres available are signed up through the Feel Free to Hunt and the Landowner Hunting Permit programs, primarily for deer and elk hunting opportunity. The region also enrolls croplands in the stubble retention program described under Region 2 and sees potential to expand the acreage if funds become available.

Region 4 efforts primarily focus on waterfowl, snow goose, and pheasant hunting access but staff here have also been working with both small and large landowners to improve access for Deer, Elk and Bear hunting. During this reporting period there were 65 cooperators and 161,829 acres under contracts. The majority of these agreements were on relatively small acreages for waterfowl hunting but the bulk of the acreage was included in new contracts with timber companies to facilitate deer, elk and spring bear hunting access. Some of the waterfowl sites in Region 4 are in the Hunt by Reservation Program and are managed to provide quality experiences. Hunting opportunities in the northern part of the region also help landowners address crop damage problems posed by large numbers of snow geese.

Private lands access programs in Region 5 have long focused on Klickitat County where over 100,000 acres enrolled was enrolled in the Feel Free to Hunt Program providing popular deer and turkey hunting opportunities. Other agreements provide upland bird hunting opportunities. The largest private land focus in Region 5 is access to industrial timberlands. Staff continued to work with Weyerhaeuser Timber Company during the 2013 hunting season to continue their partnership to improve elk hunting access on their ownership that includes approximately 250,000 acres in Cowlitz County. Up to 12 volunteers per day, coordinated by WDFW staff, assisted with implementing the program that provided motorized access on the St. Helens Tree Farm. Eighty percent of the Margaret Game Management Unit and 100% of the Toutle and Coweeman Game Management Units were made available for motorized access. These acres were available to the public, but are not included in the Table 1 acreages as this effort is not under a formal agreement. Following the hunting season, Weyerhaeuser staff advised WDFW that they would be implementing a fee access program during 2014 the hunting season. As a result, the cooperative arrangement has been discontinued.

In Region 6 there were 18 active contracts encompassing 2,884 acres of public access opportunities during the reporting period. This included waterfowl hunting opportunities in Grays Harbor and Mason Counties and pheasant hunting on private lands in Kitsap County. As in Region 5, a great deal of the effort in Region 6 was devoted to working with large industrial timber companies that are not enrolled in formal contracts. These relationships helped to facilitate public access and assist landowners in managing public recreation and providing information to the hunting public. Work in this arena relies heavily on directing volunteer efforts to monitor use and discourage abuses of private lands, conduct cleanup of illegal dump sites and maintain signage and gates. Much of the private industrial timberland acreage in Region 6 has new landowner fee access requirements or is under lease arrangements. Some of these permit programs also limit hunter numbers below levels that occurred in the past. This trend in both Region 5 and 6 is a growing concern of hunters who are finding it harder to locate places to hunt or are not willing to pay fees for access.

WDFW's Private Lands Access Program continues to be a valuable asset to the hunting public and the landowners we work with. Although urban development and changing land uses have continued to erode the amount of land available to hunters, a relatively new emerging trend has risen to the forefront of concern where many of western Washington's largest timberland owners are implementing fee permit or exclusive lease access policies. By the end of the reporting period, WDFW was aware of over one million acres where these programs were being implemented by landowners in western Washington with the majority of that acreage changing status in the last two years. WDFW was concerned that the trend could severely limit opportunities for big game hunting in particular and continued to engage landowners. Most of the already implemented company permit fees had been relatively high and the number of permits issued was usually limited. With no regulatory authority or resources to match the income potential of these programs, WDFW took the approach of attempting to discourage fee programs but also encourage higher numbers of lower cost permits as an option that would be more acceptable. Some landowners appear to have acknowledged this request as some of the new programs announced recently have had lower fees and allowed for greater hunter participation. Hunters who are unwilling or unable to obtain permits are still forced to look elsewhere for access which will increase pressure on, or cause crowded situations, on public and other private lands. Addressing this trend has become the most important issue facing the Private Lands Access Program in addition to the ongoing challenges of continuing to provide access on agricultural and other types of land.

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Table 1: Access Agreements and Acreage by County

	Feel Free to Hunt		Hunt by Reservation		Register to Hunt		Hunt w/ Written Permission		Landowner Hunting Permit (LHP)		County Totals	
County	**Cooperators**	**Acres**	**Cooperators**	**Acres**	**Cooperators**	**Acres**	**Cooperators**	**Acres**	**Cooperators**	**Acres**	**Cooperators**	**Acres**
Adams	8	10,062					43	111,792			51	121,855
Asotin	4	4,185			2	4,219	11	17,340	1	8,746	18	34,490
Benton	14	48,194			2	8,320	2	20,425	1	58,009	19	134,948
Clallam	1	216									1	216
Columbia	13	28,388					11	20,606			24	48,994
Cowlitz	2	391									2	391
Douglas	24	18,225			1	1,640	20	50,761			45	70,626
Ferry			1	563			2	570			3	1,133
Franklin	28	51,566					9	16,584			37	68,150
Garfield	14	12,199	4	2,422	3	5,511	8	11,783			29	31,915
Grant	12	30,229	3	635	1	180	15	45,849	1	41,870	32	118,763
Grays Harbor	3	848	1	70	1	111	2	130			7	1,159
Island	7	2,287									7	2,287
Jefferson	3	473					1	115			4	588
King	1	288									1	288
Kitsap	2	400									2	400
Kittitas							2	10,080			2	10,080
Klickitat	8	106,586					4	2,339			12	108,925
Lincoln	4	5,968					26	35,073			30	41,041
Mason	4	522									4	522
Okanogan	1	175									1	175
Pend Oreille	2	129,997	1	238							3	130,235
Skagit	24	2,695	5	278			2	135,828			31	138,802
Snohomish	9	1,121	1	34			1	17,331			11	18,487
Spokane	1	4,890					2	2,998	1	3,975	4	11,863
Stevens	1	62,225	6	2,122			12	10,587			19	74,934
Wahkiakum					1	86	1	120			2	206
Walla Walla	30	53,882	2	3,423			8	10,443	1	7,280	41	75,028
Whatcom	15	1,966									15	1,966
Whitman	18	14,247	58	59,526	2	321	28	28,644			106	102,738
Yakima	10	9,432					5	11,460	2	12,662	17	33,554
Grand Total	**263**	**601,657**	**82**	**69,312**	**13**	**20,388**	**215**	**560,859**	**7**	**132,542**	**580**	**1,384,757**