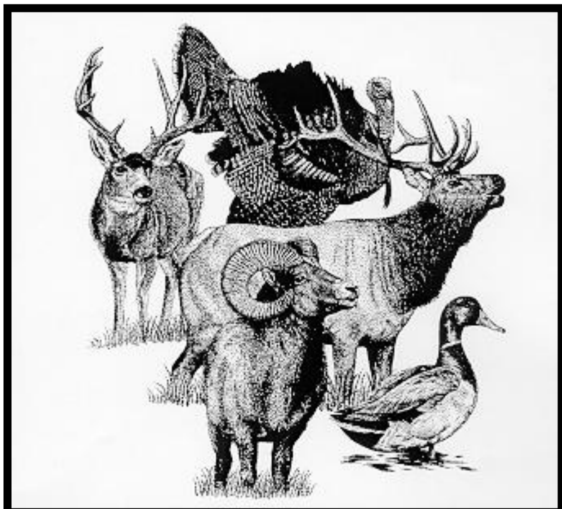
STATE OF WASHINGTON

2011 Game Status and Trend Report



Washington Department of FISH and WILDLIFE

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2011 Game Status and Trend Report

July 1, 2010 – June 30, 2011

Washington Department of Fish and Wildlife
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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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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 low 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 (Washington Department of Fish and Wildlife 2008). Antlerless hunting opportunity is managed to maintain healthy white-tailed deer populations within landowner tolerance. 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

Figure 1 depicts the trend in total estimated deer harvested by hunters within the Colville District from 2001 through 2010. The total harvest decreased by 41% from the recent peak in 2006. In addition all hunting methods showed a gradual decrease in participation from 2006 to 2010 (Figure 2). The number of days hunted per deer harvested has gone up over the last five years from 15 days in 2005 to 22 days in 2010 (Figure 3).

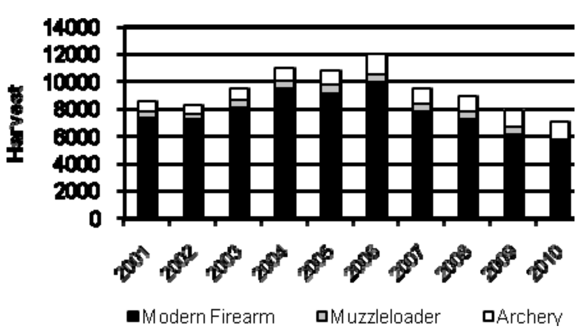

Figure 1. Trend in the total general deer harvest for GMUs 101-124 from 2001-2010.

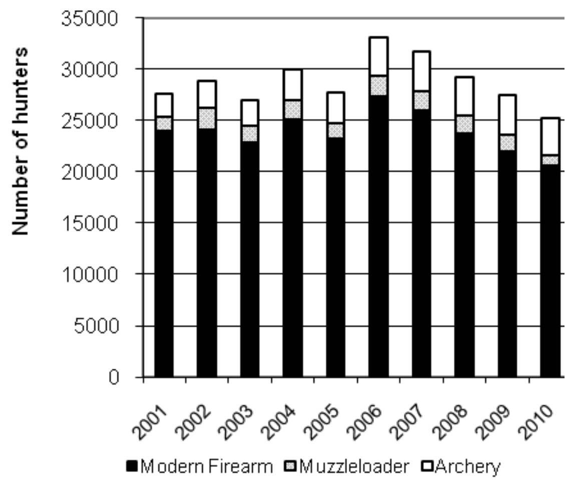

Figure 2. Trend in the number of deer hunters for GMUs 101-124 from 2001-2010.

Since 1997 mule deer bucks legal for harvest have been limited to a three-point minimum. The most prominent mule deer harvest in the Colville District occurs within GMU 101 (primarily northern Ferry County). Mule deer buck harvest increased from 2001 especially for modern firearm hunting. Since 2003 the total mule deer harvest in GMU 101 has fluctuated around 300 bucks annually (Table 1).

Table 1. Mule deer buck harvest trend from hunter reports by user group within GMU 101 from 2001-2010. (Arc = Archery ;MZL = Muzzleloader ; MF = Modern Firearm hunter harvest).

Year	Arc	MZL	MF	Total	%4pt+
2001	6	n/a	184	190	45%
2002	13	n/a	227	240	53%
2003	20	15	281	316	56%
2004	13	18	305	336	61%
2005	19	31	279	329	52%
2006	19	21	221	261	51%
2007	26	24	243	293	49%
2008	21	34	226	281	49%
2009	22	21	259	302	62%
2010	24	14	261	299	52%

The reported harvest of antlerless white-tailed deer was

1,373 and a total of 5,545 antlered white-tail bucks were reportedly taken within PMUs 11 and 13 combined (GMUs 101-124) during the 2010 season (Table 2). Harvest of white-tail bucks increased from 4,530 taken in 2009. Beginning in 2010 Youth, Senior, and Hunters with Disability (Y/S/D) were allowed to take any white-tail (including antlerless) for only 4 days including the second week-end of the Early (October dates only) Modern Firearm Deer Season within GMUs 105-121. There were only 75 antlerless white-tailed deer permits allocated for modern firearm deer hunters within GMUs 105-121 in 2010, a tremendous decrease from previous seasons. Overall the proportion of antlerless white-tails taken in 2010 was 25 per 100 antlered bucks taken. This is the lowest ratio obtained since 2001.

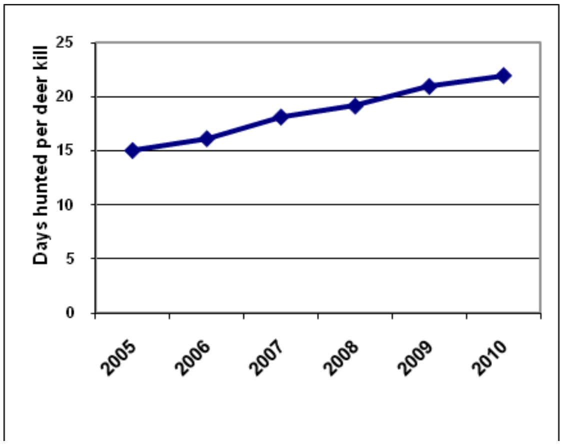

Figure 3. Five-year trend in the number of days hunted per deer harvested within the Colville District.

Surveys

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 2009 and 2010 increased considerably from previous years back to 2001 (Figure 4).

White-tail buck antler data are also collected from check stations and mandatory hunter reports. This includes tallies of mature bucks that have 5 or more points on the high side of their antlers. Field checks and hunter harvest reports in 2010 yielded 14% and 21% respectively of all bucks harvested as having 5 points or more for the overall white-tail harvest within the Colville District. These data substantiate an increase in the proportion of mature bucks represented in the harvest since 2001 particularly from hunter reports (Table 3 and Figure 5).

The proportion of white-tail yearling bucks brought to hunter check stations increased from 2009 to 2010 (Table 3). Amongst white-tail bucks, 48% (*n* = 25 of 52) were yearlings and amongst white-tail does, 30% (*n* = 6 of 20) were yearlings. There were also 5 fawns in the antlerless harvest checked in 2010. The mean age of adult white-tail bucks (yearlings excluded) checked in 2010 was 3.7 years, which is up from the previous 3-year average of 3.1 years.

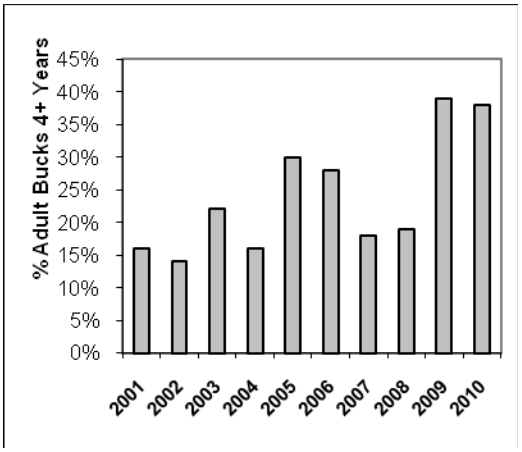

Figure 4. Percent of adult white-tail bucks 4 years and older from hunter check stations, 2001-2010.

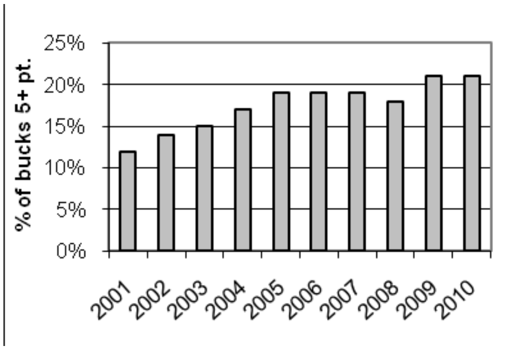

Figure 5. Percent of PMU 13 (GMUs 105-124) white-tail bucks 5 point or better from hunter reports.

Table 2. Hunter harvest of antlered and antlerless white-tailed deer by Game Management Unit in 2010.

		Antlerless					Antlerless per
PMU	*GMU*	Archery	Permit	Y/S/D*	Total**	Antlered	100 Antlered
11	*101*	42	17	142	201	466	43
13	*105*	10	5	26	41	262	16
	108	16	0	35	41	301	14
	111	0	2	27	29	351	8
	113	0	1	23	24	339	7
	117	36	14	91	141	893	16
	121	58	18	129	205	1193	17
	124	247	223	211	681	1740	39
Total:		**409**	**280**	**684**	**1373**	**5545**	**25**

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

Table 3. Whitetail yearling buck and 5+ antler point harvest trends from field checks and hunter reports for GMUs 101-124.

	October Checks		November Checks		All Field Checks		Hunter Reports
Year	Bucks	%Yrlg	Bucks	%Yrlg	%Yrlg	%5pt+	%5pt+
2001	29	48%	63	44%	45%	13%	12%
2002	40	60%	37	11%	36%	16%	14%
2003	33	55%	73	42%	47%	15%	15%
2004	45	53%	85	36%	41%	17%	17%
2005	52	77%	87	31%	46%	17%	19%
2006	30	57%	115	47%	43%	18%	19%
2007	36	33%	89	20%	25%	17%	19%
2008	19	37%	46	37%	37%	13%	18%
2009	19	32%	38	16%	21%	30%	21%
2010	30	60%	22	32%	48%	14%	21%

For GMUs 105-121 the proportion of white-tail bucks to does for summer 2010 declined from 2009, going from 29 to 24 bucks per 100 does (Table 4). In 2010 the fawn to doe ratio also declined to 48 from 54 fawns per 100 does as observed in 2009. 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).

Population status and trend analysis

The total 2010 deer harvest declined from 2009 (Figure 1) mainly on account of the reduced number of antlerless white-tail permits as well as opportunity for Archery, Muzzleloader, and Youth/Senior/Disabled hunters to take an antlerless white-tail. The Modern Firearm deer harvest decreased by about 8% from 2009 to 2010 while the Muzzleloader harvest was down about 67%. Meanwhile the Archery harvest rose approximately 6% from 2009 to 2010. Total deer hunter numbers decreased about 7% in 2010 from 2009 with most of this decline in the number of Modern Firearm and Muzzleloader 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. From 1999 until 2005 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 (Figure 4). Since 2005 this trend leveled out at least for 5+ antler point bucks (Figure 5). We are currently at a level that has reasonably good representation of mature bucks in the white-tail population. At least 1 in 5 white-tail bucks harvested is 5 point or better.

The total antlerless white-tailed deer harvest increased dramatically between 2001 and 2008. The ratio of antlerless white-tails taken per 100 antlered bucks went from a low of 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 2010. The largest reductions in this ratio took place within GMUs 105-121 (Table 2).

Disease and Predators

WDFW continues to test deer 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 1990's. In recent years general boot hunter harvests and special hound hunting opportunity to reduce populations for protection of livestock and human safety appear to have reduced cougar numbers. Cougars are a prominent predator of deer in northeastern Washington, but the impact on deer populations is likely inconsequential except on a localized basis at this time. 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

White-tailed Deer seem to be recovering from the two consecutive severe winters of 2007-2008 and 2008-2009. The winter of 2010-2011 was close to average in severity while the winter of 2009-2010 was well below average in severity. Consequently, winter deer kill was probably negligible over the last two winters compared to the immediate two winters prior.

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 severe winters and prolonged summer droughts has probably led to a reduction in white-tailed deer abundance but not overall distribution.

Wildlife damage

Deer foraging in alfalfa 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. White-tailed deer damage prevention permits are issued by the Enforcement Program to some farmers with a history of chronic damage. These permits allow licensed hunters to take antlerless white-tails on specific farms outside of general hunting seasons. This small-scale program has proven popular and effective, especially in providing landowner satisfaction. The total number of these permits available for distribution by Wildlife Officers responding to damage complaints has increased. Landowner preference and depredation permits are also tools that Wildlife Officers may use to deal with specific complaints regarding deer.

Management conclusions

Once again the total deer harvest in the Colville District decreased in 2010, as did the overall deer harvest per unit effort. The proportion of 25 antlerless white-tails harvested per 100 antlered deer taken in 2010 will likely increase escapement of female deer for growing the white-tail population back to previous levels. The proportion of mature white-tail bucks in the harvest appears to be maintaining a reasonable level of approximately 21%. 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.

References

Skalski, J.R., K.E. Ryding, and J.J. Millspaugh. 2005. Wildlife demography: Analysis of sex, age, and count data. Elsevier Academic Press. 636 p.

Washington Department of Fish and Wildlife. 2008. Game Management Plan. Washington Dept. of Fish and Wildlife, Olympia, WA. 136 p.

Table 4. White-tailed deer late summer composition surveys within Population Management Unit 13.

Year	August			September		
	Sample Size	Bucks per 100 Does	90% Confidence Interval	Sample Size	Fawns per 100 Does	90% Confidence Interval
2001	1185	29	+/- 10	720	57	+/- 10
2002	955	22	+/- 4	799	55	+/- 7
2003	1064	31	+/- 9	927	51	+/- 10
2004	1244	31	+/- 7	925	68	+/- 11
2005	1245	26	+/- 8	1204	64	+/- 12
2006	969	28	+/- 10	1055	55	+/- 10
2007	966	27	+/- 8	848	47	+/- 9
2008	574	23	+/- 9	884	48	+/- 10
2009	451	29	+/- 11	542	54	+/- 16
2010	1522	24	+/- 5	1533	48	+/- 7

DEER STATUS AND TREND REPORT: REGION 1
PMU 14 – GMUs 127, 130, 133
PMU 15 – GMUs 136, 139, 142

HOWARD FERGUSON, District Wildlife Biologist
MICHAEL ATAMIAN, Wildlife Biologist

Population objectives and guidelines

Our deer management goals are to maintain both white-tailed deer (*Odocoileus virginianus*) and mule deer (*O. hemionus*) numbers at levels compatible with landowner tolerance and urban expansion 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 2009) guidelines for buck escapement (20 to 24 bucks per 100 does post-season) 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 Population Management Units (PMUs) 14 and 15. PMU 14 contains a mixture of forest, shrub-steppe, and agricultural habitats, along with some areas of high urbanization. PMU15 is relatively open shrub-steppe and agricultural habitats. Both PMUs contain populations of white-tailed deer and mule deer, with slightly more white-tailed deer harvested annually in PMU 14 and slightly 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 general late white-tailed deer season was removed in 2006 and replaced with a special 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) are offered in all six GMUs.

Archers are offered both early and late general hunting seasons. The early archery deer hunt occurs in September and the late season run in late November or early December (varies by GMU). Muzzleloaders are offered both early and late general admission seasons, as well. Muzzleloader early season runs from late September into early October. The late season is in late November.

Harvest trends

Total deer harvest in PMU 14 does not differ substantially from PMU 15; however harvest tends to be slightly higher in PMU 15 (Table 1). Across both PMUs there was a pronounced reduction in harvest during 2006. PMUs 14 and 15 had 15.6% and 30.3% reductions in harvest compared to the average for the previous 5-years. The reduction in harvest in 2006 was probably due in part to the replacement of the general late white-tailed deer modern firearm season with a special permit hunt. Harvest rebounded in 2008, reaching pre- 2006 levels in harvest in both PMUs, but has fallen in 2009 & 2010. Mule deer comprise a greater portion (55%) of the harvest in PMU 15, while white-tailed deer comprise a greater portion (58%) of the harvest in PMU 14.

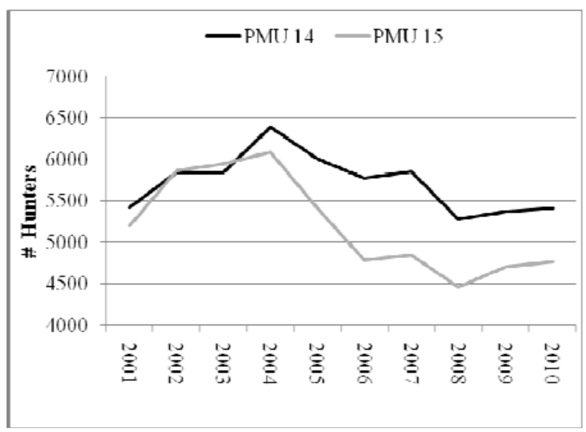

Figure 1. Trend in hunter numbers in PMUs 14 & 15.

Overall hunter participation increased from 2001 through 2004 in both PMUs, but has declined since (Fig. 1). Decline in modern firearm hunters is the main driver behind the negative trend in hunter numbers in both PMUs. In 2001, modern firearm hunters made up

83% and 93% of hunters in PMUs 14 & 15, respectively. In 2010 modern firearm hunters made up 69% and 86% of hunters in PMUs 14 & 15, respectively. Number of archery hunters is increasing in PMU 14 and remains stable in PMU 15 (Fig. 2). Muzzleloader numbers remain stable to increasing in PMUs 14 and 15, averaging 677 and 340 respectively.

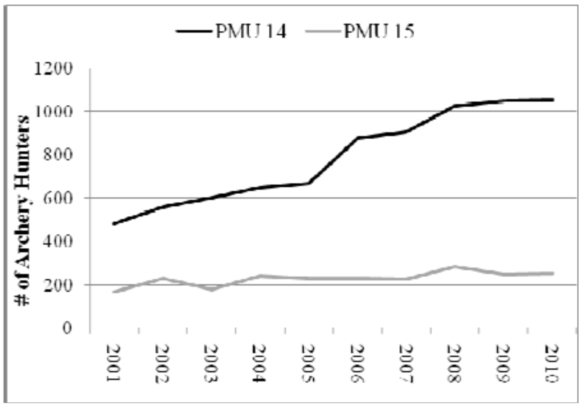

Figure 2. Trend in archery hunters in PMUs 14 & 15.

Hunter success rates in PMU 14 and 15 average 29% and 34%, respectively, over the past ten years. There is no observable trend over this time period, reflective of the complex combination of variables (deer availability, hunting conditions, access, vacation, etc) that affect hunter success each year (Fig. 3). 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 permitted hunt. However, both PMUs showed a modest rebound in hunter success in 2007 followed by a sharp increase in 2008. Success dropped in both PMUs in 2009, probably due to a combination of too much snow in the winter of 2008 leading to poor recruitment and too little snow in 2009 producing poor hunting conditions.

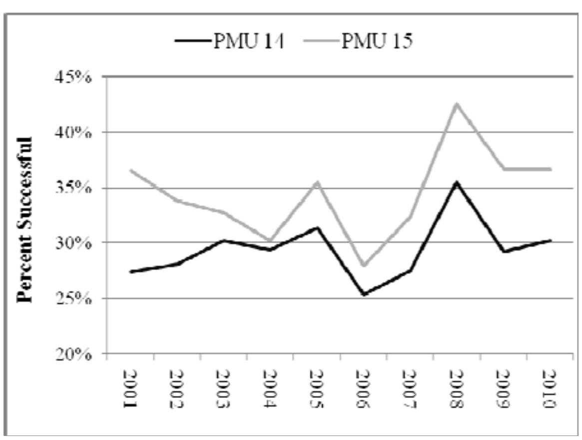

Figure 3. Hunter success rates in PMUs 14 & 15.

Catch per unit effort (measured as kills per day) has averaged 0.07 and 0.10 for PMU 14 and 15, respectively. Probability of making a kill each day has varied little (± 0.01 kill/day for both PMUs) from these averages over the past ten year. Catch per unit effort hit a high in 2008 in both PMUs, but have since declined slightly (Fig. 4).

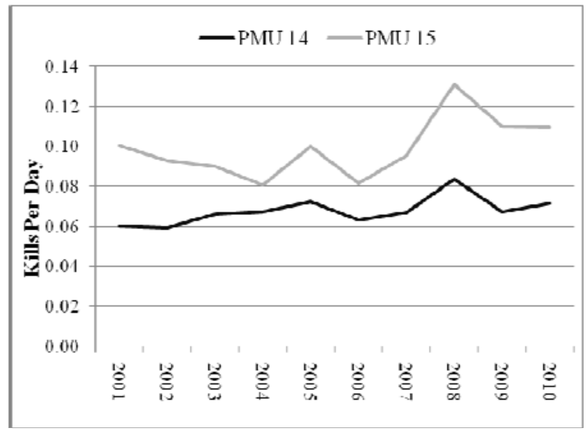

Figure 4. Catch per unit effort in PMUs 14 & 15.

Results for the first five years of the Palouse special hunt show higher success rates than in the general hunt (Table 2), though in 2010 success was not substantially higher. If we include those permit hunters that successfully harvested a buck in GMUs 127-142 during the general season then success increases to 65%, 51%, 66%, 64%, and 44% in 2006, 2007, 2008, 2009, and 2010, respectively. Additionally, 4+ and 5+ bucks make up a greater percentage of the harvest in the Palouse hunt then in the general season, where 4+ bucks and 5+ bucks have averaged 76% and 25%, respectively, over the past ten years.

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-season ratios come from ground surveys conducted during August and September. They provide an estimate of fawn production for the year. Post-season ratios come from helicopter surveys conducted during late November, December, or January. Post-season surveys reflect the effects of harvest on these herds, predominantly the antlered portion of the herds. However, due to the nocturnal behavior of bucks, the post-season buck:doe ratio is probably a conservative measure of composition when available.

The pre-season mule deer ratios show a decline in both buck and fawn ratios over the past 9 years (Table 3 & 4). Pre-season ratios for white-tailed deer show a similar trend (Table 5 & 6). 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, given the increase in number of surveys in recent years (via use of volunteers) and the overlap in 90% C.I. between years, it likely that it is due to the increased survey effort and lower sample sizes in early years.

All post season composition data in Table 7 was collected via helicopter flights. The number of flights is limited due to available funds, which results in incomplete coverage of the district. White-tailed post season buck to doe ratios have been high the past three years, while fawn to doe ratios are lower than ideal, but appear to be improving relative to previous years. However, all of the post season surveys have been focused in more open GMUs (133-142) with high visibility and have not been conducted in 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. In 2009 & 2010 mule deer fawn numbers appear to have rebounded. Post season mule deer buck to doe ratios have been very stable the past 4 years no matter the number of or coverage of the surveys. If we limit the analysis to legal bucks (3+ points) the average buck:doe ratio for the past five years is 3:100. This indicates that the current mule deer harvest is sustained by recruitment of yearling and 2.5 year old bucks.

Habitat and Disease

Mass conversion of natural habitats to agriculture occurred in past decades, but represent minor changes today in PMU 14 & 15. Gains have been made in deer habitat with enrollment of agricultural acres into the Conservation Reserve Programs (CRP). However, with current wheat and hay prices several landowners have pulled their land out of CRP or have chosen not to re-enroll after their contract expired. 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, but tends to permanently displace the deer. While low density development (<1house per 10 acres) incorporates more habitat, direct disturbance is less and post construction more habitat is usable by deer. However, these deer tend to become damage/nuisance deer. Currently the district promotes high density cluster development with larger open space areas with the hope of maintaining larger connecting tracts of habitat.

Epizootic Hemorrhagic Disease (EHD) mortalities in PMUs 14 & 15 white-tailed deer populations were high in 1998, 1999, 2003, 2004, but almost nonexistent in 2005-2010. Drought conditions coincided with these large EHD outbreaks and likely exasperated them. There are some indications that mule deer have increased in areas that were occupied by white-tailed deer prior to the outbreak of EHD.

Though Chronic Wasting Disease (CWD) has not been detected in Washington, it is a concern in District 2, due to the proximity to Idaho and Montana, which have several game farms. Lymph nodes are taken from hunter kill and road kill deer through-out the district every year to test for CWD. None of the samples have come back positive to date.

Management conclusions

Currently we are meeting the Game Management Plan guidelines for mule deer buck escapement (20 to 24 bucks per 100 does post-season). However, the low legal mule deer buck to doe ratios indicate that our harvest is being sustained solely 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 in Washington 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.

We are meeting the Game Management Plan guidelines for post season buck ratios for white-tailed deer these past three years. However, post season surveys have been focused more in mule deer habitat (i.e. open terrain) than in white-tailed deer habitat and thus may not accurately reflect the entire district. Post season survey attempts in the more forested GMUs (124,127, & 133) have routinely produced low buck:doe ratios. However this is more likely due to the poor visibility and the almost nocturnal activity patterns of bucks once hunting season has opened, than an actual decrease in buck numbers.

Those units near urban centers 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. This seems to be the most successful tool to help control damage and to provide recreational opportunity. We will continue to offer antlerless hunts by modern firearm permit, and general white-tailed antlerless opportunity for archery, muzzleloader, youth, senior, and disabled hunter seasons in units near the urban area of Spokane for white-tailed deer.

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Washington Department of Fish and Wildlife. 2008. 2009-2015 Game Management Plan. Wildlife Program,Washington Deptartment of Fish and Wildlife, Olympia, WA, USA.

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	1092	359	1451	1074	256	1330
2007	1232	361	1593	1280	274	1554
2008	1432	439	1871	1558	333	1891
2009	1135	410	1545	1341	364	1705
2010	1228	408	1636	1409	334	1743
AVERAGE	1313	363	1676	1416	365	1781

Table 2. Palouse special permit hunt results

	2006	2007	2008	2009	2010
Num. Of Hunters*	342	395	344	411	459
Hunter Success**	57%	42%	59%	57%	36%
% 4+ bucks**	85%	88%	89%	85%	91%
% 5+ bucks**	29%	37%	37%	35%	50%

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

** Calculations based on kills that occurred during the permit season.

Table 3. Preseason Mule Deer Buck to 100 Doe

Year	Buck : 100Doe	90% C. I. Lower	90% C. I. Upper	# Survey	# Deer
2002	50	26	97	4	87
2003	57	43	77	4	148
2004	34	21	53	9	194
2005	38	29	49	16	471
2006	45	37	55	9	181
2007	32	19	51	9	125
2008	42	31	56	12	360
2009	29	20	42	26	435
2010	30	20	45	17	439

Table 4. Preseason Mule Deer Fawn to 100 Doe

Year	Fawn : 100Doe	90% C. I. Lower	90% C. I. Upper	# Survey	# Deer
2002	74	64	85	15	320
2003	92	82	103	6	299
2004	87	70	109	7	223
2005	64	43	94	5	157
2006	71	55	93	12	372
2007	76	63	92	9	250
2008	74	53	103	9	223
2009	57	47	69	21	633
2010	59	46	75	18	592

Table 5. Preseason White Tailed Buck to 100 Doe

Year	Buck : 100Doe	90% C. I. Lower	90% C. I. Upper	# Survey	# Deer
2002	42	30	58	12	388
2003	34	26	44	9	328
2004	33	17	64	7	159
2005	35	25	48	14	339
2006	35	20	60	9	344
2007	33	24	44	8	441
2008	29	22	38	16	400
2009	25	21	29	38	1142
2010	28	21	37	28	813

Table 6. Preseason White Tailed Fawn to 100 Doe

Year	Fawn : 100Doe	90% C. I. Lower	90% C. I. Upper	# Survey	# Deer
2002	83	60	114	9	238
2003	97	72	130	5	61
2004	76	67	86	10	262
2005	45	38	54	14	365
2006	65	54	79	12	541
2007	63	49	83	10	309
2008	61	54	70	10	377
2009	47	40	56	34	1509
2010	44	37	52	18	811

Table 7. Post season sex and age composition ratios.

Species	Year	(Buck:Doe:Fawn) Post-season	# Days	# GMU
Mule Deer	2006	25:100:71	4	5
	2007	22:100:59	1	1
	2008	22:100:52	2	2
	2009	22:100:71	4	4
	2010	20:100:79	4	3
White-tailed Deer	2006	10:100:65	4	5
	2007	10:100:44	1	1
	2008	36:100:48	2	2
	2009	31:100:64	4	4
	2010	30:100:62	4	3

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

PAUL WIK, District Wildlife Biologist

Population Objectives and Guidelines

The mule deer (*Odocoileus hemionus*) population has remained relatively stable along the breaks of the Snake River. Mule deer populations in the mountains are still depressed, but may be slowly improving. White-tailed deer (*O. virginianus*) populations have recovered from EHD outbreaks and high antlerless harvest in the western Blue Mountains foothills.

Hunting seasons and harvest trends

The accuracy of harvest data has improved since implementation of mandatory hunter reporting in 2001. From 2001-2010 District 3 buck harvest averaged 2,096 bucks/year, and ranged from 1,789 to 2,599. In 2010, hunters harvested 2,075 bucks (Table 1), 1% below the 10-year average. In 2010, the mule deer buck harvest averaged 58% four point or better, which is slightly above the 10-year average of 52%.

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 7,418 in 2010 (Table 2). Modern firearm (MF) hunters harvested 1,953 deer in 2010; 1,745 bucks and 208 antlerless deer. General season hunter success was 26%.

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 684 hunters. ML hunters have declined since 2004, and appear to have stabilized with 459 participating in 2010. Muzzleloader hunters harvested 170 deer in 2010, 135 bucks and 35 antlerless. Muzzleloaders enjoyed a success rate of 37% (Table 2), which is the highest success rate for any user group.

Archery hunter numbers appear to be stabilizing, with 1,147 participating in 2010. Archers harvested 230 deer (109 bucks, 121 does), which is a slight increase over the long-term average (198 deer). The archery success rate is near that of modern firearm hunters at 20%.

Species composition of the general buck harvest in 2010 was 66% mule deer and 34% white-tailed deer, similar to recent years. The MF antlerless harvest consisted of 13% mule deer, which is a decrease from previous years, however, most of the antlerless harvest is focused on white-tailed deer through special permits and general season hunts (Youth, Senior, and Disabled general seasons).

The antlerless deer harvest continues to focus on white-tailed deer, due to low numbers of mule deer in many units. A total of 165 general antlerless permits (either species) along with 380 permits for antlerless white-tailed deer were issued in 2010.

The 2010 permit controlled and general season antlerless harvest totaled 548 antlerless deer (general season 364, permit season 184). Antlerless hunting pressure on mule deer has been reduced over the last few years due to drought impacts on mule deer fawn recruitment, while pressure on antlerless white-tailed deer has increased because of an increase in opportunity.

Antlerless deer were harvested at a rate of 26 antlerless deer per 100 bucks; mule deer 4 does/100 bucks and white-tailed deer at 47 does/100 bucks.

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 (Table 3).

Surveys

Both aerial and ground surveys are used to determine pre- and post-hunt herd composition. Pre-hunt surveys were conducted from the ground, and resulted in 229 mule deer being classified. Future efforts need to substantially increase the number of animals being surveyed in order to reduce the variance associated with the estimates

Post-hunt surveys were conducted from the ground and air, with 3,704 mule deer classified (Table 3). The mean December fawn:doe ratios were 49 fawns/100 does (*90% CI* 46 - 52). Additional surveys were carried out in 2010 in the Lower Snake River Wind Development area (Garfield County). These surveys were conducted to sightability protocols (Unsworth et al. 1994), with a population estimate generated for the area being directly impacted by windpower development.

The post-hunt mule deer buck:doe ratio did not change compared to the last past6 years, and remained at 17 bucks/100 does (*90% CI* 15 – 18) (Table 3). Although data on post-hunt herd composition for white-tailed deer is limited, buck ratios have averaged 21 bucks/100 does since 1995 and appear to be stable.

Population Status and Trend

The mule deer population appears to be stabile 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. In initial effort to determine populations size was implemented in the winter of 2010 in the area of the Lower Snake Wind Development. A population estimate was generated 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.

White-tailed deer populations are improving since an EHD die-off in 2008. White-tailed deer numbers in the eastern Blue Mountains have declined, while numbers on the westside of the Blues have improved.

Habitat

Summer-fall drought has occurred five out of the last 10 years (2001-2003, 2005, 2007), which had a negative impact on 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 can result in poor physical condition for breeding and increased winter mortality, and can also result in poor fawn production/survival the following spring. Fall green-up in 2010 was adequate, but 2010-2011 winter conditions were more severe than during the recent past. It is unknown whether this will affect the population in years to come.

The Conservation Reserve Program (CRP) dramatically improved habitat conditions for deer in the lowland agricultural areas, providing approximately 250,000 acres of additional habitat. These large areas of habitat provide connectivity between sub-herds, good forage, and fawning areas where little existed prior to this program. Unfortunately, large acreages of CRP are being lost as old contracts expire and are not renewed. The habitat provided by the CRP program has been a contributing factor to the increase in mule deer populations during the 1990's. 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.

Habitat conditions on 163,000 acres of National Forest and private land are improving due to 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.

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 is currently working 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 2010, construction began on 150 turbines in northern Garfield County. This new construction is phase 1 of the Lower Snake River Wind Development. This development is planning on approximately 850 turbines to be constructed in northern Garfield County. Another development has been proposed for northeastern Garfield County, effectively making these combined developments the largest developed windpower site in the country. It is unknown whether windpower development will negatively affect deer populations. WDFW has proposed to conduct research on this questions, but funding is currently limited.

Wildlife Damage

Damage complaints attributed to deer have been minimal in southeast Washington, compared to deer densities.

Management Conclusions

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

Periodic summer/fall drought along with localized winter conditions over the last six years (2001-2003, 2005, 2007) 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 2010 is similar to the past 5 years (Table 3).

The post-hunt mule deer buck ratio remained the same in 2010 at 17 bucks/100 does. High vulnerability of mule deer in the agricultural/grassland habitats contribute to lower post-hunt buck:doe ratios. Nine percent of the post-season bucks classified were 3-years old or older, and these were predominantly observed on private land that is known to be difficult to gain hunting access to. A majority of the breeding occurring within this population is likely being done by yearling bucks (78% of the observed bucks).

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 average 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. Public support for the three-point regulation is excellent, due to the combination of good hunter success rates, and improved quality of the bucks harvested.

References

Unsworth, J.W., F.A. Leban, D.J. Leptich, E.O. Garton, and P. Zager. 1994. Aerial survey: user's manual. Second ed. Idaho Dep. Fish and Game, Boise, ID. 84 pp.

Table 1: Blue Mountains deer harvest summary (2001 – 2010)

Year	Antlered	Antlerless	Total	Mule deer % $\geq$ 4 point*	Does:100Bucks Harvested
2001	2,399	1,127	3,526	50%	47
2002	2,599	1,150	3,749	47%	44
2003	2,254	1,497	3,751	50%	66
2004	1,994	1,240	3,233	48%	62
2005	1,929	904	2,833	53%	47
2006	1,919	721	2,640	55%	38
2007	1,789	572	2,361	51%	32
2008	2,032	572	2,604	53%	28
2009	1,971	508	2,479	53%	26
2010	2,075	548	2,623	58%	26

Note: % $\geq$ 4 point calculated from harvest under 3-point minimum regulation.

Table 2. 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
All Weapon	Reported Kill	255	581	302	357	118	115	19	89	55	211	207	45
	Success	38.2%	32.7%	25.1%	18.1%	24.9%	18.8%	7.3%	28.0%	10.2%	35.2%	36.4%	34.9%
	Days/GMU	1,987	5,850	4,904	7,704	1,558	2,298	1,240	1,229	2,388	2,232	2,035	384
	# Hunters	668	1,777	1,201	1,974	474	611	259	318	537	599	569	129
	Days/Kill	7.8	10.1	16.2	21.6	13.2	20.0	65.3	13.8	43.4	10.6	9.8	8.5
Archery	Reported Kill	10	21	53	32	27	13	0	1	11	45	14	3
	Success	26.3%	21.4%	22.9%	14.4%	23.3%	12.0%	0.0%	5.9%	8.9%	37.5%	35.9%	27.3%
	Days/GMU	191	511	1,426	1,384	466	620	166	96	852	630	187	30
	# Hunters	38	98	231	222	116	108	23	17	124	120	39	11
	Days/Kill	19.1	24.3	26.9	43.3	17.3	47.7		96.0	77.5	14.0	13.4	10.0
Modern	Reported Kill	229	482	249	325	91	102	19	76	40	166	135	39
	Success	39.4%	33.6%	25.9%	18.7%	25.6%	20.5%	8.3%	29.7%	10.4%	34.9%	34.1%	37.1%
	Days/GMU	1,641	4,383	3,430	6,244	1,086	1,654	1,041	926	1,444	1,579	1,298	319
	# Hunters	581	1,434	962	1,739	356	498	230	256	386	475	396	105
	Days/Kill	7.2	9.1	13.8	19.2	11.9	16.2	54.8	12.2	36.1	9.5	9.6	8.2
Muzzle loader	Reported Kill	15	78	No Hunt					12	4	No Hunt	58	3
	Success	35.7%	34.8%						30.8%	22.2%		46.4%	27.3%
	Days/GMU	122	871						180	51		519	32
	# Hunters	42	224						39	18		125	11
	Days/Kill	8.1	11.2						15.0	12.8		8.9	10.7

Table 3: Summary of late white-tailed deer harvest, modern firearm and muzzleloader combined.

Year	Permits	Bucks	Does	Total	Success Rate	%Harvest ≥ 5 pt.*
2001	210	76	10	86	56%	18%
2002	210	82	11	93	59%	17%
2003	210	93	13	106	57%	17%
2004	210	69	16	85	52%	22%
2005	210	84	9	93	67%	37%
2006	210	83	8	91	71%	40%
2007	210	60	11	71	52%	48%
2008	210	86	18	104	65%	34%
2009	210	87	13	100	69%	37%
2010	210	81	3	80	58%	40%

* Note: % 5 point in 2005-10 listed for late permit hunt, average of all seasons prior to 2005.

Table 4. Post-hunt mule deer surveys 2001-2010, Blue Mountains, Washington

	Bucks					Ratios (90% C.I.)	
Year	Adults	Yrlg	Doe	Fawn	Total	Fawn (CI)	Bucks (CI)
2001	71	109	876	471	1,529	55 (50, 60)	21 (20, 22)
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	1088	3,704	49 (46, 52)	17 (15, 18)

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*). The post-season sex ratio target is a minimum of 15 bucks per 100 does. 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

Declining post-season buck:doe ratios prompted a return to the current 9-day general modern firearm season in 2006. In 2010, we further reduced antlerless only permits for youth, disabled, and senior hunters in response to anticipated low fawn recruitment. The number of antlerless permits for the private land hunt on the Methow Valley floor stayed at 100 to address ongoing damage issues. The issuing of antlerless permits for private land continued in the North Okanogan, Central Okanogan, Omak, and Conconully areas in 2010.

Hunter numbers in 2010 remained relatively stable in both PMU 21 and PMU 22. Both hunter success and harvest remained fairly stable as compared to recent years (Figures 1-3).

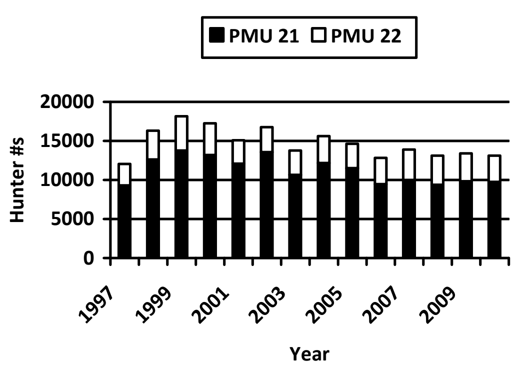

Figure 1. Trend in hunter numbers in PMUs 21 & 22.

WDFW check station personnel surveyed over 500 hunters and examined 77 deer in 2010 (Table 1). In 2010 we moved the check station site to a new location to co-locate with USFS personnel and improve station safety logistics. No biological sampling other than age-data collection occurred in this district in 2010.

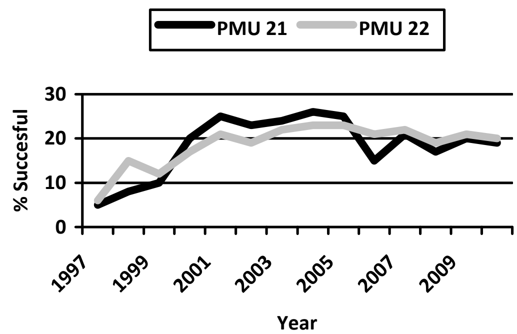

Figure 2. Trend in hunter success in PMUs 21 & 22.

Surveys

Post-hunt surveys are conducted to collect mule deer herd composition data and monitor progress toward population objectives. Surveys are conducted by helicopter in late November or 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.

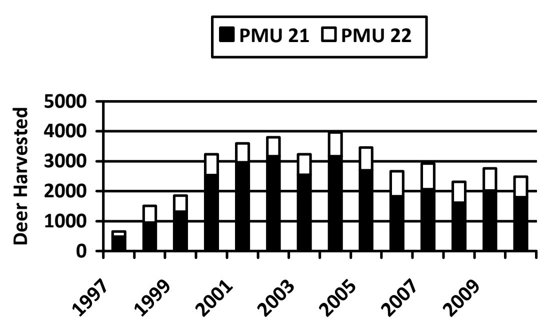

Figure 3. Trend in harvest in PMUs 21 and 22.

Table 1. Chewuch Check Station Results.

	Deer Type				
Year	Bucks	Antlerless	Total	Hunters	%Success
1997	5	0	5	729	1
1998	33	0	33	980	3
1999	53	0	53	1,414	4
2000	72	0	72	1,250	6
2001	106	27	133	1,314	10
2002	54	45	99	1,265	8
2003	71	6	77	840	9
2004	72	5	77	1,093	7
2005	49	17	66	1,114	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	529	15

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. In both seasons, surveys are not designed to census deer and differences in count totals are more reflective of changes in survey effort and survey conditions.

Table 2. Post-season mule deer population composition counts in PMU 21 from 2010, by watershed. F:100:B is fawns and bucks per 100 does.

	Bucks					
Area	≥3 pt	<3 pt	Doe	Fawn	Total	F:100:B
Methow	113	122	970	804	2009	83:100:24
Okanogan	34	61	401	322	818	80:100:24
Total	147	183	1371	1126	2827	82:100:24

Biologists classified 2,827 mule deer during helicopter surveys of PMU 21 in early December 2010 (Table 2). The counts yielded overall buck:doe and fawn:doe ratios of 24:100 and 82:100 respectively. Buck ratios reached an eight-year high, exceeding the minimum management objective of 15. Fawn production continued to improve (Table 3), likely a result of reduced competition for limited winter forage and good seasonal growth on summer range. Fawn recruitment fell overall, but varied considerably between the Methow and Okanogan watersheds, reflecting marked differences in winter severity in the two basins (Tables 4 and 5).

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

	Buck Antler Class						
Year	≥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

Table 4. Spring mule deer population composition counts from 2011, by area for PMU 21. F:100A is fawns per 100 adults.

Area	Adult	Fawn	Total	F:100A
Methow	1716	471	2187	27:100
Oka	543	225	768	41:100
Total	2259	696	2955	31:100

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 60s or 70s.

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
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

For roughly the last 35 years, 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, yet, modelling data suggests the population had almost doubled by 2000 following several consecutive mild winters (Figure 4). Since then, herd size has fluctuated moderately 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 several 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.

Habitat condition and trend

As mentioned above, 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. The situation has been exacerbated by the spread of introduced noxious weeds.

In addition, 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. This is being mitigated somewhat by land acquisition and conservation easement purchases by WDFW and local land trusts, but this is far from a complete solution,

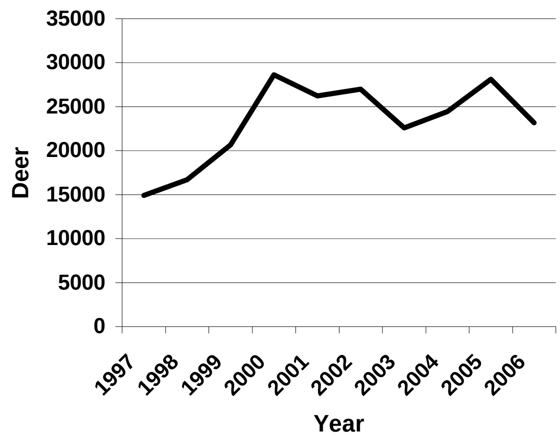

Figure 4. PMU 21 modeled deer population.

particularly as land prices escalate. More aggressive growth management planning is needed if critical private lands are going to continue to play an important role in deer conservation.

In recent years, wild fires burned over 400,000 acres of deer habitat within the district, primarily at mid to higher elevations. This should improve summer forage quality and availability. Similarly, public agencies are pursuing a more aggressive prescribed burning policy near the forest/development interface. This could potentially revitalize some winter forage if applied over a significant area.

After years of more aggressive road management that benefited deer and other wildlife, new developments may reverse this positive trend. The USFS is receiving considerable pressure to expand off-highway vehicle opportunities, which could potentially increase the amount and distribution of motorized use on the Forest. Recent national attempts to reverse protections for roadless areas, could result in expanded road construction locally. Increases in motorized use and roaded forest land would result in some habitat loss and degradation, and would likely increase disturbance and illegal harvest of deer.

It is hoped the combination of habitat protection, fire reintroduction, improved grazing management, and aggressive weed control, will slow, and perhaps even reverse the population decline over the long-term.

Management conclusions

The gradual long-term decline in Mule deer numbers is expected to continue unless steps are taken to revitalize shrub growth on the winter range and manage increasing development. Fire, community planning, and habitat protection will likely be the most important tools in this effort. More recently, the population hit a short-term low about 10 years ago 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 modeled population level exceeds about 20-25,000 animals, which appears to be the approximate 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 in recent years.

White-tailed deer numbers have also dipped during harsh winters, but also rebounded strongly in recent years. In the face of increasing human development, the long term prognosis for white-tailed deer distribution and abundance is more favorable than for mule deer. This is a function of the whitetail's ability to better handle habitat changes associated with human development, less winter range loss due to fire suppression, and the de-facto refuge effect of private lands, where white-tailed deer tend to concentrate.

For deer in the short term, fluctuations in fawn recruitment will likely be reflected in similar fluctuations in legal buck availability. Depending on hunting season conditions, buck harvest may improve in 2011, but may show a dip in 2012. The recent shortening of the general hunting season and corresponding earlier closing date have improved buck escapement and raised the post-season buck:doe ratio.

Over the last decade or two, populations of resident deer on the Methow and Okanogan Valley floor 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 high fawn mortality in developed areas. Ironically, this mortality has generated public calls to reinitiate feeding efforts, a move that would only expand the nuisance problems.

Instead, in 2007 and 2009 we initiated an antlerless permit season on resident, valley-bottom deer on private land in the Methow and Okanogan Valleys, respectively. To date, the program is operating smoothly and appears to be successful in reducing deer nuisance/damage complaints. Ultimately, long-term success will hinge on community acceptance and landowner cooperation.

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
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Population objectives and guidelines

The majority of deer in the Wenatchee District are mule deer, with white-tailed deer occuring 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, to maintain deer populations in balance with 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 most winter-range shrub habitat to wildfire in 2001 and 2002; deer numbers are increasing as habitat recovers following the fires.

Hunting seasons and harvest trends

All mule deer buck harvestis 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. Deer season begin with the September early archery general deer season. The 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. This season occurs within a portion 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. All late season modern and muzzleloader opportunity is offered under drawing permits.

The 2010 hunting season marked the first year of a restructured permit drawing system for limited-entry hunts. Hunt categories 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 in 2010. A total of 675 permits were issued for the district in 2010, 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. A total of 309 modern firearms, 86 muzzleloader and 198 archery permits were offered. Quality permits totaled 178, Buck permits 10, Antlerless permits 123, Second-deer permits 142, Youth permits 110, 65 or older permits 52 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).

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 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.

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. General season hunter numbers in 2010 were 7,804, a 7% decrease from 2008 (Figure 2). Hunter numbers increased in the Douglas PMU (31%), and decreased in the Chelan PMU (18%).

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 the 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 first two phases of the wildlife fence along S.R. 97A has dramatically reduced annual vehicle collisions along this roadway. The third and final phase of the fence will be completed in 2011.

Surveys

Both helicopter and ground surveys have been used to monitor population composition. Surveys conducted during late December or early January are timed to begin after deer have begun 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.

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 (GMUs 244-251). A total of 30 sampling units were surveyed within delineated mule deer winter range. 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. Initial plans are to complete 3 years of surveys, to develop a population estimate for PMU 26, and to formulate formal population objectives to guide future harvest management.

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 24 bucks and 79 fawns per 100 does in 2010. Legal bucks (3+ points) bucks comprised 53% 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 43:100. Limited counts were conducted in Douglas County in 2010.

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 permit holders harvested 89 antlerless deer in 2010. Antlerless permits in the Chelan PMU in 2010, resulting in 87antlerless deer harvested.

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, but 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 2010, 53% of the bucks observed during post-season survey were legal bucks. In 2010, total bucks per 100 doe ratios in the Chelan PMU were similar to 2007 at 24 bucks per 100 does. 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.

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 in most years many of the bucks 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 2006-2010 general 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.

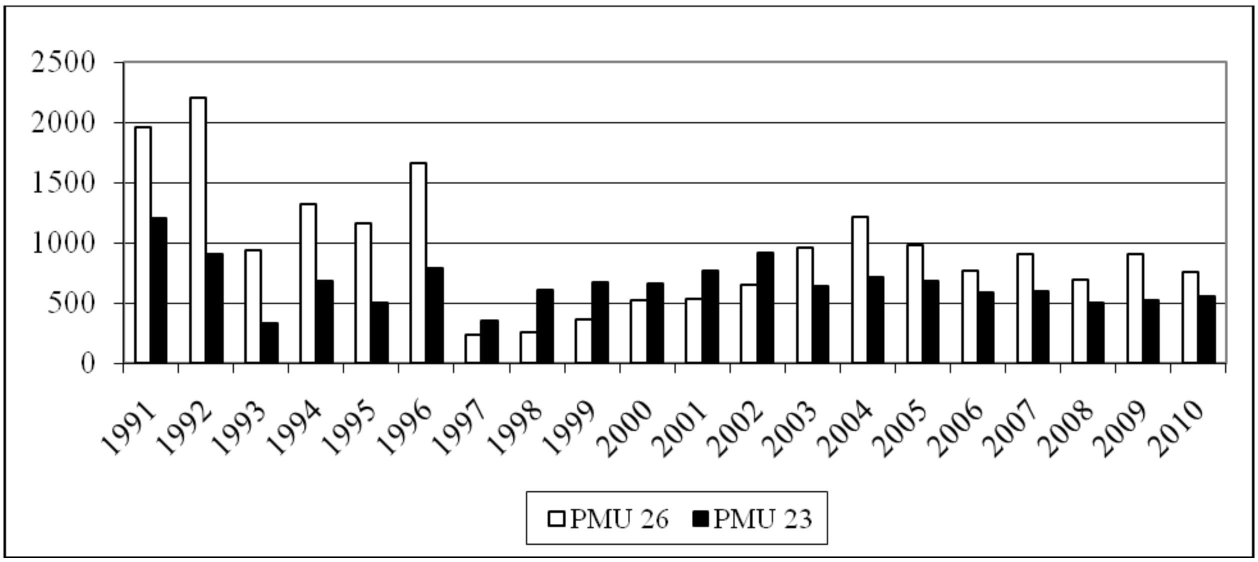

Figure 1. Antlered deer harvested from PMU 23 and PMU 26, 1991 through 2010.

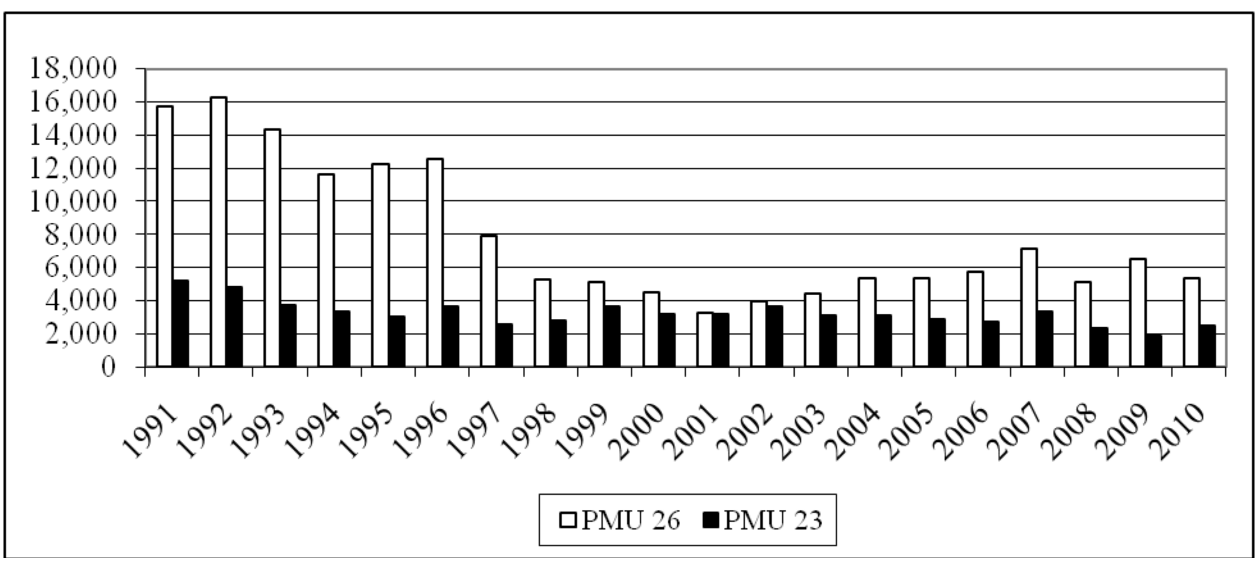

Figure 2. Numbers of hunters reported from PMU 23 and PMU 26, 1991 through 2010.

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

BROCK HOENES, Assistant District Wildlife Biologist

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. In 2010, only 5% (19 deer), 0%, and 6% (15 deer) of the estimated total deer harvest in Game Management Units (GMU) 272 (Beezley), 278 (Wahluke), and 284 (Ritzville), respectively, were white-tailed deer. Consequently, 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 general muzzleloader season were limited to GMUs 272 and 284.

All permit opportunities in GMU 272 were restricted to antlerless permits in Deer Area 2011 (Lakeview) and in areas managed by the BuckRun Landowner Permit Hunting (LHP) Program. Permit opportunities in GMU 284 were primarily limited to antlerless permits in Deer Area 2010 (Benge), but limited opportunities were available for modern firearm and muzzleloader hunters during late season hunts for 3-point minimum bucks or antlerless mule deer. No permit hunts were offered in GMU 278.

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

GMU 290 is restricted to permit only. Opportunities in 2010 were available for modern firearm, muzzleloader, and archery hunters.

GMU 272.—With the exception of the 2004 season, harvest estimates have varied little since 2001 (Table 1). The consistent trend in harvest levels has occurred despite the fact hunter numbers have been relatively inconsistent (Table 1).

Since 2001, hunters participating during the general modern firearm season have, on average, accounted for 75% of the total harvest in GMU 272. In 2010, harvest during the modern firearm season again constituted the majority (72%) of harvest, while harvest during the archery, muzzleloader, and permit seasons constituted 17%, 3%, and 5% of the total harvest, respectively (Figure 1).

The number of deer harvested on BuckRun has been steadily declining since 2005 (Table 1). Harvest in 2010 only accounted for 14% of the total harvest in GMU 272 compared to 30% in 2005. 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 mule deer harvested in GMU 272, number of hunters, overall hunter success (Suc), and days/kill (D/K), 2001–2010. Harvest estimates include mule deer harvested on BuckRun LHP (BR).

	Harvest[1]						
Year	B	D	T	BR	Hunters	Suc[2]	D/K
2001	275	63	338	UNK	1,649	0.20	18.2
2002	332	47	379	94	1,602	0.24	15.4
2003	277	57	334	72	1,254	0.27	15.5
2004	367	38	405	75	1,461	0.28	13.4
2005	257	86	343	104	1,325	0.26	14.5
2006	294	52	346	50	1,165	0.30	12.7
2007	304	35	339	45	1,210	0.28	14.7
2008	268	51	319	38	1,350	0.24	17.4
2009	263	33	296	44	1,359	0.22	18.7
2010	290	58	348	47	1,337	0.26	15.2
Avg.	293	52	345	63	1,371	0.25	15.6

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

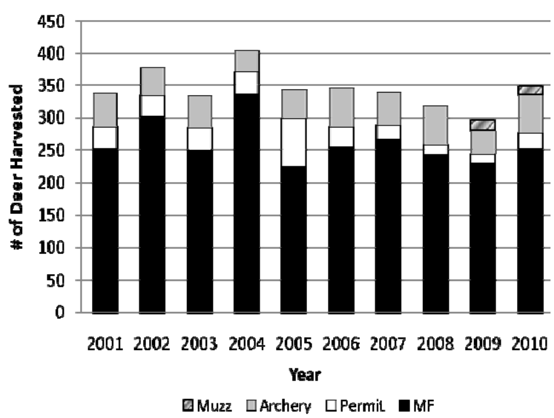

Figure 1. Estimated number of deer harvested by permit holders (permit) and during the general modern firearm (MF), muzzleloader (Muzz), and archery seasons in GMU 272, 2001–2010. Data includes deer harvested on BuckRun LHP.

GMU 278.—With only 56 mule deer and no white-tailed deer harvested in GMU 278 during the 2010 season, harvest levels remained low. Hunter numbers steadily increased from 158 in 2001 to 285 in 2009, but declined slightly to 236 hunters in 2010. Overall hunter success was 24% and well above the 10-year average of 18%.

GMU 284.—After late season muzzleloader opportunities were removed following the 2002 season, harvest levels in GMU 284 followed a slight downward trend until they increased slightly in 2008 (Figure 2). With exception to the 2009 season, hunter numbers have been relatively consistent since 2005 (Table 2).

Table 2. Estimated number of mule deer harvested, number of hunters, hunter success rate (Suc), and days/kill (D/K) in GMU 284, 2001–2010.

	Harvest[1]					
Year	B	D	T	Hunters	Suc[2]	D/K
2001	346	70	416	1,060	0.39	8.1
2002	346	113	456	1,093	0.42	8.7
2003	276	18	294	731	0.40	8.0
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	9.6
2009	273	25	298	802	0.37	8.8
2010	220	37	257	692	0.37	8.6
Avg.	258	39	297	777	0.38	8.6

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

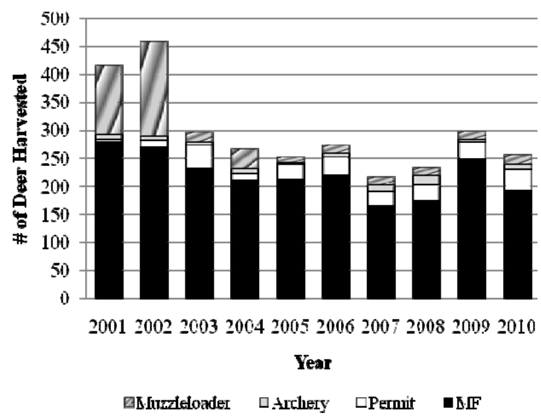

Figure 2. Estimated number of deer harvested during the general modern firearm (MF), archery, and muzzleloader seasons and by permit holders in GMU 284, 2001–2010.

Harvest during the general modern firearm season accounted for 75% of the overall harvest in 2010, which was nearly identical to the 10-year average of 76%. Overall hunter success was 37% in 2010 and has remained relatively stable since 2001(Table 2).

GMU 290.—Hunters harvested 21 bucks and 22 does in 2010 (Table 3). Success rates remained high during the modern firearm any deer season where 89% of hunters reported harvesting a deer. Success rates during the modern firearm antlerless season (63%) were comparable to the 12-year average while success rates for archery and muzzleloader hunters continued to be variable (Table 3).

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, 1997–2010. Values in parentheses are the number of permits that were available.

	Harvest			Hunter Success[1]				
Year	Buck	Doe	Total	MF Any	MF Doe	Archery	Muzzleloader	Youth
1997	22	0	22	0.84 (26)	na	0.00 (8)	0.33 (3)	na
1998	10	0	10	0.91 (11)	na	0.00 (13)	0.00 (1)	na
1999	13	14	27	0.92 (13)	0.83 (50)	0.05 (21)	0.00 (2)	na
2000	13	16	29	1.00 (13)	0.53 (50)	0.14 (21)	0.00 (2)	na
2001	14	10	24	1.00 (15)	0.23 (50)	0.07 (35)	0.00 (3)	na
2002	18	17	35	0.85 (15)	0.70 (50)	0.26 (104)	0.00 (4)	na
2003	17	11	28	1.00 (15)	0.48 (50)	0.17 (21)	0.33 (6)	na
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
Average	17	15	33	0.93	0.66	0.16	0.39	0.59

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

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, this data allows 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.). Similarly, survey date has varied from late-October to early-January. However, surveys are typically conducted by ground during late-October. In 2010, biologists conducted post-hunt surveys in November using ground based road surveys. A total of 872 deer were observed with a resulting buck:doe:fawn ratio of 24:100:58. Forty-one percent (361) of the mule deer observed were located on BuckRun LHP.

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. In 2009 and 2010, surveys in GMU 284 were completed as part of a cooperative effort to monitor migratory deer herds that winter in Adams, Franklin, and Whitman counties. In 2010, biologists classified more than 5,400 mule deer with a resulting buck:doe:fawn ratio of 21:100:77. Only 228 mule deer were located in GMU 284 with an estimated buck:doe:fawn ratio of 46:100:82.

GMU 290.—Post-hunt surveys in GMU 290 have been conducted annually since 1998 using volunteer based ground surveys. Volunteers consist mostly of individuals from the general public, but also include some WDFW employees. Volunteers are asked to survey a designated area and are allowed to use differing modes of transportation (e.g., hiking, horseback, ATV, etc.) depending on what is most suitable in their assigned area and most convenient for them. Survey date ranges from mid-November to mid-December and is scheduled between permit seasons to avoid hunter disturbance.

In 2010, 61 volunteers surveyed more than 47,000 acres and classified 551 mule deer with a resulting buck:doe:fawn ratio of 49:100:40. However, because 22 does and 5 bucks were harvested during seasons that occurred after surveys were conducted, biologists corrected ratio estimates so they would more accurately reflect “true” post-hunt ratios. Corrected buck:doe:fawn ratios were 52:100:43.

Population status and trend analysis

GMU 272.—Both harvest and survey data suggest mule deer populations in GMU 272 have remained relatively stable since 2001. The average post-hunt fawn:doe ratio from 2006–2010 has been 54:100 (Table 4) and with the exception of data from 2009 has shown little variability [Coefficient of Variation

(CV) = 13%], which suggests herd productivity has been relatively similar for the past 5 years. However, average fawn:doe ratios from 1996–2002 were 75:100 (CV = 14%) which also suggests productivity rates for this herd have steadily declined from levels observed a decade ago.

Table 4. Number of bucks, does, and fawns observed during post-hunt surveys in GMU 272, resulting number of bucks and fawns per 100 does (B:D:F), and proportion of bucks observed that were classified as being ≥ 2.5 yr old (%), 1996–2010.

Year	B	D	F	U[1]	Tot	B:D:F	%
1996	47	223	187	0	457	21:100:84	0.23
1997	29	213	133	0	375	14:100:62	0.31
1998	64	181	157	0	402	35:100:87	0.44
1999	50	213	176	0	439	23:100:83	0.48
2000	38	201	166	0	405	19:100:83	0.29
2001	85	435	282	0	802	20:100:65	0.36
2002	84	510	331	0	925	16:100:65	0.40
2003	77	517	306	0	900	15:100:59	0.25
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
Avg.	64	336	207	-		20:100:64	0.36

[1]U = Deer that were observed during surveys, but could not be positively classified by observers.

Average buck:doe ratios for the past 5 years have been 20:100 and have shown a stable trend (CV = 13%). Additionally, the proportion of adult bucks (≥ 2.5 years old) observed during post-hunt surveys (2006–2010 average = 36%) suggests the age-structure of the male population has also been relatively stable for the past 5 years (CV = 9%).

Trends in the total number of deer harvested in GMU 272 also suggest a stable population. Since 2001, there has been little variability in the overall number of deer harvested (CV = 9%).

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 (< 57 deer harvested annually since 2001), but have shown a significant degree of variation (CV = 29%). Nonetheless, this data indicates that deer populations in GMU 278 continue to exist at low densities and rates of increase have likely been minimal in recent years.

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.

Both harvest and survey data suggest a relatively stable deer population. The average number of fawns:100 does from 2001–2010 was 67:100 and showed marginal amounts of annual variation (CV = 15%; Table 5). This suggests that herd productivity remained relatively constant during this time period. However, fawn:doe ratios in 2009 and 2010 were 30% greater than the long-term average and indicate herd productivity increased substantially during the past two seasons. Relatively stable harvest levels (total harvest CV = 11%) and trends in hunter effort (CV = 10%) since 2003, also indicate the rate of increase for this deer herd has remained relatively stable.

Table 5. Number of bucks, does, and fawns observed during post-hunt surveys in GMU 284, resulting number of bucks and fawns per 100 does (B:D:F), and proportion of bucks observed that were classified as being ≥ 2.5 yr old (%), 2000–2010. 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]	Tot	B:D:F	%
2000	43	167	121	0	331	26:100:72	0.42
2001	25	69	42	0	136	36:100:61	0.64
2002	40	156	96	0	292	26:100:62	0.60
2003	90	491	300	0	927	18:100:61	0.27
2004	63	445	270	0	778	14:100:61	0.60
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
Avg.	55	260	174	-	499	26:100:67	0.44

[1]U = Deer that were observed during surveys, but could not be positively classified by observers.

Adult sex ratios (buck:doe ratio; CV = 40%) and age structure of the male segment of the population (% of bucks ≥ 2.5 year old; CV = 36%) have both shown significant amounts of annual variation since 2000. Post-hunt buck:doe ratios increased to 46:100 following the 2010 season. However, believe this increase is related to fewer doe groups being observed during surveys rather than an actual increase in buck escapement or recruitment.

GMU 290.— Decreasing trends in hunter success rates during the modern firearm any deer and modern firearm doe seasons suggest this population may have decreased slightly since 2006 (Table 3). However, success rates are still exceptionally high compared to other "open" GMUs in PMU 24 and success rates during the any deer season may also be largely influenced by hunter selectivity.

Survey data also suggests a slightly decreasing population in GMU 290 (Table 6, Figure 3). However, the number and group of sectors surveyed have varied annually, which makes it increasingly difficult to rely on the raw counts observed during surveys to adequately reflect trends in population size. Nonetheless, nearly all sectors have been surveyed enough times since 1998 such that biologists were able to rank each sector into 1 of 3 density categories: low, medium, and high. For each sector that was not surveyed, the average number of deer observed in sectors within the same category during that survey year was used to estimate the number of deer that would have been observed had the sector been surveyed.

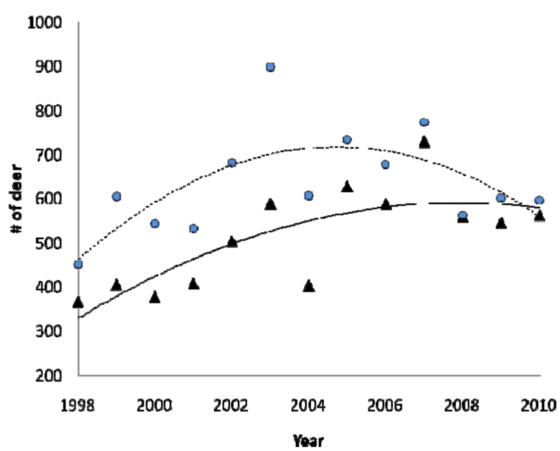

Figure 3. Long-term trends for the number of deer observed during post-hunt surveys in GMU 290 (▲) and projected number of deer that would have been observed had all sectors been surveyed (●), 1998–2010.

Using this approach to project population sizes from data collected 1998–2010 resulted in trend data that suggest the mule deer herd in GMU 290 was increasing from 1998–2002, peaked sometime between 2003 and 2005, declined from 2006–2008, and has been stable in 2009 and 2010 (Figure 3). Although this approach appears to provide informative trend data, it is still difficult to extrapolate that information to an accurate population estimate because that would assume surveyors were observing 100% of the deer located in each sector surveyed and were not double counting deer.

Fawn:doe ratios indicate productivity rates for this herd remained at moderately low levels since 2003, but have shown a slight increase since 2007 (Table 6 and Figure 4).

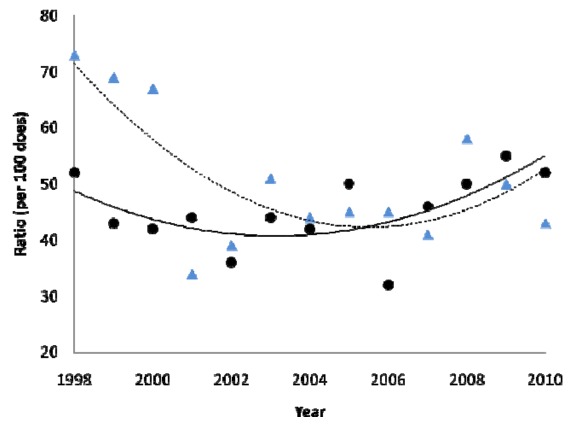

Figure 4. Long-term trends for post-hunt fawn:doe (▲) and buck:doe (●) ratios in GMU 290, 1998–2010.

Buck:doe ratios showed an increasing trend 2006–2009, were stable in 2010 (Figure 4), and are well above the management objective of 30 bucks:100 does. The proportion of bucks observed during surveys that were ≥ 2.5 years old increased to 62% and 63% in 2009 and 2010 which suggests the age structure of this population is recovering from the increased level of harvest that occurred in 2006 (Table 6). However, because surveys were conducted in mid-November during the peak of the rut, it may also be likely that more mature bucks were observed during 2009 and 2010 surveys simply because there is a smaller degree of sexual segregation during this time of year.

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*).

Table 6. Number of volunteers that participated in post-hunt surveys (Vol.), number of acres that were surveyed, number of bucks, does, and fawns observed, resulting number of bucks and fawns per 100 does (B:D:F), and proportion of bucks observed that were classified as being ≥ 2.5 yr old (% Adults) in GMU 290, 1998–2010.

Year	Vol.	Acres	Bucks	Does	Fawns	U[1]	Total	B:D:F	% Adults
1998	32	42,903	76	145	106	39	366	52:100:73	0.61
1999	26	33,306	77	180	124	25	406	43:100:69	0.51
2000	43	33,037	70	165	111	32	378	42:100:67	0.46
2001	28	32,597	90	206	70	43	409	44:100:34	0.33
2002	37	32,517	97	266	105	36	504	36:100:39	0.62
2003	27	30,324	126	288	147	28	589	44:100:51	0.62
2004	35	29,174	88	210	93	14	405	42:100:44	0.63
2005	30	36,917	154	306	137	32	629	50:100:45	0.60
2006	40	40,258	102	314	140	33	589	32:100:45	0.67
2007	50	40,546	122	264	108	15	509	46:100:41	0.59
2008	50	48,676	123	246	142	49	560	50:100:58	0.50
2009*	70	49,685	146	270	125	31	572	55:100:50	0.62
2010*	61	47,861	144	291	116	12	563	52:100:43	0.63
Avg.	41	38,292	109	242	117	30	498	45:100:51	0.57

[1]U = Deer that were observed during surveys, but could not be positively classified by observers.

* = Ratios and proportions are corrected for bucks and does harvested after surveys were conducted.

Bitterbrush (*Purshia tridentata*), a highly 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 minimal 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 2010.

Management conclusions

Trend data in GMUs 272, 278, and 284 indicate relatively stable populations with post-hunt buck:doe ratios that satisfy the management goal of ≥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). Trend data in GMU 290 suggests that productivity of this herd had been moderately low since 2001, which may be an indication this population was at or near the carrying capacity of this habitat. After increased levels of harvest occurred 2006–2009, fawn:doe ratios have been gradually increasing (Figure 4), providing further evidence this deer herd was near the carrying capacity of available habitat during its peak from 2003–2005 (Figures 3).

Lastly, because surveys in GMU 290 are conducted using volunteers, estimated ratios must be interpreted with caution. Surveys are 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.

However, survey data collected by experienced biologists does not exist for comparison and the true magnitude of this bias is unknown. Future research aimed at evaluating the differences between survey results of volunteers and experienced biologists is needed to further justify the use of volunteers to collect this important biological information.

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DEER STATUS AND TREND REPORT: REGION 3

PMU 31 – GMUS 379, 381

MIKE LIVINGSTON, District Wildlife Biologist

Population objectives and guidelines

This report covers the 2010 deer season harvest and winter surveys. PMU 31 is primarily a mule deer unit, but a few white-tailed deer are harvested each year. The population is managed to provide diverse recreational opportunity while maintaining socially acceptable densities. Post-hunt buck to doe ratio objectives are ≥15 bucks per 100 does.

Hunting seasons and harvest trends

Since 2000, an early archery general season for any deer has occurred in September. Muzzleloader general seasons were first established in 2001 in PMU 31. In 2010, a 9-day early season occurred with any white-tailed or 3 point or antlerless mule deer restriction in GMU 379. A 19-day late muzzleloader season with any white-tailed deer and 3 point minimum mule deer legal to harvest occurred in GMU 379. An 11-day late general muzzleloader season with any white-tailed deer and 3-point minimum or antlerless mule deer restriction occurred in GMU 381. Thirty muzzleloader special permits were issued during 2-9 October for any buck in GMU 381.

The modern firearm general season was 9 days long (16-24 October) with a 3-point minimum restriction for mule deer and any white-tailed deer in PMU 31. Ten youth, 10 senior and 10 disabled special modern firearm permits were issued. In addition, 10 new modern firearm any buck permits for mid-November and 20 modern firearm antlerless permits were issued for early-December in GMU 381.

Total deer harvest has averaged 326 (range 147 - 505; SE = 29.0) since 2000. The 2010 harvest was the second highest for the 11-year monitoring period and represented a 27% increase over the 11-year average (Table 1). Most of this increased harvest was due to a substantial increase in doe harvest during the muzzleloader late general season. Modern firearm general season hunters harvested more deer overall (51% of total) and more bucks (78% of total) than all other hunters combined. Harvest contributed by muzzleloader general season hunters increased from 31% in 2009 to 37% in 2010. This same group took 78% of the antlerless deer harvested in 2010. Archery remained a small portion of the total harvest at 2%.

Table 1. Deer harvest and hunters in PMU 31 during 2000 - 2010. Data are combined for general and permit seasons.

Year	Harvest			Hunters	
	Buck	Doe	Total	Success	Number
2000	119	28	147	25%	579
2001	205	72	277	40%	699
2002	239	99	338	42%	808
2003	220	60	280	31%	913
2004	214	67	281	25%	1125
2005	251	62	313	31%	997
2006	190	86	276	27%	1017
2007	235	100	335	29%	1158
2008	303	85	388	33%	1180
2009	335	170	505	40%	1249
2010	282	165	447	38%	1192
Avg.	236	90	326	33%	992

Surveys

In 2010, coordinated aerial surveys across regions (and PMUs) were completed for a second yearto estimate deer herd size at a meaningful scale. The surveyed area included randomly selected units in Whitman, Franklin, and Adams Counties. Previous research and observations indicate this herd is highly migratory beginning in the fall. Surveys were spatially and temporally designed to account for seasonal deer movements. During the early December surveys 4,170 mule deer were classified. Of this total, 1,620 were classified in GMU 381, primarily on private land above the breaks of the Snake River. Estimated ratios were 17 bucks and 64 fawns per 100 does.

Post-hunt roadside composition surveys were initiated in 2004 to estimate buck:doe:fawn ratios. These surveys are conducted from a vehicle in the eastern portion of GMU 381 near the Snake and Palouse Rivers in winter prior to antler drop. Three replicate surveys of two driving routes in mid-December 2010 yielded estimates of 20 bucks and 56 fawns per 100 does and a high count of 632 deer classified. Both the buck and fawn ratios increased from the 2009 estimates (Table 2). The buck ratio estimates from the aerial and roadside surveys were close, providing confidence in the ratio estimate. However, the fawn ratio from the roadside survey was lower than the aerial survey estimate (i.e., 56 vs. 64). The difference in the fawn ratios between the two methods reduces the confidence in the estimate. Since the sample size from the aerial survey was significantly higher, it could be assumed this ratio estimate is more accurate. However, accurately distinguishing fawns from yearling does while surveying from the air is difficult, especially during years when fawns have grown well due to good nutrition. For the next few years, both survey methods will be repeated until one appears superior, aerial survey funds run out or a hybrid of the two is determined to be the best approach.

Table 2. Post-hunt deer surveys in GMU 381 during 2004 - 2010. Buck, doe, and fawn numbers were from the survey that yielded the highest count. Ratios were averaged across the three 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

Over 70% of the bucks observed during roadside surveys had less than 3-point antlers. It is expected that the majority of legal bucks would be harvested each year in open country. Roadside surveys, however, may be biased against observing older aged bucks if they are less likely to occupy areas adjacent to roads or less active in the day. Harvest trends indicate plenty of 3-point or better bucks continue to be available to hunters. Over the last 10 years, greater than 3 point bucks have comprised over 40% of the buck harvest and have comprised over 60% the last two 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 good trend data. At the moment, 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 trends indicate that total harvest has remained at a sustainable rate (Table 1 & 2).

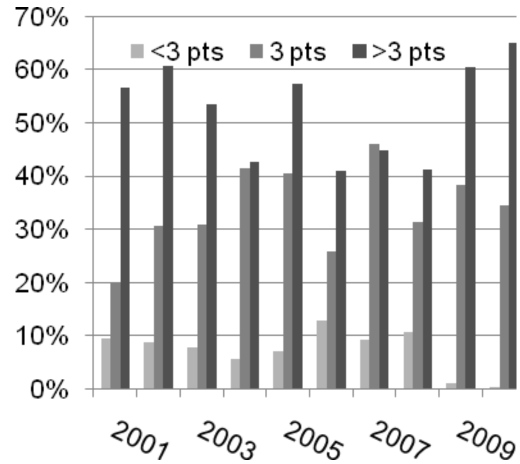

Figure 1. Antler points as a percentage of buck harvest in GMU 381.

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. 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 the 2006 through 2008 period to 37 deer in 2009 and 20 deer 2010. In the short term, harvest has declined especially of does. In the long term, it is anticipated that the herd will increase and more will be available for harvest.

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 escaping cultivation. Most of these lands receive various levels of livestock grazing. Numerous irrigation waterways traverse this landscape providing some habitat. Wildfires on the

Hanford Reach National Monument in 2005, and again in 2007, reduced the amount of habitat 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 leading to degradation of deer habitat.

GMU 381 is comprised of a mixture of dryland wheat, CRP and shrub steppe. CRP acreage increased significantly with the 1998 signup, and has increased and improved habitat for deer. Changes with the 2008 Farm Bill may result in reduced CRP acreage in the future. If this happens deer habitat 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 buck to doe ratio is on the low end of the objective and therefore requires close monitoring and possible reduction of harvest opportunity in the future. Also, the substantial increase in doe harvest in 2009 and 2010 requires monitoring to assure harvest is not reducing the population beyond 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 for 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. 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 in 2003-2006. GMUs 328, 330-342, 352-360, and 368 are open for muzzleloader. The number of units open to muzzleloader 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 decreased slightly from 2009, were below the 10-year average, 55% below the average for the 1990s, and 19% below the 10 year average (Table 1). This is likely a response to lower deer numbers and less antlerless hunting opportunity. Harvest has decreased as well (Table 2).

Table 1. Number of deer hunters and success rate PMUs 32-36, 1991-2007.

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
10-yr avg	10,511	679	3,237	14,427	11

Surveys

In December of 2010, ground surveys were conducted in PMU's 32 and 33. There was a slight increase in deer seen over 2008 and buck ratios were above objectives.

Population status and trend analysis

Deer populations across all PMUs have been declining. Population surveys and previous harvest estimates indicate a 40-50% decline in PMUs 32, 33, 35, and 36 since 2003. In the GMU 371 portion of PMU 34, the population decline was similar. The harvest data suggests only a moderate decline in population across the remainder of PMU 34.

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
10 yr avg	469	104	388	160	160	35	117	36	133	39	1 267	322

There appears to be a strong relationship between the expansion of an exotic louse *Bovicola tibialis* and deer population decline. Deer with signs of hair loss (which is caused by the lice) were first seen in 2004 in PMU 33. Observations of deer with hair loss have since become common throughout the district. *Bovicola tibialis* is distinctly different from the exotic louse *Damalinia* (*Cervicola*) sp., which has caused hair loss in the black tailed deer in western Washington and Oregon.

The change in harvest management from “any buck” to “3-point minimum” regulation in 1997 was likely responsible for some of the reduction in harvest. However, the decline in both harvest and population estimates since 2004 is not due to winter weather or regulation change. The winter of 2004-05 was one of the mildest on record. There have been droughts in the lower elevations, but no winter has been particularly severe in over 10 years.

All PMUs have typically had buck ratios at or above the goal of 15 bucks per 100 does when surveys have adequate sample sizes. Bucks tend to be somewhat isolated from doe/fawn groups in December and short term declines in PMU 32 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 buck ratios.

Habitat condition and trend

There is little 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-upper elevations, fire produces 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. Forage production on winter range has increased the last few years. Houses are also being built in prime winter range.

Management conclusions

It is unknown how the lice will affect mule deer in the long-term. An increase in harvest in 2009 was somewhat expected due to a good fawn crop in 2007, but may have been due to anomalies in projections from raw to final harvest data. Populations have declined 40-50% over most of the range since 2004. Only the southern portion of PMU 34 does not seem to be as impacted. Antlerless harvest was eliminated from PMUs 32, 33, 35, and 36, but populations have yet to rebound.

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
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
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

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

DEER STATUS AND TREND REPORT: REGION 4

PMU 41- GMU 410
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 and harvest trends

Hunting season formats differ between individual Game Management Units (GMUs) based upon geographic variation. GMUs 407 and 410 are island and coastal areas with a high human population distributed throughout the habitat base. Hunting season strategies in these units generally emphasize more conservative seasons and hunting methods (permit hunts, archery, muzzleloader, or shotgun). Either-sex hunts are more common in island and coastal units because deer populations are generally higher with less public access to private lands. GMUs 418 and 437 are characterized as mainland areas of mid elevation with lower human population densities than the more urbanized island and coastal regions. Historical harvest data indicates that deer harvest success increases substantially as GMUs move south from the Canadian border. It has been speculated that lower temperatures resulting from cold air intrusion from the Fraser River basin lower carrying capacity for deer in affected units. 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. This eastern-most unit differs from other areas in that the deer populations in high elevation habitats support predominately mule deer or mule/black-tail hybrid populations, as opposed to black-tailed deer only in lower elevation units.

Harvest and recreational opportunity profiles for GMUs 407-437.

Black-tailed deer harvest in GMUs 407 – 437 during the 2009 season totaled 1643 animals (Table 1). Antlerless harvest for the 2009 season totaled 319 animals (19% of total harvest) with antlered harvest totaling 1324 animals (81% of total harvest). In 2010 the number of hunters in GMU 407 decreased slightly from 2009, and the number of deer harvested decreased proportionally with hunter success up 4% at 29% (Figure 1). The number of hunters in GMU 410 also decreased from 2009, and hunter success was down 8 % at 35% (Figure 2). Starting in 2006, second deer tag permits for GMU 410 were allocated by island, and second deer harvest increased dramatically from 52 deer in 2005 to 152 deer in 2007. In 2009, second deer harvest decreased to the same level it was in 2005 with 52 deer harvested. In 2010 second deer harvest rebounded to 98 animals with 62% of those antlered. (Table 2). In 2011 the second deer harvest will be restricted to antlerless animals in all of these island Deer Areas in GMU 410.

In GMUs 418, 426, and 437, the number of hunters was down from 2009, but harvest was higher and hunter success increased from 14% in 2009 to 17% in 2010 (Figure 3).

The proportion of deer harvested in 2010 within GMUs 407 – 437 (1643 animals) as compared to the statewide harvest for the 2010 season (33,391 animals) indicates that these northern Region Four GMUs represent 4.9% of the statewide total harvest, up slightly from 2008 and 2009. Tribal harvest in GMUs 407-437 for the 2010 season consisted of 14 bucks and 3 does harvested in GMU 407, 2 bucks in GMU 410, 44 bucks and 38 does in GMU 418, and 11 bucks and 15 does in GMU 437.

Surveys

In the past, herd composition surveys were not conducted in GMUs 410-437 due to low deer population densities and equally low hunter distribution and numbers. However, islands in GMUs 410 and 407 support higher densities of deer, which can be easily viewed foraging in fields at dawn and dusk. A survey effort was conducted in 2004 and 2005 to gather data on deer densities and herd composition on vehicle-accessible islands in San Juan County and on Guemes Island in Skagit County. The survey was conducted by driving standardized routes on the islands in the mornings and evenings during mid-July. The buck:doe ratios for the 2004 and 2005 surveys on the islands were very high and ranged from 58 to 97 bucks per 100 does.

Hair loss syndrome continues to be prevalent throughout the mainland GMUs in north Region Four and in 2004, hair loss was confirmed in the island habitat of GMU 410 where it was previously thought to be absent.

Population status and trend analysis

The only monitoring of population status and/or trends in the mainland GMUs is the anectodal observations of 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) that consistently report fewer animals observed in traditional work areas over the last five to ten years.

In 2007, researchers from Seattle Pacific University initiated a study of black-tailed deer population size, home range, and movement patterns on Blakely Island in the San Juan Archipelago (GMU 410). Fifteen deer were captured in 2007 and 2008 and equipped with either VHF or Global Positioning System (GPS) collars, and an additional 19 deer received ear-tags. Density estimates indicate very high population densities of about 39 deer/km^2 and smaller home ranges than those demonstrated by mainland or large-island populations (Long et al., 2009).

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 2010.

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. Widespread posting of land and a county ordinance restricting hunting access to private property limit WDFW options for managing the deer populations in these areas of Region Four.

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.

Use of herbicides on private timber lands has been observed over the last three to five years. This practice had declined on state and federally owned lands over the last ten years and was considered to be of minimal concern when compared to historical herbicide use levels. It will be necessary to monitor this activity in order to evaluate actual impacts on local deer habitats.

Management conclusions

Recommendations for effective management of north Region Four deer populations include:

1. Implement a comprehensive habitat analysis of all deer range in Whatcom, Skagit, and San Juan counties.

2. Conduct herd composition surveys (age and sex class) in all GMUs in Whatcom, Skagit, and San Juan counties. Define population status in individual game management units using current population modeling techniques.

3. Increase hunter access to private land in San Juan County to alleviate deer damage. Provide incentive to landowners to create land pool available for hunting through a private lands hunter access program.

4. Confirm the absence of Chronic Wasting Disease in Whatcom, Skagit, and San Juan counties' deer populations. Collect tissue samples for laboratory analysis through targeted surveillance of sick or emaciated adult deer.

5. Continue monitoring local deer populations for presence/absence, distribution and severity of hair loss syndrome.

6. Increase biological sampling for diseases and parasites in the San Juan Island Portion of GMU 410.

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Table 1. Deer harvest summary for GMU's 407-437, 2010

Harvest	Modern Firearm	Archery	MZL	Multiple Weapons	Special Permit	Total
Antlerless	108	141	33	1	36	319
Antlered	1004	156	70	21	73	1324
Total	1112	297	103	22	109	1643

Table 2. Second deer tag harvest results by island in GMUs 410 and 407 for 2010

Island Name	Hunters	Antlered	Antlerless	Total	Success (%)
Shaw	18	5	2	7	38.9
Lopez	25	11	4	15	60.0
Orcas	19	10	2	12	63.3
Decatur	7	2	2	4	57.1
Blakely	17	6	6	12	70.6
Cypress	17	3	3	6	35.3
San Juan	18	10	4	14	77.8
Camano	16	3	2	5	31.3
Whidbey	42	8	7	15	35.7
Guemes	12	3	5	8	66.7
TOTAL	191	61	37	98	54.3

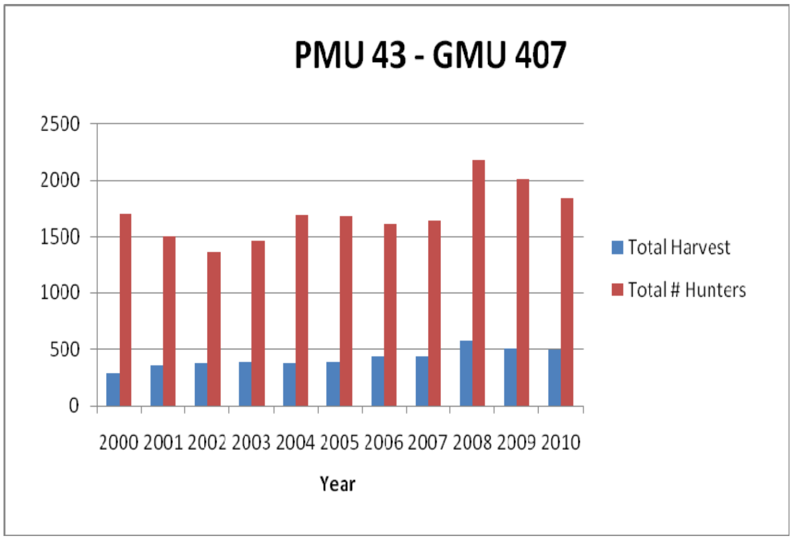

Figure 1. Hunter Numbers and Deer Harvest for GMU 407 in 2010.

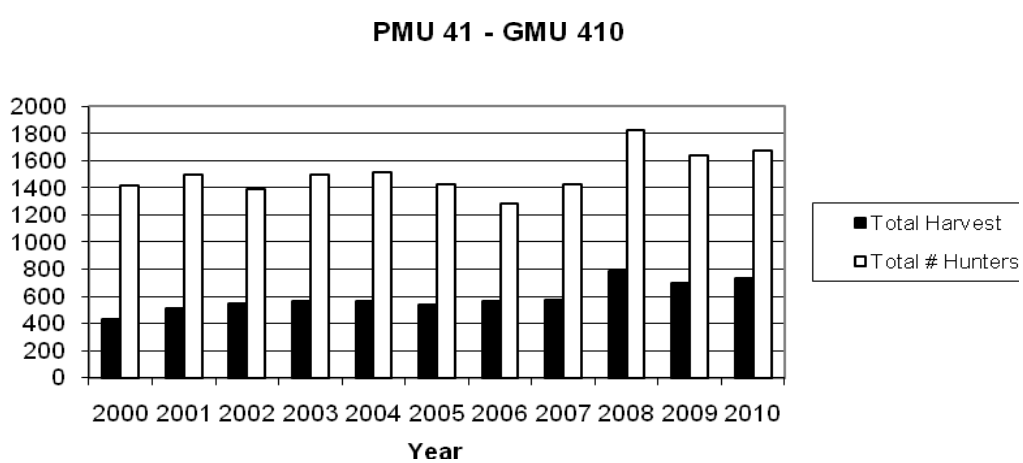

Figure 2. Deer harvest and number of hunters in PMU 41, 2000-2010.

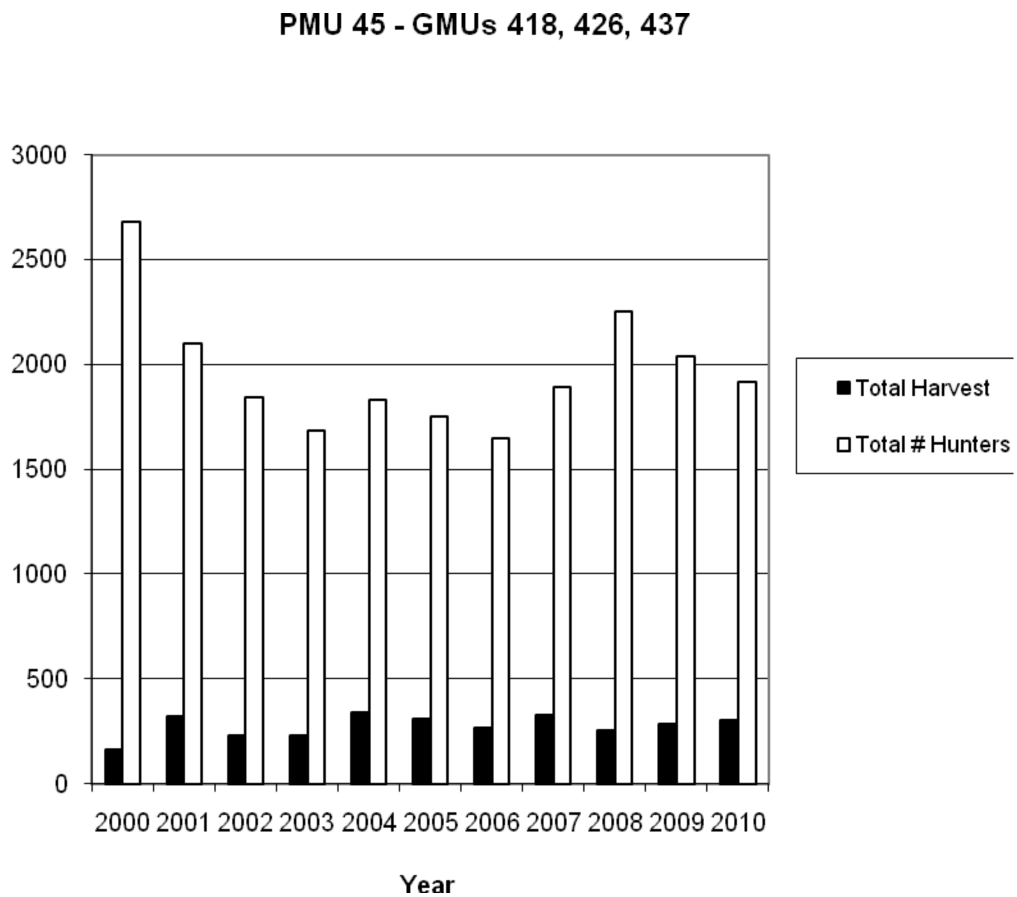

Figure 3. Deer harvest and number of hunters in PMU 45, 1999-2009.

DEER STATUS AND TREND REPORT: REGION 4

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

BRIAN KERTSON, District Wildlife Biologist

Population Objectives

Population objectives for Game Management Units (GMUs) 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 archery season, and GMU 454 has an any-deer late archery season. GMU 454 has an early muzzleloader season for any deer.

GMU 454's more liberal seasons are designed to maintain the population at an acceptable level. 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 modern firearm buck harvest beginning in 1999 (Fig. 1). Total buck harvest post 1998 showed an approximate 75% increase in harvest compared to previous harvests. While the number of modern firearm hunters reached their peak in 1999 and 2000 at 758 and 750 hunters respectively, the following years show a decrease in modern firearm hunters by roughly 300 hunters, yet buck harvest remained high. While increased habitat modification continues with widespread new home and lot development, modern firearm hunters remain able to find accessible lands with ample opportunity to harvest a buck.

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 shown some variation with yearly fluctuations most likely affected by dry early fall weather and early winter snowfall, both influencing hunter success.

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	83
1999	71.7	12.8	10.3	23.0	76
2000	51.0	11.4	0.0	11.4	57
2001	No	Data			

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.

GMU 460 has been managed as “any buck” legal strategy for more than 30 years. Harvest has varied over this period, averaging about 460 deer per year from 1984 to 1998 (Fig. 4). The late buck season closure in 1998 certainly contributed to the 41% decline in total buck harvest compared to 1997. Access fees in Hancock Forest Management lands in GMU 460 have increased over time and may contribute to lower number of hunters.

Table 2. Postseason Deer Composition Survey Results from Helicopter 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)

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. In 2000, the special permit hunt was designated as buck only. Beginning in 2003, a limited number of state permits for persons with disabilities allowed the take of any deer. A youth hunt was added in 2006. An "Any Deer" opportunity is provided to the youth and persons with disabilities on an every other-year basis.

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 454, 460 and 466. The Muckleshoot Indian Tribe (MIT) has conducted mid-winter population estimate surveys in GMU 485 since 2000 based on a mark-resight/Lincoln-Petersen technique using radio-collared deer.

In 2003, both pre and post season composition flights in GMU 460 resulted in classifying only 25 and 20 deer respectively. The extremely low sample size does not allow us to calculate meaningful ratios from the data. In addition, the scarcity of deer seen on these flights carried out under the same historic count methods, raises concerns over a continued and apparent decline in deer numbers. Further restrictions on antlerless hunting were instituted for 2004, with archery season remaining buck only.

Table 3. Trend in Deer Population in GMU 485

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		

* Poor weather prevented completion of the survey.

Population Status and Trends

Precise population estimates for GMUs 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 appear to be on the slight increase, however, confidence intervals are wide and therefore true changes in population may be dubious. Radio-marked doe survival, previous fawn ratios, and low harvest do suggest that there should be a population increase in GMU 485 (Table 3), (Vales unpubl. data 2006).

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 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 and serve as travel corridors.

In 2003-2004 an apparent increase 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. In addition, 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, yet without additional research into the relationship between current conditions, herbicide application, and deer populations, habitat quality will remain in question.

Deer habitat trends in GMU 466 and 485 are most 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 454, deer damage to ornamental shrubs and gardens can be a problem and numerous complaints are received every year. 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 GMU 460 and beginning in 1996, black-tailed field surveys documented a hair loss syndrome that affects deer during the late winter and early spring surveys. It appears this has negatively influenced deer survival and recruitment, particularly fawns. 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.

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

Management Conclusions

Deer in GMU 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 the GMU, should continue to offer hunting and recreational viewing opportunity.

In GMU 460, the Region will maintain the late buck season closure for modern firearms and measure response by monitoring post-hunt buck:doe 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.

Vales, D.J. 2006. Personal communication. Muckleshoot Indian Tribe Biologist.

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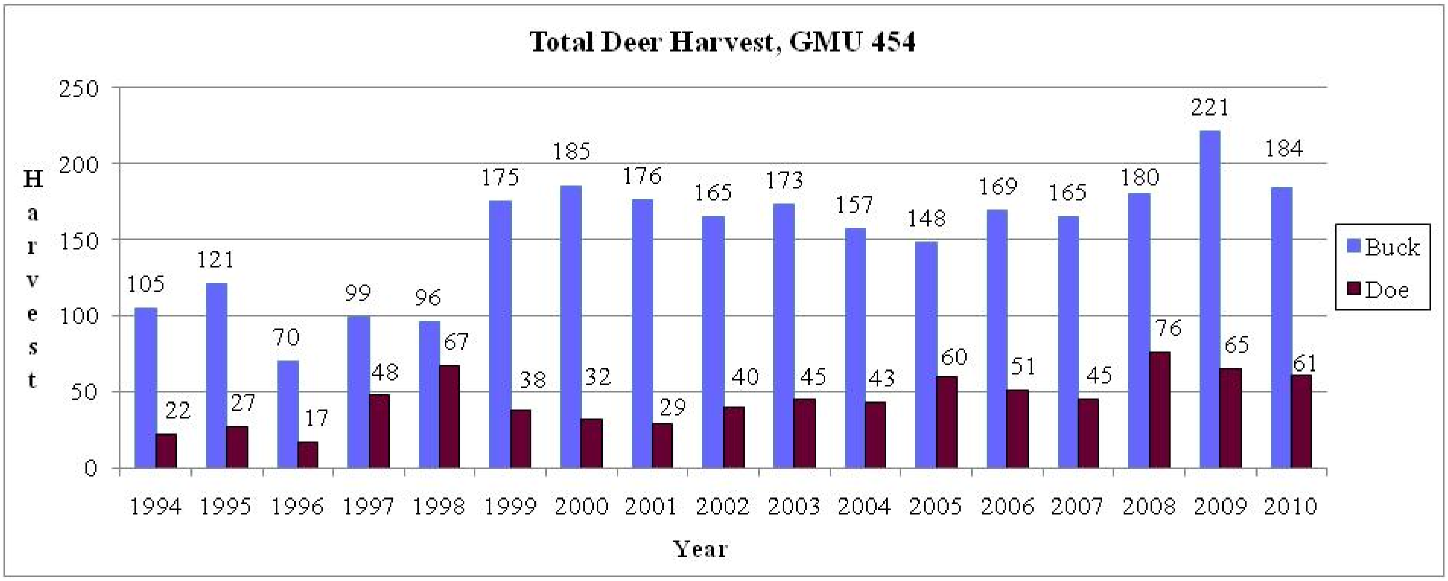


Figure 1. Annual deer harvest in GMU 454, all weapon types, 1994-2010.
*2004 harvest reflects uncorrected raw data reported from hunter report.

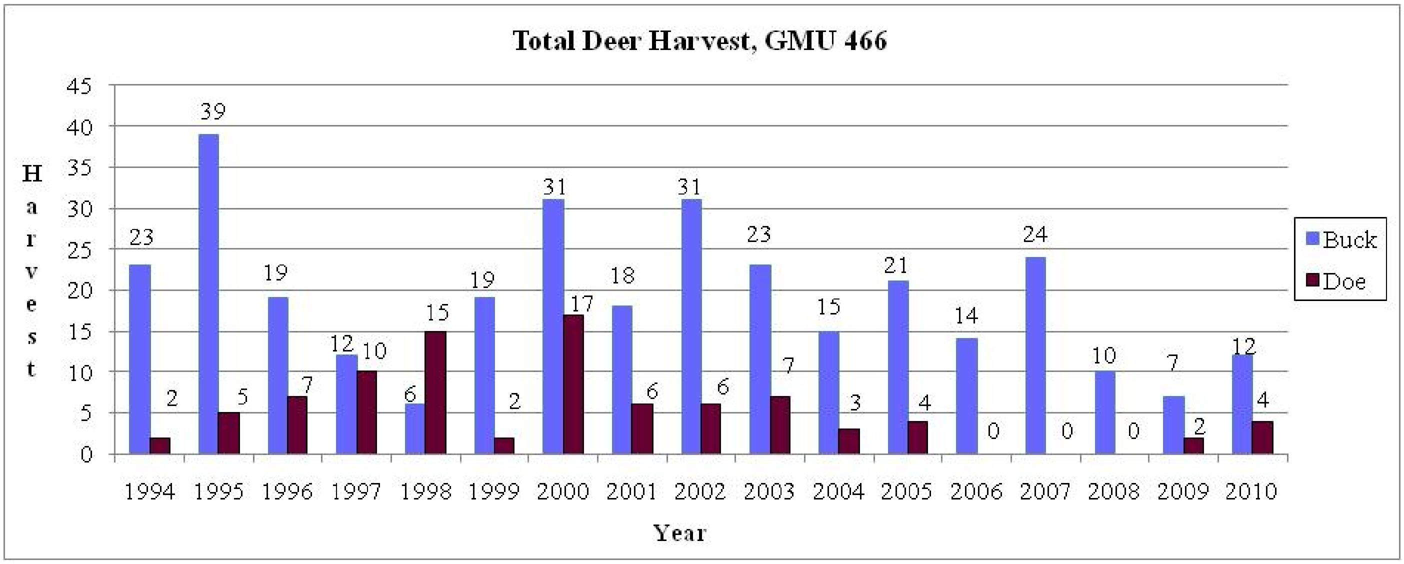


Figure 2. Annual deer harvest in GMU 466, all weapon types, 1994-2010.
*2004 harvest reflects uncorrected raw data reported from hunter reports.

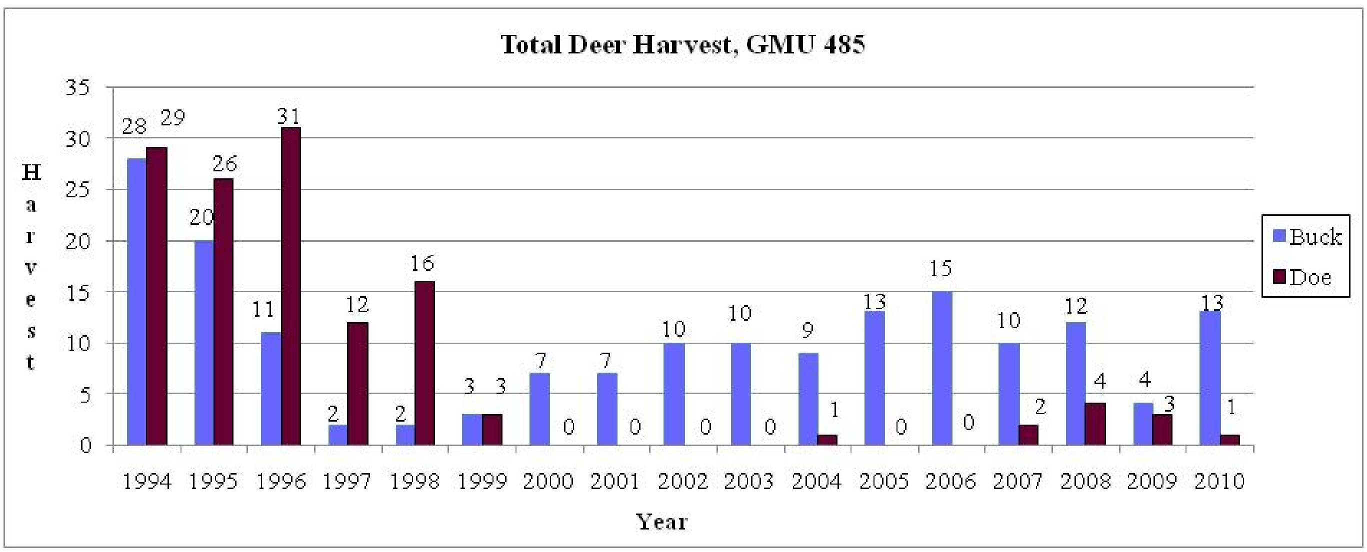


Figure 3. Annual state deer harvest in GMU 485, 1994-2010.

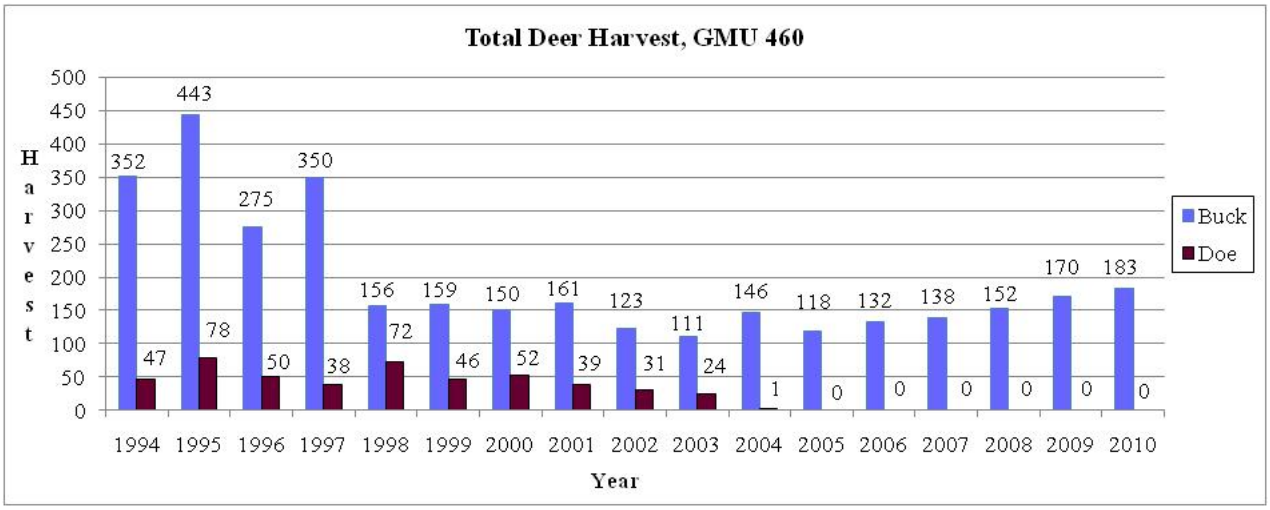


Figure 4. Annual deer harvest, GMU 460, 1994-2010, general season and special permit combined.
1997 was last year of late buck hunt.
2004 1st year of buck only archery hunt

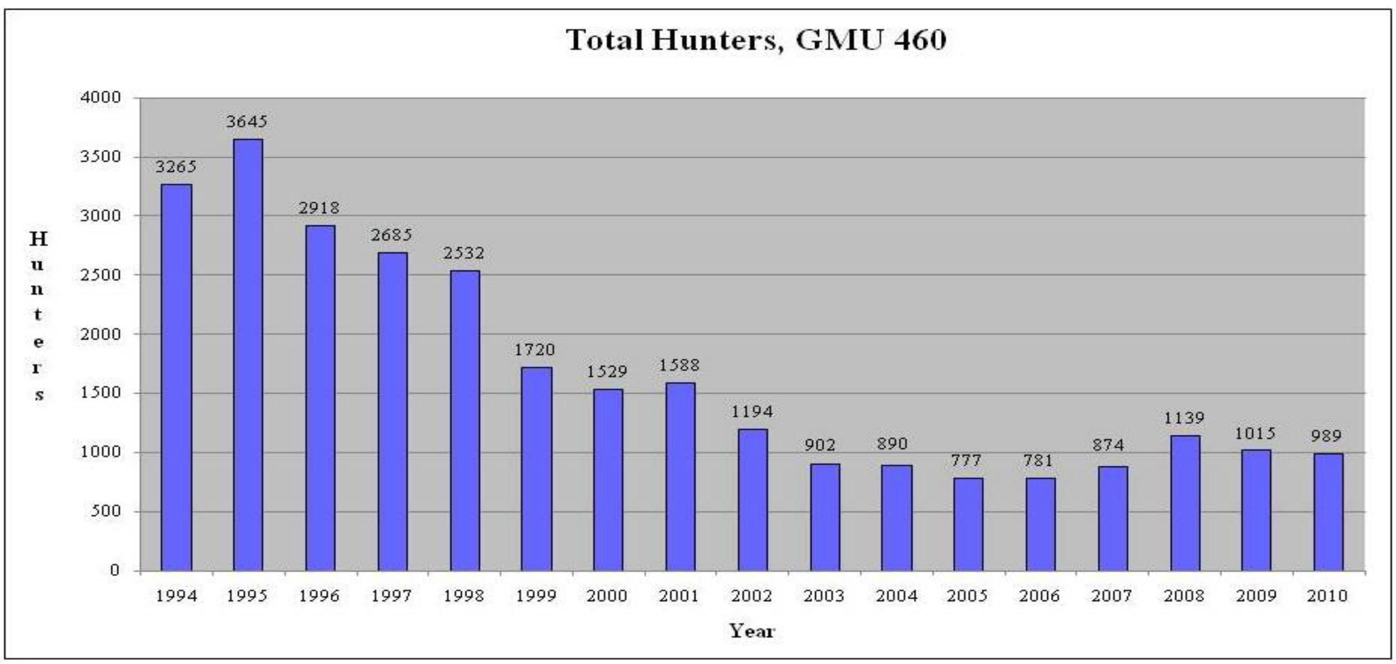


Figure 5. Number of deer hunters, GMU 460, 1994-2010, general season and special permit combined.
1997 was last year of late buck hunt.
2002 increase in access fee-Hancock Forest Management.

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 (GMU) 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 2010 hunting season in GMU 448 began with the early archery season open for any deer from through Sept. 1- 24, the early muzzleloader season open for any buck from Sept. 25 through Oct.4, and the general modern firearm season open for any buck from Oct. 16-31. Ten modern firearm permits were issued for a late buck hunt from November 19-24.

Hunter numbers remained about the same in 2010 compared to 2009 in GMU 448, with just over 800 hunters. The number of people hunting this GMU over the last decade has average about 780 people and has ranged from a high of 950 in 2001 to a low of 647 in 2005. The number of people hunting GMU 448 has declined by over 50% since the 1990's when the average number of people hunting the unit was around 1900 each year.

Harvest in GMU 448 increased in 2010 compared to 2009, with 176 deer harvested compared to 129 the previous year. Hunter success rates also improved in 2010 compared to the previous year (20% success (2010) versus 16% success (2009)) (Figures 1&2). Archery hunter success remained the same as in 2009 at 18% (27 deer harvested); modern firearm hunter success improved in 2010 (23% success rate; 147 deer harvested. Only 10 muzzleloader hunters reported hunting in GMU 448, with 1deer harvested.

Figure 1. Total Deer Harvest: GMU 448 2000-2010

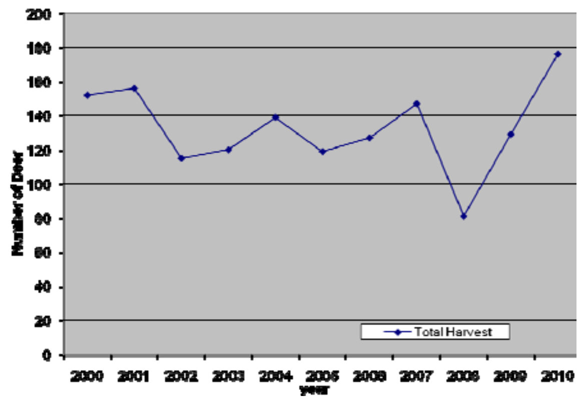
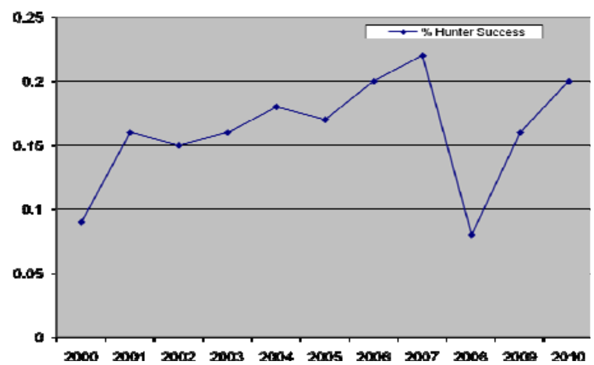


Figure 2. Percentage of Successful Hunters: 2000-2010



As in previous years, relatively few people hunted in GMU 450, however both hunter participation, number of animals harvested and hunter success were the highest seen in the last 6 years. 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 2006); hunter numbers averaged 75 (range 60 hunters in 2005 to 90 hunters in 2006); and average success rate was 12% (range 8% in 2005 to 17% in 2006). Ten late buck season modern firearm permits are allotted to this PMU. For the 2010 season, 5 deer were harvested resulting in a 50% success rate. Of these, 2 bucks were reported as 3 point deer and 1 was reported as a 5 point.

In GMU 448, 80% of hunters used modern firearms, and this group harvested 84% of the deer in 2010. Archery hunters comprised 19% of hunters and took

15% of the deer. Muzzleloader hunters accounted for 1% of hunters, with only 10 people reporting that weapon type and 1 deer harvested. Ninety hunters hunting in GMU 450 used modern firearms, harvesting 14 deer; 13 hunters used archery equipment, harvesting 6 deer; and 3 hunters used primitive weapons, with 1 animal taken.

PMU 46 is hunted by the Stillaguamish, Tulalip, and Sauk Suiattle Tribes. The tribes preliminarily report harvesting 5 bucks and 2 does from GMU 448 and no deer from GMU 450 in 2010.

Surveys

Population surveys were not conducted in GMUs 448 or 450 in 2010.

Population status and trend analysis

Insufficient data exist to model the deer population in PMU 46. Total harvest and hunter success increased in 2010. The 2010 harvest was the highest seen since 1999, and hunter success has continued to increase in recent years, also. In general, we believe that conditions are stable in this geographic area.

Habitat condition and trend

Much of the forest habitat available on USDA Forest Service lands 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. 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.

Clear-cutting continues 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 parts of the area.

Increasing human developments in Snohomish County affect the amount of habitat available for deer, as well as limiting hunter access in some areas. We expect the trend of shrinking habitat available to deer to continue, as the human population of the County continues to grow, although economic trends in recent years appear to be slowing growth for now. Access to large tracts of land continues to be a challenge in many parts of the PMU, as many public landowners are gating or decommissioning their roads and prohibiting the use of motorized vehicles.

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.

2011 DEER STATUS AND TREND REPORT: REGION 5

PMU 51 -GMUS 578 (WEST KLICKITAT), 388 (GRAYBACK), 382 (EAST KLICKITAT)
PMU 52 – GMUS 564 (BATTLE GROUND), 568 (WASHOUGAL), 574 (WIND RIVER)
PMU 53 – GMUS 524 (MARGARET), 554 (YALE), 556 (TOUTLE)
PMU 54 – GMUS 516 (PACKWOOD), 560 (LEWIS RIVER), 572 (SIOUXON)
PMU 55 – GMUS 510 (STORMKING), 513 (SOUTH RAINIER)
PMU 56 – GMUS 503 (RANDLE), 505 (MOSSYROCK), 520 (WINSTON), 550 (COWEEMAN)
PMU 57 – GMUS 501 (LINCOLN), 504 (STELLA), 506 (WILLAPA HILLS), 530 (RYDERWOOD)

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 2010 general deer season in Region 5, modern firearm hunters made up 75% 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 1% of the Regional deer hunting effort.

Table 1. Deer Hunter Numbers and Harvest Statistics for Region 5, 2001-2010.

Year	Hunters	Days	Harvest	Success (%)
2001	39,686	270,908	7,363	19
2002	29,231	201,360	5,219	18
2003	27,540	179,850	5,522	20
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

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. New for the 2009-2011 3-year-package, GMU 574 (Wind River) was changed from a 2-point antler-restriction GMU to the any-buck management strategy consistent with most Region 5 Units. Additionally, GMU 578 (West Klickitat) was changed from the 2-point strategy to a 3-point or larger management unit, thus joining the other two Klickitat County GMUs (388-Grayback and 382-East Klickitat), with the 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 allocated 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 2010, an estimated 30,394 hunters spent a total of 163,342 days deer hunting in Region 5 (Table 1). Total general-season harvest in 2010 was 5,316 with a hunter success rate of 17% (Table 1). The percentage of hunters that harvested a deer in 2010 was within one percentage point of the previous 10-year mean of 18%. Similarly, the total deer harvest was close to the mean harvest of approximately 5,700 during the period from 2000-2009.

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 2010 Deer Hunters, Hunters/Square Mile, Harvest, Harvest/Square Mile, and Success / PMU.

PMU	Hunters	Hunters /SQ Mile	Total Kill	Kill/SQ Mile	Success (%)
51	5613	3.2	1343	0.76	24
52	4922	4.1	941	0.79	19
53	1109	3.0	192	0.52	17
54	3856	2.2	314	0.18	08
55	1097	2.5	199	0.45	18
56	7834	7.8	1162	1.16	15
57	5963	4.8	1165	0.94	20

In addition to the general-season deer hunting effort and harvest discussed above, tags were offered for special hunts open only to permit holders in 2010.These tags 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 controlled deer hunting 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 2010.

In aggregate, general and permit-only deer seasons in Region 5 during the 2010 hunting season resulted in a total harvest of 4900 antlered and 705 antlerless deer.

Surveys

Region 5 deer demographics have historically been collected from several types of surveys and data collection efforts. These surveys include; (1) biological sampling stations, (2) late summer productivity surveys, (3) spring counts of the Klickitat deer herd, (4) evaluation of female deer age structure from tooth analysis, 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 2010 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. Because of the advantages in generating the AYBP in this manner, no check stations were operated in 2010.

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

Table 3. Region 5, 2010 Special Deer Permit Harvest Summary.

PMU	Antlered Kill	Antlerless Kill	Total Kill
51	**51**	**106**	**112**
52	**26**	**25**	**51**
53	**0**	**9**	**9**
54	**3**	**3**	**6**
55	**0**	**10**	**10**
56	**2**	**34**	**36**
57	**0**	**20**	**20**
SUM	**82**	**207**	**289**

effective methods. These have included collection of doe teeth at check stations and meat lockers as well as from road-killed animals. These efforts (2002-2010) 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. In2010, 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 2010 productivity surveys, a total of 837 deer were classified. The mean value of 0.55 fawns/doe is very similar to the historical average of 0.52 per doe for the Region. The surveys are conducted after the peak of neo-natal mortality, so these values are likely 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 censused on March 22-23, 2011 (Table 4). Transects were driven on the evening of the 22nd and morning of the 23rd. 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 363 deer were classified during the March 2011 Klickitat deer survey. The resulting fawn:adult ratio of 0.45 is indicative of average over-winter survival among the Klickitat deer population. The long-term mean (1980-2011) ratio for this area is 0.48.

Long-term correlations (1992-2005) between the spring fawn:adult ratio and the overall buck harvest in GMU 388 (Grayback) the following fall were historically significant ($r = 0.59$). These analyses indicated that spring surveys were a good predictor of hunting success in GMU 388. The biological significance of this relationship is straightforward. Fawns are generally more vulnerable to resource shortages and other environmental stress, low fawn:adult ratios indicate tougher over-wintering conditions and likely lower overall survival of deer. High winter mortality across all age classes will result in lower fall harvests. Secondly, biological sampling station data indicate that many yearling bucks (approximately 56% in the Grayback GMU) develop two points on at least one antler and were therefore legal for harvest at age 1.5 under the 2-point antler restriction. Depressed fawn:adult ratios in the spring meant fewer yearling bucks were available in the fall; hence, a lower total buck harvest. However, due to the 2006 changing of the Grayback GMU to a more conservative season structure (3-point minimum and abbreviated modern-firearm season), this relationship is no longer observable.

Table 4. Historic Fawn:Adult Ratios for the Klickitat Spring Deer Survey, 1997-2011.

Year	Total Deer Classified	Fawn:Adult
2011	363	0.45
2010	440	0.72
2009	277	0.53
2008	238	0.48
2007	344	0.67
2006	450	0.66
2005	462	0.60
2004	619	0.52
2003	647	0.52
2002	448	0.52
2001	764	0.54
2000	843	0.46
1999	481	0.58
1998	328	0.47
1997	702	0.18

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.

Ideally Regional Wildlife Program Staff conduct the surveys during December. The timing of post-season surveys was selected 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). Ground surveys are conducted in GMU 382 and a combination of ground and aerial surveys are conducted in GMUs 388 and 578. Due to a GMU boundary change, a portion of Unit 578 was included in the post-season survey effort for the first time in 2009. A summary of these post-season deer surveys is listed in Table 5.

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 year of the 3-point antler restriction appears to have had a similar effect in GMU 578 (West Klickitat). However in 2010, poor weather and lack of helicopter availability unfortunately pushed the 2010 post-season survey flight out to January 10, 2011. Single-antler bucks and shed-antlered bucks were observed on the survey and results likely underestimated the true amount of bucks in the population of GMUs 578 and 388.A continuation of these survey efforts will be required to adequately assess ongoing management efforts. Ideally, this would include the availability of funding for additional aerial surveys.

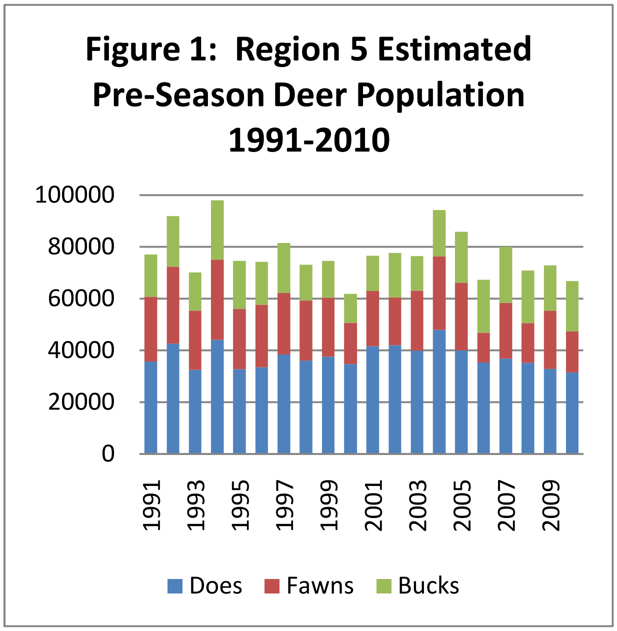
Population Status and Trend

Information compiled from hunting activity suggests stability of the deer population in the Region. Hunter success rates over the past 15 years have remained very consistent (R^2=0.01). Similarly, hunter days per kill has not changed (R^2=-0.10). In contrast, total deer harvest has steadily declined (R^2=-0.68) from roughly 7000 to 5000 during the same period. However, the reduced harvest in recent years can be explained by a concurrent reduction in the number of hunters choosing to pursue deer in Region 5. During the past 15 years deer hunters in Region 5 have declined from approximately 42,000 to 31,000.

Biological data also indicate relative stability in the overall Regional deer population. However, 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.

Table 5. Post-Season Deer Composition Survey Summary, GMUs 388, 382 and 578, 2003-10.

GMU	Year	Total Deer Classified	Bucks:Does:Fawns
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
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
578	2009	243	32:100:55
	2010	283	6:100:64
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



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). 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). These impacts primarily include the loss of security associated with increased human access to remote areas. Additional negative impacts from roads are likely associated with weed dispersal, direct loss of habitat due to hardened surfaces, soil erosion, etc. 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 (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.

Additionally, a new 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 from 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 3% of the deer observed during the March 2011 Klickitat deer survey had noticeable signs of the syndrome. Late 1990's 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).

Neither the hunter generated nor the biological data discussed earlier in this document suggest a large-scale decline in the Regional deer population. However, 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. Recent efforts 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

An effort to better understand the ecology and demographics of western Washington black-tailed deer is being conducted by WDFW. Study animals are distributed in several locations. Within Regions 5, four does from the western portion of GMU 568 (Washougal) were captured via helicopter net-gun in March of 2010. The does were outfitted with collars carrying both traditional VHS and satellite transmitters. Additionally, the deer were equipped with VITs (Vaginal Internal Transmitters) designed to broadcast an alternate signal upon parturition and facilitate the capture of fawns.

In 2011, intensive monitoring was conducted during the May-June birthing period by Regional Wildlife Program Staff. 2011 was the second year of inclusion in the study for the 4 does and the deer were not re-captured to equip them with a second VIT. Therefore, fawn capture efforts were less effective than during 2010. Two fawns associated with the study does were captured and radio-collared (VHS only) as a result of these efforts. All 4 adult deer and 1 juvenile remained alive at the end of the time-period associated with this report (June 30, 2011). Additionally, one fawn from the 2010 cohort remained alive. 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, hairloss syndrome, and limited antlerless harvest opportunity have combined to stabilize the Region's deer population in relatively recent years. However, 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, i.e. less of the landscape was developed, reforestation efforts were much less intensive, the federally managed lands were subject to extensive timber harvest, and hairloss syndrome was yet to arrive. 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 the deer population. 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 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 managed by Population Management Unit (PMU), which is a collection of Game Management Units (GMU) (Table 1).

Table 1. WDFW Population Management Unit/Game Management Unit Framework, Region 6. *represents a 2 point or better unit

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

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 or better 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. Alternatively, a limited number of multi-season permits allow a hunter to hunt with all three weapon types; 2,000 permits were issued statewide during a special draw in 2010.

Region-wide harvest during the general season was 5,508 black-tailed deer in 2010; an increase of 2.5% compared to 2009. Of these, 14% were does and 86% were bucks. Total deer harvested by PMU ranged from 237 – 1,239 in 2010 (Table 2).

Modern firearm hunters comprised 76% of all general season hunters and harvested 74% of all deer harvested during the 2010 general season in Region 6. This group had up to 20 days to hunt during the general season and hunter success by PMU ranged from 15 – 20%. Modern firearm hunters reported killing 4,203 bucks and 28 does.

Table 2. Total number of bucks and antlerless deer harvested during general and permit seasons by PMU from 2008-2010, Region 6.

PMU	YEAR	BUCKS	ANTLERLESS	TOTAL
	2008	947	149	1,096
61	2009	1,059	182	1,241
	2010	1,038	201	1,239
	2008	1,002	247	1,249
62	2009	1,068	215	1,283
	2010	1,052	151	1,203
	2008	748	101	849
63	2009	752	160	912
	2010	798	143	941
	2008	830	143	973
64	2009	961	231	1,192
	2010	998	187	1,185
	2008	238	11	249
65	2009	215	22	237
	2010	259	21	280
	2008	270	18	288
66	2009	280	28	308
	2010	237	0	237
	2008	465	45	510
67	2009	415	42	457
	2010	372	51	423

Seventeen percent of all deer hunters in Region 6 during 2010 were archery hunters. This group killed 20% of all deer harvested and had as many as 62 days to hunt during the general seasons (early and late); depending upon the GMU hunted. Hunter success by PMU among this group ranged from 9 – 25%. Archery hunters reported killing 371 bucks and 541 does.

The muzzleloader group totaled 6% of all general season hunters in the Region and they harvested 4% of deer harvested in 2010. Muzzleloaders had up to 30 days to hunt during the general seasons (early and late), depending on the GMU hunted. Hunter success by PMU for this group ranged from 7 – 28%. Muzzleloader hunters reported killing 126 bucks and 164 does.

Multi-season permits were issued to 343 Region 6 hunters in 2010. Of these, 75 reported harvesting a total of 21 does and 54 bucks in the Region.

A total of 768 special deer permits were issued in Region 6 during 2010. Of these, 468 hunters reported using their permit to harvest 162 does and 47 bucks. In comparison, during the 2009 and 2008 hunting seasons 755 permits were issued each year, 438 hunters harvested 241 deer in 2009 and 440 harvested 222 deer in 2008.

Eight GMUs- Olympic (621), Kitsap (627), Skokomish (636), Wynoochee (648), Satsop (651), Mashel (654), Capitol Peak (663), and Skookumchuck (667), had a limited, special permit hunt opportunity designed to allow buck hunting during the peak of the black-tailed deer rut in November. Of the 50 quality buck permits issued to modern firearm hunters, 40 hunters reported hunting with this permit, harvesting 13 bucks during the 2010 season; 8 2-points, 2 3-points, and 3 4-points. Of the 20 quality buck archery permits issued, 9 hunters reported hunting with this permit, harvesting 3 4-points. Only 1 of 5 quality buck muzzle loader permit holders reported hunting in GMU 621, harvesting 1 2-point. Hunter success was 32% for modern firearm hunters and 30% for archery hunters using this permit.

Regional deer harvest has remained fairly stable to slightly increasing since 2005 (Figure 1). The number of deer hunters in Region 6 has been fairly consistent since 2001, averaging 25,220 (SD=2526) (Figure 2). Participation by weapon-type has also remained fairly consistent with modern firearm hunters comprising 80% (SD=0.02), archery hunters comprising 14% (SD=0.02), and muzzleloaders comprising 6% (SD=0.01) on average of all Region 6 deer hunters.

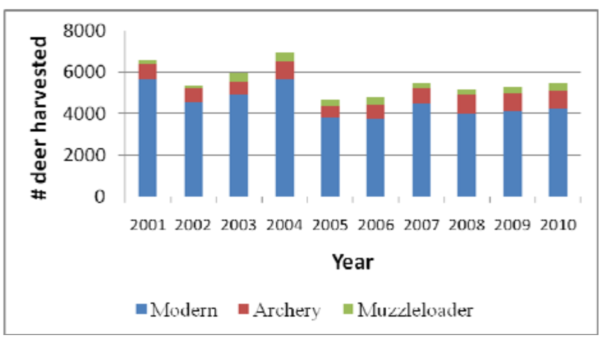

Figure 1. Estimated total number of black-tailed deer harvested during the general season by weapon-type in Region 6 from 2001 – 2010.

Modern firearm deer hunters are generally the most successful group. Average hunter success for general season modern firearm hunters was 21% (SD=0.02) from 2001 – 2010, while archery hunters averaged 19% (SD=0.02) and muzzleloaders, 17% (SD=0.04) (Figure 3).

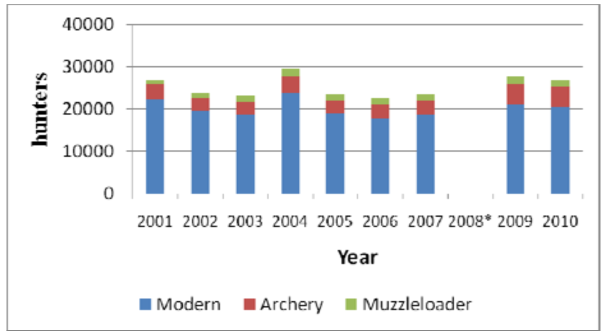

Figure 2. Total number of deer hunters by weapon type in Region 6, 2001 – 2010. *2008 data not available at this scale

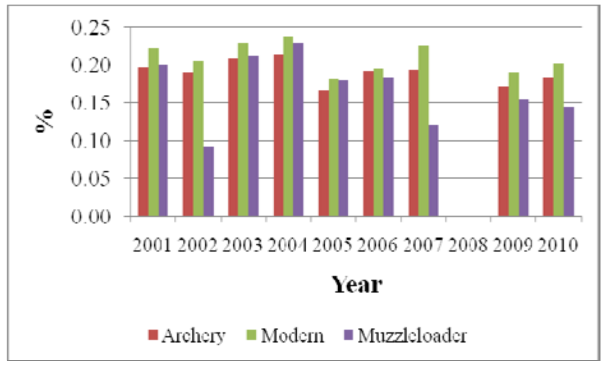

Figure 3. Average hunter success rates for deer hunters by weapon type in Region 6, 2001 – 2010. *2008 data not available at this scale

Tribal hunting accounted for 6% of the overall deer harvest in Region 6 in 2010-2011. Deer harvest was reported to be 95 does and 238 bucks (NWIFC Big Game Harvest Report 2010-2011).

Research and Monitoring

WDFW initiated a black-tailed deer study in 2009 to examine the influence of timberland management on black-tailed doe survival and productivity. This project is on-going with data collection expected to continue.

Annually, WDFW conducts sex- and age- composition counts in Region 6 to assess fawn productivity and estimate pre-season buck to doe ratios. Fawn recruitment, has been defined as the period at which fawn survival equals adult survival, (~age = 1-year old) or alternatively when a fawn is first available to reproduce or be harvested (~age = 1.5 years old) (Bender, 2006). Essentially, young of the year are “recruited” into the population to replace adults lost to mortality. Ideally, fawn recruitment would be assessed during spring surveys or during fall surveys, where fawns, yearlings and adults are classified (Bender 2006). However, distinguishing between yearling and adult females at these times of year is difficult.

Fall fawn ratios can provide a good estimate of productivity minus early mortality, as deer can be accurately classified to both age (fawn or adult) and sex (adult buck or doe) (Bender, 2006). When adjusted for over-winter mortality, fall fawn productivity ratios can provide a good index to potential recruitment. Over-winter fawn mortality rates can be derived through telemetry studies.

WDFW estimated annual fawn survival was 45% in the Capitol Forest in 2009-2010, with predation accounting for 58% of all mortalities and over-winter mortality = 23% (Dr. C. Rice, pers. comm.). The Makah Tribe recently conducted a deer study in the Hoko (601) GMU. Average-annual fawn survival in their study was estimated to be 33% with the majority of mortality attributed to predation; 74.4% (McCoy and Murphie, 2011; S. Murphie, 2010). They found significant variation in winter mortality of fawns that developed hair-loss syndrome, 43%, and those that did not, 20% (McCoy and Murphie, 2011; S. Murphie, 2010). In 2010, fall surveys were conducted in the Olympic (621) and Skokomish (636) units by WDFW and Skokomish Tribal biologists. Fall fawn: doe ratios suggest fawn productivity was quite good for GMU 621 and 636 (Table 3). The Makah Tribe conducted a fall composition survey in the Hoko (601) GMU (R. McCoy and J. Johnson, pers. comm.) (Table 3). Fawn recruitment in this unit has consistently been below levels necessary for population growth during the last few years, largely related to high mortality rates of fawns (McCoy and Murphie, 2011; S. Murphie, 2010). Accounting for buck mortality during the hunting season, pre-season buck: doe ratios observed in GMUs 601, 621, and 636 suggest these units are likely meeting management objectives (WDFW Game Management Plan 2008).

Table 3. Estimates of fall buck: and fawn: 100 doe ratios (± 90% confidence interval; Czaplewski et al, 1983) from composition flights conducted in September 2010.

PMU/ GMU	Count Summary				Ratio per 100 does	
	Bucks	Does	Fawns	Total	Bucks	Fawns
64/621	14	43	40	93	33±15	93±29
65/636	9	19	19	59	47±30	100±50
66/601	7	31	16	54	23±15	52±24

A deer check station was run at the Vail Tree Farm (Skookumchuck (667) GMU) on 4 weekends in 2010 with help from Eyes in the Woods and Master Hunter volunteers. On average 726 hunters were checked each weekend day during the general deer season. A total of 161 deer were checked with yearlings accounting for 50% of the bucks (n=142) and 20% of the does (n=19) based on tooth eruption/replacement.

Tooth envelopes were sent to 210 antlerless permit holders in the Olympic (621), Wynoochee (648), and Capitol Peak (663) GMUs to determine age, to the nearest year, by examination of annuli (Hamlin et al. 2000; Matson's Laboratory, Milltown, Montana). Twenty-three samples from 2009 and 21 from 2010 were returned and submitted for analysis (Table 5). The number of samples returned limited the utility of these data. Ages of does in this small sample ranged from 1 – 7, while the oldest buck was 6 years old.

Table 5. Results from tooth analysis for age class (yearling (Y) and adult (Ad)) from black-tailed deer tooth samples returned from permit hunters in Region 6, 2009 and 2010.

GMU	# return		Female (Y/Ad)		Male (Y/Ad)	
	'09	'10	'09	'10	'09	'10
621	5	4	0/5	0/4		
648	14	12	3/10	2/9	1/0	0/1
663	2	5	0/2	0/5		
666	1				0/1	
684	1				0/1	
Total	23	21	3/17	2/14	1/2	0/1

Population status and trend analysis

Deer population trends will vary by GMU/PMU largely due to variation in habitat quality. Small- and large-scale disturbances, such as fire, wind throw, landslides, flooding, and clear cutting, are key elements in maintaining higher quality deer habitat (Nelson et al., 2008). There are some general declines in deer numbers in some units while others are expanding, which follows the pattern that would be expected from timber rotations and natural habitat succession, where large magnitude changes in population occur with stand age.

An examination of harvest statistics (deer harvest, hunter numbers, success, and catch per unit effort) suggests some annual variation in deer numbers, but overall deer populations appear to be stable in the Region. PMUs 62 and 67 appear to be slightly declining, while PMUs 61, 63, 64, 65, and 66 appear to be stable or slightly increasing.

Management conclusions

Understanding population trends and harvest effects requires unbiased estimates of fawn recruitment, as well as, estimates of adult mortality partitioned to specific sources (hunting and natural, for example). Efforts to collect annual recruitment, cause-specific mortality, and survival rate data among fawns and other age/sex-classes in the Region continued in 2010, but more work is needed.

A total of 763 any deer or antlerless only permits will be offered in the 2011 deer season. This represents a 10% increase from 2010 levels; however this increase includes 100 doe permits that were added in the Satsop unit replacing a general season, any deer hunt during the late-muzzleloader season. Modern firearm doe permits were reduced from 15 to 5 in the Capitol Peak (663) GMU and from 20 to 10 permits in the 65+ category for Williams Creek (673).

Youth only, 2pt± or antlerless permits, were increased from 20 to 30 in the Mashel (654) and a youth only buck hunt was added to the Skookumchuck (667) GMU for the 2010 season. No other changes in the general season were proposed for the 2011.

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Elk

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

JAY SHEPHERD, Assistant District Wildlife Biologist
DANA L. BASE, District Wildlife Biologist

Population objectives and guidelines

The primary objective for elk (*Cervus elaphus*) management in the Colville District is to provide for sustainable annual hunter harvest of a viable and productive elk population with desirable population characteristics. 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 to harvest. Population data are limited, but there is currently no clear indication that bull:cow ratios or opportunities for quality bull hunting are declining.

A considerable change was made in the 3-year season package for 2003-2005 shifting the archery season later to September 8 through 21. That season structure remained in place until 2009 when it was changed to run from September 8 through 20 and then from September 7 through 19 in 2010. In 2003, muzzleloaders gained the opportunity to hunt the Selkirk GMU (113). Muzzleloader hunter opportunity in the "any elk" units (GMUs 101, 105, 108, 121) shifted from running concurrent with the modern firearm hunt to a muzzleloader only hunt in early October. In 2006, GMU 117 was added to the muzzleloader season making all GMUs open to any hunt methods during their respective seasons in 2006, 2007, and 2008. The season timing and increased opportunity for archers and muzzleloaders resulted in a significant increase in harvest for those groups. Hunter numbers have generally increased as has harvest, but it appears that most of the increase in numbers has been in the primitive method hunts, particularly archery (Figures 1and 2).

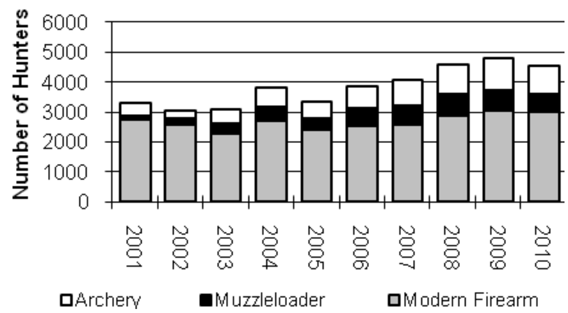

Figure 1.Trend in elk hunters by hunt methodfor GMUs 101-121.

Since mandatory hunter harvest reporting began, the number of elk hunters reporting hunting GMU's 101-121 increased from 3,296 in 2001 to 4,560 in 2010 (Washington Department of Fish and Wildlife 2010). During that time the total elk harvest increased nearly five-fold from a low of 57 elk in 2001 to a high of 244 elk in 2009, declining to 212 in 2010 (Table 1).

In 2006, the "multiple season" elk tag was introduced. This tag resulted in a modest harvest of 2 elk in 2006, 6 in 2007, 2 in 2008, 6 in 2009, and 5 in 2010. Hunter

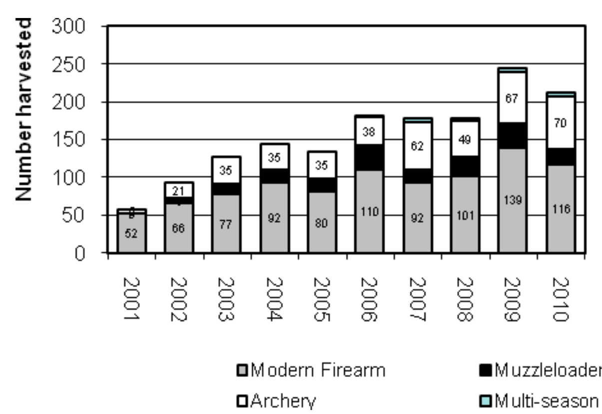

Figure 2. Trend in elk harvested by hunt method for GMUs 101-121.

success has been substantially higher for multi-season tag holders at approximately 16% in 2010 compared to general methods at about 5%.

The "any elk" permit hunts are designed to provide added hunter opportunity for antlerless elk and address landowner conflict where it occurs. The elk permit harvest in 2010 was 25 taken for a success rate of 21% (Table 2). Permits for "any elk" provide enhanced recreational opportunity for hunters, but the harvest is modest and of limited utility in addressing elk damage concerns.

Surveys

Harvest levels have been relatively low for the northern Selkirk Herd compared with other regions of Washington State. Consequently, devoting substantial resources to surveying bull-to-cow ratios has not been a high priority. For management decisions, we currently rely primarily on trends in bull mortality rates based upon implied age estimates from antler point data obtained from hunter harvest reports (Table 3). From 2003 – 2010 the proportions of bulls harvested by antler point category has ranged fairly evenly.

No aerial surveys focusing exclusively on elk have been accomplished for several years. Nevertheless any elk observed during winter aerial surveys targeting moose are classified and tallied. The winter of 2008-2009 was exceptional in that more elk were encountered in that winter survey than any previously. Altogether 81 elk were observed including 9 bulls, 42 cows, 17 calves, and 13 unclassified elk.

The best opportunity to observe elk from ground-based surveys is in the early spring from mid-March to early May. Qualified volunteers have been enlisted to help survey elk for many years. Observations during early mornings or early evenings before dark are made of elk that concentrate on "green-up" fields or within forest openings. Survey effort each spring has been variable, however, due to other work priorities. The calf:cow ratio and the trend in total numbers is the most reliable information gathered on early spring surveys in this area. The spring 2011 survey effort yielded a ratio of 65 calves per 100 cows which is the highest observed since 2001. Important to note, however, is the wide variance in bull/cow/calf ratios amongst all survey years with overlapping confidence intervals (Skalski et al. 2005).

Population status and trend analysis

Increasing hunter harvest, winter and spring surveys, and anecdotal information indicate that elk populations are higher than they have ever been in northeastern Washington. High calf ratios as observed in spring composition surveys support the general observation of a growing elk population.

Habitat condition and trend

The habitat conditions for elk in the Pend Oreille sub-herd are undergoing both positive and negative changes. Road closures by federal, state, and private land managers have been aggressive in recent years and are highly beneficial for elk habitat security and escapement. Logging continues on national and state forest lands and even more intensively on private lands. The high rate of logging during the 1990s in central Pend Oreille County has produced forest successional forage vegetation that elk prefer. Recently, however, large tracts of private industrial timberlands have been treated with herbicides to control hardwood shrubs that compete with regenerating conifer trees. In the last 4 years Forest Practice Applications & Approvals were received for treating 13,663 acres mostly within south Stevens County, which includes GMUs 117 and 121. Although the moose population will likely bear the brunt of this impact from such a broad scale of herbicide application, elk may also undergo a reduction in population due to decreased habitat carrying capacity.

Wildlife damage

Elk damage to standing hay, baled hay, and stored hay continues in the Cottonwood Creek drainage (GMU 117) southeast of Chewelah and recently began occurring in the Skookum Flats area of GMU 113. Antlerless permit opportunity was increased substantially within GMU 117 beginning in 2008 with a permit season that included December 16-31. 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 special Landowner Access 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) has implemented many projects designed to benefit elk. As of 2010 these projects including all partners amounted to a total of 57,799 acres. Most of the projects involved controlled burning to enhance winter forage production, but there were also projects to restore aspen stands and reclaim roadbeds for improved habitat. Most of these projects have been 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 2010 bull harvest was 41% which is indicative of desirable population characteristics for elk productivity and quality bull hunting opportunities.

Elk hunter numbers in the Colville District have increased over the last several years (Figure 1). In recent years WDFW has provided increased opportunity or season timing to improve equity among the three hunting method groups. Hunter participation and harvest is now well dispersed across the Colville District through all three hunting methods. In 2001 modern firearm hunters took 91% of the elk harvest and archery hunters took the other 9%. By 2006 the participation and harvest was dispersed more equitably in proportion to hunter numbers by each method. Discounting multi-season permit holders, modern firearm hunters accounted for 66% of the participation and 62% of the kill. Archers accounted for 16% of the hunters and 21% of the kill and muzzleloaders accounted for 18% of the hunters and 17% of the kill.

The number of permits issued for “any elk” has increased from 54 in 2001 to 120 from 2007 on for the three primary elk GMUs 111, 113, and 117. While there was considerable interest in these permits including 1,652 modern firearm and 379 muzzleloader applications for 2007, the resulting harvest was modest. Consequently, within GMU 117 where there are areas of chronic agricultural damage by elk, the permit season was extended to December 16-31 beginning in 2008. In 2010 the success rate made a big jump with better than 1 in 5 permit holders harvesting an antlerless elk.

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Table 1. Antlered bull and antlerless elk harvest in the Colville District, GMUs 101-121 from 2001 through 2010.

Year	Bulls	Antlerless Harvest	Total Harvest
2001	46	11	57
2002	66	27	93
2003	90	36	126
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

Table 2. Special permit allocations for “any elk” and hunter take within the Colville District, GMUs 101-121.

Year	Permits Issued	Antlered Killed	Antlerless Killed	Success Rate
2003	54	1	6	13%
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%

Table 3. Antler point distribution (high side) from hunter harvested elk within GMUs 101-121.

Year	1-2 points	3-5 points	6+ points	Total
2003	37 (41%)	22 (24%)	31 (34%)	90
2004	34 (37%)	30 (33%)	28 (30%)	92
2005	42 (42%)	34 (34%)	26 (26%)	100
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

ELK STATUS AND TREND REPORT: REGION 1

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

Howard L. Ferguson, District Wildlife Biologist
Michael Atamian, Wildlife Biologist

Population objectives and guidelines

The population goal for this elk (*Cervus elaphus*) herd 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.

These harvest strategies are 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, thus increasing hunter access. This has resulted in increased harvest, and subsequently fewer damage complaints.

Hunting seasons and harvest trends

The 2010 general elk hunting seasons for Game Management Units (GMUs) 124-142 did not change from the previous year. All units allowed the harvest of Any Elk.

Hunter numbers have varied with a high of 2707 in 2007 to a low of 2223 in 2005(Fig. 1), this year there were 2607. This past year, the number of archery and muzzleloader hunters decreased with only modern firearm hunter numbers increasing (Fig. 1). This year's hunter success, 11.97%, was the highest yearly success for the past ten years. All weapon groups had higher success than last year with modern firearm hunters having the highest with 14.79% (Table 2).

Total elk harvested during the general seasons, 312, was a large increase from the previous year of 243, and is the highest harvest ever for this area (Table 1 and Fig. 2). For all weapon types general harvest increased this year (Fig. 2) The harvest of bulls has shown an increasing trend since 2001 with 136 being harvested this year (Table 1 & Fig. 3). The majority of bulls were taken from 3 GMUs – 124, 127 and 130, with the majority being taken in GMU 130 – 66 bulls were harvested in 130 this year, 11 more than last year (Fig. 4). General antlerless harvest was also high this year with 176 cows (Table 1) being harvested compared to 122 in 2009.

These increases in the general harvest may be partially attributed to the new permit hunt offered on Turnbull National Wildlife Refuge (NWR). This permit hunt coincides with the general season off the refuge, thus creating the potential for permit hunters to push the elk off of Turnbull NWR where they can be harvested. Sixty-three permits – 1 bull and 62 antlerless, were offered on the refuge this year. A total of 24 cow elk and one 6x6 bull (and one unknown) were harvested on Turnbull NWR (Table 4).

Although antler point classes (1-2, 3-5, and 6+ points) reported in the harvest have varied from year to year, this year's data shows an increase of 6+ bulls (Table 3) after a dip last year.

Surveys

Composition counts have been conducted primarily in GMU 130 on and around Turnbull NWR due to limited survey funds, the lack of success at earlier attempts of aerial surveys in the more forested area of GMU 124 and 127, and the fact that GMU 130 comprises almost 50% of the harvest. Surveys are conducted in this area because Turnbull NWR has been able to occasionally share survey costs. While conducting annual moose surveys in December and January post-season composition data are collected in GMUs 124 & 127 if elk are observed.

Composition count data from GMU 130 (Table 6) show that since 2004, the bull:cow ratio has been at or above the 12 to 20 bulls:100 cows management objective (WDFW 2009).

The 2010 survey yielded an overall ratio of 27 $\pm$ 6.1 bulls observed per 100 cows (90% C.I., Skalski et. al 2005), which may represent a slight increase from

2009. The calf to cow ratio was 59 ± 10.1 calves per 100 cows, slightly higher than last year (Table 6).

Population status and trend analysis

Since mandatory reporting began in 2001, harvest reports indicate an increasing trend of elk being harvested. The majority of the harvest occurs in GMU 130 (~45%) with GMU 124 and 127 providing in combination ~40% (Table 5). A catch per unit effort (CPUE) analysis (measured as kills per day) shows a large increase of CPUE – more elk harvested per day – indicating an increasing population (Fig. 6).

Habitat condition and trend

The greatest concern for our elk herds in the past had been related to agricultural conversion of native habitat in the area. 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 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 as well.

Elk Damage

During the last few years, elk damage complaints have decreased in this area 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, hotspot and landowner antlerless permits 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, 127 and 130 there are indications of increasing elk numbers in GMUs 133, 139, and 142; consequently, we have begun receiving some complaints from these more southern GMUs. 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 has been set to “any elk”.

Management conclusions

Data from the last 10 years indicates a small but constant increase in population levels in the District. This year there was a significant increase in the total general harvest, with the majority of the increase occurring in the number of antlerless elk harvested. This is most likely due to the new Turnbull NWR permit hunts 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 complaints from neighboring landowners. The increase in harvest will hopefully result in reduced damage on the refuge and complaints from local landowners. However, we will maintain aerial surveys of this area to insure that herd numbers do not drop below management objectives.

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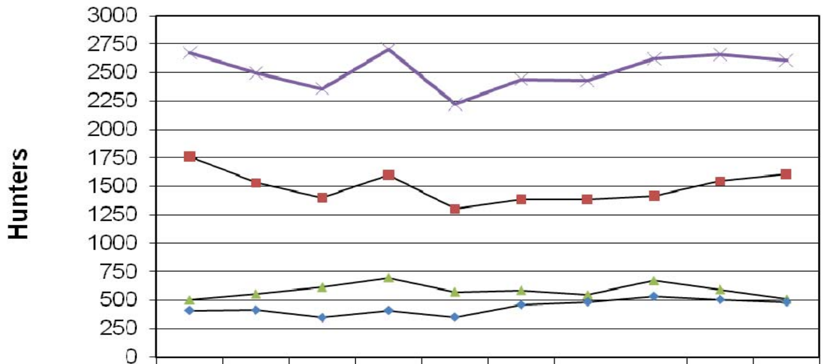
All figures and tables reflect general harvest results only, unless noted otherwise.

Figure 1. Number of Elk Hunters by Weapon Type.



	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Modern	1764	1530	1399	1600	1300	1384	1386	1415	1545	1607
Muzzle	500	554	614	697	572	586	545	671	593	507
Archery	410	413	346	410	351	460	484	532	504	483
Total	2674	2497	2359	2707	2223	2441	2427	2624	2659	2607

Figure 2. Harvest of Elk by Weapon Type.

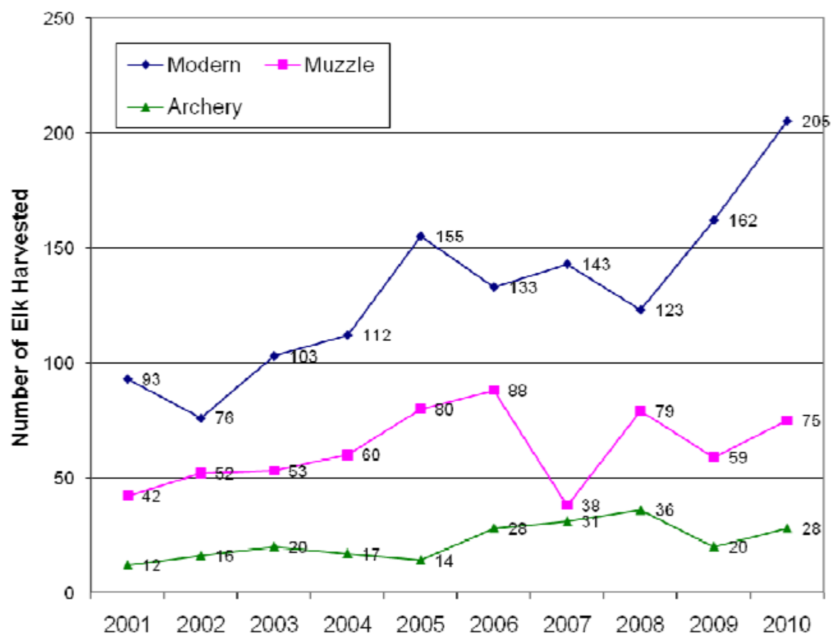


Figure 3. Bulls Harvested from 2001.

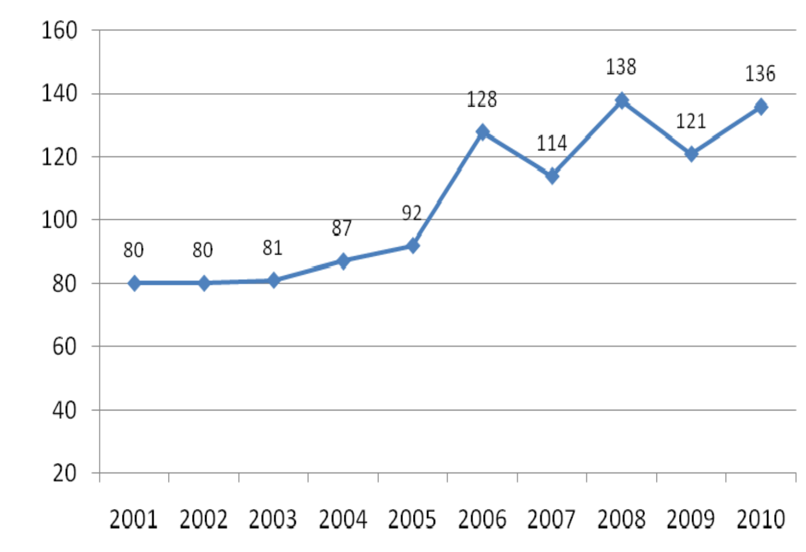


Figure 4. Number of Bulls Harvested by GMU.

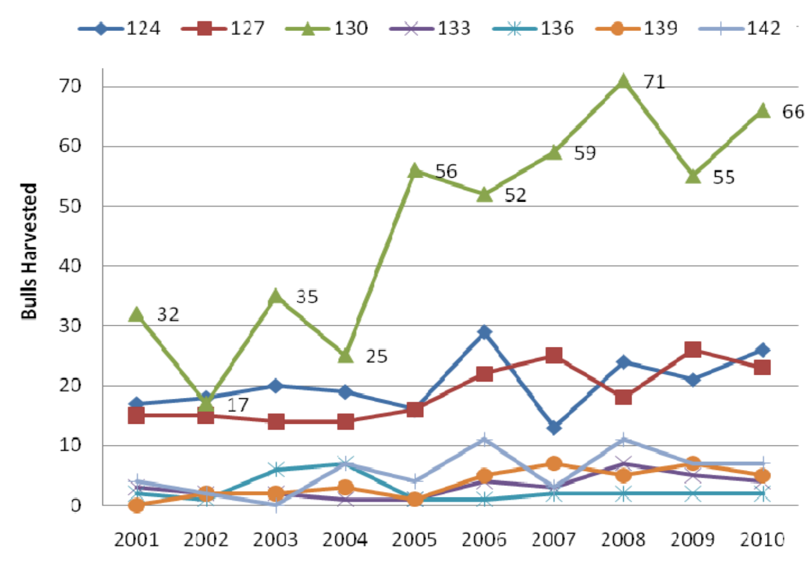


Figure 5. Elk Harvested in GMUs 124-142.

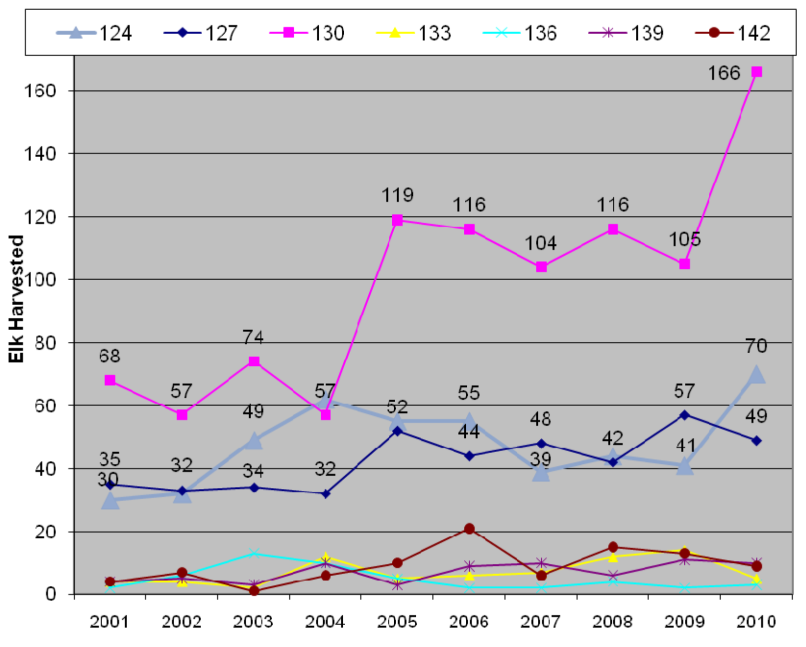


Figure 6. Catch per Unit Effort (Elk harvested/Hunter Days).

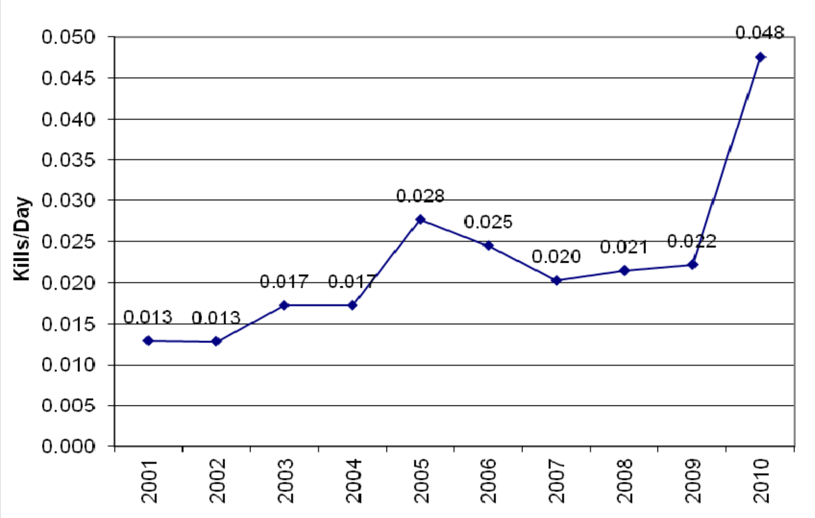


Table 1. GMU 124-142 harvest, hunters and hunter days.						
Year	Bulls	Antler-less	Total	Hunters	Hunter Days	Hunter Success
2001	80	67	147	2,674	11,380	5.50%
2002	80	64	144	2,497	11,210	5.77%
2003	81	95	176	2,359	10,221	7.46%
2004	87	102	189	2,707	10,968	6.98%
2005	92	157	249	2,223	8,992	11.20%
2006	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	6,556	11.97%

Table 2. Hunter Success By Weapon				
	Archery	**Modern**	**Muzzle**	**All**
2001	2.93%	5.27%	8.40%	5.50%
2002	3.87%	4.97%	9.39%	5.77%
2003	5.78%	7.36%	8.63%	7.46%
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%	10.49%	9.95%	9.14%
2010	5.80%	12.76%	14.79%	11.97%
Average	5.20%	9.23%	11.01%	8.99%

Table 3. Antler Point Proportion			
	1-2 Pt	**3-5 Pts**	**6+Pt**
2001	60.27%	23.29%	16.44%
2002	47.37%	36.84%	15.79%
2003	45.57%	25.32%	29.11%
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	41.35%	39.85%	18.80%

Table 4. 2010 Turnbull NWR Elk Permit Hunt Summary.								
Hunt Number	Weapon Type	Appli-cants	Permits Issued	Actual Hunters	Total Harvest	% Hunter Success (of Actual Hunters)	% Success of Permits Issued	Permit Type
2000	F	702	1	1	1	100.0%	100.0%	Quality
2203	F	850	6	4	4	100.0%	66.7%	Antlerless
2204	F	797	6	6	6	100.0%	100.0%	Antlerless
2205	F	903	6	5	3	60.0%	50.0%	Antlerless
2262	A	249	14	9	1	11.1%	7.1%	Antlerless
2280	M	210	9	8	4	50.0%	44.4%	Antlerless
2281	M	306	9	5	3	60.0%	33.3%	Antlerless
2600	EFM	168	6	3	3	100.0%	50.0%	Disabled
2700	EFM	178	6	3	1	33.3%	16.7%	Master Hunter
Totals		**4363**	**63**	**44**	**26**	**59.1%**	**41.3%**	

Table 5. Harvest and proportion of Harvest for selected GMUs.		
	Harvest	Proportion
GMU 124	70	22.4%
GMU 127	49	15.7%
GMU 130	166	53.2%
GMU 124-130	285	91.3%
GMU 133-142	27	8.7%
Total	312	

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	24 ±6.2 / 100 / 55 ±10.5
2007	50	140	78	268	36 ±9.7 / 100 / 56 ±13.0
2008	61	145	110	316	42 ±10.6 / 100 / 76 ±15.8
2009	35	146	79	260	24 ±7.4 / 100 / 54 ±12.4
2010	66	248	146	460	27 ±6.1 / 100 / 59 ±10.1

ELK STATUS AND TREND REPORT: REGION 1

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

PAUL WIK, District Wildlife Biologist

Population objectives and guidelines

Elk (*Cervus elaphus*) populations in six of eight major elk units are at or near management objective. Most elk sub-herds within the Blue Mountains are at or near population management objective, with the exception of the Wenaha and Tucannon sub-herds. The Wenaha unit held the largest sub-herd in the Blue Mountains until the late 1980's, but declined during the 1990's to less than 500 elk. The Wenaha sub-herd is still struggling, but appears to be slowly increasing. The Blue Mountains Elk Management Plan is currently being revised, which will update population objectives for each sub-herd (GMU).

Hunting seasons and harvest trends

The general season bull harvest was restricted to spike-only in 1989 in order to increase bull survival, post-hunt bull:cow ratios, and breeding efficiency. Prior to spike-only management, the 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 declined due to low calf recruitment, a major decline in the Wenaha elk sub-population, and restrictions needed to maintain bull survival. Between 2001 and 2010, the bull harvest averaged 216 bulls/year. Hunters harvested a total of 246 bulls in 2010 (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" permits.

Branched antlered bulls are harvested under permit control in spike-only GMUs (Table 2.) and GMU-157 (Mill Creek Watershed). In 2010, 172 "any bull" permits were issued in nine spike-only units for rifle, muzzleloader, and archery hunters, excluding auction, raffle, and incentive permits. Branched-bull permit hunters, excluding GMU 157, averaged 60% success with 152 hunters harvesting 96 bulls. Six point or larger bulls comprised 98% 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 2010. Weather conditions during the hunting season allowed for good access throughout the hunt period. 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. Hunters within GMU 157 reported 41 of 45 permits being hunted, harvesting 17 bulls and 3 cows. Bulls harvested in the Watershed consisted of 100% six point or better.

Antlerless elk hunting is by special permit for modern firearm and muzzleloader hunters in GMU's 149, 154, 162, 163, 172, 175, 178, and 181. Archery hunters are allowed to hunt antlerless elk on private lands in GMU 162 and 172, and unit wide in GMU's 149, 154, 163, 175, and 178. The antlerless elk harvest increased in 2010. A total of 550 antlerless elk permits were issued, which doesn't include hotspot hunts or landowner damage control permits: modern firearm 325, ML 170, archery 25. Hunters harvested a total of 103 antlerless elk from eight GMUs. Modern Firearm hunters harvested 83 antlerless elk, muzzleloaders harvested 27, and archers 41.

The antlerless harvest is generally focused on sub-populations on private land to alleviate agricultural damage. In 2010, permit levels were increased slightly to address local areas with increasing complaint levels. 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 returned to normal levels. Only a few were reported in 2010, compared to 50+ bulls between 2000-2002.

Surveys

Pre-season surveys are conducted to monitor calf:cow ratios when elk re-group after calving (July-Sept.). Surveys are conducted from the ground. A total of 601 elk were classified in 2010 with calf/cow ratios in the various sub-herds ranging from 32 - 72 calves/100 cows, and an overall average of 51 calves:100 cows (*90% CI* 43 - 58).

Post-season surveys are conducted to determine population estimates and herd composition in late winter. The 2011 survey was conducted between March 3 - 18 in most units, and April 19 in GMU 169. In the 2011 survey, the Blue Mountains elk population is estimated to be 5,638 (90% CI +/- 356). Some surveys are conducted on winter range in Oregon and an unknown percentage of those elk likely do not return to summer range within Washington.

Population status and trend analysis

Elk population status varies between sub-herds. Sub-herds in each GMU are managed according to the unique management issues associated with each unit.

Winter calf ratios in 2011 were estimated at 37 calves:100 cows (*90% CI* +/- 2.3), a significant increase from the previous year. Post-hunt bull/cow ratios in 2010 were estimated at 28 bulls:100 cows (*90% CI* 23.7 – 32.9). Surveys conducted along the Oregon border (GMUs 157, 169, 172, and 186) include survey zones within Oregon. 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 Benches in Oregon. Approximately 35% of the elk wintering at these 2 feed sites summered in Washington.

Research

No current elk research is 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 in 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 worked with USFS biologist in 2009 to develop alternatives for the South George Vegetation Management project, which includes the Hogback-Triple Ridge road complex. WDFW has proposed decommissioning roads in the complex, and moving the current road closure date from October 1 to August 1 in order to improve habitat effectiveness for elk in high value summer habitat. Unfortunately the Pomeroy Ranger District constructed a 29-mile ATV trail within GMU-175 in 2010. Although the Pomeroy District will be constructing the trail near existing roads in order to minimize the impact on elk, the increasing number of ORV's attracted to the area by the new trail system could very well have a negative impact on elk use of existing habitat. The Pomeroy Ranger District is also struggling to find funds to replace broken gates and patrol for gates wrongly left open. This has increased the vulnerability of elk in large areas of summer range within GMU's 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).

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.

Augmentation and habitat enhancement

Projects to control weeds on WDFW Wildlife Areas and elk winter range on private land were implemented in 2009-2010. 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.   During the last reporting period, 3,150 acres of private land elk winter and summer range have been aerially treated for noxious weeds in Columbia County, Washington.

Elk Damage

Elk damage continues to be a problem in some units. The largest damage issues occur in the GMU-162 Dayton, where landowners in the Eckler Mtn. area normally experience some damage to crops.

The sub-population that inhabits the wind power project lands in the Marengo unit (GMU-163) is becoming more problematic. The numbers are increasing and elk are spending more time on wind power lands.

Damage issues in GMU-181 have decreased after issuing landowners preference permits for antlerless elk in lieu of damage.

Approximately 200 elk were herded out of the Peola unit and back into GMUs 166 and 175 in 2011, but over 100 elk still need to moved out of the Peola unit. Efforts will continue to herd these elk back inside the elk fence and onto public land in GMUs 166 and 175.

Management conclusions

The spike-only management program has been in place for 22 years. Management objectives were to increase the number of bulls in the post hunting season population, while creating a diverse age structure within the bull population. The increased number of adult bulls in the population has improved breeding ecology and efficiency (Noyes et al. 1996). Most cows (93%, WDFW unpublished data) are now being bred by October 2, compared to only 55% prior to the rule change.

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

Summer calf ratios have improved and remain near historic levels; 50 ca./100 cows. Winter calf ratios have increased to the highest level since sightability surveys have been conducted. Low calf survival has a negative impact on hunting opportunity. Low calf survival has been the major factor that prevents the Wenaha sub-herd from increasing in numbers.

Shed antler hunting activity continues to be a serious problem for elk on the winter range. Shed antler hunting activity in GMUs 154, 162, 166, 169, 172, and 175 is extremely intense during March and April. Elk use patterns in GMUs 166, 169, 172, and 175 have changed significantly 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 are redistributed onto agricultural lands. Large cow/calf groups normally seen along the Wenaha River breaks redistribute to areas south of the Wenaha River to avoid human activity. 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.

Agricultural damage continues to be a problem in specific sub-herds (GMUs 154, 162, 163, and 178) resulting in damage control hunts. The current damage control strategy to target specific groups of elk on private land for damage control has worked well and allows sub- herd populations to maintain numbers or actually increase, while minimizing damage.

Habitat values have declined in some areas due to roads and noxious weeds, but extensive wildfires in 2005 and 2006 have improved habitat conditions on 163,000 acres in GMUs 154, 162, 166, 175, and 178.

The Department should continue in its attempt to develop a cooperative system of monitoring tribal harvest with the Nez Perce Tribe and the Confederated Tribes of the Umatilla Indian Reservation.

Literature Cited

Mace, R.U. 1967. The Wenaha elk herd tagging study. ODFW internal report.

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. Blue Mountains Elk Harvest (PMU 13), 2001-2010

	Bulls					Antlerless Harvest
Year	Spikes	Adult	Total	Antlerless	Total	Cows:Bulls
2001	184	36	220	127	347	56
2002	202	24	226	181	407	80
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	85
2008	90	88	178	127	302	71
2009	177	88	265	103	368	39
2010	129	117	246	154	400	63

Table 2. Special Permit Bull Elk Harvest-All Weapons, Blue Mtns. WA., 2001-2010 (Spike-only GMUs).

	Bull		Hunter	Percent
Year	Permits	Harvest	Success	6 Point+
2001	49	26	59%	90%
2002	28	15	68%	87%
2003	17	3	20%	100%
2004	33	20	65%	95%
2005	41	28	80%	78%
2006	62	36	84%	86%
2007	79	35	54%	94%
2008	134	73	66%	85%
2009	130	74	64%	95%
2010	172	100	63%	98%

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

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Population objectives and guidelines

The post-season population objective for the Yakima and Colockum elk (*Cervus elaphus*) herds is 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 a range of 12 to 20 bulls per 100 cows for all herds.

Hunting seasons and harvest trends

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. In addition, a substantial number of damage permits have been issued to landowners, to target problem elk and to reduce the sub-herd. In 2010, a modern firearm general season for antlerless elk occurred in the Blackrock Elk Area (private land west of Hanford) September 8-21. A general modern firearm season in all of GMU 372 for any elk occurred October 30-November 7. In PMU 31 and GMU 373, general seasons for modern firearm, muzzleloader and archery seasons occurred simultaneously October 30-November 15. In 2010, the reported number of elk hunters in Region 3 decreased for the fifth year in a row (Table 1). The reported hunter numbers were 21% below the 10-year average.

Reported harvest and hunter success was below average for Colockum. The Colockum herd is at objective for total elk, but below objective for bulls. The recent change to a “true-spike” regulation was designed to increase yearling bull escapement. The percentage of yearling bulls escaping the hunting season did increase. Bull harvest in Colockum was the lowest in recent history and 52% below the 10-year average. Below average harvest and success is expected to continue.

The Yakima herd had been at objective and seasons were set to maintain stability. In 2010, bull and cow harvest was well below average. Archers and muzzleloaders had average success, but modern firearm hunters had one of the lowest success rates in history. The elk were present and subsequently showed up in the winter range in large numbers.

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 elk from Hanford ALE. In 2010, field personnel documented a harvest of 82 elk (50 bulls, 32 antlerless).

No elk were reported harvested in GMU 379 in 2010. In GMU 381, 3 bulls were harvested, and in GMU 373, 1 bull and 3 antlerless elk were harvested. 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 2010. In the Yakima herd, over 70% of the winter range was flown and ground counts were conducted on feed sites in early February.

PMU 34 was surveyed as a separate area in January. All survey units on the Hanford ALE site and a random selection of units on the Central Hanford, and surrounding private land to the south and west of ALE were also surveyed.

Calf recruitment in both the Colockum and Yakima herds was up slightly from the previous year (Tables 2 and 3). There was likely some late spring mortality, post survey, due to late snow and cold weather.

The observed bull ratio in the Colockum remains below objective (Table 2). The change to “true-spike” greatly increased the number and percentage of yearling bulls that survived through the season. Unfortunately, few adult bulls were found on the survey.

The Yakima bull ratio continues to be within objective, but had been declining (Table 3). In 2010, a low harvest resulted in relatively high numbers of yearling bulls on the winter range, reversing the trend.

Population status and trend analysis

In February and March 2011, the Colockum and Yakima herds were estimated at 4,880 and 10,556 respectively (Tables 2 and 3). The Yakima herd is slightly above the objective range of 8,550-10,450 and the Colockum herd is now at population objective but still below objective for bulls.

There are 2 possible reasons for the increases: reduced antlerless harvest (Table 1) and increased use of aerial photography during surveys. Experiments with photography indicated that elk numbers were being under-estimated in large groups. Photography is now used for all large groups of elk. In the Colockum, roads on the winter range have been closed for ~ 4 years. Large numbers of elk are now appearing within the closure. Those elk may have moved in from outside the survey area.

The Rattlesnake Hills sub-herd grew from less than 100 elk in the early 1980’s to about 840 by 1999. In 2000, a trapping effort and high harvest, due to wildfire, reduced the herd to about 520. Surveys in January 2011 yielded a herd size estimate of 772 $\pm$ 48 elk (488 cows, 104 calves, 180 bulls). Ratios per 100 cows were 37 bulls and 21 calves. No surveys were conducted in GMU 373, , 379 of 381.

Habitat condition and trend

The overall acreage of summer range forage for the Colockum herd is increasing due to timber harvest, but most is also heavily grazed by livestock. Large areas now lack hiding cover and when human activity increases in late summer, many of the elk concentrate in and around the Coffin Reserve.

The U.S. Forest Service (USFS), Washington Department of Natural Resources (DNR), and industrial timber companies manage the majority of summer range for the Yakima herd. Habitat suitability for elk varies across these ownerships depending on management emphasis. The USFS shifted toward a late seral stage 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 timber over significant acreage. Prescribed burns and wildfires are starting to improve forage quantity and quality.

In the range of both Colockum and Yakima elk, human use is becoming a concern. Activity on winter and spring range has increased drastically with increased bull numbers and dropped antlers. Stories and observation of individuals chasing elk across the range have become common.

The major change to habitat for the Rattlesnake Hills elk was a fire that consumed most winter range in June 2000. The short-term effect of the fire was to reduce herd productivity and push elk onto private land. The long-term effect is unknown. Repeated fires influence the spread of weeds, including cheatgrass. In August 2007, approximately 67,000 acres burned mostly on ALE and some private land west of ALE.

Crop damage

Elk damage to agricultural crops is a concern throughout Region 3. Most of the serious problem areas within the Yakima elk 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.

Most of the Colockum herd is not fenced and damage is being managed by hunting. 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. The program has been successful in some areas. Additional problem elk are being managed through landowner damage hunts. The goal is to eliminate/displace the elk that have developed a preference for agricultural crops. The program would 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 dryland 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 permitted and after August 1st permits become antlerless or spike. 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 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 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. As of 2011, DOE has not changed its position.

Management conclusions

Based on the available information, the Colockum bull ratio is below objective and the Yakima herd is stable. Hunter opportunity and harvest have been adjusted in both herds annually. Achieving bull escapement in the Colockum is problematic. Recruitment of spike bulls through the hunting seasons has typically been low. High road density is likely contributing to elk vulnerability during damage and regular hunting seasons. A change in regulation (true-spike) is being tried in an attempt to increase bull escapement. However, without a significant increase in calf recruitment, achieving the objective of 12 to 20 bulls per 100 cows is unlikely in the short term.

Extensive permit seasons may have slowed the Rattlesnake Hills sub herd growth, but not reduced it. Displacement of elk onto private land by the two recent wildfires (2000 & 2007) has proven to be effective at increasing harvest. 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 must be reduced to <350. Landowners and hunters have not been targeting enough antlerless elk (Table 4). Bulls have averaged 51% of the total harvest the last 5-years. A controlled hunting program on ALE will ultimately be needed to reduce the sub herd and hopefully reduce the risk of crop damage.

Table 1. Elk harvest, hunter numbers, and success in Region 3.

	Colockum harvest		Yakima harvest		Regional hunter numbers				Regional hunter success			
Year	Bull	Cow	Bull	Cow	Modern	Muzz	Archery	Total	Modern	Muzz	Archery	Mean
1988	564	579	824	482	21,505	2,163	4,173	27,841	8	22	6	9
1989	797	735	1,492	1,152	23,054	2,530	4,473	30,057	15	17	9	14
1990	977	537	1,294	901	25,785	3,323	3,992	33,100	11	14	9	11
1991	621	761	1,595	1,016	NO	DATA			NO	DATA		
1992	611	652	1,348	1,246	26,928	4,086	5,865	36,879	11	10	7	10
1993	801	613	1,513	1,020	26,513	4,618	5,989	37,120	11	12	6	11
1994	550	433	782	770	26,328	5,503	6,114	37,945	6	9	7	7
1995	542	731	970	2,418	21,341	5,517	5,622	32,480	17	11	9	15
1996	469	660	631	892	20,288	6,190	4,819	31,297	9	6	8	8
1997	449	593	911	1,069	21,237	5,490	5,558	32,285	10	7	8	9
1998	335	255	717	426	18,253	3,918	3,701	25,872	6	9	9	7
1999	492	239	975	889	20,128	4,705	4,362	29,195	8	11	9	9
2000	392	214	1,140	1,058	25,383	4,554	5,549	35,486	7	8	10	8
2001	385	245	1,450	1,549	23,278	4,305	5,363	32,959	9	18	12	11
2002	379	358	1,184	1,442	22,204	4,791	6,177	33,172	11	10	8	10
2003	513	591	1,017	1,157	21,926	6,119	5,914	33,959	8	13	10	10
2004	424	393	1,083	1,373	20,888	3,342	6,521	30,751	11	13	9	11
2005	449	218	1,013	772	23,291	3,789	6,760	33,840	8	7	5	6.5
2006	418	302	927	1,093	20,654	3,497	5,972	30,123	10	7	6	9
2007	381	241	802	695	19,045	2,743	5,618	27,406	8	9	7.5	8
2008	327	282	799	826	18,552	2,898	5,578	27,028	8	7	7	8
2009	250	160	1,019	787	17,160	2,474	5,141	24,775	10	10	7	9
2010	182	121	694	440	16,320	2,400	4,942	23,662	6	10	8	7
10 YR AVG	382	291	1000	1030	20,329	3,622	5,773	29,531	9	10	8	9

Table 2. Colockum elk winter composition 1990-2009.

	Antlerless		Bulls			Ratios (per 100 cows)	
Year	Cow	Calves	Spike	Branched	Total Elk	Calves	Bulls
1992	559	213		23	795	38	4
1993	1,314	309	16	9	2,099	23	2
1994	1,439	607	22	6	2,074	42	2
1996	1,197	409	14	36	1,656	34	4
1997	1,597	486	88	66	2,237	30	10
1998	1,581	467	16	75	2,139	30	6
1999	2,807	854	88	60	3,809	30	5
2000	3,871	1,061	84	242	5,258 ± 2,048	27	8
2001	2,697	570	60	130	3,457 ± 940	21	7
2002	3,464	719	100	170	4,453 ± 543	21	8
2003	2,800	829	119	391	4,172[c] ± 566	30	18
2004	3,060	526	96	238	3,920 ± 445	17	11
2005	2,388	782	63	209	3,442 ± 168	33	11
2006	3,084	770	46	86	3,986 ± 391	25	4
2007	2,244	873	73	116	3,306 ± 160	39	8
2008	2,829	843	130	116	3,918	30	9
2009	3,723	732	80	85	4,,621 ± 21	20	4
2010	3,549	839	69	137	4,594	24	6
2011	3,695	995	121	68	4,880±15	27	5

Table 3. Yakima elk winter composition 1990-2010.

	Antlerless		Bulls		Total	Ratios (per 100 cows)	
Year	Cow	Calves	Spike	Branched	Elk	Calves	Bulls
1991	432	195		28	655	45	7
1992	940	266	8		1,214	28	1
1993	943	457	51	13	1,464	48	7
1995	748	396	5	35	1,184	53	5
1996	1,719	604	126	33	2,482	35	9
1997	610	254	44	38	946	42	13
1998	4,085	1,333	274	281	5,973	33	14
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

Table 4. Rattlesnake Hills Elk Harvest 1983-2010. 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%
28-yr avg	22	21	2	45	61%
last 5 yrs avg	39	42	0	81	51%

ELK STATUS AND TREND REPORT: REGION 4

PMU 45 – GMUS 418, 437
PMU 46 – GMUS 448, 450

Paul M. DeBruyn, Wildlife Biologist

Population Objectives and Guidelines

Management objectives are outlined in the North Cascade (Nooksack) Elk Herd Plan (Washington Department of Fish and Wildlife 2011) and include the following:

- Manage the North Cascade elk herd using sound, objective science to inform decision-making.
- Increase elk population numbers to approximately 1,450 animals in the Nooksack unit (418) and approximately 1,950 for the entire herd.
- Manage hunted elk units for minimum post-season bull ratios consistent with the statewide Game Management Plan 2009-2015 (WDFW 2008) (currently a range of 12 to 20 bulls per 100 cows) in combination with overall bull mortality rates of less than or equal to 50 percent.
- Enhance public safety by reducing elk/vehicle collision rate on SR 20 (Sedro Woolley – Concrete). Work with Washington State Department of Transportation and co-managers to increase public awareness.
- Minimize elk damage complaints on private property. Use current documented damage complaints as a measure of success.
- Expand hunt-able elk range available to both tribal and non-tribal hunters by promoting the expansion of this herd into the proposed elk closure area in the Sauk River drainage
- 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.
- Continue cooperative elk habitat management with DNR in critical winter range portion of the S. F. Nooksack River drainage (Edfro Creek/South Cavanaugh Creek Block Management plans).
- Encourage the U. S. Forest Service, state, and private timberland owners to maintain current elk habitat capability.
- 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 bull only special permit hunt was initiated in GMU 418. In 2010 the total number of permits in 418 was 40 (20 spike only, 20 any bull) and were divided equally to state and tribal hunters. The 20 state permits were allocated as 4 archery (2 spike, 2 any bull), 4 muzzleloader (2 spike, 2 any bull), 10 modern firearm (6 spike, 4 any bull), 1 Westside raffle tag, and 1 auction tag. In 2010 The auction tag holder and the westside Elk raffle winner hunted in GMU 418 and both harvested trophy bulls. Out of the 20 state permits in 418, 13 bulls (3 spike, 10 any bull) were harvested. Tribal hunters harvested 16 bulls using their permits. General season state harvest during the 2010 season was 1 bull taken by archery in GMU 407. Tribal hunters harvested five bulls in GMU 407 and seven in GMU 437(Sauk). In the Acme area (GMU 418) 4 archery and 4 modern firearm damage permits were issued to state and tribal hunters and 4 cows were harvested. Three cows were harvested with damage permits by state and tribal hunters in the Hwy 20 area of 418 and nine cows in GMU 437 in response to damage complaints.

There were three documented poaching/closed season violations in GMUS 418 and 437 with three Elk taken. Other reported sources of human-related mortality include 8 elk/vehicle collisions on Hwy 20 and one on Hwy 9, four of these animals were not found.

Surveys

A proposal for developing population estimation tools for the Nooksack elk herd was completed in April 2005 as part of a cooperative effort between WDFW and the NW Indian Fisheries Commission (McCorquodale et al 2005). Developing a sight-bias corrected model requires a known number of radio-marked elk of both sexes. Radio-marked cows in the Nooksack population came from previous research efforts and also from translocated animals moved from the Mount St. Helens herd. Nineteen resident adult bulls were darted from a helicopter and fitted with radio collars in 2005-2007 to facilitate development of the estimation model. Two additional bulls were fitted with radio collars in 2008. In 2008 and 2009, WDFW and Tribal biologists deployed 19 GPS (Global Positioning System) collars on a total of 15 elk as part of a Sauk-Suiattle project examining elk habitat use (4 animals received replacement collars). In April 2010, 10 elk (9 bulls, 1 cow) were captured and received VHF collars and 4 GPS collars were retrieved due to a malfunctioning remote release mechanism. In March and April of 2011 13 Elk (four bulls and nine cows) were captured and fitted with VHF collars. As of April 2011 at least 67 animals in the North Cascades herd had functioning radio collars.

Beginning in the fall of 2005 helicopter surveys of the herd have been made to assess the population based on a sightability model and a more traditional mark resight method.

Results indicate the most promising protocol for producing accurate estimates of the North Cascades population size is a mark-resight method using 2 complete helicopter surveys in March and April just before the deciduous trees leaf out. This will require constant capture and collaring of elk to maintain an adequate number of marked animals.

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 (M. Davison, Washington Department of Fish and Wildlife, unpublished data). In the late 1990's the herd had decreased to an estimated 425 animals. Efforts to rebuild the herd, including herd augmentations in 2003 and 2005 and a moratorium on hunting, reversed the decline and the herd is currently estimated to be over 1,000 animals. Recent aerial surveys and ground observations indicate herd expansion into previously vacant historical range. A pattern of outward migration from the central range to peripheral agricultural areas, first observed in the late 1980s, has continued.

The current population estimate for the core Nooksack herd based upon aerial surveys done in

March and April 2011 is about 1,250 animals. Estimates of bull:cow and calf:cow ratios based on data from the aerial surveys are shown in Table 1.

The bull:cow ratios, particularly for the branch antlered bulls, are likely to be biased low.

Habitat condition and trends

Habitat analysis has not been updated from earlier Landsat/GIS work completed in 1991. Upgrade of this earlier habitat work is considered a high priority. The Sauk-Suiattle Tribe has put GPS collars on 15 Nooksack elk and will analyze their movements and habitat use over a 2-year period. Problems limiting the current effectiveness of the Nooksack elk range continue to include high road densities on both summer and winter range areas, cumulative disturbance impacts from multiple recreational and management uses on the land, and increased development of trails (hiking, horse, and ORV). Housing development and conversion of forestlands to agricultural and/or industrial use is accelerating and poses the greatest threat to elk habitat in the future.

The primary winter and summer range of the North Cascade herd on the south fork of the Nooksack River has gone through a series of ownership changes. In 2005, the Sierra Pacific Corporation purchased much of the core range. Sierra Pacific has closed the road system to the public with the exception of permitted elk hunters. Any increase in public access would probably have a negative effect on the herd.

Wildlife damage

Estimates of elk numbers occupying agricultural damage areas is 140 – 180 animals. The majority of damage occurs in the Acme area (Whatcom County) and along the Highway 20 corridor between Sedro-Woolley and Concrete in Skagit County. In the Acme area, the issuance of damage permits to harvest elk in problem areas, appears to have reduced the number of animals using this area considerably. Archers in particular provide deterrence while harvesting few animals. Developing a hazing program as well as providing habitat enhancement to lure animals out of problem areas are strategies being looked at to provide relief for property owners without drastically reducing herd numbers. Despite these efforts, elk damage complaints in the traditional problem areas persist. Some of the translocated elk from Acme have added to a newer damage problem on the Sauk Prairie near Darrington, illustrating the difficulties in dealing with damage-oriented elk.

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. The Hurns Field site has been very successful in providing a year round opportunity for public elk viewing. Establishing a similar site in Whatcom County although fraught with challenges would bring more of the general public in contact with these magnificent animals. Such a site would have to be situated so as not to exacerbate elk damage issues.

The bull only special permit hunt will continue in GMU 418 in 2011 with 40 permits (20 spike, 20 any bull) divided equally between state and tribal hunters. Extremely limited general hunt opportunities exist outside of the core elk herd range in GMUs 407 and 448 but should improve as the herd grows and expands its range. Encouraging expansion of the herd east of the Sauk River could also provide more hunting opportunities. Special damage control hunts could be refined to provide hunting opportunities while discouraging elk from problem areas..

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, scientific study, cultural and ceremonial uses by Native Americans, wildlife viewing and photography.
- Preserve, protect, manage and enhance elk and their habitats to ensure healthy and productive populations.

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Table 1. Late winter/early spring elk herd ratios per 100 cows

Year	Bulls/ 100 Cows	Branch/ 100 Cows	Calves/ 100 Cows
2007	25.9	15.6	38.0
2008	31.1	15.9	41.8
2009	30.4	17.4	35.8
2010	23.5	17.7	25.8
2010	30.0	18.2	47.0

ELK STATUS AND TREND REPORT: REGION 4

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

BRIAN KERTSON, 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 2010). Elk occurring in GMU 454 are generally restricted to the eastern portions, adjacent to core elk herds and away from the suburban growth and sprawl. However, habituated, small satellite herds do occur in suburban and rural areas of GMU 454.

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 >300 animals (Erland, 2008. unpublished data). 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 1990's. 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 2006).

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.

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 designed to keep vehicle-elk collisions to a minimum and maintain the population at a level that keeps damage complaints at an acceptable level. Harvest for years 1994-2009 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 1994-2009 in GMU 460 is presented in Fig. 2.

GMU 466 continues to be included in the general season with 1998 being the last year an antlerless elk could be taken. GMU 466 elk intermix with GMU 485 elk, and 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, Mucleshoot 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://www.nwifc.org/wildlife/biggame.asp) 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.) State late archery seasons have harvested relatively few elk. This is possibly due to the earlier tribal season and restricted access in this unit during the late season because of snow combined with elk moving to lower elevations.

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). Permit numbers totaled 93 for both hunts combined. 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 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 2005-9 seasons a limited entry 3 bull permit each for the state and the Muckleshoot Tribe has occurred.

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 was 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.

Table 1. GMU 485 Post-hunt elk herd composition, 1984-2010 (ratios per 100 cows).

Year	Total Bull	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]	44	50	443 ± 108

[a] Flight and data provided by D. Vales, Muckleshoot Indian Tribe Biologist.

Post-hunt (March) composition counts from 1985-2005 have shown a general increase in calf recruitment over the last four years (Table 1).

Population status and trend analysis

Based on limited, primarily anecdotal information, the elk population in GMU 454 is stable or declining slightly. 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 March has shown a decline from 1992 thru 2003. However, the population in GMU 485 has increased since 2003.

Factors that may be affecting this herd are 1) a density dependent decline associated with changes in seral forest stages which reduces winter range carrying capacity and elk numbers exceeding carrying capacity; this can have a negative effect on recruitment and there are some data to support this hypothesis; 2) predation may be affecting recruitment; predation mortality may be additive and not compensatory. GMU 485 was closed to bear and mountain lion harvest until 2000; these predators are likely at maximum densities relative to prey availability. Analysis of mountain lion elk kills (n=28) found that selection for elk < 1 year old was statistically significant. Certainly a combination of these variables should be considered.

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 elk habitat in GMU 454 is declining, primarily as a result of habitat conversion. Habitat trends in GMU 460 are more favorable to 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).

There is preliminary information to indicate that overall elk winter range carrying capacity in GMU 485 has declined from about 1955 to 1995. This was determined from a forage based model called HABSIM (Raedeke and Lehmkuhl 1984, Raedeke 1995) that tracks forest seral stages and quantifies the change in the amount determined as forage and change in elk numbers for each seral stage over time.

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 Hansen 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 Hansen 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 and city and county staff. The primary role of the group is to address the problems associated with the rapidly increasing herd.

Elk in GMUs 485 and 466 are not a problem to private property, and there are no nuisance complaints.

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 increasing the population to 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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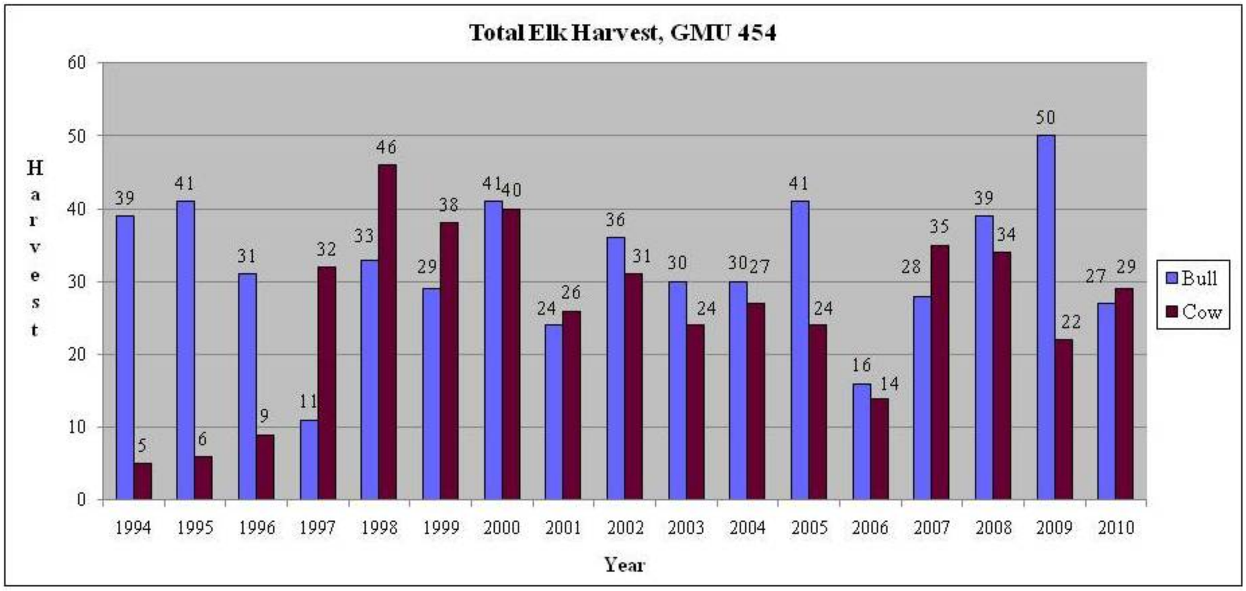

Figure 1. Annual elk harvest, GMU 454, 1994-2010 (all weapon types combined)

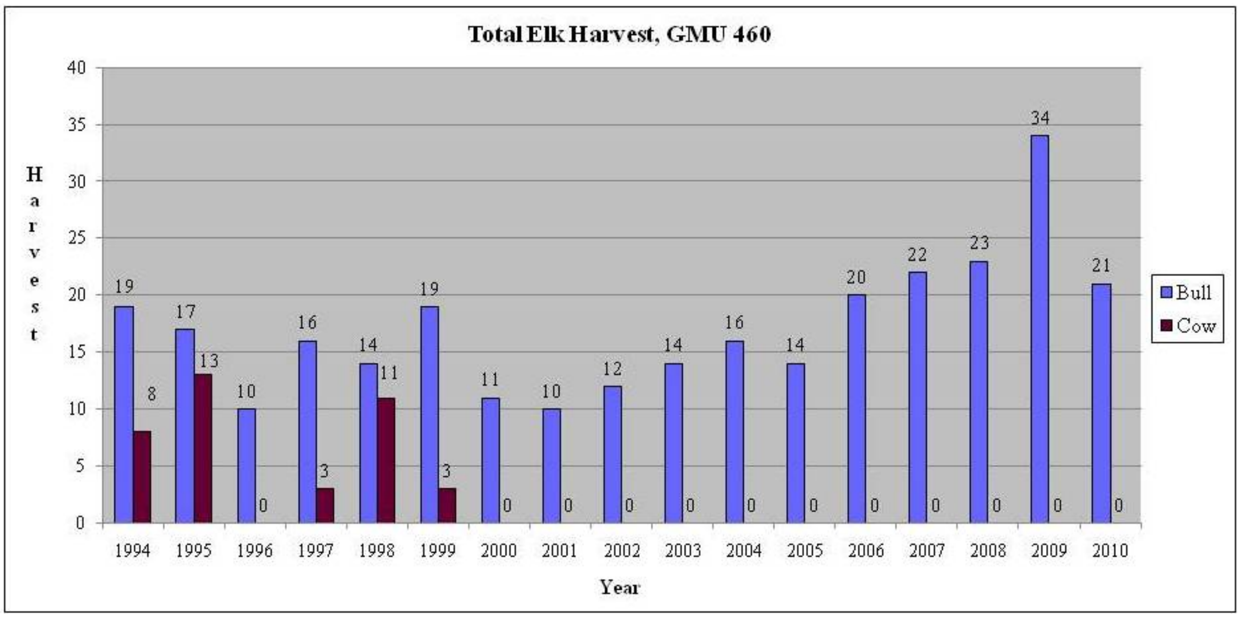

Figure 2. Annual elk harvest, GMU 460, 1994-2010 (all weapon types combined)

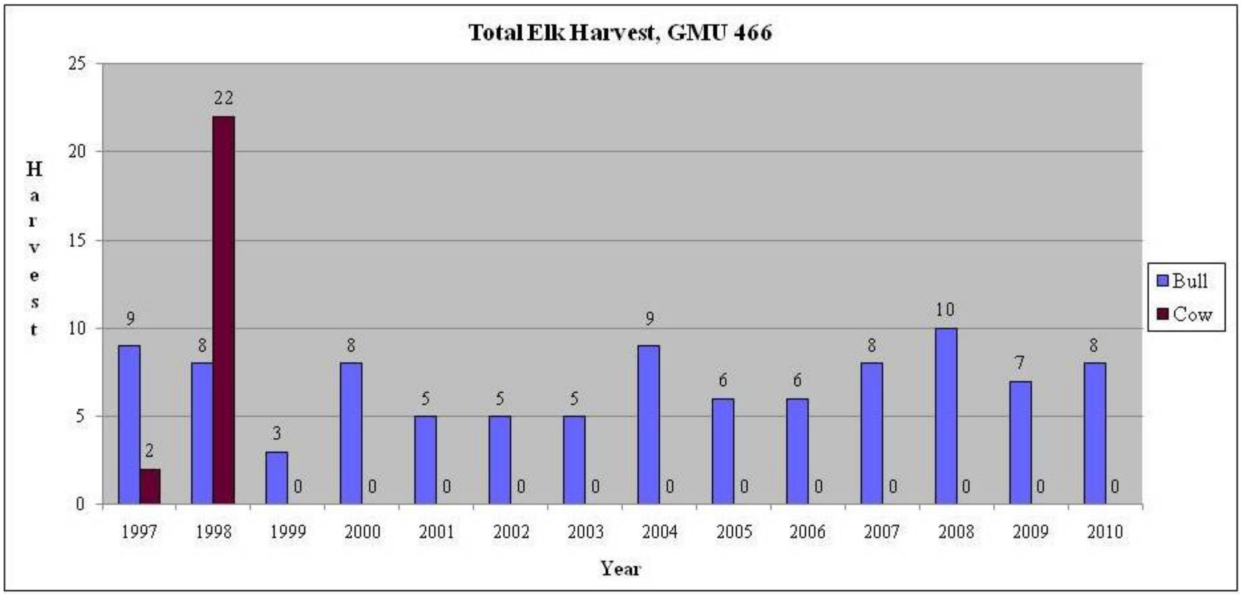

Figure 3. Annual elk harvest, GMU 466, 1997-2010 (all weapon types combined)
*2004 harvest reflects uncorrected raw data reported from hunter reports

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

MARLA KOBERSTEIN, Wildlife Biologist
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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 in the process of being written. 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, 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 currently under a period of revision. Specific goals of the South Rainier herd plan are to increase the estimated elk population in the eastern half of the herds 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 plans and the Game management Plan. Specific population objectives and monitoring techniques will be set to keep within habitat limitations and public tolerance.

General Hunting Seasons and Harvest Trends

In 2010 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 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 the table below. 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 28,168 general season elk hunters spent 153,171 days afield in 2010 (Figure 1). Region 5 general season harvest was 2,167 elk and broken down by season and success as follows: 757/10% in archery, 386/10% in muzzleloader and 977/6% in the modern firearm season; the other 47 elk were killed by multi-season permit holders. Overall, hunter success during the general season was 8%. The 2010 general season elk harvest of 2,167 was down 17% from the most current 10 year average (2001-2010) and is down 14% from the 2009 harvest. Table 3 lists a summary of the 2010 general season elk harvest in all Region 5 GMUs.

Table 3. Summary of general season elk harvest, all weapons combined, for 2010 in Region 5.

GMU	Bull Harvest	Cow Harvest	Total Harvest
388	0	0	0
501	37	31	68
503	20	23	43
504	33	65	98
505	45	78	123
506	185	64	249
510	3	0	3
513	51	0	51
516	56	0	56
520	228	194	422
524	0	2	2
530	204	80	284
550	252	36	288
554	18	0	18
560	171	36	207
564	37	62	99
568	23	0	23
572	78	20	98
574	17	0	17
578	16	2	18
TOTAL	**1,474**	**693**	**2,167**

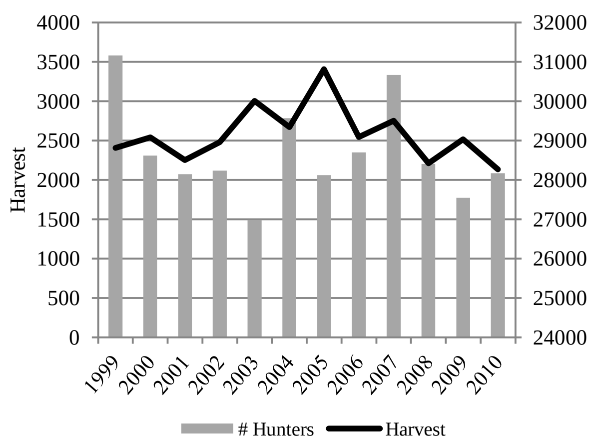

Figure 1: General season harvest and hunter numbers for all user groups from 1999-2010

Permit Hunting Seasons and Harvest Trends

The harvest of antlerless elk in Region 5 is primarily allowed through the special permit system. Additionally, the opportunity to hunt 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. Starting in 2009, these permit levels started to level out and/or decrease in some parts of the region. A total of 2706 special permits were distributed within 98 hunts in the Region for the 2010 season. Of this total number of permits, 2408 were antlerless only permits (554 more permits than in 2009). The total permit harvest in 2010 for the region was 898. Some of these special permits were issued in designated elk areas and are designed to help minimize damage being caused by elk. In 2010, a large portion of the increase in antlerless elk tags stemmed from a change in GMUs 568, 574, and 578 where antlerless elk hunting opportunity was changed from a general season structure to permit-only.

Antlerless permits within the MSH herd GMUs have been substantially increased since 2007 for all seasons to assist with the population reduction goal. Permit hunts on the Mount St. Helens Wildlife Area within GMU 522 continued in 2010. Thirty-one antlerless and twenty-nine any elk permits were distributed among all of the user groups in Elk Area 5099.

In 2010, elk permit hunts were continued for 3 Elk Areas the within the boundary of Mount St. Helens National Volcanic Monument. These hunts are aimed at reducing damage caused by elk to vegetation research plots within the monument as the damage indicated elk numbers were too high. These hunts were all in GMU 522, and along with the additional Elk Area permits account for the notable increase in harvest within this GMU as compared to previous years.

Table 4 lists the number of antlerless only elk permits and antlerless harvest for all user groups combined in Region 5 during 2010. 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.

Table 4. Antlerless only permit levels and antlerless harvest for all user groups combined for 2010 in Region 5

GMU	Antlerless Permits	Antlerless Harvest
503	30	4
504	75	14
505	155	20
506	50	31
520	290	103
524	150	78
522	58	15
530	230	96
550	275	142
554	75	14
556	220	127
560	150	49
572	50	17
578	300	23
574	175	12
568	125	16
TOTAL	**2408**	**761**

Three GMUs within Region 5 are permit-entry only units for all elk hunting. All of these GMUs are within the MSH herd area and two of them (524 and 556) are designed to be quality hunt areas. These limited entry units had a combined success rate of 44% in 2010.

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

GMU	Number of Permits (Cow/Any Elk /Bull))	Elk Harvest (Cow/Bull)	Success Rate
522	90 (58/37/0)	38 (15/16)	42%
524	223 (150/0/73)	96 (78/18)	43%
556	466 (220/0/246)	206 (112/94)	44%

Surveys

A new research project was initiated in the region, and it is anticipated that a more robust method of population estimation will be developed. Based on this new initiative, Region 5 began flying elk composition surveys in the post-season beginning in the winter/spring of 2009. The limiting factor of how much area is covered by these surveys is still budget related, but has more to do with this new approach being refined within specific, representative GMUs before being extrapolated to other portions of the herd and region.

GMUs surveyed by WDFW in the spring of 2011 include 522, 524, 556, 550, 520, 554, 560, and 572. Under a new protocol using radio-marked animals in a mark-resight approach, two separate survey periods were conducted within GMUs 520, 522, 524, 556, and 550. The population estimate for these 5 GMUs was 7,496 elk. A single flight was flown in GMUs 554, 560, and 572 but no estimate was developed.

In addition to the composition surveys discussed above, an annual winter elk mortality survey is conducted on the Mount St. Helens Wildlife Area in the spring or post-winter. Throughout the winter, elk counts are performed from a fixed point overlooking the Wildlife Area once a month to determine elk use and winter severity. These count and winter severity data are then used in determining whether an emergency winter feeding program for elk will be initiated on the Wildlife Area. Figure 2 shows the winter elk mortality for the past 13 years and the peak winter elk counts for the past six years on the mudflow portion of the Wildlife Area.

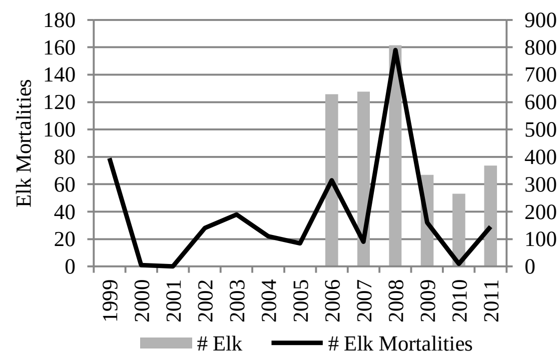

Figure 2: Elk mortality and high elk counts on the mudflow portion of the Mt. St. Helens Wildlife Area 1999-2011

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. 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.

Mount St. Helens Herd

Because of the need for essential information about the size, composition, and dynamics of the MSH elk herd, Region 5 opted in 2007 to begin 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 55 elk in February 2009, 35 in February 2010 and 31 in February of 2011 across a northwestern core area of the MSH elk herd (GMUs 520, 522, 524, 550, and 556). As of time of writing, there are approximately 85 elk on the air including 25 with GPS collars that are recording fine grain habitat data. In March and April 2009, 2010, and 2011 project staff conducted 2 weeks of intensive aerial surveys across the 5-GMU study area. These resighting flights are being used to generate statistically robust estimates of elk numbers in the survey area using mark-resight models. The data collected will also be used to explore the possibility of deriving sightability-correction models for future aerial surveys of the MSH elk herd. The current investigative phase of this effort is expected to last 4 years. The intent is to refine a methodology over the 5-GMU focal area that can be applied at the larger herd-scale.

In the short term, the surveys conducted in the spring of 2009, 2010, and 2011 do provide an evaluation of current elk management strategy 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 lists the raw or uncorrected sex and age ratios for each of the spring flights. It should be noted that these are not “true” or corrected ratios and may not be representative of the population as a whole.

Table 7: Raw sex and age ratios for winter/spring elk flights in 2011 for Region 5

Flight	GMUs	Bull:Cow	Calf:Cow	% Mature Bulls
1	520, 522, 524, 556, 550	30:100	46:100	20%
2	520, 522, 524, 556, 550	31:100	43:100	19%
3	554, 560, 568, 572	13:100	36:100	0%

South Rainier Herd

The Puyallup Tribe of Indians developed a tool for estimating elk abundance called a sightability model (Gilbert and Moeller 2008). Sightability models attempt to correct for visibility bias by standardizing observation factors under the control of the observers (flight speed, number of observers, etc.) and providing a measure of visibility bias for environmental factors not under the control of the observers (group size, obscuring vegetation cover, snow cover, animal behavior, etc.). 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. Although, the model was developed by the Tribe, and survey funding is provided by the Tribe and Tribal wildlife grants (USFWS and BIA), WDFW staff participated and contributed to survey efforts in both 2005 and 2006. 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 to supplement the South Rainier herd section of this report provides estimates for wintering elk in the upper Cowlitz River basin within portions of GMUs 513, 516, 510, and 503.

Table 8: Spring Population Estimates for a portion of the South Rainier Herd, Puyallup Tribe of Indians, 2006-2011.

Year	Population Estimate
2006	938
2007	964
2008	815
2009	1084
2010	1282
2011	1618

Willapa Hills Herd

For the Willapa Hills herd, current population status is not known. Trend information can be gathered through harvest success and from past survey efforts. A desire to monitor all of the elk populations within the region using more sophisticated techniques currently requires the region to focus on the MSH herd.

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 3 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 relative to what would naturally occur (*e.g*., what occurred on the early post-eruption landscape). Limited logging 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 LSR's within the Gifford Pinchot National Forest and the continual development of the herd 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. Lime and/or fertilizer treatments were applied to over 100 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. Volunteers mowed the St. Helens Loop pastures in the summer to maintain plant vigor and palatability until the winter period. WDFW and the Cowlitz Tribe installed wood bank stabilization structures along approximately 0.75 miles of the river to slow the loss of winter range habitat and improve riparian conditions. Approximately 5,000 trees and shrubs were added to the existing riparian bank stabilization planting over a reach of about 2 ½ miles. Some of the plants are intended to increase browse availability in addition to providing root structure to stabilize the site. Scotch Broom control efforts included hand spraying individual plants in approximately 250 acres and WDFW also contracted to helicopter spray about 50 acres in areas that are difficult to reach by ground spraying. The helicopter treatment was very effective but sizeable portions of the area treated by ground will need to be retreated due to plants missed and apparent low efficacy of the mix used.

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 11,000 acres surrounding the reservoirs.

Habitat improvements have also occurred on the federally managed lands 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 1,366 acres of wide-spaced thinning projects have been completed on both summer and winter range areas. Funding for 2011-2012 is currently being solicited to thin up to 400 additional acres of both summer and winter range habitat. 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 both replanted forest areas and agricultural crops are increasing. These complaints come from all over Region 5. Agricultural 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 along with WDFW law enforcement, have created special late and early season damage hunts within specified elk areas. These hunts are designed to decrease the herd causing the damage and to haze the elk from the area.

Unfortunately, the herds causing the most damage seem to be resident herds that have lost their historical pattern of movement. As long as high quality forage exists within the valleys year-round, the elk do not move far from the agricultural lands.

Current Research Projects

In recent time 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 new effort to research population monitoring protocols within the MSH herd area will yield direct and rigorous estimates of annual elk mortality. The fate of radiocollared elk forms the basis for these estimates. This will allow a more formal test of whether observations made regarding overwinter elk mortality on the mudflow are actually typical of herd-wide patterns or represent a phenomenon restricted to the highly impacted mudflow. This is a key management question that needs to be answered. The answer to this question will help define logical management strategies for the larger MSH elk herd.

During the captures of elk for radiocollaring, data are being 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.

Another aspect of the body condition data being collected from the MSH elk herd was initiated in 2009. 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 paracardium), kidneys, incisors and the animals' lactation status. Body condition in elk can be evaluated by the amount of fat surrounding the heart and kidneys. WDFW mailed out 1500+ packets to permit holders in 2010 and received 130 samples. This type of data collection over a broad geographic area is key to understanding the condition of this herd. Additional collections are planned that will provide valuable information to the larger picture of understanding the MSH elk herd.

A research project that focuses on habitat use of the South Rainier elk herd has been completed by the Puyallup Tribal Wildlife Program (Moeller 2010). A copy of the thesis may be accessed at the Northwest Indian Fish Commission website (www.**nwifc**.org) under wildlife project reports. The research data has been made available to supplement the South Rainier elk herd plan updates. The report provides information on herd distribution and dynamics which will contribute to the understanding of the South Rainier elk herd.

Also, 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 double-observer method is used and basic compositional data are recorded on the flights with the goal of developing a robust population estimate of elk within the park, more directly in the sub-alpine zone. This is part of a larger effort focusing on both the North and South Rainier elk herds within the park.

Management Conclusions

Recent survey coverage has been inadequate to provide representative sampling of most parts of the region. The elk harvest (success ratio) in the region continues to be fairly consistent with years past, so no drastic change in elk numbers can be detected through harvest numbers. With recent harsh winters and increased antlerless permit levels within the MSH herd, we believe we are moving towards our management goals in this herd. New research efforts within this herd should give us a better estimate of population.

The South Rainier elk herd plan is being revised and the Willapa Hills plan is being drafted in the upcoming year and the new goals presented in those plans will guide the future management and monitoring of those herds.

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ELK STATUS AND TREND REPORT: REGION 6

PMUS 61-67, GMUS 601-699

S. M. Harris, Wildlife Biologist

Population Objectives and Guidelines

Each elk herd is managed under a separate plan. Overall management goals are to increase or maintain elk populations in suitable habitat with a sustainable harvest while addressing localized elk damage complaints. Elk populations are generally managed by Population Management Unit (PMU) which is a collection of Game Management Units (GMU) (Table 1). General hunting seasons are set at the GMU level.

Long term management strategies for GMUs are being cooperatively developed and implemented with individual treaty tribes. This includes a variety of recreational, educational, and aesthetic purposes, including hunting, scientific study, cultural and ceremonial uses by Native Americans, wildlife viewing, and photography while ensuring healthy productive populations and ecosystem integrity. Region 6 contains all or part of four elk herds (Table 2).

General season bull elk harvest is generally limited to three points or better. Antlerless harvest is limited to certain weapon types and/ or permit.

General guidelines for establishing season structures include managing for an acceptable pre-hunt ratio of 15 – 35 bulls per 100 cows and post-hunt ratio of 12 – 20 bulls per 100 cows with total bull mortality from all sources less than or equal to 50% (WDFW 2008).

Hunting Seasons and Harvest Trends

The three-point minimum antler restriction was retained for the 2010 hunting season. Special permits were issued to all user groups including hunters with disabilities, and youth hunters. Permits are issued to address damage complaints, provide an opportunity to harvest a cow in GMU's where sustainable, and for quality hunts.

General Seasons

Region-wide general season harvest of elk was 1,089 (Bull = 830, Cow = 259). From 2001 through 2010, elk harvest for Region 6 showed a non-significant ($p > 0.05$) increasing trend (Figure 1). Relative percent of harvest by PMU throughout Region 6 is presented in Table 3. Harvest by weapon type is presented in Table 4.

Harvest trend for PMU 61 from 2001 though 2010 shows a non-significant ($p > 0.05$) increase in total harvest and bull harvest, while cow harvest shows a non-significant ($p > 0.05$) decreasing trend (Figure 2). PMU 61 lies within the range of the Willapa hills elk herd.

Harvest data for PMU 62 shows a non-significant ($p > 0.05$) increasing trend in total elk and antlerless harvest while bull harvest shows a significant ($p < 0.05$) increasing trend from 2001 through 2010 (Figure 3). PMU 62 lies within the range of the North Rainier elk herd and within the range of the South Rainier elk herd.

Harvest trends for PMU 63 shows a non-significant ($p > 0.05$) increase in total elk harvest while bull harvest shows a non-significant ($p > 0.05$) decreasing trend from 2001 through 2010 (Figure 4). Antlerless elk harvest shows a significant increasing trend ($p < .05$). The increase in antlerless and total elk harvest is largely due to a shift from antlerless harvest by permit only to general season archery for the 2007 general season in GMU 648. PMU 63 lies within the range of the Olympic elk herd.

PMU 64 lies within the range of the Olympic elk herd. Because of low elk numbers, hunting in much of this PMU is by permit only with only a few areas open during the general season thus general season elk harvest remains quite low in this PMU. Total 2010 general season harvest for PMU 64 was one bull, similar to the last 2 years; 2008 = 1 bull and 2009 = 2 bulls.

Harvest trends for PMU 65 show a significant increasing trend ($p < 0.05$) in bull harvest from 2001 through 2010 (Figure 5). PMU 65 lies within the range of the Olympic elk herd. There is no general antlerless season in this PMU.

Harvest trends for PMU 66 show a non-significant ($p > 0.05$), increasing trend from 2001 through 2010 (Figure 6). PMU 66 lies within the range of the

Olympic elk herd. There is no general antlerless season in this PMU.

Harvest trends for PMU 67 show non-significant ($p > 0.05$) increases from 2001 through 2010 (Figure 7). Bull harvest shows a non-significant ($p > 0.05$) decreasing trend. Antlerless harvest shows a significant ($p < 0.05$) increasing trend. Efforts to reduce elk numbers in areas of high agricultural damage through a general season harvest are influencing this trend. PMU 67 lies within the range of the North Rainier elk herd.

Special permits

For 2010, 246 special permits were issued in Region 6. Permit categories were Quality Hunts, Bull Elk, Antlerless, Youth, Disabled, and Master Hunter. Of the 179 hunters reported to have hunted during their permit season, 110 harvested an elk. The overall success rate was 61% (Table 5).

Surveys

The WDFW conducts aerial and ground composition surveys as budgeting and weather conditions permit, classifying elk counted as bull, cow, or calf. Because of this we are not able to consistently survey every GMU.

In 2010 the Treaty Tribes on the Olympic Peninsula and Region 6 staff began working cooperatively to share GMU survey responsibilities and share data in a composite data base.

For 2011, the number of composition surveys was reduced to allow funding to be used for population estimation. These estimation flights were conducted by tribal co-managers or by cooperative efforts between WDFW and tribal co-managers. Results of pre-season, composition surveys conducted by the WDFW and Tribal co-managers are summarized in Table 6.

Composition flights are conducted from late August though September. Sometimes they are conducted after the early archery season because of scheduling and weather conflicts. Pre-season surveys can be good indicators of calf production and bull ratios in a population (WDFW 2005).

Results of post-season surveys are summarized in Table 7. Surveys are usually conducted from mid-March through April prior to spring calving. Post-season surveys provide data about calf survival, and anticipated recruitment into the yearling age class (WDW 2005). The data from these flights are also used to develop post-hunt population estimates.

Population status and trend analysis

Current population estimates are not available for all GMUs within Region 6. In 2010, cooperative efforts with tribal co-managers began to collect population estimates in several GMU's in Region 6 using a group mark/ re-sight methodology (Eberhardt et al. 1998, McCoy 2002). This project is expected to last several years. The elk population in GMU 602 was estimated to be 1,359 (95% C.I. 796-2844) elk in September 2010 and 859 (95% C.I. 581-1664) elk in spring 2011. In GMU 651, the spring 2011elk population was estimated at 313 (95% C.I. 155-666) (Murphie et al. 2011).

Of the PMUs surveyed, pre-season bull: cow ratios were within management objectives to maintain 15-35 bulls per 100 cows in pre-season counts for PMUs 63, 65 and 66. The pre-season bull to cow ratio in PMU 64 was below management objectives in fall 2010. Elk harvest in this PMU predominantly occurs in 2 GMUs (621 and 624) based on current elk distribution and is limited to permit only except in areas where a decrease in elk numbers is desired due to damage issues.

Among the PMUs surveyed, post-season calf to cow ratios show that reproduction should be sufficient to offset adult cow mortality provided cow mortality does not exceed 10-15%.

Road closure programs on public and private land as well as increased logging on state and private lands likely contribute to stability in herd size. In past years, the age and density of much of the managed forest landscape prohibited and or inhibited elk forage-species growth. And increase in logging in some areas has increased available elk forage.

Research

Survival and cause-specific mortality was assessed for 78 radio-tagged bulls (24% yearlings and 76% $\geq$2.5 years in the Williams Creek GMU (673). Average annual survival for branched bull elk was estimated to be .372 (97% C.I. 0.269-0.476) with legal hunter harvest accounting for 93% of branched bull mortalities. Survival of yearling bulls marked for this study was estimated to be 87% indicating good recruitment into the 2-year old age class. Survival of 2.5 year old bulls during their first year at-risk to harvest (as a 3-point or better branched bull) was estimated to be only 27%, but increased to 53% during their second year.

The Makah Indian tribe is currently assessing branched bull elk and calf survival in a study area contained within GMUs 601 and 602. WDFW is an active partner in this effort supplying staff time and volunteers to assist in capture efforts. No preliminary results are available at this time.

Habitat condition and trend

Overall habitat conditions are improving in the region. In recent years logging has increased in some GMU's resulting in improved conditions on state and private managed timber lands. This has resulted in increased acreage in an early stage of regeneration. This trend is likely to continue for the next several years. Also 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 National forests.

Augmentation and habitat enhancement

The WDFW 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. WDFW continues to work with private landowners on habitat management and forage plantings for elk.

Elk damage

Elk damage continues to be an issue with damage to agricultural property and crops as well as tree damage to private timber lands. Problems areas are typically addressed through an increase in harvest opportunities via special permits and damage hunts for master hunters. In extreme circumstances land owners are reimbursed for damage or issued a permit to harvest a problem elk. In some areas where habitat conditions have improved, there is a noticed reduction in the amount of complaints from landowners.

Management conclusions

Overall elk populations appear to be stable in Region 6. Continued work on population estimates may or may not support this conclusion, which may require a revision of current management goals. Additionally work by tribal co-managers will aid in further understanding of branched bull and calf mortality.

For 2011, the number of special permits was increased by 41 (15%). The number of Quality Bull tags was unchanged, while Bull elk permits were reduced by 9 (14%). Antlerless permits were increased by 30 (24%). Disabled permits remain the same, while the 65 and older category was increased from zero to ten. Youth permits were changed from five antlerless tags to ten any elk tags. Master Hunter permits were increased to 35 (17%) to assist in addressing damage complaints.

Both Archery and Muzzleloader hunters gained one day during the late season in some GMU's. No other changes were introduced for the 2011 elk general season.

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Washington Department of Fish and Wildlife. 2008. 2009-2015 Game Management Plan. Wildlife Program, Washington Department of Fish and Wildlife, Olympia, Washington, USA. 64pp

Table 1: WDFW Population management unit / game management unit framework for Region 6.

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

Table 2: Region 6 elk herds and associated GMUs. Only the Olympic herd resides entirely within Region 6.

Herd	GMUs
North Rainier	652, 653, 654
South Rainier	667
Willapa Hills	658, 660, 663, 672, 673, 681, 684, 699
Olympic	601, 602, 603, 607,612, 615, 618, 621, 624, 633,636, 638, 642, 648, 651

Table 3: Relative percent of total elk harvest for Region 6 by PMU.

Relative Percent of Harvest by PMU

PMU	Bull	%	Cow	%	Total	%
61	397	48%	123	47%	520	48%
62	114	14%	96	37%	210	19%
63	47	6%	22	8%	69	6%
64	1	0%	0	0%	1	0%
65	144	17%	0	0%	144	13%
66	89	11%	0	0%	89	8%
67	38	5%	18	7%	56	5%
Total	830	100%	259	100%	1089	100%

Table 4: 2010 elk harvests by weapon type for Region 6.

Method	Number Hunters	Total Harvest	Hunter Success
Archery	3,713	349	9%
Modern	5,396	504	9%
Muzzleloader	1,872	219	12%
Multiple	129	17	13%
All	11,110	1,089	10%

Table 5: Special permit harvest in Region 6 by permit type.

Type	# Permits	# Hunted	Harvest	% success
Quality	34	33	17	52%
Bull Elk	68	50	28	56%
Antlerless	105	74	48	65%
Youth	5	3	3	100%
Disabled	6	5	5	100%
M.Hunter	30	14	9	64%
Total	248	179	110	61%

Table 6: Pre-season ratios for Bulls: and Calves: per 100 cows as observed from helicopter and ground surveys conducted by WDFW and/ or Tribal Co-managers during August and September 2010 in Region 6.

PMU	GMU	# of Elk Seen	Calf	Bull
63	651	156	34	31
64	621	107	37	14
65	607	209	29	19
65	636	93	38	22
66	601	161	46	12
66	602	385	43	21
66	612	157	39	23

Table 7: Post-season ratios for Bulls: and Calves: per 100 Cows as observed from helicopter and ground surveys conducted by WDFW and/ or Tribal Co-managers during March and April 2011 in Region 6.

PMU	GMU	# of Elk Seen	Calf	Bull
63	651	217	29	6
64	621	163	29	8
65	636	93	36	13
65	607	223	19	11
66	601	144	29	15
66	602	356	29	10
66	612	357	33	15

Figure 1: General season elk harvest trends for Region 6 from 2001 to 2010.

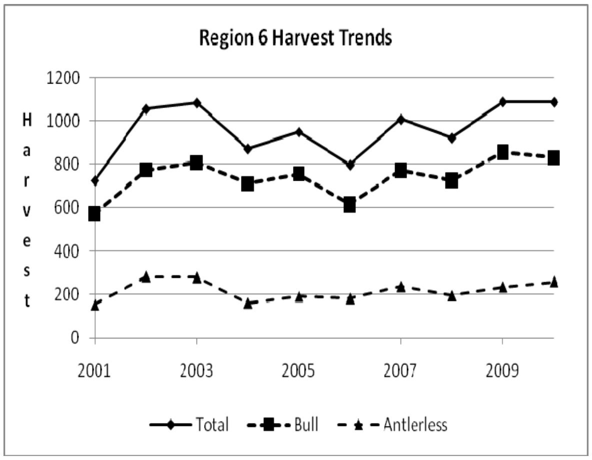


Figure 2: Elk harvest trends for PMU 61, 2001-2010.

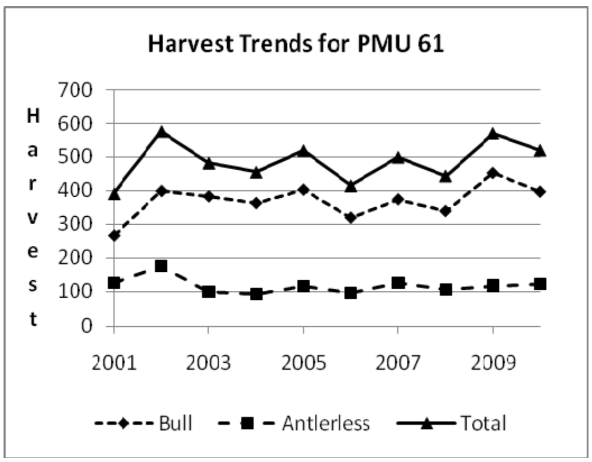


Figure 3: Elk harvest trends for PMU 62, 2001-2010.

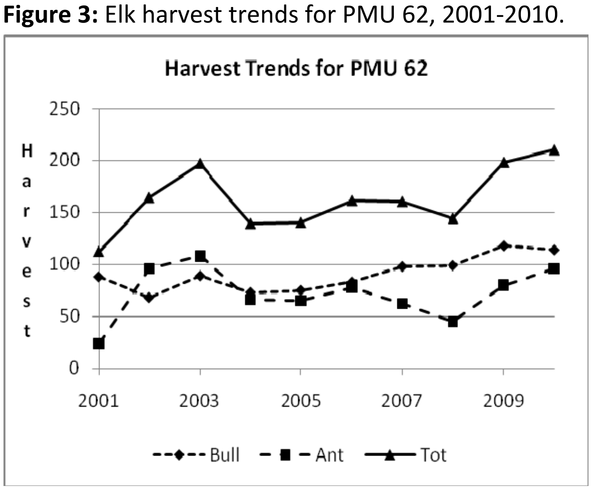
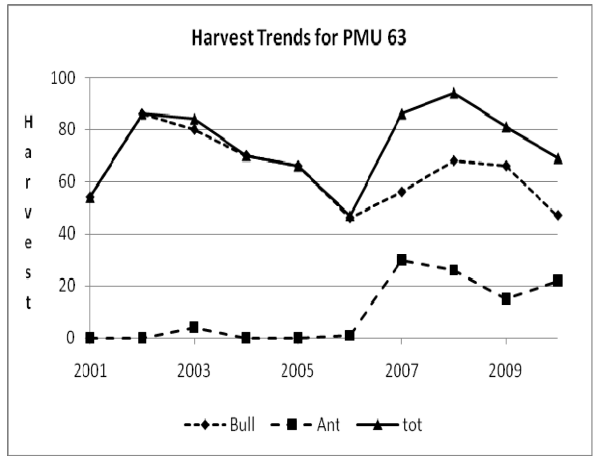


Figure 4: Elk harvest trend for PMU 63, 2001-2010.



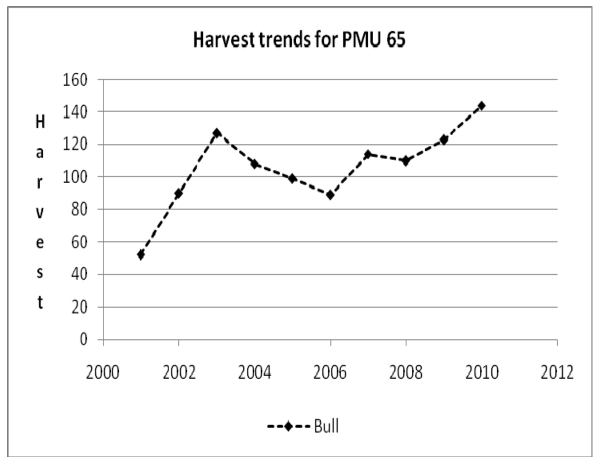


Figure 5: Elk harvest trends for PMU 65, 2001-2010.

Figure 6: Bull elk harvest trends for PMU 66, 2001-2010.

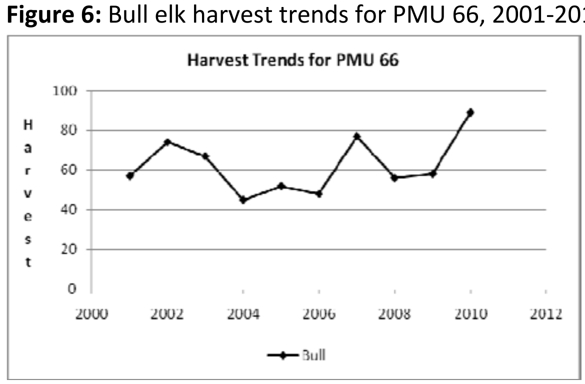
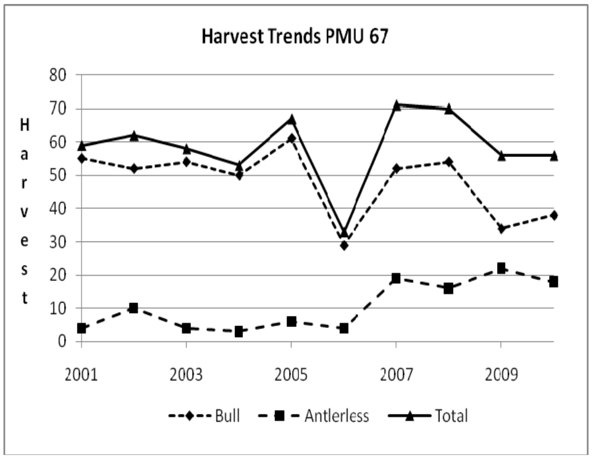


Figure 7: Elk harvest trends for PMU 67, 2001-2010.



Mountain Goat

MOUNTAIN GOAT STATUS AND TREND REPORT
STATEWIDE

DONALD A. MARTORELLO, Carnivore, Furbearer, and Special Species Section Manager

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Population objectives and guidelines

The population monitoring objective for mountain goats is to monitor population demographics of mountain goats at a level where a decline in population size can be detected within 3-years or less. The corresponding 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 WDFWs Game Management Plan (2008). The harvest guidelines are to limit harvest opportunity 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% or less.

Hunting seasons and harvest trends

Mountain goat hunting opportunity in Washington is limited by permit. Permit availability (and therefore hunter opportunity) has decreased dramatically over the last 10 years (Figure 1). Seventeen permits (15 general permits, 1 raffle permits, 1 auction permit) were available in 9 goat management units in 2010. The 2010 mountain goat season provided 47 days of mountain goat hunting (September 15 to October 31). Hunters were able to use any legal weapon and may harvest any adult goat with horns greater than 4 inches.

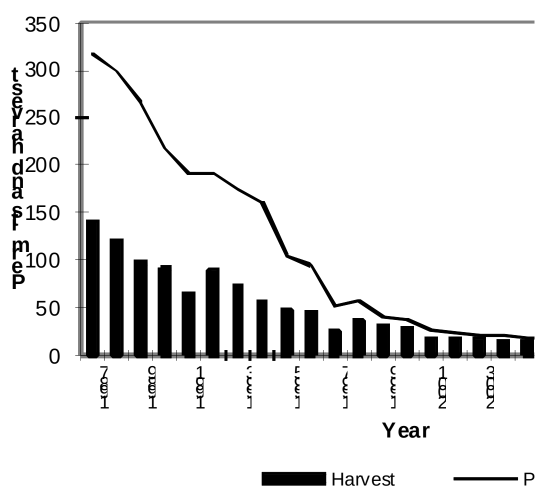

Figure 1. Mountain goat recreational hunting op

Of the 17 permits available in 2010, 16 individuals actually reported that they hunted goats. A total of 14 goats were killed for a hunter success rate of 82%.

Given the marginal status of mountain goats (see **Population status** section), only goat populations that are surveyed annually, and meet or exceed population guidelines described in the Game Management Plan are considered for recreational hunting.

Surveys

All surveys were conducted using a helicopter and generally occurred between July and September. From the survey, the total number of goats were calculated using a sightablility model recently develop in Washington. Because the funding level wasn't enough to survey all goat units, (regardless if they're hunted or not) priority was given to hunted units.

Population status and trend analysis

Mountain goat populations have been on the decline in Washington for many years. Historically, goat populations may have been as high as 10,000 animals. Today goats likely number around 2,400. Hunting opportunity has decreased accordingly, and current permit levels are conservative and represent 4% or less of the known population in herds that are stable to increasing. Despite the overall declining trend in goat numbers and range, a few populations are doing well. Goat populations around Mt. Baker, alone the lower Cascade crest, and the north shore of Lake Chelan appear to be stable.

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.

Management conclusions

In terms of goat management, the biggest obstacles are consistent funding base to assess the status of goats, estimates of demographics for individual herds, and the existence of vast 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.

Table 1. Goat harvest statistics, 2010, WDFW.

Hunt Name	Total Applicants	Permits Issued	Total Harvest	Males Killed	Females Killed	Hunter Days	Days/Kill	Hunter Success
Avalanche Gorge	837	1	1	1	0	4	4	100%
Chowder Ridge	1218	1	1	1	0	3	3	100%
Lincoln Peak	1521	2	2	2	0	5	3	100%
Dillard Creek	627	1	1	1	0	12	12	100%
North Lake Chelan	2301	2	2	2	0	5	3	100%
Naches Pass	4312	1	1	1	0	5	5	100%
Bumping River	4422	1	1	1	0	25	25	100%
Blazed Ridge	4060	1	1	1	0	1	1	100%
Goat Rocks/Tieton Ri	6449	5	4	2	2	12	3	80%
Total		15	14	12	2			

MOUNTAIN GOAT STATUS AND TREND REPORT: REGION 2
METHOW UNIT 2-2

SCOTT FITKIN, District Wildlife Biologist
JEFF HEINLEN, Wildlife Biologist

Population objectives/guidelines
The Methow unit (Goat Unit 2-2) is being managed for population growth and increased distribution. Limited harvest compatible with this objective is also being offered. In addition, watchable wildlife opportunities, such as the salt lick along the Hart's Pass Road and the goats on Grandview Mountain, are encouraged.

Hunting seasons and harvest trends
Mountain Goat populations have declined dramatically in some portions of the North Cascades. Research findings suggest historical hunting levels may have been to high and unsustainable for goats. Starting in 2009, for Mountain Goats to be hunted, statewide mountain goat strategies recommend surveys must indicate a population size of at least 100 goats in a population management unit. Limited resources have resulted in minimal survey data for the last few years and harvest activity was suspended in 2009 and 2010 (Table 1). More recently, anecdotal reports suggest a total Methow Unit population of over 100 animals, and possibly some limited range expansion. As a result, a single annual harvest permit is is proposed for 2012 - 2014. The local population is roughly split between two sub-bands within the unit, consequently the harvest permit area will alternate between the two sub-bands each year to spread harvest pressure across the unit. Moving forward it hoped that resources will allow for adequate aerial survey efforts to firm up population estimates and help fine tune harvest strategies..

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	--	--	--	--	--

Table 2. Population composition counts from the Methow Unit, 1995-2010

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	--	--	--	--	--

*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
Historically, we conducted annual surveys to determine minimum population size and herd productivity. This data is used to generate hunting permit allocations in accordance with statewide management guidelines. The last survey occurred in the summer of 2009. Very poor survey conditions produced a minimal sample size.. The survey yielded a count of 18 animals with a ratio of 38 kids per 100 adults (Table 2). The scarcity of goats in the survey was likely a result of poor survey conditions rather than a real reduction in animals.

Population status and trend analysis

This unit had been monitored closely from 2000-2007 with a stable population being observed. The low number of animals observed during the 2009 survey is attributed to poor survey conditions. A large fire burned a significant portion of the unit several years ago. This resetting of successional conditions has likely improved forage conditions within the burn area and may also be improving herd productivity. A renewed survey effort is needed to explore an potentially noticeable population-wide demographic effects.

Incidental observations outside of traditional hunting units suggest 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 or trend is unknown for these animals.

Habitat condition and trend

Goats in the Okanogan District had a long winter with a higher than average snow pack this past year. Some degree of winter mortality is likely to have occurred.

Goat habitat is almost entirely within secured areas and habitat availability remains stable. Habitat quality varies noticeably throughout goat range in the Okanogan District. For instance, regenerating burns in the Handcock Ridge area are improving forage conditions and contributing to observed robust kid production in this portion of the Methow Unit. Conversely, the fire in the Mt Gardner area is now over 20 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 and moderate productivity for the herd as a whole is expected.

Much of the district's goat habitat is in wilderness areas. Thus, changes in habitat quality will occur primarily through natural stochastic events such as wildfires and avalanches, rather than human intervention. Wildfires burned over 20,000 acres of goat habitat in the Methow Unit in 2003, resulting in habitat and herd health improvements noted above.

Management conclusions

Management objectives should continue to focus on population growth and distribution; however, recent incidental observations suggest some limited and spatially controlled harvest is sustainable. Additional survey data is needed to verify this assessment. Goat populations in the Methow Unit are the most robust in the district, and past fires have improved overall productivity. Still, significant differences in productivity between the north and south portions of the unit may be developing. Limited telemetry data and survey flights suggest fairly minimal interchange between the two herd segments, so a new sub-basin harvest rotation strategy is being implemented. In addition, the Handcock Ridge band spends significant time west of the Cascade Crest. As a result, redrawing the Unit boundary for the northwest portion of the area should be explored.

Suitable goat habitat adjacent to this unit is sparsely populated and could likely support many more animals than exist currently. Hopefully, habitat enhancement from past fires will continue to boost productivity and promote dispersal. If in practice, the Methow herd grows but exhibits little dispersal, animals could be actively relocated to other suitable areas in the county.

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 management goal for Chelan County mountain goats is to a ensure healthy productive population, provide opportunities for multiple use and to maintain self-sustaining goat populations in historic ranges, providing 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 size and trend and have 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 observed adult 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 the north shore of 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. Only 1 goat was harvested during 2002-2007, however, hunter success has increased recently with 5 goats taken in the last three years. Rugged terrain, remote wilderness areas, and very limited access limits hunting success. The overall success rate of 62% satisfies the success threshold required to maintain a permit. Of the 8 goats harvested since 2001, only one has been a nanny (13%).

The increase in permits for the North Lake Chelan unit was based on the increasing survey trend and the harvest of 2 goats remians <4% of the adult population. Based on the above criteria, the South Shore population be proposedfor a single permit starting 2012.

Populations within the East-central Cascades (Chiwawa, East Stevens Pass, and North Wenatchee Mtns, Stehekin) cannot be surveyed intensively enough with current resources to evaluate population size, thus are not hunted.

Surveys

Two survey methods have been used to monitor mountain goat populations in Chelan County, in addition to incidental observations. 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 all surveys completed during each winter. This is the only annually collected, long-term data for Chelan County mountain goats (Pope and Cordell-Stine, 2011). However, sightability of goats and ability to classify age is difficult and contributes to the high variability in observation and composition data. Kid numbers and ratios might also be biased high from the large number of unclassified mountain goats (41 unclassified this year).

In other mountain goat areas in Chelan County, helicopter surveys have been used in the past. Recent observations of mountain goats collected along driven survey routes suggest these goat numbers may be increasing. To gain insight into the distribution and minimum size of these concentrations, ground-based counts of goats on winter range along East Stevens Pass, North Wenatchee Mountains (Icicle and Tumwater Canyons), and Chiwawa (White River) are being conducted. (Table 2). Priority should be given to acquiring data on other goat populations within the East-central Cascades zone.

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 20-30 years ago. The Lake Chelan populations (which the PUD has monitored for the last 29 years) appear to be stable or increasing (Table 3). Kid:adult ratios appear adequate for population growth, averaging 32 kids:100 adults over the last three years.

The North Shore population was estimated at 85 goats (range: 78-95), with 24 kids:100 adults (range: 19-27) over the last three years. Future harvest (assuming harvest biases toward males) is within objectives and unlikely to slow population growth. The south shore population was estimated over the last three years to average 96 goats (range: 66-128), with 37 kids:100 adults (range: 27-53). This population has consistently had higher observed production than the north shore over the last ten years. Last year's high count of 128 goats on the South Shore is the highest count in the last 30 years. A count of about 100 goats on the South Shore has been documented in three of the previous five years. While herd productivity and habitat conditions are good, it is unknown if there are additional bands of goats from other areas utilizing the south shore as winter range, or whether they are all resident.

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 shores of Lake Chelan. 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 traveled 10-12 miles east to the south shore of Lake Chelan. Any potential hunting opportunity offered on the south shore of 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 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. However, forest cover will be reduced for decades.

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 surveys of the south shore population to document its size and correlation 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.

Literature Cited

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Washington Department of Wildlife. 2008. 2009-2015 Game Management Plan. Wildlife Program, WDFW, Olympia, Washington, USA.

Table 1: Summary of Mountain Goat Harvest for North Lake Chelan, 2001-2010

Year	Permits	Hunters	Harvest	Success	Goats Seen/Hunter	Days Hunted
2001	2	2	2	100	24	6
2002	1	1	0	0	0	20
2003	1	1	0	0	12	8
2004	1	1	1	100	3	3
2005	1	1	0	0	25	15
2006	1	1	0	0	0	1
2007	1	1	0	0	27	12
2008	1	1	1	100	25	8
2009	2	2	2	100	17	8
2010	2	2	2	100	35	5

Table 2. Mountain goat counts in Chelan County, 1996-2010.

Area	N. Lake Chelan	S. Lake Chelan	Stehekin	Chiwawa	North Wenatchee Mtns	East Stevens Pass	Total
1996-97	42	13	4	14	42	33	123
1997-98	80	44		15	6	14	163
1998-99	64	41	5		27	13	150
1999-00	58	40					98
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	0	15	23	20	219
2009-10	81	128	0	9	69	22	309
2010-11	78	94	0	8	38	10	228

Table 3. Mountain goat population composition for Lake Chelan, Chelan County, 1994-2010.

Year	Adults	Kids	Total Count	Kids:100 adults
1994	98	25	123	26
1995	109	12	121	11
1996	47	7	54	15
1997	105	18	123	17
1998	93	17	110	18
1999	79	19	98	24
2000	76	24	100	32
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
Average	99	24	123	24

MOUNTAIN GOAT STATUS AND TREND REPORT: REGION 3
GOAT UNITS: 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 is open only to hunters drawing a special permit. In 2010, there were three permits spread over three units (Tables 1-3) and 3 goats were taken.

Surveys
Tables 1-4 show annual survey results for mountain goat units. Kachess is 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 other surveys and hunting seasons. Years with the lowest counts were typically those with June surveys. In 2010, surveys were conducted during August. Surveys were only completed at Naches/Corral Pass due to weather and helicopter mechanical problems.

Population status and trend analysis
The status of mountain goat populations is assessed using aerial surveys and, as an ancillary data source, interviews with hunters, guides, and others people knowledgeable about goats.

All goat populations in the Region probably declined from historic levels due to over harvest. Research suggests harvesting no more than 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 should be increasing.

One problem is that aerial surveys results are often highly variable. In the Bumping River unit, the number of goats seen on surveys has varied between 39 and 98 over the last 10 years, with no obvious pattern. The unit is large, with extensive habitat and cover. It is easy to miss entire groups of mountain goats on a given survey.

Historically, the Naches and Corral Pass areas were managed as different units even though large numbers of goats were observed near the boundary. Corral Pass was rarely surveyed as a unit and Naches Pass surveys frequently included goats on the Corral Pass side. The population was very likely overharvested, especially since tribal harvest was also occurring in the area. In recent years the permits have been reduced and the unit surveyed in cooperation with the Muckleshoot Indian Tribe. The number of goats seen has increased from a low of 21 in 2001 to 147 in 2009. Reduced harvest has probably helped the population rebound, but better survey efforts likely helped as well. The lower number in 2010 was probably due to goats being missed on the survey.

Blazed Ridge was historically included as part of the Naches Pass unit. In 1996, permits were issued for the new Blazed Ridge unit. Historic records indicate it was not unusual to issue 40 permits for the area. Survey counts in the unit have been highly variable with no obvious pattern (Table 3). In recent years, 70-80 animals are typically seen during the survey. The actual population is probably ~100. Blazed Ridge and Naches/Corral Pass are close enough to potentially be the same population.

Kachess Ridge was historically surveyed with Davis and Goat Peak units. Thirty-two goats were taken from the area from 1975-81, which is more adults than have been seen in the last 10 years. The current population for the entire area is probably less than 50 animals. This unit is the smallest unit in the region. If the area was expanded, the population may exceed the 100 goat threshold.

Habitat condition and trend

The majority of goats in the Bumping, Tieton and Naches Pass spend summer 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 the area prime for a large fire. Recreational use could also be influencing use of available habitat. There is no comprehensive documentation of where the goats winter. Outside the wilderness, timber harvest and road building could 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 loggeded. 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. ORV 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 like I-90 have probably limited movements between herds over time. Smaller highways and developments like ski areas could also limit movement and use of areas. This may limit re-colonization and recovery of some areas.

Management conclusions

Goat populations in Region 3 have declined over historical levels. Over-harvest appears to have been a factor. Harvest has been reduced and populations appear to be slowly recovering. Future harvest should be conservative with no permits unless the unit is surveyed.

Boundaries of existing herds need to be reviewed to determine realistic population units and levels. Current resources for surveys are limited. Options for collecting better quality data need to be explored.

Table 1. Harvest and surveys for mountain goat Unit 3-7 Bumping River

Harvest Information				Survey Data			
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	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	22
2008	2	*3	*3	15	53	68	28
2009	2	2	2	17	46	63	27
2010	1	1	1				

*Includes raffle/auction

*Includes 21 unclassifed

Table 2. Harvest and surveys for Naches/Corral Pass (Mountain goat Units 3-6 and 4-38)

Harvest Information				Survey Data			
Year	Permits	Hunters	Harvest	Kids	Adults	Total	K:100
1989	9	7	4	24	94	118	26
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	4	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

* Includes auction/raffle permit hunter

Table 3. Harvest and surveys for Blazed Ridge (Mountain goat Unit 3-10)

Harvest Information				Survey Data			
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	[a]30	[a]83	[a]113	36
2007	2	1	1	22	56	78	39
2008	2	*3	*3	22	50	72	44
2009	1	1	0	15	52	67	22
2010	1	1	1				

* 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
2006-09	0			No	Survey		

MOUNTAIN GOAT STATUS AND TREND REPORT: REGION 4
GOAT UNITS 4-1 – 4-14

Paul M.DeBruyn, Wildlife Biologist

Population Objectives/Guidelines

The management objective for mountain goat units in north Region 4 is to maintain stable populations in all units for public viewing and harvest opportunities. Harvest levels are set at 4% or less of recognized sub-populations throughout individual goat management units (Hebert and Turnbull, 1977).

Hunting Seasons and Harvest Trends

The history of mountain goat hunting seasons and associated harvest trends demonstrates a severe decline in both areas throughout north Region 4 (Whatcom and Skagit counties). Hunting seasons have dramatically declined since the earliest mountain goat season format in 1897 when Washington State hunters were allowed two goats per person in a three-month season. The typical season format for mountain goats in north Region 4 during the 1980's was 47 days (late September through October). In Whatcom and Skagit counties, the mountain goat range was divided into six geographic areas (Goat Management Units) with a total of 72 harvest permits issued (70 rifle, 2 archery). In 1986 mountain goat units were re-designated to more adequately reflect the geographical distribution of discrete sub-herds and to allow WDFW better management control over harvest distribution. Goat management units increased from 6 to 14 in north Region 4. Permit numbers in 1986 were 63 for the 14 new units. Harvest in these units totaled 16 goats in 1986. By 1996, all but two of the GMUs were closed to hunting (GMUs 4-8 –East Ross Lake, 4-9 – Jack Mountain). A total of 12 permits resulted in the harvest of 5 mountain goats within the two units during the 1996 season. All of the original 14 goat management units were closed to hunting in 2002. In 2007, Mt. Baker units 4-3 –Chowder Ridge and 4-7 – Avalanche Gorge were reopened with one permit issued per unit. In 2010 the number of goat permits for Mount Baker remained the same as 2009 at 5, 2 in Mt. Baker East and 3in Mt. Baker West. The permit holders were instructed to contact Olympia to receive a map of their hunt area boundary. In 2010 all the 5 permit holders harvested male goats(Table 1). One male Mountain Goat was harvested by a tribal hunter in this area in 2010

Surveys

In August 2010 an aerial mountain goat survey was flown in the Mt. Baker/Loomis Mountain areas of Whatcom and Skagit counties. This was a cooperative survey effort involving Sauk-Suiattle Indian Tribe, Upper Skagit Indian Tribe, and the Northwest Indian Tribal Commission. A Bell JetRanger helicopter was used to fly the survey area. The survey route(s) were similar to previous years' surveys but do vary slightly in response to weather and habitat changes. A total of 349goats were observed on Mt. Baker, Mt. Shuksan (Lake Ann), and Loomis Mountain (Table 2). The number of goats seen in just the Mt. Baker areas was slightly lower than the high count in 2009. When adjusted for sightability bias due to group size, terrain obstruction, and vegetation obstruction, the number of goats in all survey areas in 2010 is estimated at approximately 399 animals (Table 4).

The Department of Fish and Wildlife initiated a mountain goat research project in 2002 that included cooperators such as the U.S. Forest Service, the National Parks Service, the Sauk-Suiattle Tribe, the

Table 2. 2010 mountain goat survey results for the Mt. Baker/Loomis Mountain area.

Block	Total	Adults	Yearlings	Kids	Unknown
Black Buttes	58	33	6	15	4
Heliotrope	21	15	4	2	0
Chowder Ridge	121	77	14	28	2
Sholes Glacier	14	8	2	4	0
Coleman Pinnacle	73	48	9	15	1
Lava Divide	25	14	4	7	0
Lake Ann	33	22	5	6	0
Loomis Mountain	4	4	0	0	0
Total	349	221	44	77	7

Table 3. Mt. Baker* mountain goat surveys 2003-2010

Year	Kids	Yearling	Adult	Unk.	Total	Kids:100 adults**
2003	33	-----	84	0	117	39
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

*Mt. Baker includes the following survey blocks: Black Buttes, Heliotrope, Chowder Ridge, Sholes Glacier, Coleman Pinnacle, and Lava Divide.
**Starting in 2004 adults and yearlings were classified separately. Prior to 2004 yearlings were classified as adults.

Table 4. Sightability estimates 2010

	Observed	Estimates	90%CI
Groups	66		
Total	349	398.6	367.2-430
Adults	221	255.4	236.4-274.5
Yearlings	44	49	44.3-53.7
Kids	77	84.6	77.1-92.1
Unknown	7	9.5	4.2-14.8
Adults & Yearlings	265	304.4	279.1-329.8
Juveniles	121	133.6	123.1-144.0
Kids/Ad+Yl	0..29	0..28	0.26-0.30
Juv/Adult	0.55	0.52	0.50-0.55

Dates: 07/20/2010,07/21/2010
Blocks: Black Buttes, Chowder Ridge, Coleman Pinnacle, Heliotrope, Lava Divide, Sholes Glacier, Lake Ann, Loomis Mt.

Stilliguamish Tribe and Western Washington University. The long-term objective of this project is to assess the magnitude, extent, and causes for the reported declines in mountain goat populations in Washington. As part of this study, GPS collars were placed on a total of 13 goats in the Mt. Baker/Mt. Shuksan areas of Whatcom County. The locations from these collars were used to evaluate movements and habitat use. Collared animals also provided information to assess sightability bias (i.e. whether or not an animal or group is seen) during population surveys and a sightability bias model was developed to calculate population estimates from survey data.

Population Status and Trend Analysis

The historical status of mountain goat populations in north Region 4 GMUs is not well documented. 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 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 as compared to the 1996 survey. Although survey coverage has differed slightly between years, the population counts from more recent surveys in the Mt. Baker range continue to be stable or increasing.

Habitat Condition and Trend

A graduate student at Western Washington University has recently developed a mountain goat habitat map for the west side of the Cascade Range, including Mt. Baker. Road and hiking trail development continues to encroach upon existing habitat and is projected to further expand the influences of increased human disturbance throughout mountain goat ranges in Whatcom and Skagit counties.

Management Conclusions/ Recommendations

It is anticipated that considerable new information regarding the habitat utilization patterns of North Cascades mountain goats will emerge from the ongoing research initiated in 2002. An enhanced understanding of habitat use will enable managers to better regulate the perceived conflicts between recreational activities and mountain goats on critical winter and summer ranges.

The Mt. Baker/Mt. Shuksan mountain goat population has grown large enough to allow a limited harvest in certain goat units. However, the level of tribal harvest is uncertain. Discussions on goat management between WDFW and the Tribes are ongoing and remain a high priority.

Literature Cited

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Table 1. Summary of harvest information for mountain goats in north Puget Sound, 2007-2010

Hunt Name	Unit	Year	Permits	Hunters	Harvest	Success (%)	Goats seen	Kids seen	Days hunted
Mt. Baker West	Chowder Ridge	2010	1	1	1	100	92	35	3
		2009	1	1	1	100	65	15	2
		2008	1	1	1	100	1	0	1
		2007	1	1	1	100	150	12	7
	Lincoln Peak	2010	2	2	2	100	56	8	5
		2009	1	1	1	100	47	14	8
		2008	0	-	-	-	-	-	-
		2007	0	-	-	-	-	-	-
Mt. Baker East	Avalanche Gorge	2010	1	1	1	100	27	7	4
		2009	1	1	1	100	9	1	1
		2008	1	1	0	0	40	2	0
		2007	1	1	1	100	57	17	5
	Dillard Creek	2010	1	1	1	100	40	20	12
		2009	1	0	0				0

MOUNTAIN GOAT STATUS AND TREND REPORT: REGION 5
GOAT ROCKS, SMITH CREEK, TATOOSH

PATRICK J. MILLER, District Wildlife Biologist
ERIC HOLMAN, Wildlife biologist

Population objectives and guidelines

Mountain goats (Oreamnos americanus) are prized in Washington as both a game animal and for viewing purposes. Region 5 of the Washington Department of Fish and Wildlife (WDFW) has three mountain goat population management units; Tatoosh (Goat Unit 5-2), Smith Creek (Goat Unit 5-3), and Goat Rocks (Goat Unit 5-4). In 2003, the management of the Goat Unit *Tieton River* 3-9 was combined with the *Goat Rocks* unit. Goat Rocks-Tieton River unit probably has the highest goat population in the state of Washington. Hunting in all three units was allowed by permit only. Current population goals for these three areas are to maintain or expand current population levels. A productivity goal of 20-25 kids per 100 adults is applied to these populations. Legal harvest levels are designed to remove 4% or less of the population (WDFW 2008).

Hunting seasons and harvest trends

Since 1997, all three units in Region 5 have been open to any legal weapon. Prior to 1997, Smith Creek Unit was an archery-only unit. Harvest quotas were conservative in 2010 Smith Creek = 0; Tatoosh = 0; and Goat Rocks-Tieton River = 5.

Hunting seasons in all three units have traditionally been in the last two weeks of September and the entire month of October. Beginning in 2005, the season has opened on 1 September for archery-only hunting. Firearm hunting was allowed from 15 September-31 October. The bag limit was one goat of either sex, with horns longer than 4 inches per permit. Hunting pressure in each unit is limited by the conservative nature of the permit allocations.

Harvest trends, hunter success rates, and hunter survey returns indicate declining mountain goat populations in the three units. Aerial surveys conducted by WDFW indicate that mountain goat populations in the Tatoosh and Smith units are declining. Most of the goats observed in the Tatoosh unit are actually in the nearby Mt Rainier National Park. Visibility of goats in the Smith creek unit has long been a concern as the habitat is narrow strips of alpine vegetation with heavy forest nearby.

Mt Goat studies recently completed by WDFW have led to a new population guideline to direct harvest management. A goat unit needs to have an estimated population of 100 or more to allow harvest. The Smith Creek and Tatoosh units both have populations under this goal and no permits were issued for these units in 2010. These populations will be monitored periodically to determine if populations have improved to the point of allowing hunting again. In 2010 5 Mt Goats permits were authorized for the Goat Rocks Unit. Four of the 5 permits holders reported killing a goat, half females and half males (Table 1).

Surveys

In 2010 the Goat Rocks and Smith Creek units were surveyed. The Goat Rocks/Tieton survey yielded 217 animals and the Smith creek unit survey observed 36 (Table 2).

Population Status and Trend Analysis

Survey data from 2004 through 2010 in the Goat Rocks unit indicate a declining trend with an overall slight decline in number of goats, even when the Tieton River unit influence is incorporated (Table 2). Knowledge of the movement between the Goat Rocks and Tieton units still needs to be examined.

A Mt. Goat study that was conducted by WDFW provided new methods for estimating goat numbers via a mark/resight sightablity technique. The population estimates for Region 5 units are outlined in Table 3.

Sightings of goats are becoming common around the Mt. St. Helens area and the north-south ridge systems south of the Cispus River contain good numbers of goats (see Management Conclusions below). A small herd of goats was observed in the caldera of Mt St Helens in the summer of 2007. These goats are likely migrants from the nearby McCoy Peak and surrounding area. Historic sightings of ear-tagged Smith Creek transplants in the Mt. Adams Wilderness indicate that goats are likely expanding their range. Informal surveys are also observing goats in areas to the south and west of Smith Creek. Long-term changes in habitat (see

Habitat Condition below), particularly in the Smith Creek Unit, may limit certain goat populations in the future.

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, their decline represents a serious threat to the sustained viability of this goat population. Results of the cooperative Cispus AMA 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 have been lost in the period 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 10 years since the completion of this study, the loss of meadow has likely increased.

Increasing use of high elevation meadows by elk is another concern. Elk are typically observed using high elevation meadows adjacent to goats. Elk use will further degrade these habitats for goats, and may even preclude goat use. Any inter-specific competition that occurs in the alpine meadows will favor elk. Thus, the need for restoration and preservation of these areas is paramount to continued healthy goat populations.

Habitat Enhancement

Continued budget cuts and other constraints in both the USFS and WDFW make the possibility of a prescribed burn program in the foreseeable future unlikely. Presently it does not appear that habitat is limiting goats; however, enhancement will have to be pursued in the next decade, as more and more habitat in the Smith Creek Unit is lost to conifer encroachment.

Another possible avenue to address conifer encroachment is through the use of girdling and snag creation. Informal discussions concerning snag creation have occurred, and hopefully more formal discussions will transpire in the near future.

Management Conclusions

All three mountain goat units in Region 5 are valued for both viewing and hunting opportunities. Consequently, harvest quotas are kept conservative to maximize both the consumptive and non-consumptive recreational attributes of these populations. Management direction dictates that the Smith Creek and Tatoosh units 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 data and the most efficient method of census, particularly considering the large expanse of area involved.

Raffle and auction permit holders often 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. Raffle and Auction permit holder harvest information was not available as of the date this document was written.

Regional staff have become concerned with the long term decline of goat numbers in Goat Rocks. Permit harvest and auction and raffle harvest may be causing this decline. Raffle and auction hunters may hunt any unit that is open; however, Goat Rocks is often preferred. Based upon this information, permit numbers for the 2011 hunting season were reduced to 3. Surveys in this unit will continue to help clarify the population trend in this unit and should be conducted every year.

Additionally, resource managers should identify important habitat linkages between Smith Creek and Goat Rocks and suitable isolated habitats such as Mt. Adams and Mt. St. Helens National Volcanic Monument. Geographic Information Systems (GIS) coverages could be used to identify suitable goat habitat within unsuitable matrix lands. Potential corridors between such areas could then be managed for goats.

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 statistics for Region 5 mountain goat harvests (1993-2010).

Unit	Year	Permits Issued	Harvest*	Success (%)	Avg. goats seen	Kid:Adult seen	Avg days to harvest
Smith Creek	**2010**	**0**					
	2009	0					
	2008	1	0	0	13	1	N/A
	2007	1	1	100	75	25	10
	2006	1	1	100	30	16	7
	2005	1	1	100	40	20	16
	2004	1	1	100	21	5	4
	2003	1	1	100	19	6	12
	2002	1	1	100	30	23	5.0
	2001	1	1	100	17	70	12
	2000	3	2	67	16	60	14.5
	1999	3	2(2)	100	4	25	1.0
	1998	3	2	67	21	36	7.7
	1997	3	1(2)	50	25	67	9.5
	1996	5	2	40	42	26	12.5
	1995	5	2(4)	50	24	14	22.5
	1994	3	2	67	17	28	6.0
	1993	3	2	67	53	59	11.0
Goat Rocks	2010	5	4(4)	100	51	7.5	3
	2009	5	5	100	40	30	2
	2008	5	5	100	46	9	4
	2007	5	3	60	56	4	9
	2006	5	5	100	65	27	3
	2005	6	6	100	24.7	5	18
	2004	6	4	66.7	87	26	12.7
	2003	6**	6**	100	55	19	3.2
	2002	3	2	66.7	77	28	5.0
	2001	3	3	100	44	26	4.3
	2000	7	6(6)	100	55	28	3.2
	1999	7	7	100	52	20	2.7
	1998	7	7	100	32	43	3.2
	1997	10	9(9)	100	19	30	2.8
	1996	10	6(9)	67	55	36	5.8
	1995	10	10	100	40	42	2.2
	1994	10	10	100	46	39	2.3
	1993	10	10	100	37	39	1.9
Tatoosh	2010	0					
	2009	0					
	2008	1	1	100	12	3	18
	2007	1	0	0	7	5	0
	2006	1	1	100	55	25	4
	2005	1	0	0	32	8	0
	2004	3	2(2)	100	6	2	4.5
	2003	3	3	100	27	11	21
	2002	3	2	66.7	21	23	12.5
	2001	3	1(2)	50	4	29	4.0
	2000	5	2	40	14	40	10.0
	1999	5	2(3)	67	22	35	18.0
	1998	5	2(4)	50	15	54	7.5
	1997	5	1	20	9	16	8.0
	1996	5	1(3)	33	9	37	35.0
	1995	5	3(4)	75	7	28	6.0
	1994	5	2	40	3	33	15.0
	1993	5	2	40	3	15	12.5

* Numbers in ( ) indicate number of hunters, if less than permits issued.
** Permits for both Goat Rocks and Tieton River were combined.

Table 2. Survey results of Mountain Goat flights Region 5 (1998 –2010).

Goat Unit	Year	Adult	Yearling	Kid	Unknown	Total	Kid:Adult
5-2 Tatoosh	2010						
	2009						
	2008	0	0	0	0	0	
	2007	1		1	0	2	
	2006***	16		4	0	20	25:100
	2005	12	4	6	0	22	50:100
	2004	5	0	2	0	7	40:100
	2003	2	3	1	0	8	50:100
	2002	5	3	1	1	10	20:100
	2001	6	1	2		9	33:100
	2000	9	0	2		14	22:100
5-3 Smith Creek	2010	28	6	8	0	36	29:100
	2009	****					
	2008	9	2	4	2	17	44:100
	2007	28	0	6		34	21:100
	2006	16	6	5		27	31:100
	2005	15	6	11		34	73:100
	2004	16	3	11		30	69:100
	2003	9		6		15	67:100
	2002	8	3	6		17	75:100
	2001*						
	2000	23	0	10		33	43:100
	1999	6	2	2	1	11	33:100
	1998	3		1		4	33:100
5-4 Goat Rocks	2010	181	14	36	0	217	20:100
	2009	170	33	73	0	276	43:100
	2008	178	23	60	7	268	34:100
	2007	****					
	2006	203	14	71		290	35:100
	2005**	188	47	66		303	35:100
	2004**	183	31	43		261	23:100
	2003**	130		36		166	28:100
	2002**	168		36		203	21:100
	2001	79		13		92	16:100
	2000	50		12		62	24:100
	1999	20	2	9	8	39	45:100
	1998	6		2	6	14	33:100

* No survey in 2001 due to poor weather conditions.
****** Survey combined Goat Rocks and Tieton River units
*** Survey conducted by Mt Rainier National Park Staff
**** No survey due to lack of funding

Table 3. Mt. Goat Population Estimates Region 5

Area	Year	Unit	Mt. Goat Unit	Population Estimate 90% CI
Goat Rocks	2004	Goat Rocks/Tieton R.	5-4	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)
Smith Creek	2008	Smith Creek	5-3	32
	2009			N/A
	2010			41 (33-49)
Tatoosh	2008	Tatoosh	5-2	10
	2009			N/A
	2010			N/A

Bighorn Sheep

BIGHORN SHEEP STATUS AND TREND REPORT
STATEWIDE

DONALD A. MARTORELLO, Carnivore, Furbearer, and 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).

Table 1. Population size objectives for specific bighorn sheep herds.

Herd	Desired Population [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

Hunting seasons and harvest trends

Bighorn sheep hunting opportunity in Washington was limited by permit-only hunting. Permit availability, and therefore hunter opportunity, has steadily increased in Washington (Figure 1). In 2010, 42 general season permits, 1 auction permit, and 4 raffle permit were available in 14 different sheep management units. The 2010 bighorn sheep season was September 15 to October 10, (except 5 areas; either October 1-10 or November 8-30). Hunters had the choice of any legal weapon to harvest any bighorn ram (no curl restrictions). Of the 47 permits available in 2010, 37 sheep were killed for a hunter success rate of 79%.

Surveys

All bighorn sheep herds are surveyed annually. Survey results indicate bighorn populations are stable in most areas (see regional reports). A notable exception is the Umtanum-Selah Butte herds where bighorns recently experienced a disease outbreak (see below). Both ground counts and aerial surveys were used to survey and classify sheep as lambs, ewes, or rams. Rams were further classified as yearling, less than 3/4 curl, or greater than 3/4 curl. Surveys were conducted at differing times throughout the year, with a general pattern for most regions to survey lamb production in early summer and total herd composition in winter.

Population status and trend analysis

Rocky Mountain bighorns in the Blue Mountains continue to struggle as they recover from the 1995 *pasteurella* outbreak. Lamb mortality has remained high and ewe survival has declined in several herds; however, the total sheep population has remained fairly

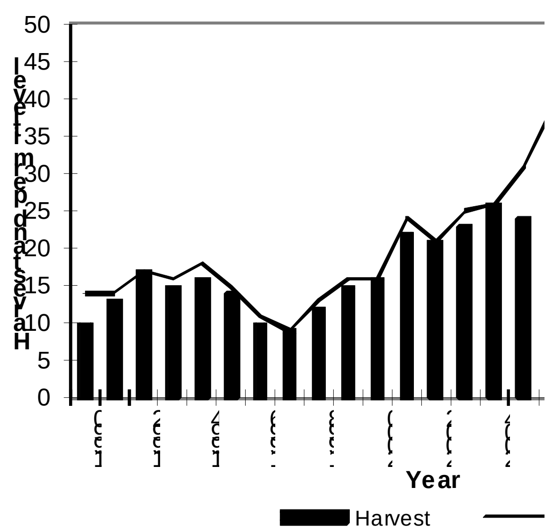

Table 1. Bighorn sheep harvest statistics, 2010, WDFW.

Hunt Name	Total Applicants	Permits Issued	Total Harvest	Sheep Seen	Lambs Seen	Hunter Days	Days/Kill	Hunter Success
VULCAN MOUNTAIN A	1,146	1	1	75	15	5	5	100%
SELAH BUTTE	4,932	5	3	122	24	7	2	100%
UMTANUM	5,739	5	4	40	1	7	2	100%
CLEMAN MOUNTAIN A	4,643	3	3	125	23	4	1	100%
CLEMAN MOUNTAIN B	3,562	3	2	65	6	3	2	100%
MT. HULL A	1,143	1	1	90	10	7	7	100%
LINCOLN CLIFFS	1,456	1	1	26	5	14	14	100%
QUILOMENE	3,742	4	4	205	52	15	4	100%
SWAKANE	3,209	1	1	27	5	2	2	100%
TIETON A	2,944	4	4	225	141	56	14	100%
TIETON B	2,587	4	3	170	55	22	7	100%
MANSON	2,149	2	2	50	7	3	2	100%
ASOTIN	1,657	1	1	5	0	2	2	100%
CHELAN BUTTE	2,002	1	1	12	0	1	1	100%
SINLAHEKIN	1,282	1	1	75	17	4	4	100%
MT. HULL B	1,107	2	2	118	29	3	2	100%
VULCAN MOUNTAIN C	507	1	1	10	3	2	2	100%
VULCAN MOUNTAIN B	172	2	2	105	15	4	2	100%

stable, with a sizable mature ram component. California bighorn populations remained stable in most herds (see individual herd reports).

Washington Department of Fish and Wildlife continued 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 domestic-bighorn sheep.

In December 2009, an outbreak of pneumonia (*Mycoplasma ovipnuemonia*) was discovered in the Umtanum herd. Forty-four sheep are known to have died from the outbreak between December 2009-May 2010. No mortalities were found immediately east of the river in the Selah Butte herd. 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, and increase subsequent lamb recruitment. No significant adult mortality has been observed on either side of the river since early 2010. Lamb survival in 2009 was poor, however lamb survival so far in 2010 appears to be good.

Habitat condition and trend

Range conditions for bighorn sheep were fair to poor in most units, with the exception of Mount Hull and Tucannon due to recent fire activity. Noxious weed invasion, primarily yellow-star thistle, continued to be a major concern for most bighorn sheep ranges (particularly in the Blue Mountains). Grazing also is a concern is several areas of the Blue Mountains and Yakima River basin.

Management conclusions

Bighorn sheep management in Washington centers on three main issues at this time: minimizing disease outbreaks, increasing forage conditions, and establishing new self-sustaining herds.

Disease outbreaks associated with domestic-bighorn interactions is the primary concern for several herds. Disease has decimated or threatens at least 6 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

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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 trans-located 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 has not been hunted, however, beginning in 2009 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 the year 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 no longer occurred. 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 these sheep are replaced by their progeny, they are losing fidelity to the winter-feeding site.

Two incomplete ground-based surveys of the Hall Mountain bighorn sheep were accomplished in the winter of 2010-2011 along with incidental observations. The composite total count was only 15 sheep. Due to their long distance away from observation points along with marginal viewing conditions these sheep could not be accurately classified. (Table 1).

A population of bighorn sheep pioneered by the Hall Mountain population has existed in British Columbia since about 1982. In summer, these sheep occasionally mix with the Hall Mountain herd. These bighorn sheep have been surveyed each year since at least 1998 at a winter feeding station near Highway 3 in Canada. In 2006-2007, the total count at this winter feeding site was 43 bighorn sheep including 12 rams, 24 ewes, and 7 lambs (Mowat, pers. comm. 2007).

From 1995 – 1999, the U.S. Forest Service (USFS: Sullivan Lake Ranger District, Colville National Forest) regularly monitored survival and movements of the Hall Mountain bighorn sheep using radio telemetry (Baldwin 1999, Aluzas 1997, and Bertram 1996). The last radio-tracking was conducted from the Sullivan Lake Road at the south end of Sullivan Lake on March 20, 2006. The radio collars had been deployed for over 6 years and the batteries gradually became depleted until they no longer transmitted signals.

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 go through valley bottoms and dense forest where vulnerability to predation may increase by cougars, bears, and most recently gray wolves.

The U.S. Forest Service owns the vast majority of the habitat 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 controlled burns subject to funding (Suarez 2001). There is no

Table 1. Population composition counts of Hall Mountain bighorn sheep, 2001 - 2011. (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 **

* Estimated classification due to poor viewing conditions during surveys.

domestic livestock grazing within the portion of national forest used by the bighorn sheep.

Augmentation and trans-location

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 trans-location. With the closure of the winter feeding site in 2003, annual trapping activities ceased. The last year bighorn sheep were trans-located from Hall Mountain was in 1994 with 9 sheep that were taken to the Asotin Creek area in the Blue Mountains. WDFW has no further plans to trap sheep at Hall Mountain.

Management conclusions

Last winter was the eighth season since winter feeding operations were terminated. The bighorn sheep continue to winter at the south end of Sullivan Lake on the lower slopes of Hall Mountain, and generally spend less time within the immediate vicinity of the old Noisy Creek feeding site.

With the loss of the ability to reliably survey sheep at the feeding site each winter, other survey techniques and protocol have been used. Ground-based surveys are time-intensive and generally require more than one visit to obtain a reliable count. As the sheep disperse over a larger range for forage, they are less likely to be surveyed with precision. Helicopter surveys, which are expensive, may occasionally be necessary. If the population increases to a level that would facilitate area-specific permit hunting, more intensive monitoring of the Hall Mountain herd would be required.

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BIGHORN SHEEP STATUS AND TREND REPORT: REGION 1
Vulcan Mountain

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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 including 2 rams and 6 ewes were trans-located 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 1990's to about 20 bighorn sheep in 2001.

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 2003) were attained.

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 survey is 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.

A composite total of 54 bighorn sheep which includes 2 unclassified animals were observed in the fall of 2010. Classified bighorn sheep included 19 rams, 9 lambs, and 24 ewes (Table 1).

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 dramatically 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, and to 0 in 1998 and 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 2001, the population objective for this herd is now met and there is a need to actively manage its level so that numbers do 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 1ewe. 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. Only one animal was harvested, a 4.5 year old ram by the State permittee. In 2006 a 2.5 year old ram was harvested by the State permittee. In 2007 two rams, aged at 5.5. and 6.5 were harvested by State permittees and 1 young ram by a CCT permit holder (Krausz 2008). One ram and two ewes were harvested by State permitees and one ram by a CCT permit holder in the 2008 season. In each of the 2009 and 2010 seasons State permitees harvested one ram and three ewes (Table 2). CCT permit holders reportedly harvested 1 ram and 2 ewes in 2009 and only 1 ewe in 2010 (Krausz 2011).

Herd health and productivity

We believe that this bighorn sheep population declined subsequent to about 1995 mainly as a result of complications from exceptionally high internal parasite loads. Mortalities appear to have been highest from 1996 through 1998. Surviving animals observed in 1998 and 1999 were generally in poor physical condition (thin, gaunt body mass, signs of chronic scours, and unusually poor horn growth). No lambs were observed at any time in 1998 or 1999 and only 2 lambs appear to have been produced in 2000.

Efforts to determine the primary cause of the herd decline began in 1999. Numerous samples of fecal pellets were collected in all seasons and sent for analysis of parasites to both the Washington State University Veterinary Sciences Laboratory as well as the Canadian Food Inspection Agency Laboratory in Saskatoon, Saskatchewan. In November of 2000 an adult ram was euthanized and necropsied by the Washington State University Diagnostic Laboratory (Foreyt 2000). While this ram was in good health, it also carried a high density of nematode larvae judged to either be, or similar in appearance to *Parelaphostrongylus,* a muscle worm (Murphy 2000). Additional fecal samples were collected. Further analyses completed by Dr. Alvin Gajadhar identified *Muellarius capillaris*, the lungworm of domestic goats rather than *Parelaphostrongylus* (Gajadhar 2002). Domestic goats were known to share part of the Vulcan Bighorn Sheep range. The parasite *Muellarius 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 *Muellaris capillaris*, likely succumbed to pneumonia that this parasite causes (Hall 2002).

Parasite levels in the Vulcan Mountain Herd were monitored almost annually from 1999-2007 by fecal samples collected and submitted to the Washington State University Veterinary Sciences Laboratory for analysis. Levels of dorsal-spined nematode larvae declined after 2001 subsequent to the "outbreak period" of 1999-2000. Except for *Coccidea*, recent parasitological monitoring has yielded reasonably low parasite levels in the Vulcan Bighorn Sheep (Mansfield 2007). That these bighorn sheep now appear healthy and are producing lambs annually suggests that the overall health of the herd is acceptable.

Table 1. Annual fall population composite counts of the Vulcan Mountain Bighorn Sheep Herd from 2001 through 2010.

			Rams					Ratio
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

* Introduction of 1 ram and 4 ewes trans-located from Nevada in January 2003.

Range use and habitat enhancement

Between April of 2002 and March of 2004, six of the Vulcan Bighorn Sheep including 3 rams and 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 the past seven years several projects to enhance habitat for the Vulcan Mountain Bighorn Sheep have been completed. 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 include 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. As an example, one of the forage range seeding projects that was accomplished on private property in 2002 was followed up in 2004 with weed treatment. The most 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 Vulcan Mountain Herd of bighorn sheep has recovered in health and in population. Lamb ratios since 2001 average approximately 50 lambs per 100 ewes. With healthy lamb recruitment, the Vulcan Mountain Herd has likely returned to the population goal of 80–110 animals.

The 2004 fall census results indicated that the Vulcan Herd could once again sustain limited-entry hunting. The population parameters for establishing a permit were met as 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 2003). One permit for any ram was authorized and filled in each of the 2005 and 2006 fall seasons. With a recovered population the WDFW issued two ram permits in 2007. In 2008 the WDFW issued one general ram permit and two ewe permits for senior (age 65 +) hunters only. An additional ewe permit was added for the 2009 hunt for youth hunters only (under age 16) making a total of 4 permits, 1 ram and 3 ewes. The same permit quota was offered again in 2010 and for both years, all permits resulted in hunter-harvested bighorn sheep. As the observed population declined in the late fall of 2010, the permit quota was cut back for the 2011 hunting season to 1 ram and 1 ewe.

Table 2. Summary of State and Colville Confederated Tribes (CCT) hunter harvest of bighorn sheep from the Vulcan Mountain Unit from 2005 through 2010.

Year	Org.	# Tags	Harvest
2005	State	1	1 ram
2005	CCT	1	None
2006	State	1	1 ram
2006	CCT	1	Unknown
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

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BIGHORN SHEEP STATUS AND TREND REPORT 2011: 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 within the local landowners' tolerance. The population objective for the Lincoln Cliffs herd is to reach a self-sustaining population size of 90-100 animals (WDFW 2009).

The bighorn distribution was historically centered on the original release site on the Lincoln Cliffs area just south of the town of Lincoln. 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 semi-regularly using the cliffs above Sterling Valley, the area just west of Lincoln Cliffs. Bighorns were released in spring of 2008-2010 into the Hells gate area of the Colville Indian Reservation, 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 1380 over the past five years (Table 1). In addition to the annual permit the statewide 2003 and 2004 auction winners and the 2005 raffle winner all selected Lincoln Cliffs to harvest their rams. However due to concerns with the mature males at Lincoln Cliffs, auction and raffle winners are no longer allowed to hunt.

Table 1. Bighorn Sheep Harvest Data

Year	Applications Received	Seen by Permitee Sheep	Lambs	3/4+Curls
1997	527	38	15	3
1998	451	60	23	8
1999	732	42	5	7
2000	1,078	55	0	7
2001	1,100	13	0	3
2002	1,352	38	4	17
2003	1,219	1	0	1
2004	1,311	50	10	9
2005	1,375	40	12	4
2006	1,218	8	3	0
2007	1,326	7	1	2
2008	1,290	42	8	8
2009	1,608	58	16	9
2010	1,456	26	5	N/A

Hunters have spent on average 5.3 days hunting per kill. However, days hunted ranges 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, 17 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), but shows a decline since 2002. However, lower number of mature rams observed by hunters may also reflect the amount of time the individual spent hunting.

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.

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

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 10 years (averaging 42 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 10 years (average 57, range 44-178; Table 3). Survey results were greatly improved by radio collaring thirteen of the 15 sheep translocated in 2003, leading to a more stable lamb and ram to 100 ewe ratio and smaller 90% CI. However, as of 2008 no collars remain active.

Table 3. Lincoln Cliffs Herd Nov. Ram Surveys

Year	Ewes	Rams	Rams: 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

Population status and trend analysis

The Lincoln Cliffs population was started with an introduction of eleven 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 reports of animals seen (Table 1). Hunter observed animals peaked at 60 in 1998 with high numbers continuing to be reported through 1999 and 2000. Since 2001, numbers reported, appear to be decreasing with a high of 50 being reported in 2004 and dropping to a low of 7 reported in 2007. Lower number of sheep observed by hunters may also simply reflect the amount of time the individual spent hunting.

In March 1999, 10 ewes and 1 ram lamb from the Lincoln Cliffs herd were captured and translocated to the Lake Chelan release site. 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 the Cleman Mountain area. From 1999 to 2001, a total of 27 ewes and 1 ram were removed from this population.

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 appeared to have not recovered 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 given 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, the remaining 4 ewes appear to have outlived their radio collars. No radio signals have been picked up since May of 2008.

Since November of 2002, 32 known sheep mortalities have occurred -- 17 from hunting, 2 from vehicle collisions, 5 from cougar, and 8 unknowns -- a total of 24 rams and 8 ewes.

Minimum population estimates, based on maximum count of rams, and ewes from all helicopter surveys in a given year, show the Lincoln Cliff population to be relatively stable (Fig. 1). There was a decline in ewes in 2005 followed by a decline of rams in 2006. The population appears to have mostly recovered from this in the past three years. Estimates are only shown from 2002 on because this is the year regular helicopter surveys were initiated.

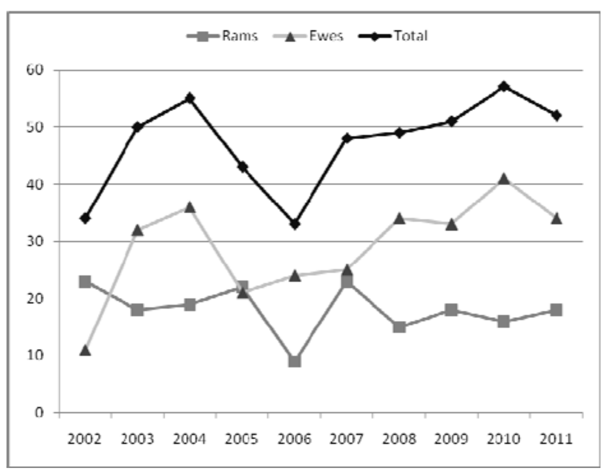

Figure 1. Lincoln Cliffs minimum population estimate by sex for 2002 – 2011. Estimated as the maximum count from all helicopter surveys conducted each year.

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. There is no known interaction with domestic livestock at the present time. However, it is important to remain vigilant, since three domestic sheep were discovered to have escaped in the area of Sterling Valley, but follow up observations indicate they did not survive. In the future, big horn sheep information pamphlets should be made available to the many new residents around the Lincoln Cliffs area.

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, however, the presence of domestic sheep and goat herds within the unit represent an ongoing disease threat.

Wildlife damage

We have received only a few damage complaints related to bighorns in the Lincoln Cliffs area. However, the local human population and associated construction of new housing and splitting of parcels all increase the future potential for sheep-human conflicts.

Management conclusions

The herd is now roughly estimated to be around 60-80 adult animals. This sets the Lincoln Cliff herd just below the stated goal of 90-100 animals for this population (Game Management Plan, WDFW 2009). This very rough estimate would be improved through the radio collaring of 10-15 sheep for use in creating a sightability model for this herd. Given the apparent permanent expansion of this herd to Whitestone Rock, and sporadic use of Sterling Valley, population goals for this herd should be reviewed.

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. Permit controlled hunting for rams will be continued in the 2011 & 2012 season. However, because of the rough population estimate and the number of mature rams being removed during the past years, the number of permits offered will remain at 1 and no raffle or auction hunts will occur at Lincoln Cliffs.

Literature Cited

Washington Department of Fish and Wildlife. 2009. Game Management Plan July 2009 – June 2015. Wildlife Program, Washington Department of Fish and Wildlife, Olympia, Washington, USA.

BIGHORN SHEEP STATUS AND TREND REPORT: REGION 1

BLUE MOUNTAINS

Paul A. Wik, District Wildlife Biologist

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 1960's, and consisted of California (*O. c. californiana***)** 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. The first two herds consisted of California bighorn sheep (Tucannon and Mountain View), but subsequent transplants have consisted of Rocky Mountain (*O. c. canadensis*) bighorn sheep from Hall Mountain in Washington, Montana, Wyoming, and from the Wallowa Mountains in Oregon. California bighorn subspecies genetics are likely diminished in the Blue Mountains due to diseases introduced from inter-herd movement. Scabies (*Psoroptes ovis*) spread into the Mountain View and Tucannon herds during the late 1980's and 1990's, resulting in a massive die-off of California bighorns. The Mountain View herd has frequent interchange of radio-marked individuals with the Wenaha herd, likely further shifting the genetics towards the Rocky subspecies. Also, the School Fire killed 7 - 9 (~50%) of the remaining sheep (thought to have been about 17) in the Tucannon drainage in 2005. Currently, it is thought that herds in the Blue Mtns consist primarily of the Rocky Mountain subspecies.

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 1995). These herd objectives were identified in 1995, prior to large scale disease die-offs. Updating our herd plan 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 conducts disease research, develops population survey methodology, conducts transplants, coordinates intergovernmental management activities, and implements projects designed to improve bighorn sheep habitat. Four of Washington's bighorn sheep populations are included in HCI; Black Butte, Mountain View, Wenaha, and Asotin Creek.

Hunting seasons and harvest trends

Permit controlled hunting was terminated in most the Blue Mountains after the *Pasturella* die-off of 1995-1996. Permits were terminated in the Tucannon in 1999, after this herd suffered a major population decline.

One raffle permit per year has been authorized by the Fish & 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 2010, the Black Butte herd and Hall Mountain herd in NE Washington were available.

Raffle permit holders have been successful in harvesting rams in all years; 2005 – Tucannon, 2006 – Wenaha, and 2007 – Mountain View, 2008 – Wenaha, and in 2009 – Black Butte. In 2010, the harvest occurred outside of the Blue Mountains in the Hall Mountain herd. In 2010, only one draw permit was available in the Blue Mountains. This permit was valid for the Asotin herd, resulting in the harvest of a new state record ram.

General hunt 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 9 rams over the last 8 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, which was a major step forward in tribal cooperation. It is unknown the current status of this closure.

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 Asotin and Black Butte herds in 2011 by WDFW. ODFW conducted aerial surveys for the Mountain View and Wenaha herds. The minimum population estimate for 2011 was 241 bighorn sheep, 129 ewes, 37 lambs, 77 rams for a ratio of 60 (90% CI: 46-74) rams and 29 (90% CI: 20-38) lambs per 100 ewes (Table 1.). A population estimate using the sightability correction has not been developed for 2011 at this time, but biologists estimate that there are approximately 241 - 275 bighorns in the 5 herds. The population appears to be relatively stable over the past 5 years, despite low lamb recruitment 4 of the past 5 years in all herds except Asotin.

Population status and trend analysis

Lamb survival has been limiting population growth since the *Pasturella* die-off in 1996, with lamb survival varying greatly between years. Only one lamb was recruited within the Black Butte herd in the Washington portion of the range and Mountain View only produced 2 lambs during 2011. The Wenaha herd had 8 lambs survive to one year of age. The Asotin herds had 23 lambs survive the first year, while the Tucannon herd had 3 lambs survive the first year. The Asotin and Tucannon herds are the only herds that have not had lambs die from pneumonia during the past 15 years of intensive monitoring. Lamb mortality has already been high in the Black Butte and Wenaha herds by July 2011, with few lambs expected to survive into the yearling class. It is expected that the Asotin herd will continue to grow in the absence of disease, and has 20 lambs entering July 2011.

Individual herds should be able to increase if lamb production and survival returns to 30 lambs:100 ewes or greater for several years. Unfortunately the Black Butte herd has not reached this level since 2005 (Table 3). This trend has continued through 2011 with the Black Butte, Mountain View, and Wenaha herds all suffering from high lamb mortality. It is expected that population numbers will decline until lamb survival improves significantly on a long-term basis.

The population suffered high mortality during the *Pasturella* die-off in 1995-96. Low lamb survival following the all age class 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 except Asotin, and still remains substantially below the number that existed prior to the die-off (Table 1). Poor lamb recruitment, predation, and pneumonia are all contributing to the poor fitness of the bighorn population in the Blue Mountains.

The Tucannon herd received a transplant of 5 young (1 – 3 years old) ewes from the Asotin herd during February 2011. All five were equipped with ARGOS/VHF collars that allow for remote downloading of locations. Approximately 1,500 locations have been obtained during the first 5 months of monitoring.

During the February 2011 Asotin capture, 8 additional sheep were captured and fitted with VHF or GPS/VHF collars as part of the ongoing Hells Canyon Initiative research.

Since October 2010, 5 rams and 1 ewe have been lethally removed from the Asotin and Tucannon herds. One radio-collared ram was removed from the Tucannon following possible contact with a domestic goat 9 miles north of the elk fence. The domestic goat was also removed and taken to WSU for disease testing. Four rams were removed from Asotin Creek in 3 separate incidences following contact, or possible contact, with domestic sheep and goats. One ewe lamb was euthanized for testing within the normal homerange of the Asotin herd after behaving abnormally. The lamb tested positive for scabies.

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 herds in the Blue Mountains. It is too early to determine the impact of the School Fire on the Tucannon range, but it is expected to exacerbate the noxious weed problem over the next 5 - 10 years. An aggressive weed control program on the Wooten W.A. is currently in effect on WDFW and USFS lands to minimize this impact.

Disease and parasites

Pneumonia continues to plague three bighorn populations; Black Butte, Wenaha, and Mountain View. The Asotin and Tucannon herds have not experienced pneumonia caused mortality, but do carry scabies (*Psoroptes ovis*). Bighorn populations in the Blue Mountains have not recovered from the *Pasturella* induced 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 *Pasturella* 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 affects on the populations. The Tucannon herd suffered a major die-off caused by scabies when it was infected in 1999.

Lamb mortality continues to be high in the Black Butte, Mountain View, and Wenaha herds (Tables 3, 4, & 6). Lambs collected from these herds that recently died, or were on the verge of dying 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

Three of the five bighorn sheep herds in the Blue Mountains are struggling with *Pasturella* induced pneumonia. The Black Butte, Wenaha, and Mountain View herds still experience periodic pneumonia outbreaks, which result in high lamb mortality and sporadic adult mortalities. The Tucannon herd escaped the *Pasturella* out-break, but suffered a major die-off after being infected with scabies in 1999. This herd is unlikely to recover without a supplemental transplant. 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, although recent rapid growth of the Asotin herd is creating new challenges associated with herd distribution on private lands and increased exploratory movements by young rams.

Domestic sheep and goats continue to be a major problem for bighorn sheep populations in the Blue Mountains. Rural landowners continue to use domestic sheep and goats to control weeds, which poses a severe threat to all herds in Hells Canyon. HCI research has shown that a large amount of inter-herd movement occurs (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 a major *Pasturella* outbreak 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 officially adopted.

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. 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 another *Pasturella* outbreak in the bighorn population is very high.

Table 1. Bighorn Sheep Population Trend and Herd Composition, Blue Mountains 1994-2010

			Rams					Count	Population	Ratio (90% CI)	
Year	Lambs	Ewes	C I	C II	C III	CIIIB	C IV	Total	Total	Lambs (CI)	Rams (CI)
2002	29	83	7	15	28		7	57	169	35 (23, 47)	69 (49, 88)
2003	38	96	9	14	24		7	54	189	40 (27, 52)	56 (41, 72)
2004	50	103	17	10	30		6	63	216	49 (35, 62)	61 (45, 77)
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)

*Rams were not classifed within the Wenaha herd, only total number seen is given. Survey was conducted by ODFW staff.

Table 2. Population Trend and Herd Composition, Asotin Creek Herd, Blue Mtns. Washington.

			Rams					Ram	Population	Ratio (90% CI)	
Year	Lambs	Ewes	CI	CII	CIII	CIIIB*	CIV	Total	Total	Lambs	Rams
2002	7	17	0	4	4		1	9	33	41 (11, 72)	53 (17, 89)
2003	11	23	1	5	1		1	8	42	48 (19, 77)	35 (11, 58)
2004	12	22	6	1	5		0	12	46	55 (22, 87)	55 (22, 87)
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	10	30	2	8	6		3	19	59	33 (13, 53)	63 (33, 94)
2008	13	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)

* Class IIIB rams are Class IV rams broomed off to a point they no longer are considered full curl.

Table 3. Population Trend and Herd Composition, Black Butte Herd, Blue Mtns. Washington

			Rams					Count	Population	Ratios (90% CI)	
Year	Lambs	Ewes	CI	CII	CIII	CIIIB	CIV	Total	Total	Lambs	Rams
2002	2	18	3	6	14		1	25	51	11 (0, 25)	139 (68, 210)
2003	13	24	2	3	10		1	16	53	54 (23, 85)	67 (31, 102)
2004	9	26	6	4	6		1	17	52	35 (13, 57)	65 (32, 99)
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)

Count excludes the Upper Joseph subherd that resides in Oregon

Table 4. Mountain View herd population trend and composition counts, 1974-2010,
Blue Mtns., Washington.

			Rams						Population	Ratios (90% CI)	
Year	Lambs	Ewes	CI	CII	CIII	CIIIB	CIV	Total	Total	Lambs	Rams
2002	8	10	0	1	0		0	1	19	80 (18, 142)	10 (0, 27)
2003	0	11	1	1	4		1	7	18	0	64 (13, 114)
2004	10	14	2	2	2		1	7	31	71 (23, 120)	50 (12, 88)
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	2	24	0	9 (0, 20)
2009	0	7	0	4	2	0	0	6	13	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 population trend and composition counts, 1975-2010, Blue Mtns., Washington.

			Rams						Population	Ratios (90% CI)	
Year	Lambs	Ewes	CI	CII	CIII	CIIIB	CIV	Total	Total	Lambs	Rams
2002	0	7	0	0	4		2	6	11	0	86 (7, 164)
2003	2	9	1	1	3		1	6	17	22 (0, 51)	67 (9, 124)
2004	2	9	1	1	2		2	6	17	22 (0, 51)	67 (9, 124)
2005	2	5	2	1	2		2	7	14	40 (0, 95)	140 (5, 275)
2006									7 - 9		
2007	2	2	1						5	100 (0, 265)	0
2008	3	3	1		1		1	3	9	100 (0, 234)	100 (0, 234)
2009	0	7	0	1	0	0	1	2	9	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)

* School Fire burned the entire Tucannon Sheep range in 2005. Unknown number of sheep were directly killed and displaced during this event.

Table 6. Wenaha Herd Population Trend and Composition Counts, Blue Mtns. Washington.

			Rams						Population	Ratios (90% CI)	
Year	Lambs	Ewes	CI	CII	CIII	CIIIB	CIV	Total	Total	Lambs	Rams
2002	6	35	4	4	8		3	19	60	17 (5, 30)	54 (29, 80)
2003	12	29	4	4	7		3	18	59	41 (18, 65)	62 (31, 93)
2004	17	32	2	2	15		2	21	70	53 (27, 79)	66 (35, 96)
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)

( ) indicates number of Class-4 rams in > 3\4 class

BIGHORN SHEEP STATUS AND TREND REPORT: REGION 2

MT. HULL UNIT 10

SCOTT FITKIN, District Wildlife Biologist
JEFF HEINLEN, Wildlife Biologist

Population objectives and guidelines

Mt Hull Herd. The population objective for the Mt. Hull herd is 55-80 animals. Currently herd size is just above this level with an estimated 80-100 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 herd is 50 animals. Currently herd size exceeds this level with an estimated 70-90 animals. Over the last decade seasonal ranges for this herd have changed significantly, thus a reevaluation of the population objective may be warranted. The Sinlahekin herd is being managed for a stable population.

Hunting seasons and harvest trends

Mt Hull Herd. Due to a slightly lower ram cohort in the survey data ram permits were reduced from two to one in 2009. In addition two adult only ewe permits were issued for herd reduction goals. This is the first time ewe permits have been issued for this herd. WDFW permit holders harvested one mature ram and two adult ewes in 2010. In addition two adult ewes were harvested under the Colville Confederated Tribe (CCT) two ewe permits in 2010. No harvest occurred under the CCT any sheep permit in 2010 (Table 1). WDFW issued one any ram permit and two adult ewe only permits for 2011.

Sinlahekin herd. Due to an increased number of animals observed during the 2009 survey this herd met the statewide management guidelines to issue one any ram permit for the 2010 season. One mature ram was harvested in 2010.

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	1 ram	1 any	1 ram
2009	2 ewe	1 ewe	2 ewe	1 ewe
2010	1 ram	1 ram	1 any	0
2010	2 ewe	2 ewe	2 ewe	2 ewe

[a] CCT=Colville Confederated Tribes

Surveys

Population surveys are conducted almost every year on both the Mt Hull and Sinlahekin herds to determine composition and trend (Tables 2 & 3). The surveys are conducted in late fall or early winter and consist of helicopter or ground count surveys. An attempt is made to classify every bighorn sheep in each herd but that effort likely never results in a complete population census.

Mt Hull Herd. Washington Department of Fish and Wildlife Biologists conducted a ground survey of the Mt. Hull Unit in mid January 2011and classified 71 sheep, including 9 rams, 3 of which were $\geq$ ¾ curl (Table 2). The low observed ram count can be attributed to the late date of the survey. The rams most likely had separated from the ewe and lamb groups making their observation more difficult. Observed lamb production declined from that in 2009

Sinlahekin herd. Washington Department of Fish and Wildlife Biologists also conducted helicopter and ground surveys of the Sinlahekin Unit in early December 2010 and classified 67 sheep, including 14 rams, 5 of which were ≥ ¾ curl (Table 3). Observed lamb production remained the same from 2009.

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 have climbed gradually over the last 10 years following the 2000 Rocky Hull fire and are now continually above population objectives. The ram cohort fluxuated significantly in the early 2000s in response to fire activity in the US and Canada, but is now quite robust.

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).

Year	Lambs	Ewes	Rams <3/4	Rams ≥3/4	Rams Total	Count Total	Population Estimate	L:100:R
1992	0	26	1	7	8	34	40-60	0-100-31
1993	0	17	2	7	9	26	40-50	0-100-53
1994	5	28	2	8	10	53	50-60	18-100-36
1995	11	16	6	11	17	44	55	69:100:106
1996	0	5	10	6	16	21	40-60	0:100:320
1997	8	25	--	--	8	41	55-65	32:100:32
1998	--	--	--	--	--	--	--	--
1999	19	24	15	8	23	66	70	80:100:96
2000	21	30	9	0	9	60	60-65	70:100:30
2001	10	30	15	4	19	59	60-70	33:100:63
2002	11	40	6	4	10	61	65-70	28:100:25
2003	20	39	9	12	21	80	80-90	51:100:54
2004	9	32	7	10	17	58	70-90	28:100:53
2005	16	48	16	10	16	90	90-100	60:100:33
2006	8	40	25	5	30	77	100+	20:100:75
2007	13	54	17	6	23	90	100+	24:100:43
2008	18	52	20	13	33	103	110-120	35:100:63
2009	17	58	11	10	21	96	100+	36:100:29
2010	19	43	6	3	9	71	80-100	44:100:21

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).

Year	Lambs	Ewes	Rams <3/4	Rams >3/4	Rams Total	Unknown	Count Total	Population 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	0	0	0	0	0	0	0		
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	45:100:48

In 2001 WDFW augmented the herd with 8 ewes and 3 rams from the Cleman Mountain area. This herd was again augmented in 2003 with 5 animals from 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.

The number of bighorn sheep crossing west of Highway 97 and being struck by vehicles has decreased in the last few years. Four bighorn sheep perished each year in vehicle collisions during 2006 and 2007. However, only one bighorn sheep was known to perish in vehicle collisions in 2008, two in 2009, none in 2010, and none to date in 2011. Complaints from landowners due to large numbers of sheep foraging in irrigated agricultural fields adjacent to Mt Hull have also decreased in the past few years. This reduction in road kills and complaints may be due to herd reduction actions and the previous mild winter and wet summer providing adequate natural forage away from the highway and agriculture fields. Changes in private land use have also lead 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 over the last two winters, agency and tribal 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, we implemented ewe only permits starting in 2009 to help reduce herd size to management objectives. . Monitoring of the population to determine if these herd reduction efforts have achieved the desired results will occur over the next few years. If surveys indicate the Mt Hull population remains high, further herd reduction efforts may be implemented.

Sinlahekin herd. The long-term outlook for the Sinlahekin herd is improving. 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 have improved in the last few years with the 2009 survey documenting the most bighorn sheep in the last 20 years. This is likely a function of the herd expanding its range into previously unused habitat to the north, genetic mixing through augmentation and improved survey accuracy.

A total of 21 bighorn sheep were fitted with radio collars in two separate captures, one in 2010 (10 ewes and 2 rams) and one in 2011 (4 ewes and 5 rams). This research project is designed to gather data on herd range expansion and seasonal animal movements, and evaluate the effectiveness of prescribed fire as a sheep habitat enhancement tool in the Sinlahekin Wildlife Area. These collared sheep are being monitored 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 Psoroptic mange in a bighorn herd can vary from no signs at all (a few mites in the ears) to fatal infections. Monitoring of the herd will continue to determine the effect on the Sinlahekin bighorn sheep population.

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.

Cheat grass has flourished in portions of the burn and other new invasives, including white-top and dalmation toadflax are on the increase. In the past programs such as the Forest Service's aggressive weed control effort, funded by FNAWS 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 Sinlahekin herd with the small bighorn sheep herd at Omak Lake on the CCT. Radio collar data showed 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. The Omak Lake herd is pre-existing and has never been augmented. DNA testing of the Omak Lake herd showed all animals tested, but one, where identical to the Sinlahekin herd. The one remaining was identical 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 continuing to use the area from Aeneas Mountain south to Blue Lake within the Sinlahekin Wildlife Area. The amount of available sheep habitat on Aeneas Mountain and in the Sinlahekin Wildlife Area has likely declined due to tree encroachment and successional progression.

Much of the sheep forage habitat for the Sinlahekin herd is not under WDFW control. The WADNR and USBLM 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.

An extensive timber thinning and prescribed fire program within the Sinlahekin Wildlife Area reduced tree encroachment and increased forage on 400 acres of sheep habitat in 2005. This continuing effort burned an additional 350 acres and thinned an additional 200 acres of timber 2011. The projects 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 also improve habitat conditions within the Sinlahekin Wildlife Area.

Road mortality has been a minor issue in the Sinlahekin herd with four mature bighorn sheep rams and one lamb known to be killed 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 in the Mt Hull herd and in one case causing injury to a lamb in this herd.

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 year 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*. Despite conditions on Aeneas Mountain, overall herd demographics are improving. This is likely a result of herd expansion into previously unused habitat and augmentation efforts. An extensive fuels treatment and prescribed fire program in the Sinlahekin Wildlife Area and weed control strategies are producing improving habitat in the Sinlahekin Wildlife Area. In addition management should focus on continued habitat enhancement projects, separation of bighorn sheep from domestic sheep and goats, reducing competition with livestock and reducing the impacts of noxious weeds to insure the long-term health of the herd and the range. Also, the incidence of disease in the herd should be closely monitored due to proximity of a domestic sheep and goats.

As sheep move north onto Chopaka Mountain, competition with mountain goats may also be a concern.

BIGHORN SHEEP STATUS AND TREND REPORT: REGION 2

SWAKANE (SU 14), CHELAN BUTTE (SU 18) AND MANSON (SU 16)

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. Bighorn sheep from the Quilomene herd use areas along the Chelan-Kittitas County border in 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 110-120bighorn sheep in the Swakane herd as of June 2011. The 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 101-120 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 other Swakane harvest was by the 2002 auction tag winner. Currently, the bighorn season in the Swakane runs September 15-October 10. All of the hunters have been successful at killing a mature ram ($\geq$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 in 2009 and 2010. The final construction phase of the wildlife fence will be completed during summer 2011. A drawing permit for the harvest of one bighorn ram was reinstated for the 2010 hunting season The ram harvested in 2010 is considered 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;, all were successful. The 2010 auction permit holder and the 2010 North Central Washington-Big Game raffle permit holder also harvested a ram from the Lake Chelan herd. There will be two drawing permits offered for the the north shore of Lake Chelan for 2011.

The Chelan Butte herd was hunted for the first time in 2010, with the permit holder successfully harvesting a ram. 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 herd have confirmation of herd size and composition. Another drawing permit for the herd was offered in 2011.

Surveys

In the past 10 years, all 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.

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 compared to 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. Twenty-five Swakane bighorns were 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 is 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 rougly two miles to the south. Completion of the remaining section is planned for and 2011. Only two vehicle collision mortalities have occurred since completion of Phase 1of the fence.

Telemetry data from collared sheep has improved our ability to estimate population trends. In 2009 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.

The Lake Chelan herd exhibited rapid population growth typical of a founder population in excellent quality, unoccupied habitat. Disease and wildfire concerns have to date resulted in no observed impacts to the population. 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 rate of increase seems to have plateaued based on decreased observed lamb production. Evident from recent telemetry data, 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 finding them, 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).

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 is estimated at 84-98. In 2010 a ground survey resulted in a minimum count of 101 sheep, and in 2011, 93 sheep (Table 3). The Chelan Butte heard 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 are expanding 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. 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 S.R 97A and the Columbia River. Due to the observed preference of California bighorns for low elevation habitats, those 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 Lake Chelan 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 bighorns. The Foundation for North American Wild Sheep may be able to secure agreements for bighorn reintroduction, if landowner concerns can be addressed. 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 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

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 200 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. As resources become available, 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, 1996-2011

			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	14	63		14	16	23	107	110-120	22	48

*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

*High count of sheep observed by Chelan PUD during their 12 boat surveys per year.

Table 3. Observed population composition of the Chelan Butte Bighorn sheep herd, 2004-2009.

			Rams					Lambs:100	Rams:100	Population
Year	Lambs	Ewes	Yrl	<3/4 curl	≥3/4 curl	Total rams	Total sheep	ewes	ewes	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

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 four populations of California Bighorn Sheep: Tieton, Cleman Mountain, Umtanum/Selah Butte, and Quilomene. 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 also issues permits in all herds.

Surveys

Quilomene and Umtanum/ Selah Butte are typically surveyed via helicopter in June or early July. Cleman Mountain is surveyed at the feeding station in December/January. Aerial surveys in the Tieton have not been productive due to extensive cover, so the Tieton herd is mostly monitored via ground surveys and through interviews with permit holders. Umtanum and Selah Butte were aerial and ground surveyed numerous times from late 2009 through early 2011 due to a disease outbreak. 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 1960's) and the population was estimated at over 100 animals by the late 1960's. The population then crashed in the early 1970's. 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 around 2004-2006. Since 2007, aerial counts have generally been declining, but hunters are reporting more sheep than seen on aerial surveys, so the status of the herd in unknown.

The Cleman Mountain population was established in 1967 with the release of eight animals. The herd grew rapidly to over 100 animals and then declined and stagnated in the late 1980s. A portion of the population was captured, tested, and treated with antibiotics in 1990. Augmentation included 27 animals from 1989-96. Production increased after 1996 and the population exceed the goal of 150 animals by 2000 (Table 2). Over 135 sheep have been captured and translocated or used for research since 2001. Another 77 have been harvested, during that period, but the population is still above objective. The Cleman Mountain herd is very healthy.

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 one 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 subsequent increase in lamb production. Harvest was being increased to prevent population growth.

In December 2009, an outbreak of pneumonia was discovered at the north end of Umtanum. *Mycoplasma ovipnuemonia* was documented in the Umtanum 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 (Selah Butte). 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 *Mycoplasma ovipnuemonia.* 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 lamb survival to August in 2011 appears to be good, especially in Umtanum. It is too early to be sure, but the herd may now be recovering.

The Tieton herd was established with the release of 54 sheep from 1998-2002. Radio telemetry indicates relatively low mortality. The rams in the herd have been difficult to survey, due to heavy cover. However, very reliable hunters drew tags in recent years and have provided excellent data that supported population estimates. Lamb production has been very high. An aerial survey in 2008 confirmed the population was over objective. Sixty animals have been removed for translocation since 2009. During the capture, crews also confirmed population estimates. The area has a lot of suitable habitat. The production of 54 lambs from 81 ewes (67 lambs per 100 ewes) in 2008 was the highest ever recorded within the district. Since ewes do not typically breed until 2.5 year old and twinning is rare, nearly every ewe >2.5 was productive in 2008. Such high productivity indicates the herd is below carrying capacity and initial population goals were low. One problem has been that translocations focused on ewes, leaving a potentially large surplus of rams (Table 2). The rams were seen in fall 2009 and September 2010. Ground survey attempts in October and November failed to document many adult rams. Hunters confirmed the survey results. One patient hunter spent over 2 weeks scouting and hunting during the rut. The oldest ram he could find was 4.5 years old. A few rams were hit on the highway between Cleman Mountain and Tieton and movement between the herds has been documented via ear tags. Additional sheep were found on Cleman Mountain, but the numbers were small compared to what was missing. An air survey was flown in February, but no large numbers of adult rams were found.

Habitat condition and trend

Forage resources vary annually with moisture. Summer drought conditions ended in 2006. Moist spring and early summer 2010 and 2011 undoubtedly increased forage production. Small fires on Cleman Mountain and Tieton areas have regenerated new growth that benefited sheep, in the last 5 years.

Augmentation/habitat enhancement

Augmentation efforts ended in 2002. Cleman Mountain and Tieton are healthy herds and are being used as sources for translocation efforts. Consideration should be given to augmenting the Quilomene herd. Sheep at Cleman Mountain are fed during the winter and salt blocks are occasionally placed in the Tieton and Cleman Mountain ranges. In 2006, a large private ranch in Quilomene was purchased by WDFW and the possibility of domestic sheep grazing was eliminated. Similar efforts are under way in the Tieton and Cleman Mountain areas.

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 that documented in the Yakima River Canyon in 2009-2010.

Disease outbreak are not unexpected as domestic sheep and/or goats have been documented in close proximity to bighorns in every herd in the Region. In 2009 - 2011, a small but growing group of bighorns were seen within a USFS domestic sheep allotment a few miles west of the Cleman Mountain core herd. Domestic goat ranching has increased dramatically within the region in the last 10 years and contact with bighorns is likely. Radioing sheep in herds near USFS grazing allotments is currently underway and should continue, to document disease risk.

A concern the last 3-4 years has been Cleman Mountain and Tieton bighorn sheep licking highways. It is not uncommon for 40-60 animals to be on the pavement. The content of the de-icing materials is very attractive to bighorns. Center lines have had pits ground into the pavement in recent years. Those pits seem to concentrate the minerals and bighorns are often observed on the centerline. The highways also have many blind corners making accidents likely. Mineral blocks have been placed up away from the highways in attempts to attract bighorns away from traffic. Options are being explored to minimize the number of sheep on highways.

Table 1. Summary of bighorn sheep harvest in Region 3.

Area	Year	Permits	Harvest	Comments
Cleman Mtn.	1996	1	1	
	1997	2	2	
	1998	4	6	Harvest includes raffle and auction hunters
	1999	3	2	One hunter became ill and could not hunt
	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
Umtanum	1990	5	3	
	1991	3	3	
	1992	3	3	
	1993	3	3	
	1994	3	3	
	1995	3	3	
	1996	3	3	
Umtanum/Selah Butte	1997	3	3	
	1998	4	4	
	1999	4	4	
	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
Quilomene	1998	1	0	
	1999	3	6	Harvest includes auction, raffle, and 1 accidental
	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	
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

Table 2. Quilomene June Population Composition

Year	Lambs	Ewes	Total Rams	Adult Rams	Total Count	Estimated Population	Desired Population
1995	12	26	7		45		
1996	14	43	13		70		
1997	19	44	23		86		
1998	21	46	19	4	86	143	
1999	30	57	41		128	164	
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

Table 3. Clemans Mt. June Population Composition

Year	Lambs	Ewes	Total Rams	Adult Rams	Total Count	Estimated Population	Desired Population
1989			12		31	35	
1990	7		16			40	
1991	7	13	23	2	47	47	
1992	8	19	20	1	47	47	
1993	8	20	23		51	51	
1994	4	18	27		49	55	
1995	6	17	20	4	43	60	
1996	9	30	19		58	65	
1997	17	40	24	2	81	100	
1998	20	42	36		98	117	
1999	32	66	37		135	135	
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

Table 4. Umtanum/Selah Butte June Population Compostion

Year	Lambs	Ewes	Total Rams	Adult Rams	Total Count	Estimated Population	Desired Population
1990						180	
1991						190	
1992						190	
1993	32	66	31		129	200	
1994	20	102	29		151	200	
1995	41	83	53		147	175	
1996	34	72	52	0	158	175	
1997	13	61	36	11	110	175	
1998	30	41	37	4	108	175	
1999	26	68	44	0	138	175	
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	210	250-300

* Probable double count of 24 ewes and lambs

Table 5. Tieton Maximum June Population

Year	Lambs	Ewes	Total Rams	Adult Rams	Total Count	Estimated Population	Desired Population
1998	4	6	1	1	11	11	
1999	4	14	7		25	25	
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

Moose

MOOSE STATUS AND TREND REPORT: REGION 1
GMUs 101, 105, 108, 111, 113, 117, 121, 124 W.

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Population objectives and guidelines

Statewide goals for managing moose include the following: 1) to preserve, protect, perpetuate, and manage moose and their habitats to ensure healthy, productive populations; 2) to 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) to 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 2010, there were 68 permits available in 5 moose management units within the Colville District including the Kettle Range, Threeforks, Selkirk Mountains, 49 Degrees North, and Huckleberry Range Permit Hunts (Game Management Units 101/105/204, 108/111, 113, 117, and 121/124 West respectively). In 2010, drawings were offered in GMU 117 and 121/124 West for 9 “antlerless only” permits for youth, senior, or disabled hunters. In 2009, there were also 68 permits available in 5 moose management units within the Colville District as well as 9 “antlerless only” permits for youth, senior, or disabled hunters.

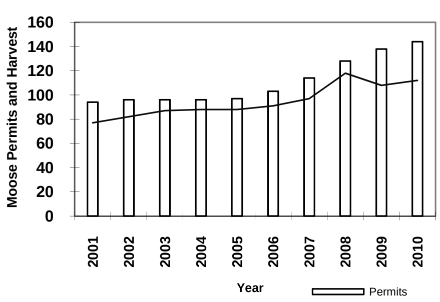

Figure 1. Statewide moose permit quota levels and harvest, 2001-2010.

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) to maintain options for hunting. Except for the 9 antlerless moose tags in the 49 Degrees North B, C, and Youth Only Permit Hunts and the Huckleberry Range B Permit Hunt, moose hunters in the Colville District units were allowed to take 1 moose of either sex.

A total of 65 moose, including 55 bulls and 10 cows, were harvested within the Colville District units in 2010 (Table 1). The hunter success rate was 96 % and hunters averaged 6.7 days of hunting per moose harvested. Permit hunts 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 for an 89 % success rate. Hunters averaged 2.4 days of hunting per moose harvested in those permit hunts.

Surveys

During the winter of 2010-2011, winter helicopter surveys were conducted in the Kelly Hill (GMU 105), Aladdin (GMU 111), Selkirk (GMU 113), and 49 Degrees North (GMU 117) management units. Surveys were conducted in portions of sub-watersheds referred to as “quadrats”. This survey method allowed for a complete census and repeatable coverage of targeted survey areas using GPS and real time tracking of the helicopter. The overall sighting rate was 16.1 moose per flight hour. In 2010-2011, the overall bull and calf to cow ratio was 45 bulls and 26 calves per 100 cows, respectively (Table 2).

Moose hunters provide incidental moose observations in the mandatory report. Hunters reported observing 871 moose within the Colville District during the 2010 season for a mean sighting rate of 13.1 moose per hunter (Table 3).

Population status and trend analysis

Early winter composition survey flights have been accomplished every year for the last 17 years (Table 4 and Figure 2). The December 2010 survey yielded an overall ratio of 45 $\pm$ 21 bulls observed per 100 cows (90% C.I., Skalski et. al 2005), which does not represent a significant decline from 52 $\pm$ 24 bulls per 100 cows observed in 2009. The calf to cow ratio was 26 $\pm$ 12 calves per 100 cows in 2010, which also does not represent a significant decline from 33 $\pm$ 7 calves per 100 cows observed in 2009. For both bulls and calves, the 10-year trend indicates a decline relative to cows (Figure 2).

Age and antler spread of harvested bull moose are monitored to detect trends in age structure of the bull population, which in turn indicates the mortality rate on the bull population (Figure 3 and Table 5). For the Colville District in 2010, the mean antler spread of harvested bull moose was 39 inches. The average age of bull moose taken in 2010 was 6.0 years. In 2010, 30 adult bulls (age 5+ years), 17 sub-adult bulls (age 2-4), and 2 yearling bulls were harvested. More adult bulls than subadults or yearlings were harvested in 7 of the 10 years from 2001 through 2010 (Table 5).

The limited hunter harvest has likely had a low impact on the overall population of moose within the Colville District. The hunter success rate in 2010 remained at a high level of 96%.

Habitat condition and trend

Moose prefer 15-25 year old clear cuts or pre-commercially thinned areas 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 significant 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. In the last 4 years Forest Practice Applications & Approvals were received for treating 13,663 acres, primarily within southern Stevens County, which includes GMUs 117 and 121. The broad scale application of herbicides may cause a reduction in carrying capacity for the moose population in northeastern 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 either herding 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 are the increasing rate of motor vehicle collisions with moose. Moose have also been known to attack snowmobilers, hikers, and other humans as a defensive reaction, especially cows with calves.

Management conclusions

The primary emphasis of the 2010-2011 winter moose survey was to obtain data in a systematic manner using quadrat surveys within the major traditional moose hunting units, where a majority of moose permits are allocated. Until recently, moose survey and harvest data indicated a robust moose population, with excellent quality hunting opportunity and reasonable numbers of mature bulls. In 2007, however, harvest success dropped (possibly due to weather), but rebounded to over 90% in 2008 through 2010. At the same time habitat conditions are becoming less favorable to moose with widespread herbicide treatment within shrub fields. In some hunt areas, WDFW has likely reached a threshold in permit levels. As a consequence permit levels may have to be adjusted to maintain the traditionally high harvest success rate.

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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 1. Colville District (GMUs # 101/105/204, 108/111, 113, 117, and 121/124 West) moose harvest and hunter effort, 2001 – 2010.

Year	Permit Quota	Success	Bull	Cow	Total	Total Days	Days / kill
2001	47	83%	36	3	39	318	7.6
2002	49	84 %	37	4	41	443	10.8
2003	56	91 %	46	5	51	390	7.6
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

Table 2. Composition counts of moose for helicopter-surveyed areas in the 2010-2011 winter.

Area	GMU	Bull	Cow	Calf	Unclassed	Total	Bulls :100 Cows : Calves	Hours	Moose/hour
Kelly Hill	105	10	5	2	0	17	200 : 100 : 40	2.1	8.1
Aladdin	111	2	4	1	0	7	50 : 100 : 25	1.2	5.8
Selkirk Mountains	113	10	35	5	0	50	29 : 100 : 14	2.9	7.2
49 degrees North	117	12	32	12	1	57	38 : 100 : 38	1.9	30.0
Overall :		34	76	20	1	131	45 bulls : 100 cows : 26 calves	8.1	16.1

Table 3. Moose hunter observations and days per kill in the Colville District for the 2010 season.

Area	Permit quota	Total moose Harvested	Total moose observed	Average number of moose seen per hunter	Average number of days per kill
Kettle Range	3	3	19	6.3	7.3
Three forks	6	6	104	17.3	7.8
Selkirk Mtns.	22	21	247	11.8	7.5
49 Degrees N	29	27	369	13.7	5.3
Huckleberry Mtns.	8	8	132	16.5	5.8
Overall :	68	65	871	Mean = 13.1	mean = 6.7

Table 4. Summary of early winter survey effort by helicopter on moose within the Colville District from 2001 through 2010.

Year	GMUs Surveyed	Hours Flown	Total Moose Observed	Moose Observed per Hour	Bulls : 100 Cows : Ca
2001	113, 117, 109, 121	11.0	97	8.8	63 : 100 : 35
2002	117, 121/124-W	7.3	139	19.0	128 : 100 : 74
2003	117, 111, 121	5.4	160	29.6	98 : 100 : 56
2004	113 , 117	7.7	107	13.9	83 : 100 : 45
2005	108, 111, 117, 121/124-W	7.5	102	13.6	71 : 100 : 42
2006	113 , 117	7.4	297	40.1	93 : 100 : 45
2007	113, 117, 121/124-W	9.6	197	20.5	90 : 100 : 37
2008	113, 117, 108/111	7.3	125	17.1	72 : 100 : 38
2009	113, 117, 121/124-W	7.1	195	27.5	52: 100 : 33
2010	105, 111, 113, 117	8.1	131	16.1	45 : 100 : 26

Table 5. Tooth age and antler spread in inches for harvested bull moose in the Colville District from 2001 through 2010.

Year	Mean Spread (inches)	Sample Size for Antler Spread	Mean Age (years)	Sample Size for Aging	Yearling	2-4 years old	$\geq$ 5 years old
2001	39	36	6.9	32	0%	31%	69%
2002	36	37	5.1	37	3%	61%	36%
2003	39	45	5.3	46	0%	46%	54%
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 %

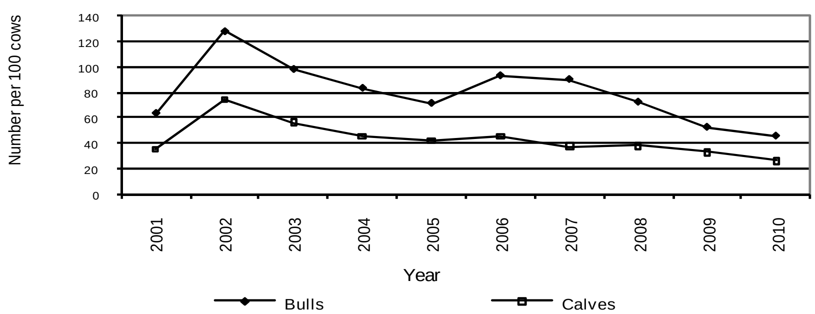

Figure 2. Age and sex ratios of moose observed during early winter helicopter surveys 2001-2010. Areas surveyed vary annually.

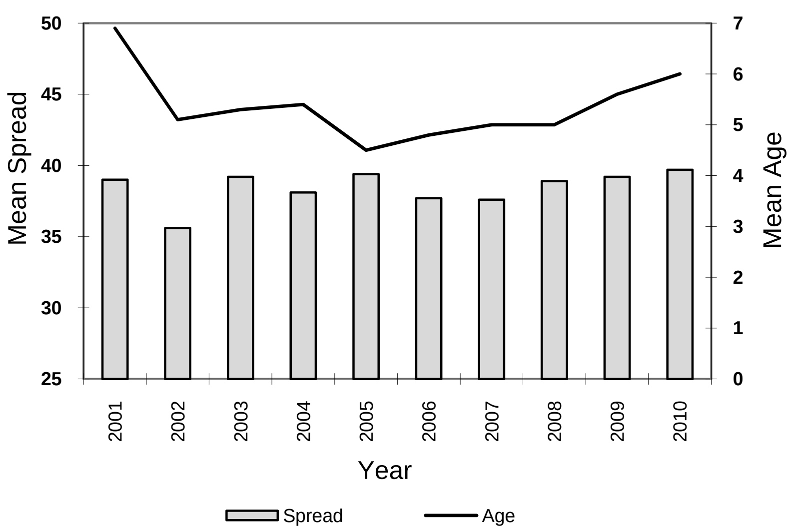

Figure 3. Mean age (years) and antler spread (inches) of bull moose harvested in the Colville District, 2001 - 2010.

MOOSE STATUS AND TREND REPORT: REGION 1

GMUS 124, 127, AND 130

HOWARD FERGUSON, District Wildlife Biologist
MICHAEL ATAMIAN, 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 near 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.

Permits were maintained at 50 this year -- 36 in Mt. Spokane and 14 in Hangman. However, one of the moose raffle permit hunters also hunted in GMU 124, successfully, bringing permits to 51 this year. There has been a steady increase in the number of applications for these permits with 24,771 this year, 18,799 in 2009, 16,777 in 2008, 14,811 in 2007, and 14,638 in 2006. Both the Hangman and Mt. Spokane units had an either-sex moose hunt and an antlerless-only hunt. The Mt. Spokane unit also had a youth-only antlerless hunt with 10 permits.

Forty-eight permittees reported in 2010, with 100% of those reporting having hunted moose. Only in the Mt. Spokane B hunt were all permits not issued and reporting rate was not 100%. Of the 14 permits offered in the Mt. Spokane B hunt only 13 were issued and one of the 13 hunters failed to report. A total of 44 moose were killed this year which is the same as last year (Table 1). The mean numbers of days hunted per kill increased from 3.1 in 2009 to 4.4 days this year (Table 1). The success rate for all hunts combined this year was 92%, but the any moose hunts (i.e. once in a lifetime bull hunts) had a success rate of 100%. The cumulative success rate since 2001 is 96% for all hunts and 99% for the "any moose" hunts.

The mean antler spread for bulls harvested in the Mt. Spokane unit in 2010 was 39.4 inches up from 35.8 in 2009 setting a high for this unit. The mean antler spread for the Hangman unit was 42.9 this year up from 36.7 in 2009 setting a new high for this unit, as well (Table 2).

Surveys

During the winter of 1999-2000, the first standardized aerial surveys were flown to survey for moose numbers in the Mt. Spokane Unit and adjacent management units of Idaho. These surveys were conducted by WDFW's Wildlife Science Division, in cooperation with Idaho Fish and Game.

Since 2002, aerial surveys have been flown every winter (December/January) by district biologists covering some of the same survey quadrats as those flown in 1999, with the exception of those units straddling the Idaho border. Additional survey quadrats have been established in the Hangman unit around Tekoa Mtn. and will be surveyed when funds allow. See Tables 3 and 4 for a comparison of moose observed from aerial survey data.

Population status and trend analysis

The number of moose observed during aerial surveys varies somewhat from year to year depending on survey conditions; however, the trend suggests a stable population in the Hangman Unit and an increasing population in the Mt. Spokane Unit (Tables 3 and 4). 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 to increase.

Survey results vary from year to year (Table 4). This is primarily attributed to these GMUs bordering with Idaho and the movement of moose back and forth across state lines. Snow depths appear to have a strong influence not only on the ability of the surveyors to detect moose, but also on the distribution of moose across survey quadrants. Heavy snowfalls tend to push moose down into the lowlands, while in low snow years they remain at higher elevations.

While moose are apparently expanding their distribution in the district, and the number of nuisance complaints is on the rise, the greatest increases appear to be occurring on private lands and at lower elevations where hunter access is limited. Management in this district is complicated by the fact that the moose regularly move from Washington to Idaho and back. Numbers vary throughout the season depending on hunting pressure, weather and snow conditions.

Habitat condition and trend

Moose prefer 15-25 year old clear-cuts or thinned stands on mesic sites. 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 largely composed of large private timberlands in some stage of succession that is of benefit to moose, especially winter range. Lands owned by Washington State Parks provide ample security habitats but little forage in the Mt Spokane unit. The clearcut logged habitats with abundant high quality forage and good hiding cover are thought to be important to moose in all seasons. Forested cover is important during summer heat and deep winter snow (Costain 1989).

The Hangman Unit is mostly agricultural land with moose range largely limited to the northeast portion of the area. The limited forage areas for moose in the Hangman Unit tend to restrict the opportunity for moose to expand greatly in that unit. However, where moose do occur in the Hangman unit, habitat quality appears to be high allowing moose to occur at observed high densities; 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 moose damage/nuisance hunt that was initiated in 2009 continued in 2010. This hunt is a limited entry hunt (20 master hunters only) and ran from Dec 1 through Mar 31. Only one hunter was called and only one nuisance moose harvested in 2010. This was due primarily to the mild winter allowing moose to remain at higher elevations, thus reducing moose nuisance complaints. Dealing with urban/suburban moose will continue to be a priority for WDFW in the Spokane area.

Management conclusions

While there is tremendous interest in moose hunting in Washington, coincidentally moose populations appear to be expanding their distribution. The results of recent surveys indicate that numbers of moose in the Mt. Spokane may be increasing while the Hangman Units are stable (Table 3). Both units are prone to fluctuation because of proximity to the Idaho border – allowing more movement in and out of our aerial survey boundaries, variable winter weather conditions, and flight time year to year.

Permittee satisfaction with the quality of the hunt will continue to be monitored in both units, particularly for the "once in a lifetime" hunts, to ensure a high quality and successful hunt with permits being adjusted accordingly with population data.

Large concentrations of moose in the Hangman unit are limited to the northern end of the units (GMUs 127 and 130); however, moose density in some of these areas is high. Though moose have been observed in other areas and other GMUs, these isolated populations, although increasing, do not seem to be increasing as quickly as the herd in GMU 124 did during the 1990s.

Information gathered by the Washington Department of Transportation has revealed a large 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 comes from moose being observed while performing elk surveys in and around Turnbull National Wildlife Refuge. These sightings have shown low moose numbers that have been slowly increasing.

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Myers, W. 2000. Personal communication.

Table 1. Moose harvest and hunter effort for GMUs 124, 127 and 130.						
						Days/
Year	**Permits**	**Success**	**Bulls**	**Cows**	**Total**	**Kill**
2001	45	82%	18	19	37	9.6
2002	45	96%	15	25	40	9.0
2003	38	97%	13	24	37	4.1
2004	38	92%	13	22	35	6.6
2005	37	95%	17	18	35	4.5
2006	40	100%	14	19	33	5.4
2007	40	100%	14	21	35	3.2
2008	50	90%	17	27	44	4.2
2009	50	90%	18	26	44	3.1
2010*	50	92%	19	25	44	4.4
*Does not include Hunt #8014 or Raffle Hunt in 124.						

Table 2. Antler average spread for moose units.		
Year	**Mt. Spokane**	**Hangman**
2001	29.5	40.3
2002	31.5	37.2
2003	31.9	40.3
2004	35.4	32.7
2005	36.5	35.1
2006	29.2	34.1
2007	39.2	32.3
2008	32.4	33.5
2009	35.8	36.7
2010	39.4	42.9
Average	**34.1**	**36.5**

Table 3. Observed moose for each unit for years 1999-2010, during aerial surveys.										
Unit	**1999**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Mt. Spokane	88	45	43	150	22	66	77	78	80	122
Hangman	0	46	17	57	53	28	35	41	44	46

Table 4. Moose observations and herd composition during aerial surveys from 1990 to 2010

Survey Area	Year	Bull	Cow	Calf	Total	Bull:Cows:Calf
Mt. Spokane Unit	1990	-	-	-	7	39:100:61
Mt. Spokane Unit	1992	-	-	-	7	50:100:25
Mt. Spokane Unit	1999	8	22	11	41	36:100:50
Idaho-Unit*	1999	6	27	14	47	22:100:52
Mt. Spokane Unit	2002	11	23	8	42	48:100:35
Hangman Unit	2002	5	33	16	54	15:100:48
Mt. Spokane Unit	2003	9	22	12	43	40:100:55
Hangman Unit	2003	4	9	4	17	44:100:44
Idaho-Unit*	2004	31	46	21	98	67:100:46
Mt. Spokane Unit	2004	14	22	16	52	64:100:73
Hangman Unit	2004	18	19	20	57	95:100:95
Mt. Spokane Unit	2005	4	12	6	22	33:100:50
Hangman Unit	2005	13	30	11	54	43:100:37
Mt. Spokane Unit	2006	22	30	13	65	73:100:43
Hangman Unit	2006	7	14	6	27	50:100:43
Mt. Spokane Unit	2007	26	33	18	77	79:100:54
Hangman Unit	2007	8	19	8	35	42:100:42
Mt. Spokane Unit	2008	20	43	14	77	47:100:33
Hangman Unit	2008	2	24	15	41	8:100:63
Mt. Spokane Unit	2009	18	41	21	80	44:100:51
Hangman Unit	2009	6	27	11	44	22:100:41
Mt. Spokane Unit	2010	21	68	33	122	31:100:49
Hangman Unit	2010	6	25	15	46	24:100:60

* Survey unit primarily in Idaho

Cougar

COUGAR STATUS AND TREND REPORT
STATEWIDE

DONALD A. MARTORELLO, Carnivore, Furbearer, and Special Species Section Manager

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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 kittens) statewide.

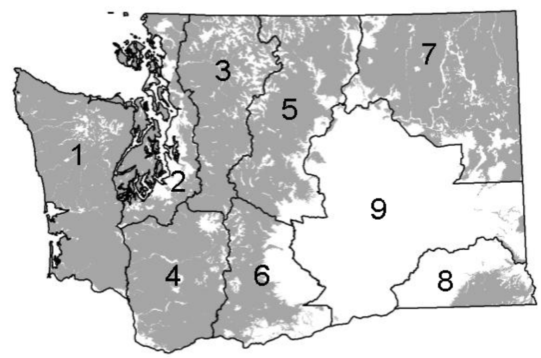

Figure 1. Distribution of cougars (gray) and cougar management units in Washington.

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.

Hunting seasons and harvest trends

Hunting seasons have been fairly dynamic in Washington over the past decade. Most of the major changes in hunting seasons have been due to experimental seasons evaluating the use of cougar hunting with the aid of dogs. Since 2000, four separate pieces of legislation allowed for the use of dogs to hunt cougar for potential benefits to public safety and protection of personal property. The issue is very contentions and continues to be debated in the public, legislative, and scientific arenas.

Statewide cougar harvest was 165 animals in 2010,

Table 1. Cougar population objectives for each cougar management unit in Washington, 2008.

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

* Implement cougar population reductions over a 3-year period and monitor annually.

which is below the 10-year average of about 200 (Table 2). The Game Management Plan identifies allowable female harvest guidelines that results in a stable cougar population based on the research findings in Washington. In general, reductions in cougar seasons coincide with areas where harvest trends exceed the female harvest guidelines.

Recent work has demonstrated that heavy hunting can change the age structure of the cougar population, which can then impact the territoriality among adult males. The Department is currently evaluating the need for an adult male harvest guideline for managing hunting seasons.

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 (Table 4). 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. There continues to be a critical need for better information of cougar behaviors related to human-cougar interactions, impacts of population manipulations to conflict levels, and predator-prey interactions.

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Table 2. Cougar harvest statistics by CMU, WDFW.

CMU	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
1	34	15	24	14	18	26	7	18	17	9
2	17	8	2	13	11	11	12	12	11	6
3	11	15	3	4	3	7	9	7	6	2
4	20	12	19	28	25	23	11	16	12	20
5	64	42	46	52	45	42	64	49	21	41
6	16	14	20	13	10	13	14	21	16	17
7	115	90	86	65	75	54	65	41	41	48
8	19	13	18	14	11	14	9	14	7	15
9	4	1	4	5	4	10	10	10	11	7
	300	210	222	208	202	200	201	188	142	165

Table 3. Cougar statistics 2010, WDFW.

	General Season				Special Permit Season				Depredation/Kill permit				Other			
CMU	M	F	Unk	Total	M	F	Unk	Total	M	F	Unk	Total	M	F	Unk	Total
1	5	2	0	7	0	0	0	0	0	1	0	1	1	0	0	1
2	2	4	0	6	0	0	0	0	0	0	0	0	0	0	0	0
3	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
4	10	9	0	19	0	0	0	0	0	1	0	1	0	0	0	0
5	4	10	0	14	11	6	0	17	3	3	0	6	0	4	0	4
6	3	6	0	9	6	2	0	8	0	0	0	0	0	0	0	0
7	9	14	0	23	14	4	0	18	1	2	0	3	3	1	0	4
8	7	6	0	13	2	0	0	2	0	0	0	0	0	0	0	0
9	4	3	0	7	0	0	0	0	0	0	0	0	0	0	0	0
Total	46	54	0	100	33	12	0	45	4	7	0	11	4	5	0	9

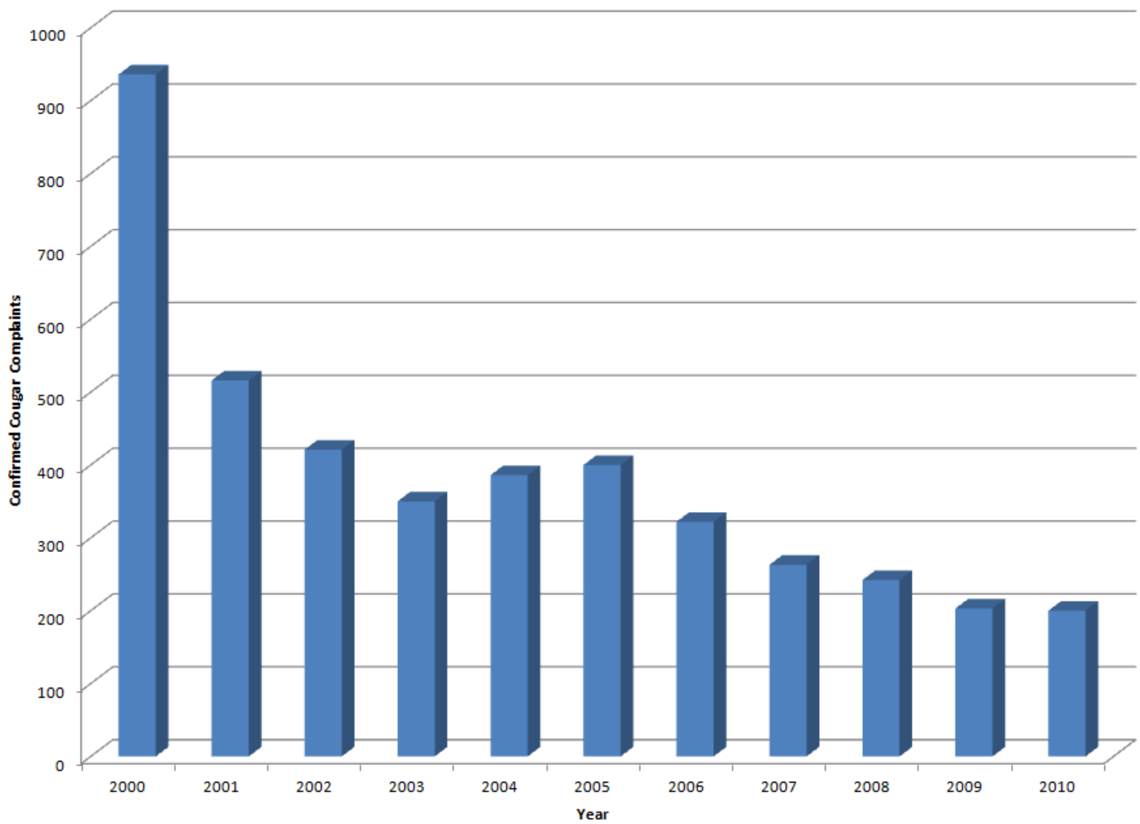

Figure 2. Statewide confirmed cougar complaints, 2000-2010, WDFW.

Black Bear

BLACK BEAR STATUS AND TREND REPORT
STATEWIDE

DONALD A. MARTORELLO, Carnivore, Furbearer, and Special Species 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 (BBMU's)(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). 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.

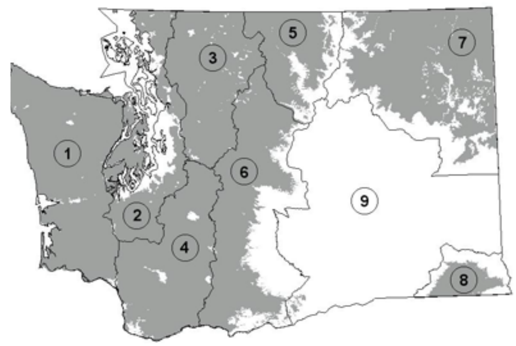

Figure 1. Black bear distribution and black bear management units.

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 began monitoring female and cub survival in western Washington (Capitol Forest) in

2004 and is currently initiating a project in northeastern Washington.

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 2010, 1,972 bears were harvested during recreational seasons, which is above the long-term average of about 1,481 bears per year (Table 2). Increases in harvest are typically associated with falls when nature foods are less abundant.

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

Since bear populations appear to be healthy throughout Washington, formal population estimation studies have not been a high priority. However, the Department has conducted some 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.

Beginning in 2004, capture efforts have been initiated in eastern Washington to monitor adult female and cub survival in selected areas to better assess bear population status and impacts of hunting (see Coastal Black Bear Management Unit report).

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

Table 2. Statewide black bear harvest, hunter effort, and median age information, 1996 - 2010, 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	Median Age: % 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	NA	NA	NA

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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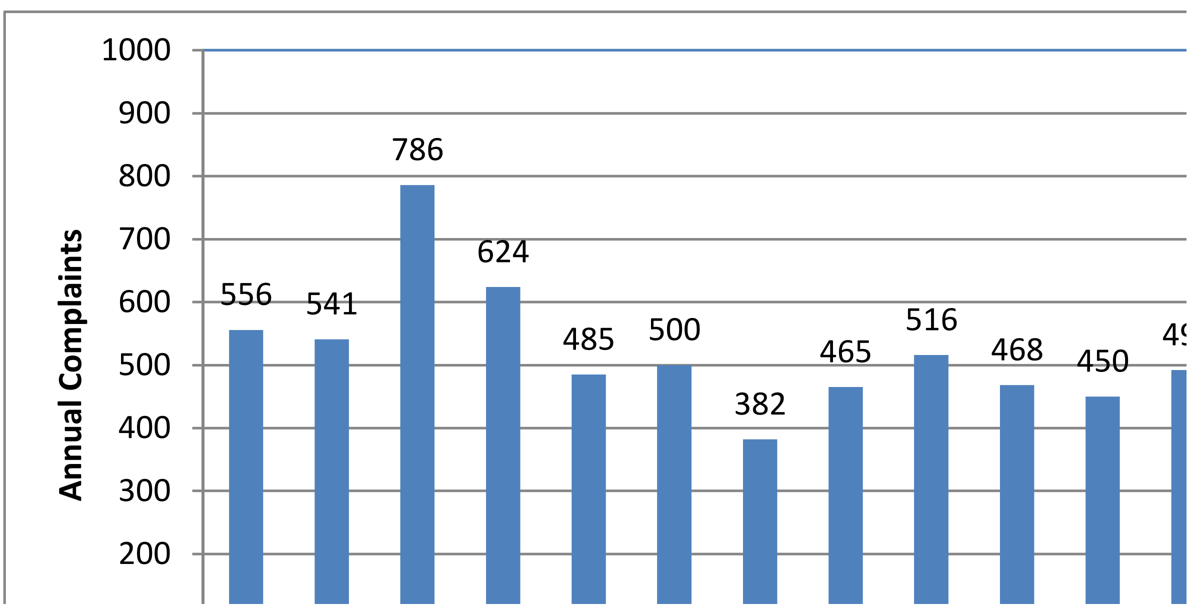

Figure 2. Trend in confirmed human-black bear interactions in Washington.

BLACK BEAR STATUS AND TREND REPORT: REGION 1
Northeastern Black Bear Management Unit (BBMU 7)
GMUs 101, 105, 108, 111, 113, 117, 121

DANA L. BASE, DISTRICT WILDLIFE BIOLOGIST

Population objectives and guidelines

The objective for the Northeastern Black Bear Management Unit (BBMU) 7 is to maintain a healthy bear population and to minimize threats to public safety and property damage from black bears. Hunting opportunity is maximized consistent with statewide bear harvest guidelines and trends in depredation and nuisance complaints. Harvest guidelines are based on median ages of males and females, and percentage of females in the bear harvest. The acceptable median age parameters for harvested males and females are 2-4 years and 5-6 years respectfully. The acceptable percentage of females in the harvest is 35-39%.

Hunting seasons and harvest trends Beginning in 2009 the general fall black bear season within GMUs 101-121 of the Northeastern BBMU was changed to open on September 1. The closing date remained the same, however, on November 15. An estimated total of 3,643 hunters hunted these units in 2010, which was about a 4% decrease from 2009, and the lowest number since 2001. The 2010 spring permit and fall general combined hunter harvest was 353 black bears. This was a substantial increase from the 285 bears harvested in 2009, however, the 2010 harvest remained below the seven-year (2001-2007) annual average harvest of 398 black bears. Hunter success in 2010 was 10%, which along with 2003 is the highest rate observed since 2001 (Table 1, Figure 1).

Population status and trend analysis

Within GMUs 101-121 of the Northeastern BBMU, the median age of harvested female black bears in 2010 was 4.5 years (Table 1, Figure 2). This median age is short of the acceptable limit for female black bears. The median male age in 2010 was 3.5 years, which is within the acceptable limit for male black bears (Table 1, Figure 2). The percentage of female black bears in the harvest increased in 2010, climbing to 36% from 33% in 2009. This proportion, 36% of the total bear harvest, is within the parameter for acceptable harvest limits for black bears.

Nuisance and damage activity

Black bear incidents (including sightings, nuisance complaints, and depredations) are common in the Northeastern BBMU. Agency staff continue to stress management of food, garbage, and other attractants to avoid bear/human conflicts. High-risk bear incidents involving depredation on livestock, pets, or dangerous behavior toward humans are seriously addressed and usually result in the black bear being euthanized.

Habitat condition and trend

Huckleberry and other soft mast production were reported to be good in 2010; however, the long-term bear habitat condition and trend is uncertain. Recently large tracts of private industrial timberlands have been treated with herbicides to control broadleaf plants, including berry-producing shrubs that compete with regenerating conifer trees. In the last four years Forest Practice Applications & Approvals were received for treating 13,663 acres mostly within GMUs 117 and 121.

While humans are increasingly moving into bear habitat, people today tend to make more of an effort to avoid conflicts rather than to just eliminate the bear. Conflicts with bears escalate during specific years when huckleberry production fails; otherwise bears and humans generally co-exist in the same habitats with information and education from the WDFW providing intervention when necessary. Eliminating food attractants around residences and campsites greatly reduces the conflicts that humans have with black bears.

In years of low natural berry production the bears typically move to the lower elevations and forage extensively on residential fruit trees and gardens, consuming the fruit and extensively damaging trees and protective fencing. These bears are exceptionally difficult to manage for the homeowner and WDFW. The bear mortality rate is high when these conditions prevail.

Management conclusions

Spring 2010 was the third year for a spring permit season on black bears. There was a moderate increase in permit numbers going from 70 to 90 permits available within 6 GMUs for spring black bear hunts to run from April 15 through May 31, 2010. The spring harvest was reported to be 14 black bears taken for a success rate of 16%. The percentage of female black bears in the harvest was within management guidelines in 2010, however, the median age of hunter-harvested female black bears was not.

Hunters have unlawfully killed at least 3 grizzly bears by mistaken bear identity within the last 13 years. A voluntary bear identification and certification program has recently been developed to help reduce the possibility of incidental take while black bear hunting. The WDFW and U.S. Forest Service also continues to provide a proactive approach to maintaining black bear hunting within the Selkirk Grizzly Bear Recovery Zone (northern portion of GMU 113) through information and education in the form of contact with hunters in the field, presentations at hunter education classes, and other community gatherings. Signs that provide information on species identification, bear awareness, and do's & don'ts in "bear country" are posted liberally throughout much of northeastern Washington to remind hunters and campers that grizzly bears are known to occur in the area.

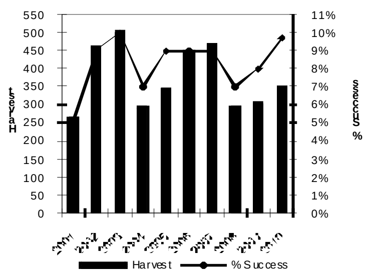

Figure 1. Total harvest and % hunter success within GMUs 101-121, BBMU 7,

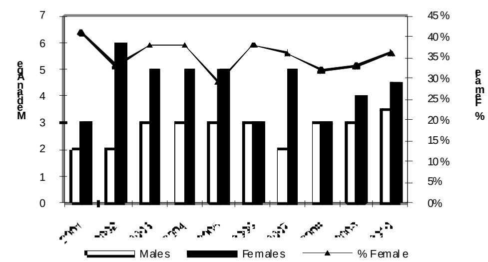

Figure 2. Median ages of harvested bears and % females in the harvest, BBMU 7, 2001-2010.

Table 1. Black bear harvest, hunter effort, and median age, Northeastern Black Bear Management Unit, GMUs 101-121, 2001-2010.

Year	Male	Female	Total	# of Hunters	Success	General Season Hunter Days	Days per kill	Median Age Males	Median Age Females	% Females
2001	158	108	266	4,967	5%	33,667	127	2.5	3.5	41%
2002	308	151	459	5,000	9%	34,739	76	2.5	6.5	33%
2003	310	193	503	4,943	10%	32,961	66	3.5	5.5	38%
2004	181	113	294	4,405	7%	28,414	97	3.5	4.5	38%
2005	247	100	347	4,090	9%	26,541	77	3.0	5.0	29%
2006	279	171	450	4,750	9%	27,756	62	3.0	3.5	38%
2007	301	167	468	5,268	9%	30,569	67	2.0	5.0	36%
2008	202	95	297	4,467	7%	27,520	99	3.0	3.0	32%
2009	190	95	285	3,786	8%	23,133	86	3.0	4.0	33%
2010	227	126	353	3643	10%	21,331	63	3.5	4.5	36%

BLACK BEAR STATUS AND TREND REPORT: REGION 1
BLUE MOUNTAINS BLACK BEAR MANAGEMENT UNIT (BBMU 8)

PAUL WIK, District Wildlife Biologist

Population objectives and guidelines

The black bear population in the Blue Mtns. BBMU is managed to provide maximum recreational opportunity, while maintaining a healthy bear population and minimizing conflicts with the public and other resource management objectives. Harvest guidelines are based on median ages of males and females, and percentage of females in the bear harvest. The acceptable median age parameters for harvested males and females are 2-4 years and 5-6 years respectfully. The acceptable percentage of females in the harvest is 35-39%. Currently, the black bear population in the Blue Mountains appears strong, and offers excellent hunting opportunity during the spring permit hunt, and the fall general season.

Hunting seasons and harvest trends

Two bear hunting opportunities are offered in the Black Bear Management Unit 8 (BBMU-8). The general season runs from Sept. 1 - Nov. 15. A permit controlled spring bear season runs from April 15 to May 31 in most units, and April 15-June 15 in GMU-169 Wenaha, with 115 permits distributed between 7 game management units.

The permit controlled, spring hunting season was added in 1999 in order to improve the distribution and composition of the bear harvest. From 2001-2010, 1214 permits have been issued with 644 hunters participating in the hunt. Hunters averaged 31% success, harvesting 199 bears; 129 males, and 70 females. Hunters during the spring of 2010 had a success rate of 23%, harvesting of 17 bears; 11 males, 6 females (Table 2).

Hunter success during the 2010 fall general season was 6%, with a harvest of 89 bears (53 males, 36 females). The 2010 general season bear harvest increased slightly over the 2009 harvest, but is still very close to the 2001-2010 average harvest of 85 bears/year. The combined harvest for the 2010 spring/fall seasons was 106 bears; 64 males, 42 females.

The bear harvest in the Blue Mountains has remained fairly stable over the last 10 years, ranging from 84 - 165 bears during this period, with an average of 104 bears/year (Table 3.). The percentage of females in the harvest varies from year to year, averaging 35% over the 10 year period.

Nuisance and damage

The number of bear complaints received has remained relatively low during the last few years.

Habitat condition and trend

The U.S. Forest Service continues to implement their prescribed fire program on the Pomeroy Ranger District. This program will help improve habitat conditions on the Forest, which will eventually benefit the bear population by increasing the forage base (i.e., huckleberry fields).

Extensive wildfires in 2005 and 2006 burned 163,000 acres of habitat in GMU’s 154, 162, 166, 175, and 178: School Fire (2005), Columbia Complex Fire-(2006). The fires have created excellent habitat conditions for bears, as shrubs and new vegetation in the burned areas regenerate.

Management conclusions

The black bear population in the Blue Mountains appears to be stable. The Wenaha-Tucannon Wilderness and Mill Creek Watershed are remote areas that contain healthy bear populations, but receive very little hunting pressure. These areas supplement bear populations in adjacent units through emigration.

Combining the general bear season with a permit controlled spring bear season has provided expanded recreational opportunity, and a well-balanced harvest by game management unit.

Table 1. Black bear general season harvest summary 2001-2010, Blue Mountains, Washington

GENERAL SEASON HARVEST								**Days/**	**Median Age**	
YEAR	**Male**	**Female**	**Total**	**% Female**	**Htrs**	**Htr Succ**	**Htr Days**	**Kill**	**Male**	**Female**
2001	42	32	74	0.43	1,429	0.05	9,377	127	3.0	2.5
2002	86	49	135	0.36	1,478	0.09	9,026	67	5.0	5.5
2003	57	41	98	0.42	1,312	0.07	8,582	88	5.5	4.5
2004	49	29	78	0.37	1,292	0.06	7,989	102	5.5	8.5
2005	43	18	61	0.30	1,128	0.05	7,108	117	3.5	4.5
2006	65	26	91	0.29	1,175	0.08	6,793	75	4.0	3.5
2007	53	20	73	0.27	1,386	0.05	8,066	110	4.0	6.0
2008	52	24	76	0.32	1,502	0.05	9,017	119	3.8	8.6
2009	51	29	80	0.36	1,419	0.06	8,828	110	6.2	6.4
2010	53	36	89	0.40	1,473	0.06	9,191	103	5.0	6.9
10-yr Avg	**55.1**	**30.4**	**85.5**	**0.36**	**1359**	**0.06**	**8,398**	**98**	**4.6**	**5.7**

Table 2. Spring bear hunt summary 2001-2010, Blue Mountains, Washington

PERMIT HISTORY								**App's Rec**	**% Htrs.**	**Median Age**	
Year	**Permits**	**Htrs.**	**Male**	**Females**	**Total**	**Htr. Succ.**	**% Females**		**Hunted**	**Male**	**Female**
2001	108	47	5	3	8	17%	38%	587	44%		
2002	106	72	18	12	30	42%	40%	562	68%		
2003	105	57	13	2	15	26%	13%	626	54%		
2004	105	72	9	5	14	19%	36%	825	69%		
2005	105	57	10	3	13	23%	23%		56%		
2006	105	33	13	4	17	52%	24%				
2007	155	69	17	12	29	42%	41%				
2008	155	81	16	12	28	35%	43%			4.8	3.0
2009	155	81	17	11	28	35%	39%	2586	63%	4.5	9.7
2010	115	75	11	6	17	23%	35%		65%	3.7	4.0
10-yr Avg			12.9	7	19.9	0.314	0.332				

Table 3. Bear Harvest Summary, Blue Mtns., Wash.

Year	**Males**	**Females**	**Total**	**%Females**
2002	104	61	165	37%
2003	70	43	113	38%
2004	58	34	92	37%
2005	53	21	74	28%
2006	78	30	108	28%
2007	70	32	102	31%
2008	68	36	104	35%
2009	68	40	108	37%
2010	64	42	106	40%

BLACK BEAR STATUS AND TREND REPORT: REGION 2
EAST CASCADES BLACK BEAR MANAGEMENT UNIT (BBMU 6)

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

Population objectives and guidelines
Management goals for black bears in the East Cascades Black Bear Management Unit (BBMU 6) are to ensure healthy populations, provide for multiple use and hunting opportunity under sustained yield management, minimize human-bear conflicts and better understand the role of black bears in predator prey systems. Recreational hunting is the major source of mortality within hunted populations. Current guidelines direct management based on parameters of the harvest. Under an acceptable harvest management condition, the female portion of the total harvest ranges between 35% and 39%, a median age of the female harvest ≥6 years old, and median age of the male harvest ≥5 years old.

Hunting seasons and harvest trends
Beginning in 1999, big game license packages included a black bear tag (lowering the cost). As a result of this change, the number of bears hunters more than tripled in 1999 (11,050), compared to an average of 3,394 from 1989 to 1998 (Table 2). Since the increase in 1999, bear hunter numbers declined to around 5,300 in 2001 and have stabilized at that level for the last decade, averaging around 4,900. Hunter success has been relatively stable during the last decade, ranging from 3.3 to 5.3%, and averaging 5%. In 2010, hunter success increased to 6.8% .

The harvest of black bears in BBMU 6 ranged between 120 and 339, from 1995 to 2010, averaging 193 (Table 2). In 2010, 275 black bears were harvested,, the third highest harvest in the past 16 years. Over the same time period, median female age was 7 years and male age was 4. The percent of females in the harvest was 36% in 2010. The average female harvest over the last decade has been 31%, remaining within the desirable harvest guidelines. Both sex and age composition of the harvest is within the acceptable and desirable harvest objectives.. The increase in harvest and hunter success may be attributed to a poor berry crop in 2010, forcing bears to travel more and into lower elevations for food, thereby making them more available to harvest.

Population status and trend analysis
Harvest statistics indicate the bear population in BBMU 6 is within management objectives. The percentage of females in the harvest has averaged 31% over the last decade, while the median age of male and female bears harvested have remained stable. These data suggest a stable population and harvest.

Nuisance and damage activity
In recent years, bear nuisance and damage complaints increased over historical levels. Most of the bear nuisance complaints involve garbage, bird feeders and/or pet food at residences in the Leavenworth and Lake Wenatchee areas. Much of the recent development is of summer or weekend residences where garbage ,bird feeders, and pet food are left unattended for extended time periods. Complaints have resulted in some bears being relocated and some euthanized, however, the cause lies with people providing attractants, not with an increasing black bear population. Efforts to increase the public's awareness of garbage, pet food and bird feeders as attractants to bears are ongoing.

Habitat condition and trend
Large sections of BBMU 6 are in remote wilderness areas where little human habitat alterations occur. Forest management has not changed significantly in recent years and provides abundant quality habitat. Black bears rely on berries and other soft mast production as a staple food source, but the quality and quantity of these food sources varies yearly with climate conditions. Mast production is not surveyed in BBMU 6, but observations from Forest Service personnel indicate that 2010 was a very poor year for huckleberries and other mast.

Development and recreation in the suburban-wildland interface continues to expand, and reducing the availability of lower elevation black bear habitat. This expansion also increases opportunities for bear-human conflicts.

Management conclusions

The black bear population in BBMU 6 appears to be stable. High amounts of secure, relatively inaccessible habitat suggest the population will remain so under current management. Trend in age and sex composition of harvested bears will continue to be monitored.

Table 2. Black bear harvest statistics and hunter information for BBMU 6, 2001-2010.
GMU's 244-247, 249-251, 328-368, 382, 388, 578.

Year	No. males	No. females	Total	No. hunters	% success	Hunter days	Median Age: Males	Median Age: Females	% females in harvest
2001	138	73	211	5,283	4.0	42,408	2.5	6.5	35
2002	142	67	209	5,356	3.9	41,302	5.5	8.5	32
2003	129	58	187	4,768	3.9	36,686	3.5	6.5	31
2004	125	73	198	4,664	4.2	34,460	4.5	7	37
2005	114	52	166	4,326	3.8	33,293	4.5	7	31
2006	148	101	249	4,828	5.2	33,738	4.5	6.5	41
2007	105	41	146	5,204	5.3	33,738	2.5	12	28
2008	181	96	277	5,299	5	36,628	2.5	4.5	35
2009	102	58	160	4,842	3.3	31,794	4.5	4.5	36
2010	176	99	275	4,669	6.8	30,686	N/A	N/A	36
Avg.	**136**	**72**	**208**	**4924**	**5**	**35473**	**4**	**7**	**34**

BLACK BEAR STATUS AND TREND REPORT: REGION 2
OKANOGAN BLACK BEAR MANAGEMENT UNIT (BBMU 5)

SCOTT FITKIN, District Wildlife Biologist
JEFF HEINLEN, Wildlife Biologist

Population objectives and guidelines
Harvest guidelines are designed to provide maximum recreational harvest opportunity and minimize nuisance and damage complaints, while maintaining population health. The Okanogan BBMU currently meets the state management plan objective of a sustainable well-distributed black bear population.

Hunting seasons and harvest trends
The 2010 black bear season in the Okanogan BBMU occurred between August 1-November 15. Hunters had variable conditions during the general season due to spotty berry production and particularly poor crops of service berries and choke cherries at lower elevations. Even so, Hunter success increased and hunter numbers increase in 2010 to 1574, a bit below the 10-year average. (Table 1).

Population status and trend analysis
Bears have always been a difficult animal to survey and census. Results from WDFW black bear research have helped refine statewide population estimates; however, no estimate for the Okanogan BBMU exists.

An ongoing research project is currently using bear hair-snag techniques to investigate black bear movement and distribution in relation to highways in the North Cascades. This DNA sample collection approach holds promise as a long-term population monitoring tool for this species. An effort to test this methodology in select areas of the state including the Okanogan Unit may begin next year.

Harvest figures and age population parameters for harvested animals in the Okanogan BBMU suggest a relatively stable population over the last 10 years, within the context of highly variable sample data. The female percentage of the total harvest decreased in 2010 to 30%, which is within acceptable harvest guidelines. The 2010 median age data was not available during the writing of this report. However, in 2007 the median ages for harvested animals dropped to 12-year lows for both sexes, but sample sizes were quite small (12 animals for both sexes combined). The significance of this cannot be assessed with only one year's limited data, but if median ages stay this low in future years, then the current harvest rate is not sustainable.

Nuisance and damage activity
Wildlife officers routinely respond to complaints of bears damaging property or potentially threatening human safety near rural residences or campgrounds. The number of complaints varies from year to year as a function of weather and changes in natural food availability. Nuisance complaint levels increased significantly in 2010 for reasons that are unclear. . A cold wet spring and poor early season berry production likely contributed to the increase.

Habitat condition and trend
At lower elevations throughout bear range in the Okanogan BBMU, human development continually nibbles away at bear habitat, and noxious weeds continue to displace native grasses, forbs, and shrubs. The combination of these impacts is systematically reducing the quantity and quality of black bear spring and early summer habitat components. This is likely to result in increased incidence of human-bear conflict and associated control mortality.

Efforts to expand off-road use on public land in the District could negatively affect the bear population. Increased motorized use on the landscape will likely increase animal disturbance, degrade habitat and increase illegal harvest. This could undo many of the habitat gains associated with many years of aggressive, wildlife-related road management by several state and federal agencies. On the other hand, successful efforts to recover wild salmonid stocks could increase the bear forage base and positively affect bear populations.

Management conclusions
In general, harvest pressure has remained fairly stable for several years and bear populations appear to be fairly stable as well, although data to support this assumption is limited. decreased in 2009 but continued to be below the 12-year average and the percent female

harvest is within acceptable harvest guidelines. Population parameter declines of harvested animals in the past suggest obtaining age data from harvested animals is important to assess the effects of hunting pressure, particularly in the absence of survey information ; however, for this data to be meaningful, hunter compliance with tooth submittal for aging must be improved to generate larger samples.

Threats to habitat continue, and these will affect overall carrying capacity. Effort to maintain proactive road management should be supported and expansion of off-road vehicle areas should be minimized and tightly managed. This is especially true for habitat at low to mid elevations containing bear spring/summer range, the time and place where bears are often most vulnerable to illegal harvest and human conflict.

WDFW's ongoing land acquisition in the Unit will help protect low elevation habitat and movement corridors. This program should be supported to the fullest extent possible.

All WDFW lands and facilities in bear habitat that accommodate garbage disposal should be outfitted with bear proof garbage containers. In addition, existing recommendations concerning proper sanitation in bear country should be adopted as regulations and enforced. Other agencies should be encouraged to do the same. Proper sanitation will greatly reduce the potential for bears to become conditioned to human food, and reduce the potential for human-bear encounters. This will in turn reduce the number of nuisance complaints and associated expenditure of resources.

Table 1. Black bear harvest, hunter effort and median age for BBMU 5.

								Median Age		
Year	Male	Female	Total	# of Hunters	% Success	Hunter Days	Days / kill	Males	Females	% Females
1996	73	24	97	889	11%	4,181	43	2.5	4.5	25%
1997	30	20	50	858	6%	3,967	79	6.5	6.5	40%
1998	62	32	94	1,514	6%	6,823	73	4.5	5	34%
1999	49	12	61	3,016	2%	25,763	422	5.5	4.5	20%
2000	17	51	68	3,153	2%	17,258	254	3.5	8	75%
2001	77	41	118	1,922	6%	13,905	118	3	7.5	35%
2002	90	55	145	2,039	7%	14,077	97	8	4.5	38%
2003	59	31	90	1,669	5%	11,298	125	3.5	8.5	34%
2004	82	51	133	1,551	9%	11,654	88	3.5	3.5	38%
2005	62	30	92	1,687	5%	10,484	114	4.5	5	33%
2006	82	37	119	1,396	9%	8,461	71	4	5	31%
2007	83	30	113	1,594	7%	8,461	75	2	3	27%
2008	99	32	131	1,644	8%	9,678	74	n/a	n/a	24%
2009	61	34	95	1,479	6%	9,012	95	n/a	n/a	36%
2010	93	40	133	1,574	8%	9569	72	n/a	n/a	30%

BEAR STATUS AND TREND REPORT: REGION 4
BMU 3, NORTH CASCADES BLACK BEAR MANAGEMENT UNIT

RUTH L. MILNER, District Wildlife Biologist

Population objectives and guidelines

Black Bear Management Unit (BMU) 3 is comprised of Game Management Units 418, 426, 437, 448, 450, and 460. The population objective for Black Bear in the North Cascades BMU is to maintain healthy bear populations, which are capable of sustaining a recreational hunt, while minimizing damage complaints from timber owners and nuisance complaints from suburban homeowners.

Hunting seasons and harvest trends

The 2010 general season for the North Cascades BMU ran from August 1 through November 15, with a limit of 2 bears. Hunting conditions and access were generally favorable throughout the early season. Unusually wet and cool spring weather likely favorably influenced the availability of plant foods for bears.

The number of general season bear hunters hunting in BMU 3 increased in 2010 compared to 2009. Hunter success and harvest also increased in 2010. The total 2010 general season harvest was 267 bears, which was twice the 2009 harvest. In 2009 132 bears were taken during the general season, the lowest harvest seen since 2005 and less than 1/3 the number harvested in 2008, when an unusually large number of bears were taken (Table 1). The 2010 harvest exceeded the 10 year average of 206 bears.

The statewide harvest objectives for Black Bear include: maintain a female harvest of 39% or less of the total harvest, with median age at harvest for males at 2 years or older, and for females at 5 years or older. Percentage of females taken during the 2010 general season harvest was 37%. Age data are not available.

To help alleviate bear damage in some locations, a spring permit hunt was initiated in 2008 in BMU3. In spring 2010, 25 permits were issued in a portion of GMU 448 (Permit hunt #7015, Monroe Unit), and 20 permits were issued in portions of GMU 418 (Permit hunt #7014, North Skagit Unit). Eighteen hunters hunted the Monroe unit and harvested 7 bears, 5 males and 2 females. Twelve hunters reported hunting the North Skagit unit and harvested 3 male bears. Thus, the total harvest combining the spring hunts with the general season resulted in a total harvest of 277 animals, of which 36% were females.

The 2009-2010 big Game harvest Report for the Western Washington Treaty Tribes indicate no bears were harvested.

Nuisance and damage activity

Twenty-two depredation permits were issued to industrial timberland owners concerned about tree damage in 2010, with a total of 17 bears taken of which 13 were male, 5were female.

The number of problem bears seen along the urban-rural interface continued in all three counties contained within BMU 3. WDFW staff engaged in ongoing efforts to educate the people living along the suburban/rural landscape interface, advising them to secure garbage, pet food, and other food items from bears. WDFW staff regularly work with citizens to reinforce the need to keep bears from associating people with food. Despite these efforts, enforcement personnel caught and relocated or euthanized a minimum of 25 problem bears within the BMU in 2010.

Habitat condition and trend

Human populations in BMU 3 are expected to increase in the coming years and continued habitat loss is the expected result. Although the push for development along the rural/suburban interface has slowed in recent years, conversion of wildlands to housing still continues. Where human encroachment is not an issue, habitat is sufficient to support healthy black bear populations.

Management conclusions

Black Bear general season and spring permit harvest in BMU 3 increased in 2010 over the previous year. The combined total of bears killed in damage hunts, permit hunts and the general season was 289 animals. Median age data are not available for 2010; however the percent of females in the harvest is consistent with statewide management goals.

Table 1. General Season Harvest Data for BMU 3, North Cascades, 2001-20010

Year	male	female	total harvest	# hunters	% hunter success	% female
2001	102	47	149	2147	7	46
2002	119	68	187	2083	9	57
2003	105	64	169	1660	10	38
2004	176	70	246	1626	15	28
2005	87	34	121	1465	8	28
2006	110	63	173	1662	10	36
2007	153	44	197	1922	10	29
2008	254	162	416	2443	17	39
2009	100	32	132	1897	7	24
2010	169	98	267	2224	12	37

2011 BLACK BEAR STATUS AND TREND REPORT: REGION 5
SOUTH CASCADES BLACK BEAR MANAGEMENT UNIT (BBMU 4)

DAVID P. ANDERSON, District Wildlife Biologist

Population Objectives and Guidelines

Black bears are managed in western Washington to sustain healthy populations through all bear habitats. In addition, bear populations are managed to provide recreation, reduce timber damage, and minimize human/black bear interactions. Black bear population levels are monitored through harvest statistics (median harvest age for each sex and percentage of females in the harvest). Acceptable harvest parameters for black bears in the South Cascade Bear Management Unit (BBMU 4) are: <40% females in the harvest, with a median female harvest age of >5 and a median male harvest age of >2.

Hunting Seasons and Harvest Trends

In 2010, hunter success for the general black bear season in the BBMU 4 was 0.05%. This was an increase from the 2009 season, but is similar to success rates seen over the past 10 years in the in BBMU 4. Hunter success in BBMU 4 is typically lower than the majority of other bear management units in Washington. The 2010 general season black bear harvest in the BBMU 4 was 238 animals, a moderate increase from the 10 year average (170) (Table 1). Bear hunter numbers were lower in 2010 than the previous two years.

Depredation Season

In addition to general season hunting, black bear depredation permits continued to be issued to commercial forest landowners during the spring of 2011 to mitigate timber damage. Results from hunter harvest on private forest lands have not been summarized at this time. A spring black bear special permit hunt was conducted in the Lincoln Unit of Lewis County in 2010 and 2011. For spring 2010, a total of 4 bears were harvested with a 0.09 hunter success rate. This hunt was created as an alternative to depredation permits.

The overall effect of the spring depredation permit harvest on black bear populations and the benefit these hunts have in the overall reduction of timber damage needs further evaluation. Continued effort should be made to document the sex for all harvested bears associated with depredation. This will assist in our efforts to evaluate management goals.

Population Status and Trend Analysis

There was a moderate increase in the 2010 general season bear harvest (238) from the previous year (185). The 2010 harvest was slightly higher than the 10 year average in the South Cascades Bear Management Unit. In 2010, the median age~~s~~ of the female harvest was 3.0 which does not meet management goals for BBMU 4 (>5). The percentage of females in the 2010 harvest was 40% and technically does not meet the target level of less than 40% female harvest in the population. Harvest of male black bears (3.0) did meet median age objectives in 2010 (>2).

Surveys

No bear surveys were conducted in BBMU 4 in 2010. Bear surveys are generally not conducted each year as they are difficult and costly.

Nuisance and Damage

WDFW responded to bear nuisance and damage complaints made by the general public in 2010. No kill permits were issued in 2010 in Region 5.

All bear issues, outside of the commercial forest program, were resolved by WDFW enforcement agents by working with landowners to reduce bear attractants (i.e. garbage).

In BBMU 4, the majority of human/bear interactions are reported in Clark, Cowlitz and Lewis counties. Many reports from the public are of bear sightings in forest habitats on state and federal lands. These do not typically require a follow-up investigation.

Damage to certain industrial and private timberlands continues to be addressed through the issuance of depredation permits. Many industrial timber companies, however; continue to administer feeding programs to reduce spring bear damage to young trees. Little information exists on the impact of bear feeding and the impacts to local bear populations.

Habitat Condition and Trend

Black bear habitat is affected by a variety of land use practices. Timber harvest in BBMU 4 has remained relatively constant on private timberlands. Timber harvest on United States Forest Service (USFS) land will remain low for the foreseeable future. Timber harvest on Washington State Department of Natural Resources (DNR) lands will continue to be moderate, while industrial timber harvest will vary more significantly. Bear damage will continue to be an issue on industrial timberlands. Encroaching residential development, however, poses the greatest threat to black bear habitat in BBMU 4. The human population in this bear management unit has increased in the past 10 years and further human/bear interactions will likely continue. Public education continues to be an important tool for reducing human/bear interactions, especially in suburban and rural residential areas.

Management Conclusions

The primary concern in black bear harvest at this time for BBMU 4 is the median harvest age of female bears (>5.0) in the population. Management objectives for females have not been met for five of the past 10 years. Considerations should be made to modify the hunting season structure to improve female harvest objectives.

Male harvest objectives, as determined by age class data and percent of harvest, were met as per the current bear population management objectives.

To better evaluate black bear harvest, WDFW will continue to prioritize the collection of tooth samples returned from the bear harvest, particularly from bears taken during the spring depredation permit hunts. This information will improve sex/age data for bear harvest management.

Habitat management trends in large-scale forest landscapes will continue to provide habitat for black bear populations in the South Cascades. Continued long-term habitat changes (i.e. human development) in the suburban/forest interface will continue to be one negative factor that will impact future bear populations.

Table 1. General season black bear harvest in the South Cascades Black Bear Management Unit, 2001-2010.

Year	Male	Female	Total	Success	Hunters	Days Hunted	Days/Kill
2010	143	95	238	0.05	4734	35008	147
2009	131	54	185	0.04	5107	41827	226
2008	211	106	317	0.06	5239	47297	140
2007	128	62	190	0.04	4835	31262	164
2006	110	49	159	0.04	4013	31262	196
2005	117	51	168	0.04	3818	31574	187
2004	162	80	242	0.05	4122	38119	157
2003	111	81	192	0.04	4132	36335	189
2002	134	61	195	0.04	4563	38997	198
2001	156	77	233	0.05	4690	41916	179

Table 2. Median age of black bear harvested in the South Cascades Black Bear Management Unit, 2001-2010.

Year	Male	Sample	Female	Sample	Sexes Combined	Sample
2010	3.0	47	3.0	25	3.0	72
2009	4.6	53	5.6	22	4.9	75
2008	n/a	n/a	n/a	n/a	n/a	n/a
2007	3.0	32	4.0	13	3.0	45
2006	3.0	63	4.0	27	3.5	90
2005	4.7	49	6.3	27	5.2	76
2004	4.0	42	4.5	24	4.5	66
2003	3.5	49	4.5	29	4.0	78
2002	3.5	39	5.5	14	4.5	53
2001	3.5	45	5.5	29	4.5	74

BLACK BEAR STATUS AND TREND REPORT: REGION 6

COASTAL BLACK BEAR MANAGEMENT UNIT (BBMU1)

WARREN MICHAELIS, Wildlife Biologist
RICH BEAUSOLEIL, Bear/Cougar Specialist

Population objectives

Black bears are managed in western Washington to provide recreation (general season hunts), reduce timber damage (permit season dog hunts), and black bear/human interactions. Black bear population levels are monitored using hunter harvest data such as median harvest age by sex and percentage of females in the harvest. Acceptable harvest parameters for black bears in the Coastal Bear Management Unit (BBMU 1) are: 35-39% females in the harvest, with a median female harvest age of 5-6 years-old and a median male harvest age of 2-4 years-old. No formal statewide bear surveys are conducted in Washington. However, in Region 6, a demographic research project has been conducted in Capitol Forest since 2004 (see below).

Hunting seasons and harvest trends

Mandatory reporting is required for black bear in Washington. However, reporting averages 60% and submission of biological data and a tooth for ageing is voluntary. The estimated total black bear harvest from general season for the coastal region in 2010 was 332, 57% higher than 2009 (Table 1), despite a similar number of hunters (4,250 vs. 4,028, respectively). About 67% of the total harvest was male and 33% female, similar in proportion with the reported 2009 harvest. Hunter success increased during the 2010 season from 5% to 8% (Table 1). How tribal harvest from the 9 tribes within BBMU 1 influences these statistics is unknown.

Table 1. Coastal BBMU1 bear harvest summary 2000-2010.

Year	Male	Female	Total	Days/ Kill	Hunter Success
2010	223	109	332	113	8%
2009	125	63	188	306	5%
2008	260	125	385	113	3%
2007	174	76	250	138	5%
2006	169	79	248	140	6%
2005	173	69	242	145	6%
2004	200	93	293	119	8%
2003	135	71	206	176	5%
2002	150	77	227	198	5%
2001	178	97	275	184	6%
2000	127	32	159	327	2%

The 2010 general black bear season extended from August 1 through November 10. Spring bear hunt seasons were held April 15 to June 15: in the Copalis Unit (GMU 642) a total of 100 permits were issued and 15 bears (9 male and 6 female) were taken. Information on spring bear harvest on the Quinault Indian Nation is not given.

Additional hunts to reduce timber damage in Region 6 are conducted using depredation permits on an "as needed" basis and occur throughout the year. A total of 63 bears were taken (40 males and 23 females) in BBMU 1.

During 2010 BBMU 1 constituted approximately 31% of the total western Washington damage harvest (Region 4, 5, and 6). In previous years, non-reporting of depredation permits has averaged about 40% and may represent additional take.

Research

Capitol Forest Project

The Capitol Forest project was initiated to gather demographic data to monitor the impacts of spring bear hunt seasons. Capitol Forest is 371 km^2 and is managed for multiple use. The primary objectives are to estimate density and female survival. In 2004 and 2005, trap effort was on a trial basis (3 days and 7 days, respectively) until funding could be secured. Beginning in 2006, more formal trap effort was conducted (Table 2). On average 114 trap nights per bear visit was recorded.

Through July 2011, a total of 30 individual bears (16 female, 14 male) were captured 34 times have been captured and radiocollared. Approximately 63% of the females captured were adults and 64% of males captured were adults (> 3yrs).

All documented mortality has been attributed to hunting season (1 female and 3 males). A total of 16 bears have been censored (dropped radio or lost contact); 6 bears (4 females and 2 males) dropped radiocollars as designed (rotted spacers), 2 bears (2 males) pulled their collar within days of capture, and 8 radios are unknown fates (lost contact).

Management conclusions

Capture success on the Capitol Forest project seems to be correlated with low hunt success (higher captures in 2007 and 2009 when harvest was lower) (Table 3). This trend continues into 2011.

Table 2. Summary of black bear trap effort in Capitol Forest, Washington, 2004-2010, WDFW.

Year	# Traps	Total Trap Nights	# Bear Captures	# Trap Nights/ Bear Capture
2004	12	33	1[a]	33
2005	21	164	0	
2006	67	562	2 (2F)	281
2007	66	669	7 (3F, 4M)	96
2008	46	477	3 (1F, 2M)	159
2009	47	443	9 (5F, 4M)	49
2010	30	277	6 (4F,2M)	46
2011	78	818	6 (3F, 3M)	136

Total

[a] Bear was poached in trap

Table 3. Black bear harvest, by sex, in GMU 663, Capitol Forest, 2000-2010, WDFW.

	Spring		Fall		
Year	Male	Female	Male	Female	Total
2000	0	0	7	3	10
2001	0	0	4	3	7
2002	0	0	7	1	8
2003	0	0	3	6	9
2004	0	0	6	4	10
2005	11	6	7	0	24
2006	5	1	6	6	18
2007	4	0	7	0	11
2008	2	0	13	5	20
2009	2	1	2	0	5
2010	0	0	9	9	18

The coastal BBMU has ample secure habitat for bears and a defacto bear reserve (Olympic National Park). So the long-term outlook for healthy and viable bear populations is good. The primary management need for bears in BBMU 1 is a comprehensive harvest management database that takes into account harvest from all sources (i.e., general seasons, permit seasons, and spring tree damage depredation take). If complete removals were known, we could analyze overall harvest statistics and more reliably monitor whether the BBMU is within management parameters.

Mourning Dove and Band-Tailed Pigeon

WATERFOWL STATUS AND TREND REPORT: STATEWIDE

BAND-TAILED PIGEON AND MOURNING DOVE POPULATION AND HARVEST

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 13 surveys during the July 10-20, 2011 survey period.

Mourning dove call-count survey

The mourning dove survey was completed between May 20-31, 2011 following USFWS (2011) methods. Cooperators from WDFW, USFWS, Yakama and Colville Tribes, and Chelan P.U.D completed routes. Data were sent to USFWS in Laurel, MD.

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, 2010.

Mourning dove harvest estimation

Mourning dove harvest was estimated as part of the statewide hunter survey conducted by WDFW (WDFW 2011).

Results

Band-tailed pigeon call-count survey

Past call-count survey results are presented in Table 1 and Figure 1.

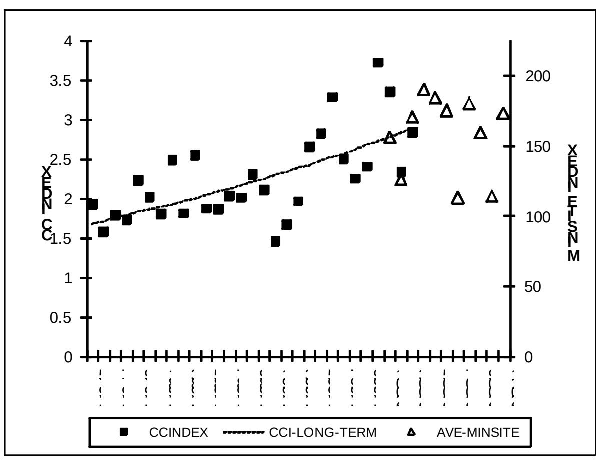

Figure 1. Band-tailed pigeon call-count results and mineral site raw data summaries.

Band-tailed pigeon mineral site survey

Mineral site survey raw data summaries are presented in Table 2 and Figure 1. Complete 2010 survey results are available through USFWS (2011), but the 2011 analysis will not be available until 2012.

Mourning dove call-count survey

Mourning dove survey results are presented in the USFWS mourning dove report (USFWS 2011).

Band-tailed pigeon harvest

Harvest and hunter activity for the 2002-2010 seasons are summarized in Figures 2-3 and Table 3.

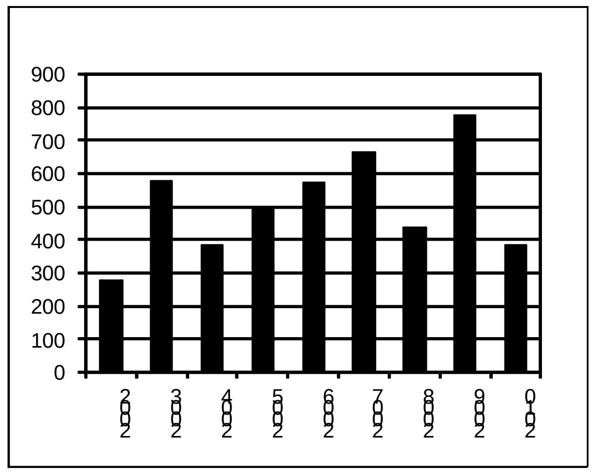

Figure 2. Band-tailed pigeon harvest.

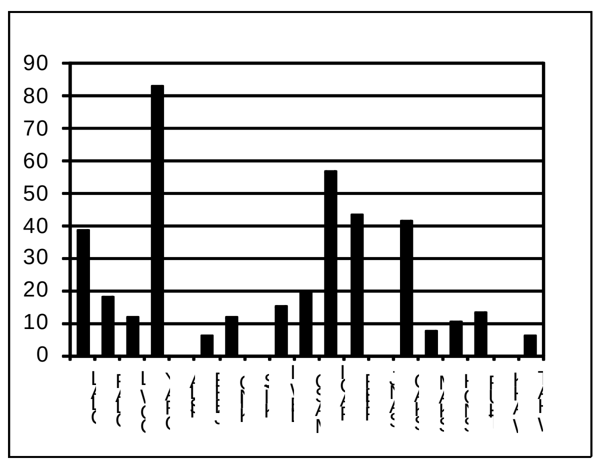

Figure 3. Band-tailed pigeon 2002-2010 average annual harvest by county.

Mourning dove harvest

As measured by WDFW surveys, harvest in 2010 was estimated at 52,924 doves, up 9% from 2009 (Figure 4). Hunter numbers were estimated at 4,220, down 3% from 2009. Number of days hunted was 13,648, up 3% from 2009.

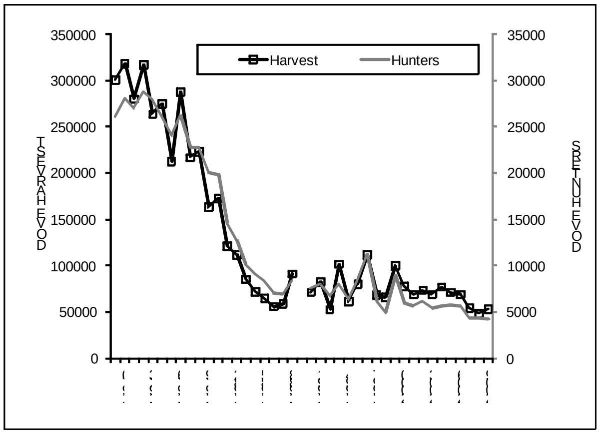

Figure 4. Mourning dove harvest and hunter numbers.

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). The 2011 mineral site survey raw data summaries point to a rebound in numbers of band-tails present during the breeding season compared to 2009 and 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
Altoona				64	0	5	0				
Cedar Cr.	328	215	157	215	185	231	191	312	163	154	30
L. Cavenaugh - Pefley				108	172	76	71	117	70	89	113
Lilliwaup	60	77	108	199	143	273	141	89	110	123	167
McAllister	82	118	174	124	174	87	25	136	46	134	107
Mud Bay	164	154	222	134	371	294	95	203	130	70	175
Oyster Cr. – Pigeon Pt.	362		455	474	542	293	157	331	314	190	344
Newaukum				634	167	335	309	219			
Potlatch	135	147	90	297	285	306	168	295	480	129	297
Red Salmon	52	103	121	179	103	64	33	107	41		0
St. Martins				220	128	191	189	141	210	214	439
Sumas	67	71	31	46		68					78
U. Kalama				110	225	327	120	350	317	111	368
Totten -Oyster Bay										119	53
Warm Beach				48	58	62	83	36	29	29	72
Willapa				3	24	10	3	0	5	5	
Mean	156	126	170	190	184	175	113	180	159	114	173

Table 3: WDFW band-tailed pigeon harvest report summary.

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2002-10 AVE.
# PERMITS ISSUED	522	657	766	809	909	894	917	567	632	741
TOTAL DAYS (SUCCESSFUL)	357	337	209	382	315	364	247	548	362	347
TOTAL HARVEST	273	574	383	492	569	661	434	776	381	505
HARVEST BY COUNTY										
CLAL	37	35	14	25	35	37	5	0	39	25
CLAR	29	45	29	35	60	51	56	94	18	46
COWL	28	54	4	2	3	32	24	39	12	22
GRAY	47	53	104	76	71	145	103	129	83	90
ISLA	0	0	0	0	9	0	0	0	0	1
JEFF	10	16	31	26	14	29	6	4	6	16
KING	4	23	13	6	11	14	9	43	12	15
KITS	0	1	0	0	0	0	0	0	0	0
LEWI	7	13	11	34	5	22	13	19	15	16
MASO	26	38	48	62	63	84	59	126	19	58
PACI	13	21	37	35	73	80	82	136	56	59
PIER	20	82	30	62	85	63	32	85	43	56
SANJ	0	0	12	0	0	0	0	0	0	1
SKAG	33	99	15	97	74	65	31	30	42	54
SKAM	5	16	0	10	16	21	11	27	7	13
SNOH	15	29	3	12	11	3	4	4	10	10
THUR	0	13	8	2	24	10	0	5	13	8
WHAT	0	34	24	6	14	4	0	7	0	1

Waterfowl

WATERFOWL STATUS AND TREND REPORT: STATEWIDE
Breeding Populations and Production

MIKAL MOORE, Waterfowl Specialist

Introduction

This report summarizes waterfowl productivity data collected during 2011, including breeding waterfowl populations, duck broods, pond indices, and goose nest surveys, for the State of Washington. Washington Department of Fish and Wildlife, U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, Yakama Indian Nation, Colville Confederated Tribes, Washington Waterfowl Association, and Chelan County Public Utility District contributed data.

Duck Breeding Population Survey

Methods

Surveys are conducted annually within the 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 are conducted on historical transects and sampling quadrats (sections or 1/4-sections; Fig. 1). Samples are multiplied by weighting factors to provide an index to the total number of breeding ducks and coots within the defined areas (Table 1). Weighting factors are determined from the proportion of areas within the strata that are sampled. Observations are treated as complete counts within sampling units (transects or quadrats) with no corrections for visibility bias. Surveys are conducted by ground counts, except helicopter counts are used for the 1/4-sections in the Desert Wildlife Area (Frenchman and Winchester Wasteways) within the Columbia Basin Irrigated strata.

In 2008, WDFW began the process of redesigning the existing eastern Washington waterfowl breeding population survey. The new design consists of aerial transects intended to replace existing ground counts. 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.

Survey design for 2011 was modified slightly from 2010 (Fig. 2). Irrigated stratum transects remained at 8 mile spacing (2.8% coverage). Potholes transects remained at 10 miles apart (2.5% coverage). Transects were modified slightly to address some safety concerns with the 2010 transects. Safety and efficiency continues to be a concern for the Northeast Highlands stratum, resulting in a design limiting the survey to 25 sections, 8 miles or less in length, of the major river valleys in the stratum. Overall, in eastern Washington, observers surveyed approximately 1,136 transect miles over a 6 day period between May 9 – 16, 2011.

In 1997, breeding duck surveys were initiated in western Washington using a stratified random quadrat design. Section lines or square mile areas define survey plots, selected at random from strata delineated based on knowledge of breeding duck densities. Most areas were surveyed by helicopter.

Beginning in 2010, line-transect surveys, similar to the new eastern Washington survey, replaced the existing western Washington breeding waterfowl population survey. The 2011 survey design was modified from the 2010 survey. Major changes included dropping the North Sound Islands stratum due to safety concerns, trimming the 3 southern-most transects out of the South Puget Sound Lowlands strata for lack of habitat, changing the transects on the Chehalis River Valley to run north/south and the Dungeness to run northeast/southwest to better represent the strata, removing the mostly densely urbanized areas from the expansion area, and decreasing the transect spacing from 10 to 7.5 miles on all strata. Observers surveyed 41 transects totaling approximately 659 transect miles over a 3 day period between April 26 – April 29, 2011. Survey coverage of the survey expansion area was approximately 3.8%, compared to 2.6% in 2010.

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: Eastern Washington Traditional Survey Area

The 2011 index of breeding duck populations in eastern Washington, according to the traditional ground-based survey, was 122,254 (Table 2; Fig. 4), up 16% from 2010 and 19% below the long-term average. This count represents the first increase in breeding duck counts in eastern Washington since 2006. Breeding pair counts increased in 2 out of 4 eastern Washington strata (Fig. 6, Table 3).

Irrigated Stratum--The Irrigated stratum increased

28% from 2010, 6% above the 1979-2010 average (Fig. 6, Table 3). Mallards in the Columbia Basin exceeded the 2010 estimate by 118% and the LTA by 29%, the highest mallard count in the substrata since 1996. Yakima Basin mallard counts remained robust, down 6% from 2010, but exceeding the LTA by 57%. Other dabbling ducks, including gadwall (+42%, +16%), American wigeon (+519%, +44%), American green-winged teal (+329%, +7%), northern shovelers (+213%, +89%), and northern pintail (+622%, +586%) all increased from the previous year and exceeded the LTA, respectively. Cinnamon/blue-winged teal (-14%, -46%), and redheads (-19%, -69%) fell below the previous year's count and LTA, respectively. The long-term decline in duck production on wetlands associated with Desert Wildlife Area wasteways abated somewhat in 2011 (Fig. 7). While redhead populations continued to decline on the wasteways, mallards increased 64% from the previous year, 21% below the LTA. This decline is believed to be the result of advanced succession of wetland vegetation in association with invasive wetland species, resulting in the loss of open water habitats preferred by breeding ducks. Redheads and mallards appear to be most heavily impacted by habitat conditions in the Columbia Basin (Fig 8).

Potholes Stratum--Breeding duck indices in the Potholes stratum were up 20% from 2010, 39% below the long-term average (Fig. 6, Table 3). This increase is attributed to gadwall, bufflehead, and ruddy ducks. Mallards were 11% below the 2010 count, and 61% below the LTA, the lowest mallard count on record for the Potholes since 1992. Most of the long-term variability in Washington's breeding duck index has come from surveys in the Potholes area. This area has inconsistent precipitation patterns and many semi-permanent and ephemeral wetlands. The winter of 2010-11 was influenced by a "La Niña" weather effect, resulting in cool, wet conditions across the Pacific Northwest and good habitat conditions in eastern Washington's Channeled Scablands. The Potholes held 28% of all waterfowl surveyed in eastern Washington in 2011.

Northeast Stratum--The Northeast stratum was 25% below the 2010 count and 37% below the long-term average (Fig. 6, Table 3). This stratum represents 11% of breeding ducks in all eastern Washington strata in 2011. All dabblers were below the 2010 count and LTA. Several diver species increased from the 2010 survey, including redheads (+52%), scaup (+14%), ring-necked duck (+207%). In 2011, almost all duck species in the northeast strata were below the long-term average. The reason for this decline is unknown, but may be related to extensive flooding in the rivers of the northeast stratum causing uncertain nesting conditions. Dabbling ducks in particular may have chosen to nest in the Potholes where habitat conditions were above average.

Palouse Stratum--Breeding pair counts in the Palouse stratum were largely unchanged from the previous year (-5%), but 64% below the long-term average (Fig. 6, Table 3). The Palouse stratum only represents 1% of all breeding ducks in the eastern Washington strata. Mallards are often the only species detected on the Palouse transects.

Total Mallards--Total mallards numbered 54,940 up 12% from 2010, and 4% above the long-term average (Fig. 5, Table 2). The Irrigated stratum hosts 60% of eastern Washington breeding mallards, on average. Despite excellent habitat conditions, breeding mallard counts in the Potholes were the lowest on record since 1992.

Total Gadwall--Gadwall breeding indices increased 14% from the previous year, following a 4 year decline (Fig. 5, Table 2). Gadwall breeding population counts fell below the long-term average by 78% in 2011. The population growth of gadwall has occurred gradually over the past three decades. Between the 1970's and the 1990's the average number of gadwall has increased by 3.5 times with the most noticeable increases during the early 1980's. Gadwall are similarly abundant in both the Irrigated and Potholes strata. This species appears to be more drought tolerant than other dabbler species due to their association with semi-permanent ponds and deep water rather than seasonal or ephemeral wetlands.

Total Redheads--Redhead numbers in 2011 were down 6% from the previous year and 57% below the long-term average, continuing their long-term decline (Fig. 5, Table 2). Redheads are detected in greatest abundance in the Lincoln County Potholes and Columbia Basin Irrigated transects. Drought, loss of semi-permanent and open water habitat to wetland succession, invasive wetland plants, and loss of submerged aquatic vegetation and invertebrates to common carp are all detrimental to breeding redheads.

Results: Eastern Washington Helicopter Transects

Total breeding duck counts numbered 76,679 (+/- 6,833) within 3 eastern Washington strata (Table 4). This count fell short of the traditional survey total by 45,574. This difference is largely attributable to major changes in the Northeast survey design that limited counts to major rivers only. Total mallards numbered 39,096 (+/- 4,264), less than the traditional survey total by 15,844. This discrepancy took place largely in the Irrigated strata where particularly high concentrations of mallards on traditional ground counts did not fall within the randomized survey transects of the helicopter survey. Gadwall were the second most numerous species on the survey (n = 10,000), followed by ruddy duck (*n* = 7,368*)*, redhead (*n* = 4,659), and blue-winged/cinnamon teal (*n* = 3,783).

The Irrigated stratum accounted for 37% of the total duck count in the helicopter survey, and 58% in the traditional survey. The Potholes stratum comprised 62% of the total duck count in the helicopter survey, versus 30% in the traditional survey. The Northeast stratum represented 2% of the total duck count in the helicopter survey, and 11% in the traditional survey.

Compared to the 2010 helicopter survey, 2011 total breeding duck counts declined 38% in eastern Washington (Table 5). The ground count detected a 16% increase from the previous year. These comparisons should not be given too much weight, considering the differences in survey design between the two years.

Results: Western Washington Helicopter Survey

The revised survey design for western Washington estimated the total duck breeding population at 61,986 (+/-13,321). Mallards comprised 39% of the total (*n* = 24,046, +/-5,214), followed by American green-winged teal (17%), northern shoveler (8%); (Fig. 9, Table 6). The North Puget Lowlands (Skagit Valley) stratum held the majority of breeding ducks in 2011 (44%), followed by the South Puget Lowlands (33%), Chehalis River Valley (8%), Dungeness (8%), and Hood Canal (7%); (Fig. 8, Table 6). It is difficult to compare surveys between 2010 and 2011 due to changes in the survey design.

Pond Survey

Ponds are counted on 8 transects during the traditional eastern Washington survey within the Potholes Strata (Fig. 1) to index water conditions and to monitor the availability of breeding habitat. The 2011 pond index was 8,310, 57% above 2010 levels, and 27% above the long-term average (Fig. 10, Table 7). All substrata showed improved pond counts in 2011 except the Omak survey area. Increased pond counts were due to a cool, wet winter and spring related to the "La Niña" weather effect.

Duck Production Survey (Brood Survey)

Methods

The same sampling transects used for 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 (Table 1). 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 2011 duck brood production survey index for the Potholes, Palouse, and Northeast strata was up 15% from 2010 and 41% below the long-term for all combined duck species (Fig. 11, Table 8). Green-winged teal (+63%) and gadwall (+4%) were the only dabbling duck broods above the long-term average. Among other ducks, goldeneye (+126%), bufflehead (+28%), and merganser (+11%) broods all exceeded the long-term average (Table 8).

Brood production increased in the Potholes, but declined in the Northeast strata over the previous year. The Palouse estimates did not change. (Fig. 11, Table 9).

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 10). Surveys are conducted annually, biennially, or periodically. Total number of goose nest attempts found is used to index the goose breeding population. Geese are also recorded on the breeding duck surveys. Geese observed during the breeding duck surveys are weighted and provide an index to the goose population (Fig. 1, Table 2). Goose nest surveys are focused on areas with high densities of nesting geese. The breeding duck surveys cover a much larger area with low densities of nesting geese. Data from both nest surveys and breeding-duck routes are interpreted together to index Washington's breeding-goose population. Areas with relatively recent goose population expansions, particularly north of Spokane are not surveyed. Geese are also counted in the western Washington breeding duck survey.

Results

The 2011 index of goose nests increased slightly across the survey area (+3%) from the previous year (Figure 12). Twelve out of 21 surveys were conducted according to the variable survey schedule. The nest index was 8% below the 20-year average. The 20-year average provides a representative comparison for current goose nest counts.

The nest surveys in the Upper Columbia were up 1% from the 2010 nesting effort and 32% below the 20-year average (Fig. 13, Table 11). Goose nest counts on the Upper Columbia began a steep decline starting in 2003. On individual transects in the Upper Columbia River, only Rocky Reach Pool exceeded the 20-year average in 2011 (+5%).

The total number of nests found on the Lower Columbia decreased by 1% from 2010, 8% below the 20-year average (Fig. 13, Table 11). The transect with the most consistent survey is below the I-5 Bridge to Puget Island. For this area, 360 nests were recorded in 2010, a 3% increase from 2010, and 18% below the long-term average.

Goose nesting effort on the Snake River in 2011 was up 7% from the previous year and 15% above the 20-year average (Fig. 13, Table 11). This is the highest nesting effort on the Snake River pools survey since 1995. The Snake River cliffs are no longer surveyed by the USACE. Consideration should be made to remove this transect from the survey.

The total number of nests found in the Columbia Basin was up 10% from 2010, 15% above the 20-year average (Fig. 13, Table 11). The Potholes Reservoir survey, conducted every other year, yielded 15% more nests (n = 424) than the previous survey. The highest goose nest count on Potholes Reservoir (n = 593) occurred in 1986.

The weighted number of geese observed during the breeding duck survey has been included in this report since 1995 (Fig. 14, Table 11). This index provides information about the expansion of Canada geese in areas of eastern Washington outside of our traditional goose nest index areas, and provides parallel results to the information obtained from the goose nest index. The 2011 index increased 37% from 2010, 14% above the 20-year average.

In western Washington, the helicopter breeding pair survey detected 3,725 (+/- 1,328) Canada geese. The majority of geese were found in the South Puget Sound Lowlands (42%), North Puget Sound Lowlands (33%), and Hood Canal (14%); (Table 6, Fig. 9).

Potential Improvements to Waterfowl Breeding and Production Surveys

- Expand this report to better cover western Washington
- Expand databases to include older data.
- Clearly delineate strata and check accuracy of weighting factors and sample size.
- Evaluate the goose nest survey areas for accuracy of frequency and completeness of surveys.

Fig. 1. Breeding duck surveys in eastern Washington.

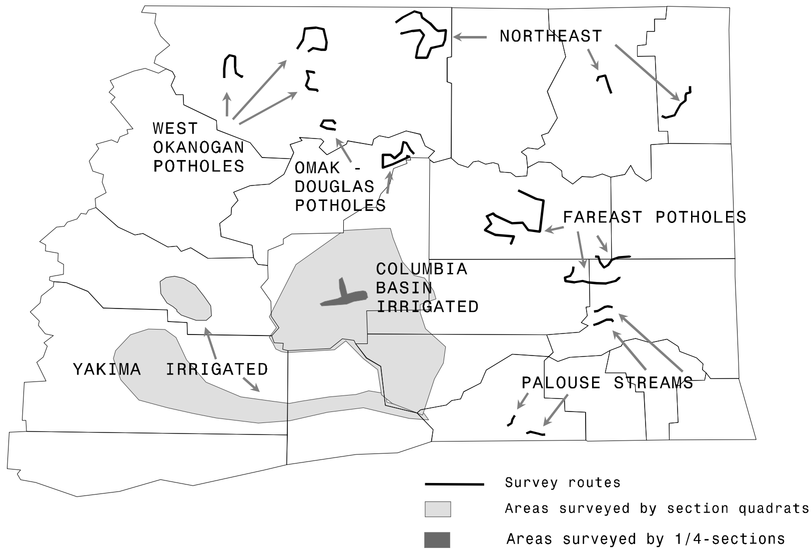


Figure 2. Eastern Washington aerial breeding waterfowl survey transects flown in 2011.

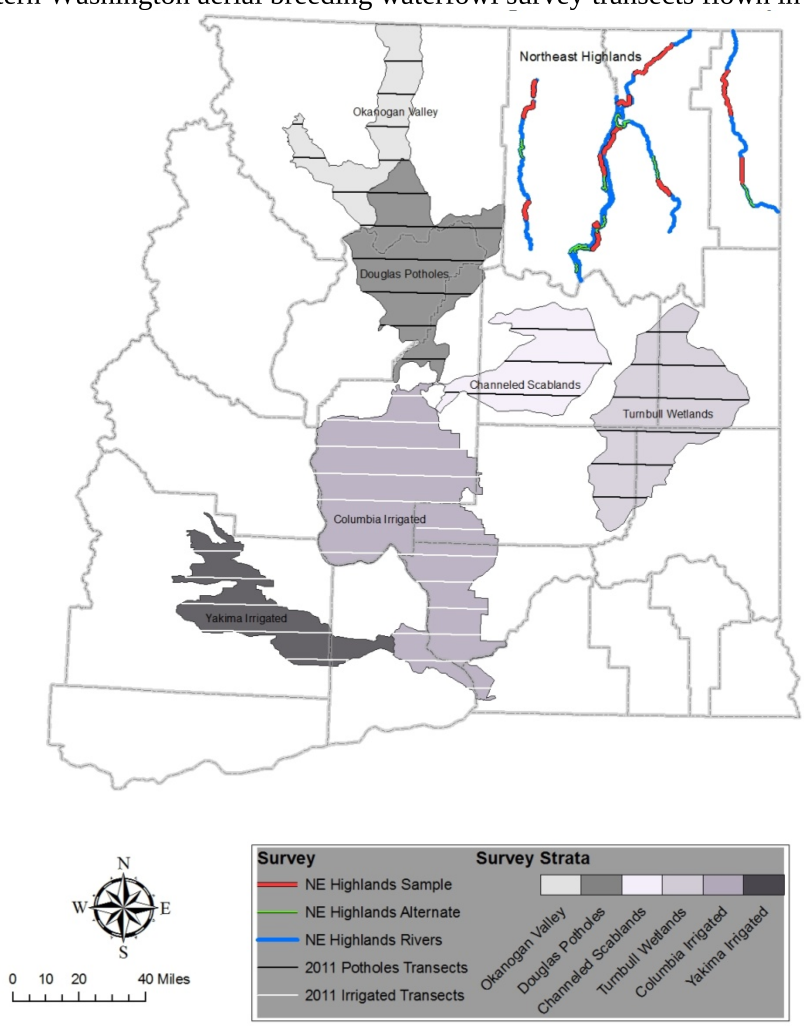


Figure 3. Western Washington aerial breeding waterfowl survey transects flown in 2011.

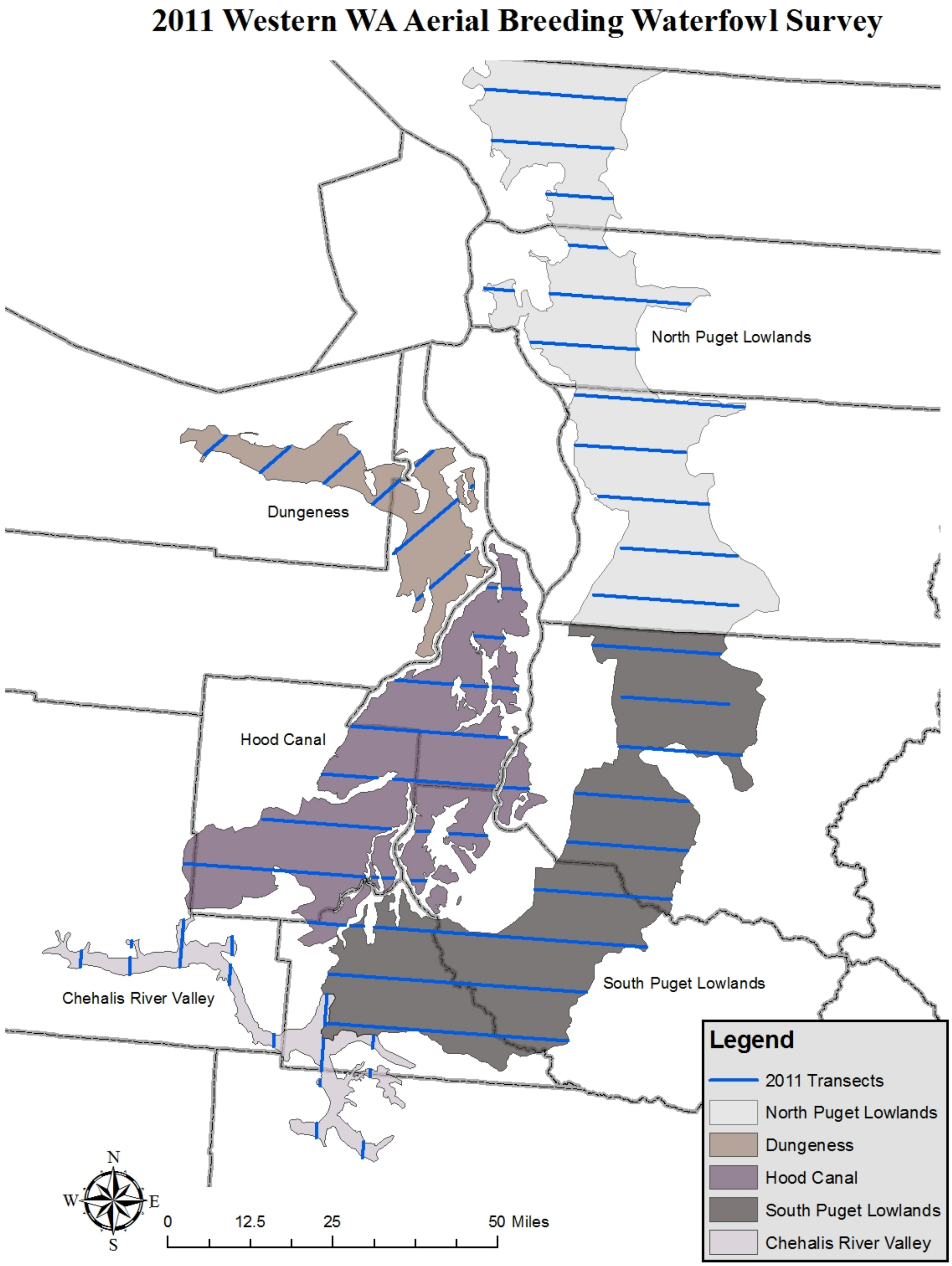


Figure 4. Total breeding duck population index for eastern Washington, 1961-2010

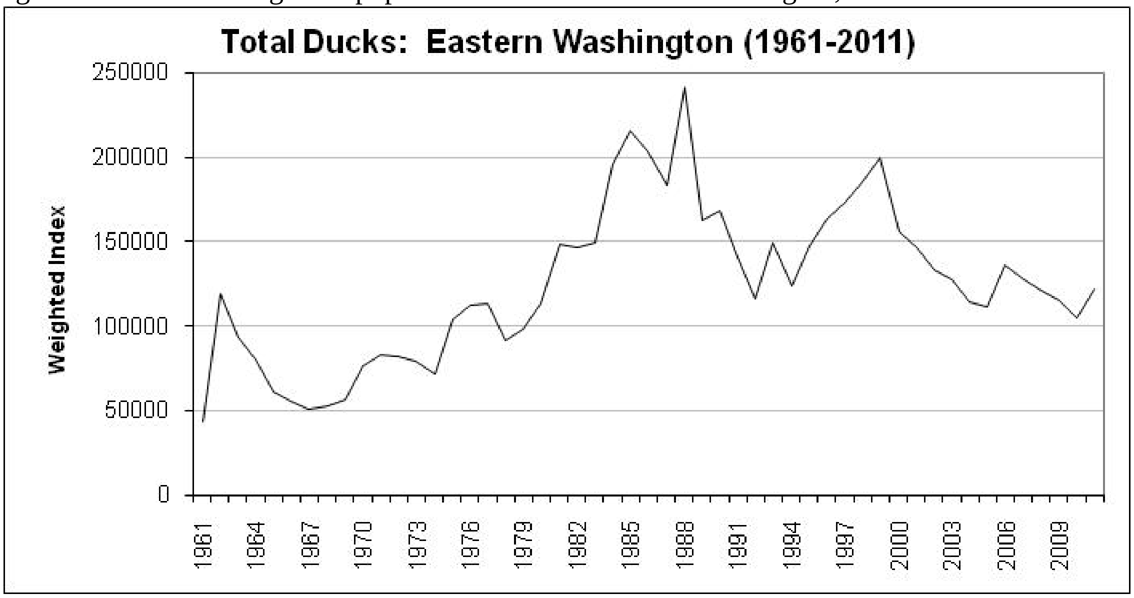


Figure 5. Indices of common breeding ducks in eastern Washington, 1962-2011.

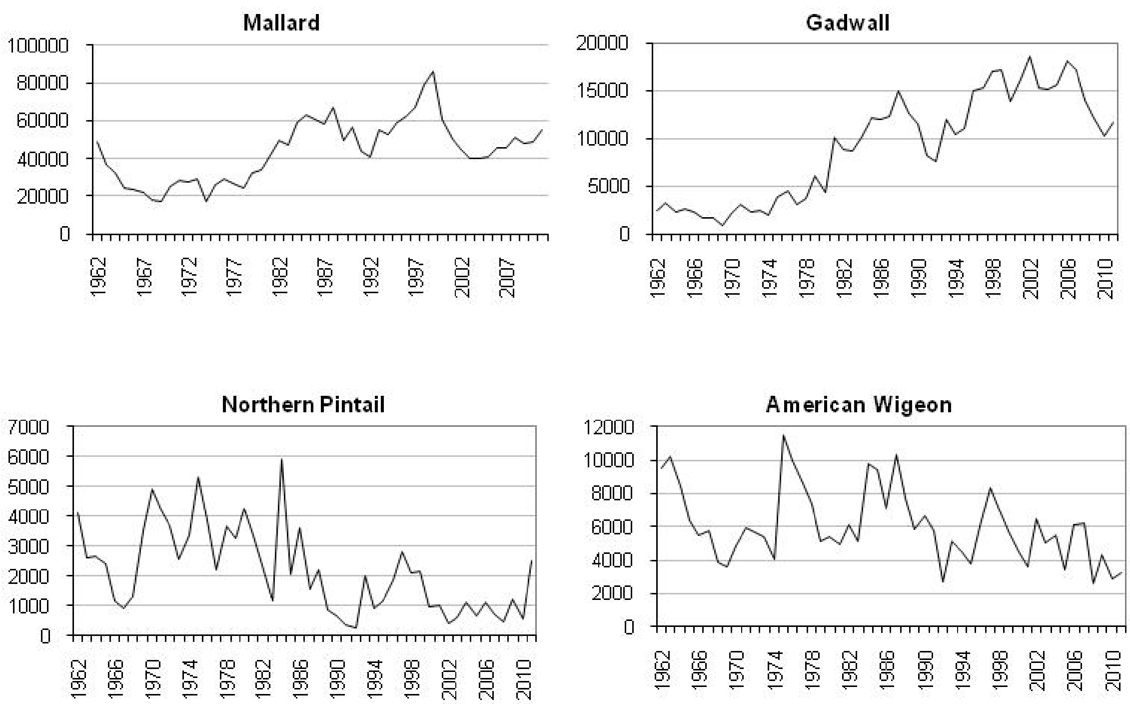


Figure 5. Continued.

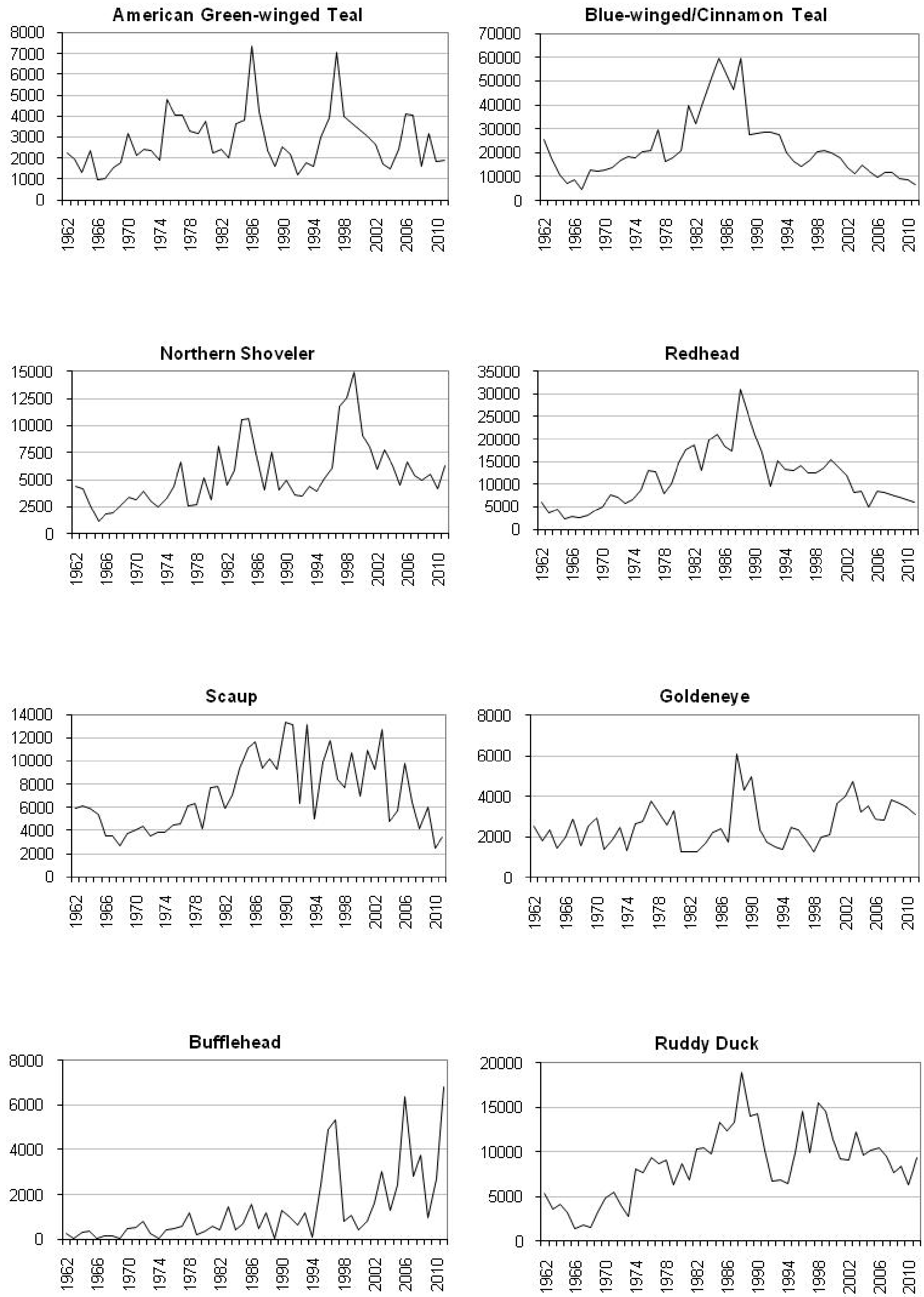


Figure 6. Weighted duck breeding population indexes by eastern Washington strata, 1962-2011.

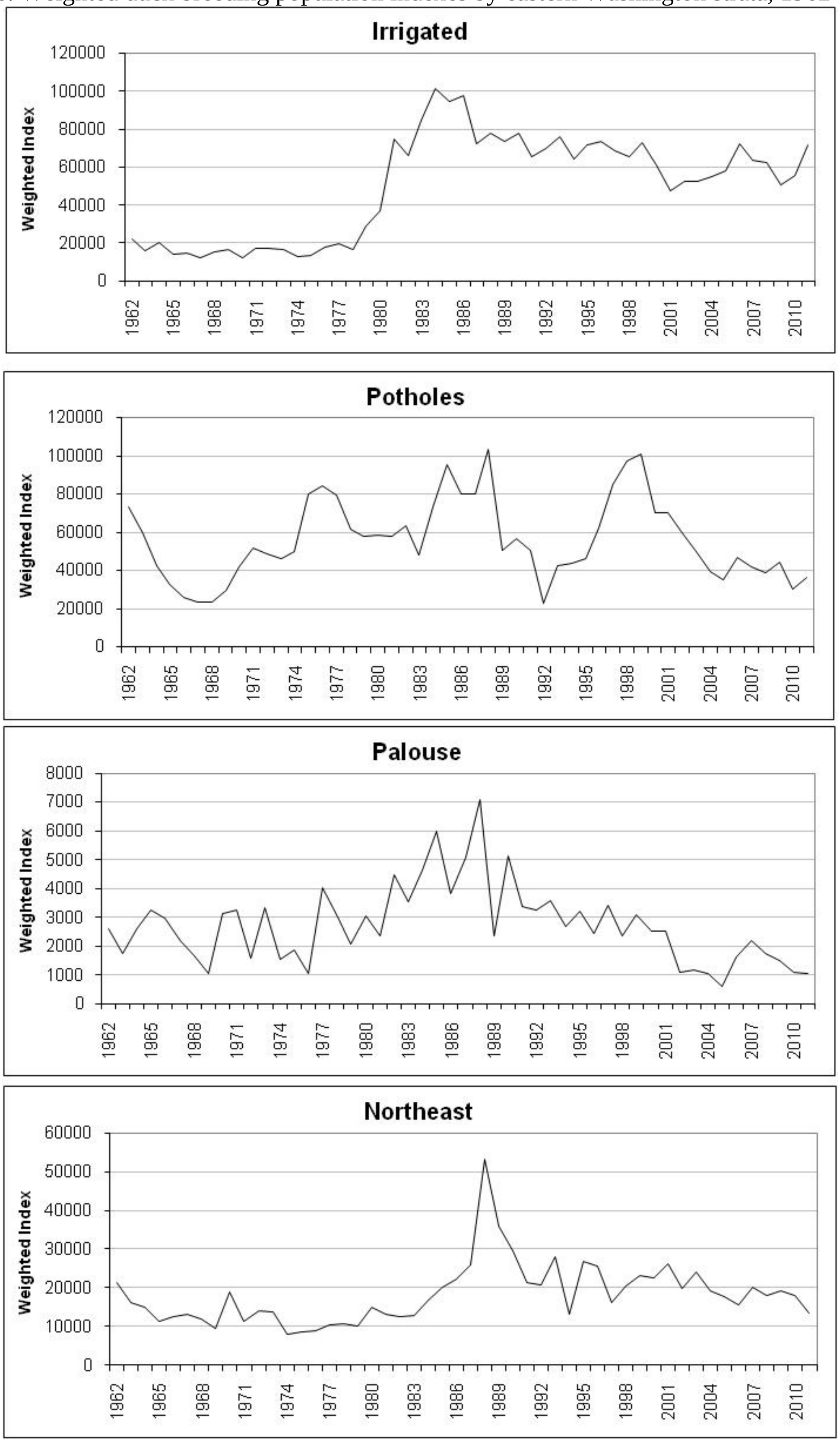
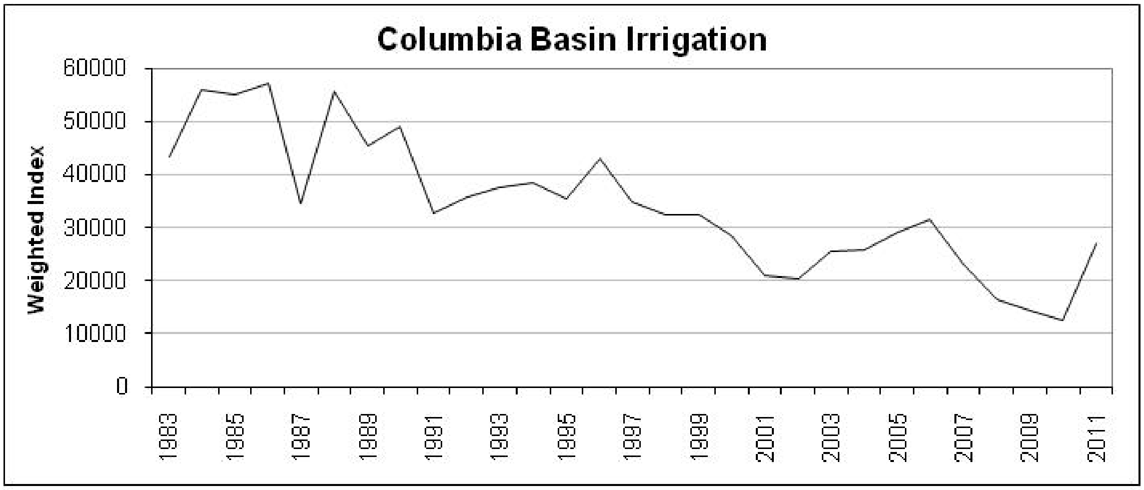


Figure 7. Weighted duck breeding population indices for the Columbia Basin, 1983-2011.



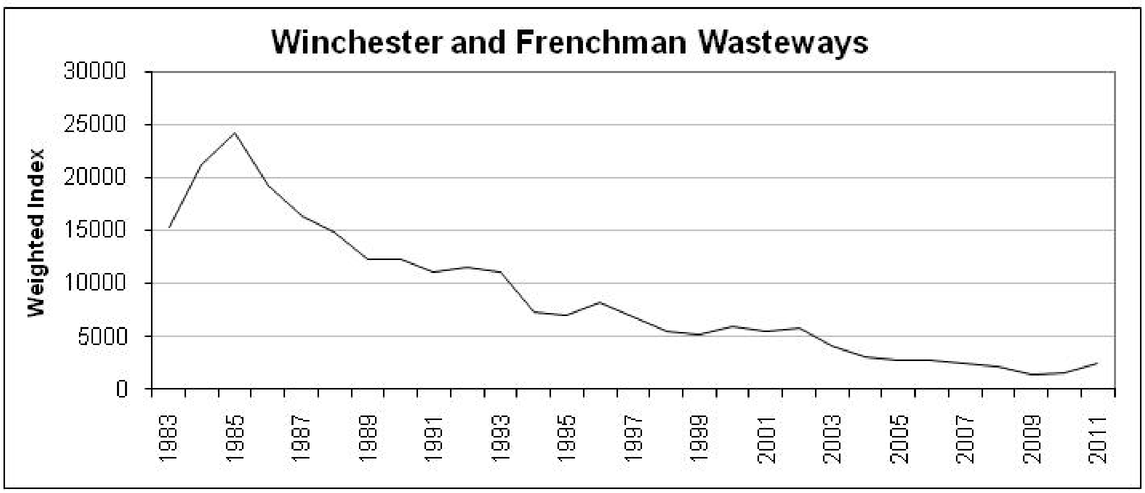


Figure 8. Mallard and redhead breeding pair trends on two Columbia Basin irrigation wasteways

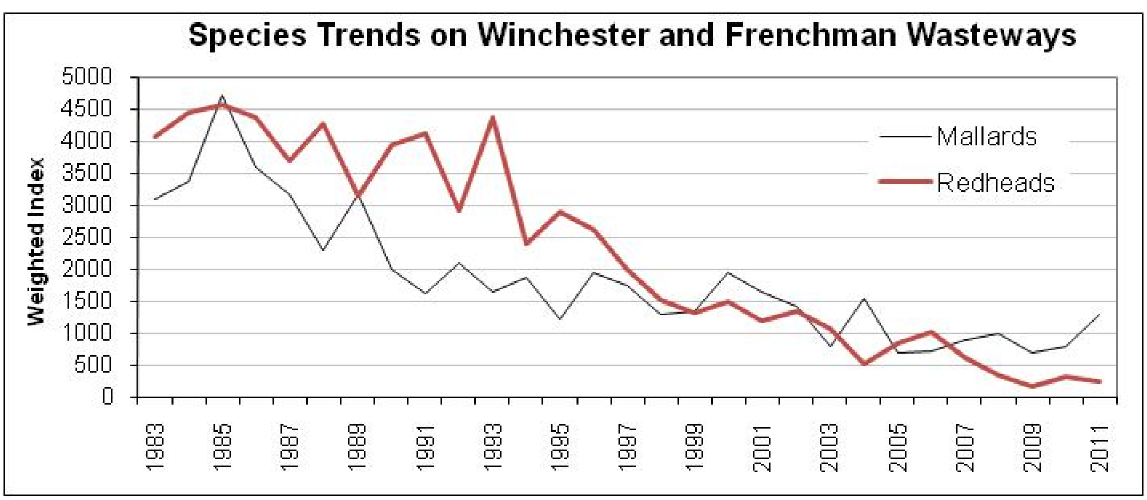


Figure 8. Western Washington weighted total duck breeding population survey, by strata, 2010.

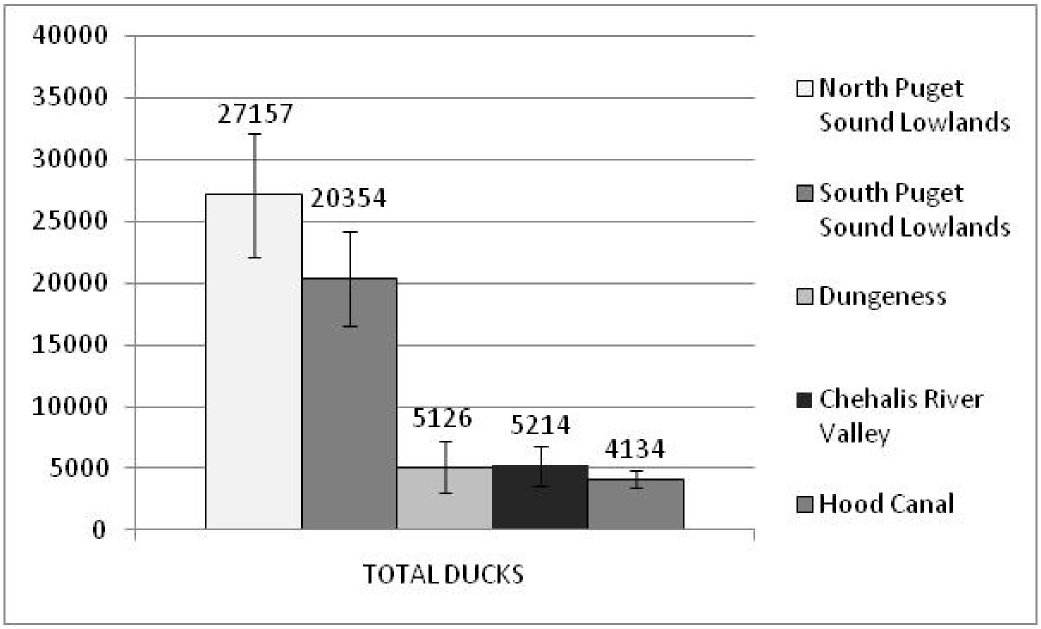


Figure 9. Western Washington weighted duck and goose breeding population survey, by species and strata, 2011.

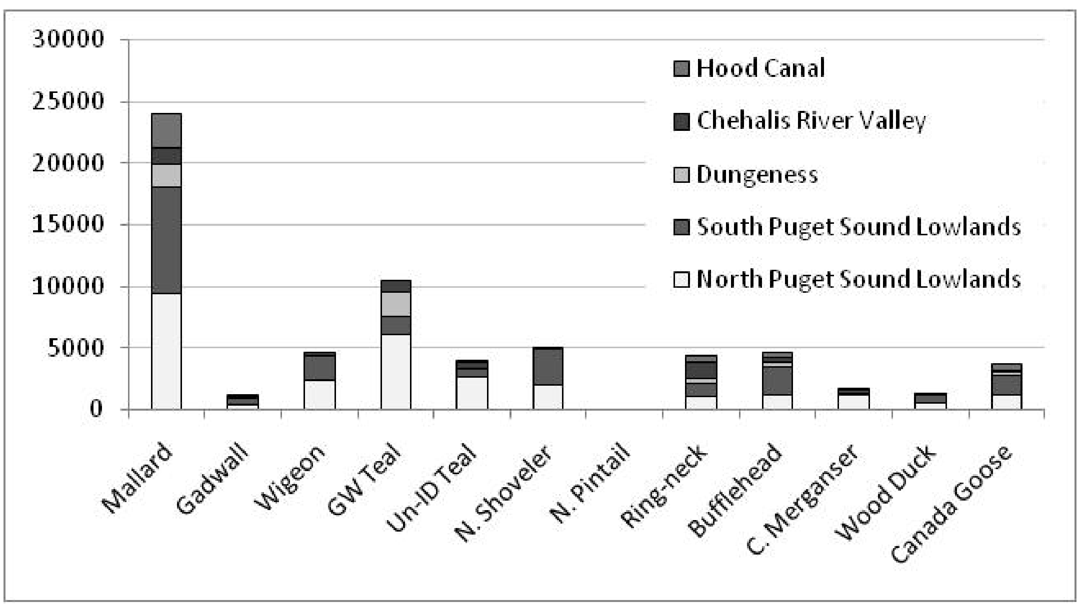


Figure 10. Index to pond numbers in the Potholes Strata, 1979-2011.

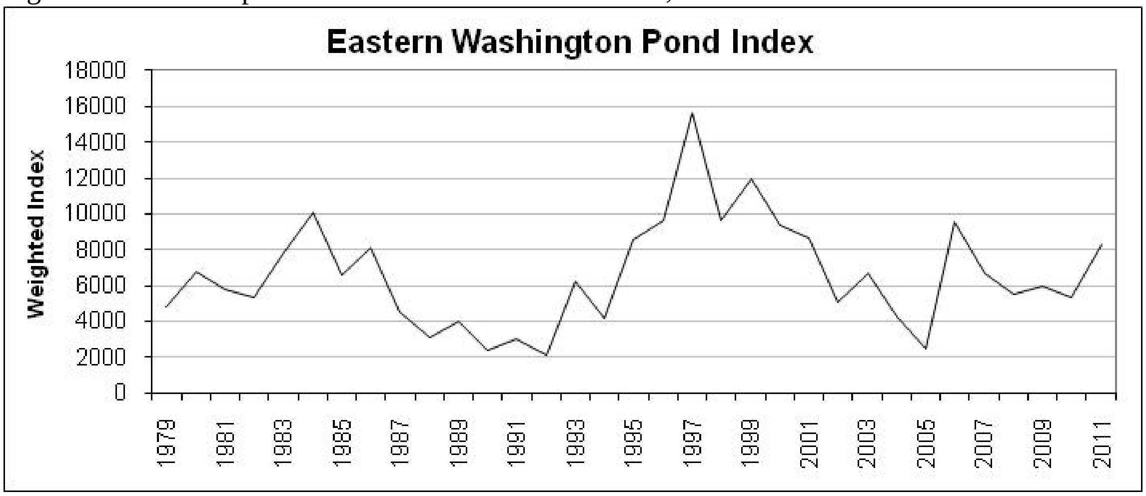


Figure 11. Weighted duck brood index (all species) for 3 eastern Washington strata, 1979-2011.

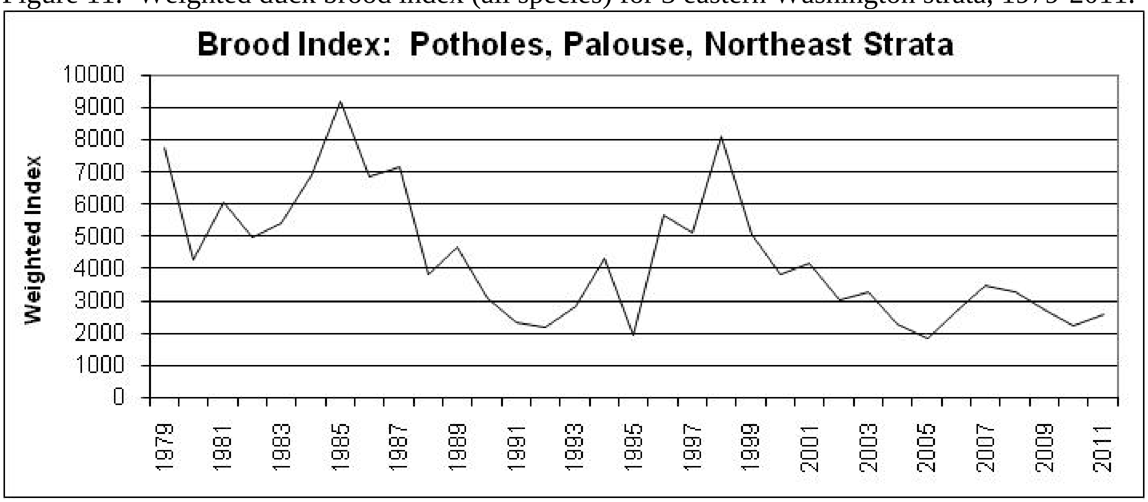


Figure 12. Total Canada goose nest attempts found on Columbia and Snake Rivers and in Columbia Basin, 1982-2011.

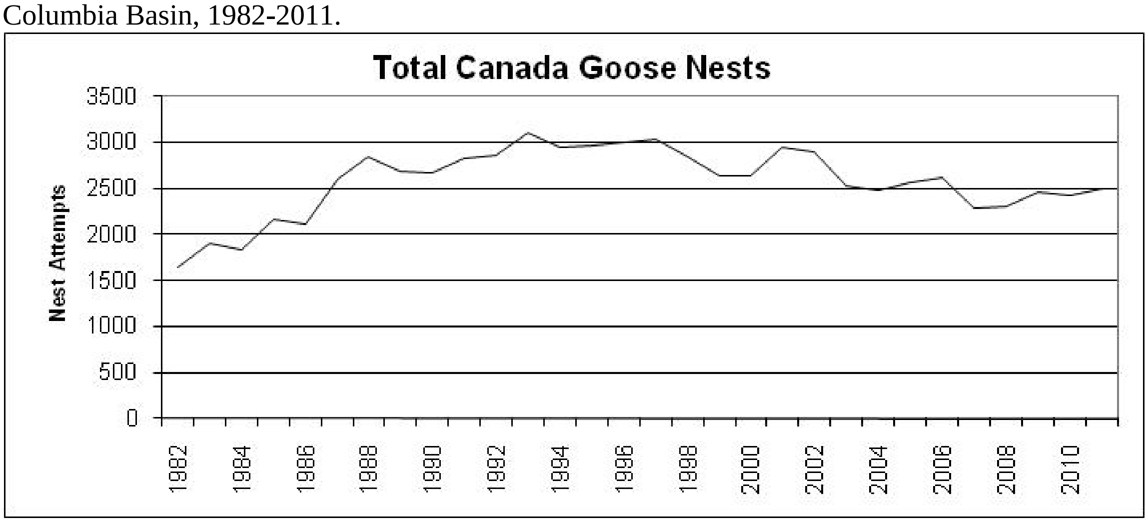


Figure 13. Canada goose nest surveys (number of nest attempts) by strata, eastern Washington, 1982-2011.

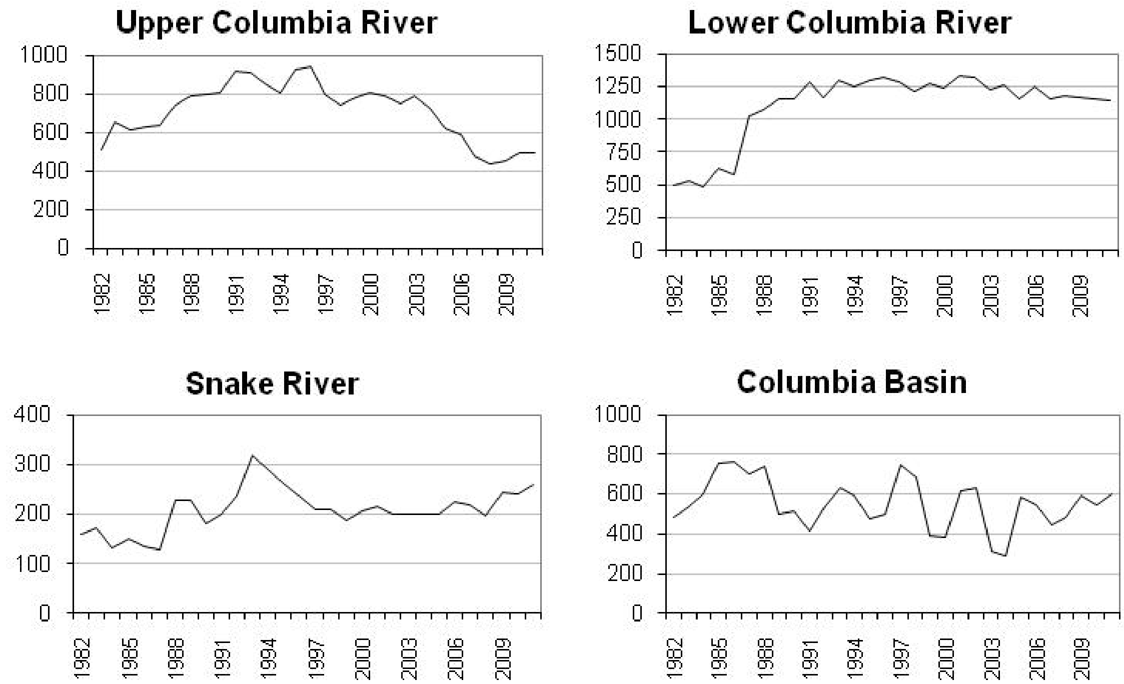


Figure 14. Breeding Canada goose index from eastern Washington breeding duck surveys, 1979-2011.

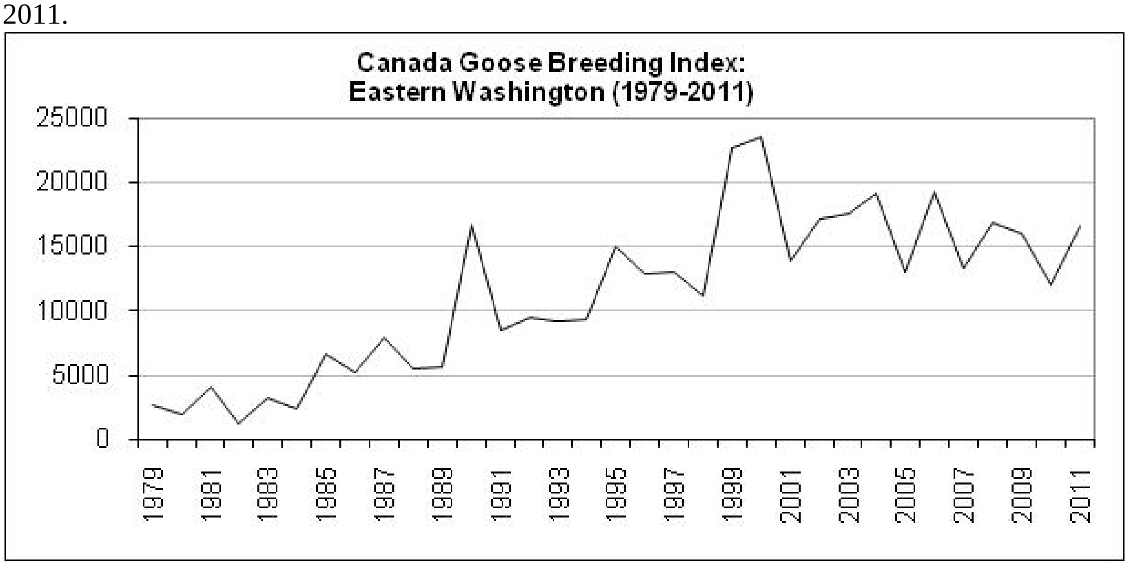


Table 1. Breeding duck routes, weighting factors and percent of area surveyed for areas and subareas surveyed for weighting breeding duck, goose, and ponds indices in Washington.

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 traditional survey area (2002-2011).

Species	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	1979-2010 average	2011 vs. 2010	2011 vs. LTA
Mallard	44676	39843	39958	40794	45485	46053	50647	47977	49160	54940	52598	0.12	0.04
Gadwall	18527	15353	15185	15665	17995	17165	14065	10277	10277	11735	12639	0.14	-0.07
Am. Wigeon	6501	5028	5442	3439	6012	6240	2618	4283	2844	3248	5716	0.14	-0.43
Am .green-winged teal	2673	1749	1477	2406	4095	4060	1590	1612	1844	1905	3033	0.03	-0.37
Blue +cinnamon teal	13717	11274	14619	12404	9544	11999	11921	9282	8657	6645	25344	-0.23	-0.74
Northern shoveler	5968	7794	6293	4477	6581	5409	4898	5555	4199	6249	6567	0.49	-0.05
Northern pintail	395	608	1096	644	1089	723	450	1198	542	2489	1676	3.59	0.49
Wood duck	1863	616	1553	1375	1549	1870	1781	1327	2409	1527	1693	-0.37	-0.10
Redhead	11831	8117	8365	4978	8492	8265	7757	7156	6466	6072	14037	-0.06	-0.57
Canvasback	1507	919	618	610	1460	756	1132	873	385	765	799	0.99	-0.04
Scaup spp.	9289	12722	4807	5741	9709	6530	4244	5982	2484	3429	8513	0.38	-0.60
Ring-necked duck	1405	3063	850	2525	3640	2732	2995	2521	2381	2136	2791	-0.10	-0.23
Goldeneye spp.	4036	4713	3255	3567	2847	2837	3841	3686	3495	3121	2759	-0.11	0.13
Bufflehead	1606	3034	1280	2425	6361	2809	3728	949	2701	6838	1636	1.53	3.18
Ruddy duck	9023	12175	9624	10150	10464	9538	8262	8378	6400	9306	10536	0.45	-0.12
Merganser spp.	327	757	463	304	121	1279	969	1095	794	1848	471	1.33	2.92
Total ducks	**133343**	**127764**	**114883**	**111503**	**135442**	**128265**	**120897**	**115663**	**105036**	**122254**	**150818**	**0.16**	**-0.19**
American coot	18171	19328	19085	12346	22151	33763	22069	25521	20511	16834	30472	-0.18	-0.45
Canada goose	17179	17596	19137	13022	19253	13244	16342	16023	12014	16511	11117	0.37	0.49

Table 3. Weighted breeding duck population indices by area for eastern Washington traditional survey (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**
1979-10 Avg	67073	59429	2942	21373	150818
2011 vs. 2010	+28%	+20%	-5%	-25%	+16%
2011 vs. LTA	+6%	-39%	-64%	-37%	-19%

Table 4. Comparison of breeding waterfowl helicopter survey results (new method) and traditional survey (old method), Eastern Washington, 2011.

SPECIES	New method	SE	Old method	New method	SE	Old method	New method	SE	Old method	New method	SE	Old method
Mallard	21469	*3109*	45007	*17118*	*2916*	5675	510	*128*	3370	39096	*4264*	54940
Gadwall	1795	*654*	6629	*8151*	*1687*	4494	54	*34*	613	10000	*1809*	11735
American Wigeon	598	*214*	1263	*1100*	*433*	1627	43	*18*	357	1742	*483*	3248
Cinnamon Teal	665	*319*	4563	*2282*	*751*	1324	0	*0*	460	2947	*816*	6389
Blue-winged Teal	266	*148*	0	*571*	*380*	176	0	*0*	51	836	*408*	256
Am. Green-winged teal	465	*113*	863	*1671*	*607*	969	82	*41*	51	2218	*619*	1905
Northern shoveler	598	*443*	3645	*2853*	*890*	2451	14	*10*	153	3465	*994*	6249
Northern Pintail	0	*0*	2207	*0*	*0*	282	0	*0*	0	0	*0*	2489
Redhead	665	*546*	1706	*3994*	*1324*	3320	0	*0*	1047	4659	*1432*	6072
Canvasback	0	*0*	0	*245*	*241*	663	0	*0*	102	245	*241*	765
Scaup	764	*414*	1488	*530*	*298*	894	2	*2*	1047	1296	*511*	3429
Ring-necked Duck	0	*0*	175	*408*	*205*	863	202	*149*	1098	609	*253*	2136
Goldeneye	0	*0*	0	*82*	*84*	900	9	*6*	2221	91	*84*	3121
Bufflehead	266	*159*	1335	*734*	*381*	4609	59	*23*	638	1058	*414*	6838
Ruddy duck	199	*112*	674	*7132*	*4449*	7993	36	*36*	894	7368	*4451*	9306
Mergansers	266	*171*	884	*163*	*115*	56	163	*90*	842	592	*225*	1848
Wood duck	199	*201*	961	***245***	***138***	56	14	*15*	511	458	*244*	1527
TOTAL DUCKS	**28216**	***3324***	**71399**	***47277***	***5943***	**36352**	**1187**	***558***	**13454**	**76679**	***6833***	**122254**
American Coot	1795	*1279*	1707	*6888*	*1943*	8693	5	*4*	6434	8687	*2326*	16834
Canada goose	8840	*2934*	3955	13286	*4435*	4740	528	*123*	7123	22655	*5319*	16511

Table 5. Summary of eastern Washington helicopter surveys for breeding waterfowl (2009-2011).

STRATA	YEAR		Mallard	Gadwall	American Wigeon	Cinnamon Teal	Blue-winged Teal	Am. Green-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**		45491	7478	1731	3723	261	523	2286	0	2384	65	2678	196	0	653	163	327	0	2351	**70768**	12932	8817
		+/-SE	*8489*	*2402*	*801*	*979*	*145*	*215*	*723*	*0*	*912*	*66*	*1372*	*102*	*0*	*283*	*106*	*147*	*0*	*865*	***9146***	*5815*	*2025*
	2010		27448	3294	213	5171	283	602	4250	0	1523	71	1417	567	0	2479	248	266	0	1204	**49053**	7544	4569
		+/-SE	*8066*	*986*	*103*	*3071*	*177*	*410*	*1980*	*0*	*741*	*72*	*805*	*199*	*0*	*1267*	*176*	*171*	*0*	*602*	***9102***	*3926*	*1660*
	2011		21469	1795	598	665	266	465	598	0	665	0	764	0	0	266	199	266	0	199	**28216**	1795	8840
		+/-SE	*3109*	*654*	*214*	*319*	*148*	*113*	*443*	*0*	*546*	*0*	*414*	*0*	*0*	*159*	*112*	*171*	*0*	*201*	***3324***	*1279*	*2934*
POTHOLES	**2009**		16756	9309	1513	4654	931	465	1978	233	7331	233	0	349	0	815	1804	349	0	1047	**47766**	14080	10182
		+/-SE	*4295*	*2413*	*522*	*1349*	*752*	*339*	*901*	*158*	*4452*	*231*	*0*	*208*	*0*	*477*	*1725*	*191*	*0*	*600*	***7169***	*9485*	*3557*
	2010		19563	14754	1223	4891	2038	2445	2119	82	7784	0	489	1304	82	652	3383	163	0	408	**61379**	7010	7540
		+/-SE	*4841*	*3186*	*412*	*1547*	*728*	*643*	*503*	*82*	*1971*	*0*	*253*	*521*	*84*	*353*	*1318*	*115*	*0*	*266*	***6597***	*2327*	*2071*
	2011		17118	8151	1100	2282	571	1671	2853	0	3994	245	530	408	82	734	7132	163	0	245	**47277**	6888	13286
		+/-SE	*2916*	*1687*	*433*	*751*	*380*	*607*	*890*	*0*	*1324*	*241*	*298*	*205*	*84*	*381*	*4449*	*115*	*0*	*138*	***5943***	*1943*	*4435*
HIGHLANDS	**2009**		13892	1292	162	1292	162	808	162	0	646	162	0	1777	323	808	1050	1292	323	2423	**26572**	10823	8965
		+/-SE	*6044*	*1244*	*155*	*633*	*147*	*556*	*155*	*0*	*453*	*155*	*0*	*916*	*326*	*647*	*1011*	*690*	*209*	*1792*	***6723***	*5066*	*8452*
	2010		5499	745	380	380	127	174	428	0	246	0	943	975	507	317	452	0	0	887	**12392**	3439	673
		+/-SE	*2276*	*473*	*214*	*121*	*85*	*90*	*231*	*0*	*113*	*0*	*576*	*335*	*306*	*168*	*242*	*0*	*0*	*469*	***2538***	*1006*	*414*
	2011		510	54	43	0	0	82	14	0	0	0	2	202	9	59	36	161	2	14	**1187**	5	528
		+/-SE	*128*	*34*	*18*	*0*	*0*	*41*	*10*	*0*	*0*	*0*	*2*	*149*	*6*	*23*	*36*	*90*	*5*	*15*	***558***	*4*	*123*
TOTAL	**2009**		77291	18159	3405	9670	1360	1802	4426	233	10361	460	2678	2322	323	2275	3017	1994	330	5828	**146391**	37834	28492
		+/-SE	*11276*	*3625*	*969*	*1783*	*780*	*686*	*1165*	*158*	*4567*	*286*	*1372*	*945*	*326*	*852*	*2002*	*731*	*209*	*2079*	***13429***	*12225*	*9391*
	2010		52510	18792	1816	10442	2448	3222	6797	82	9553	71	2849	2845	589	3448	4082	429	0	2499	**122823**	17993	12782
		+/-SE	*9678*	*3369*	*475*	*3441*	*754*	*768*	*2056*	*82*	*2109*	*72*	*1022*	*651*	*317*	*1326*	*1351*	*206*	*0*	*808*	***11525***	*4674*	*2686*
	2011		39096	10000	1742	2947	836	2218	3465	0	4659	245	1296	609	91	1058	7368	590	2	458	**76679**	8687	22655
		+/-SE	4264	1809	483	816	408	619	994	0	1432	241	511	253	84	414	4451	225	5	244	**6833**	2326	5319

Table 6. Summary of western Washington breeding waterfowl population survey, 2011

	South Puget Sound Lowlands		North Puget Sound Lowlands		Chehalis River Valley		Hood Canal		Dungeness		TOTAL	
SPECIES	**2011**	***SE***	**2011**	***SE***	**2011**	***SE***	**2011**	***SE***	**2011**	***SE***	**2011**	***SE***
Mallard	8675	*1309*	9390	*1791*	*1328*	*817*	2788	*668*	1864	*629*	24046	*5214*
Gadwall	501	*520*	368	*207*	*98*	*74*	0	*0*	186	*193*	1154	*995*
American Wigeon	1974	*1532*	2363	*1597*	*246*	*275*	0	*0*	62	*64*	4645	*3468*
Unidentified Teal	723	*586*	2639	*1378*	*418*	*275*	192	*121*	0	*0*	3972	*2361*
Am. Green-winged teal	1335	*593*	6168	*3770*	*935*	*684*	0	*0*	2020	*1931*	10457	*6978*
Northern shoveler	2947	*2988*	1964	*1542*	*49*	*55*	0	*0*	0	*0*	4961	*4585*
Northern Pintail	0	*0*	0	*0*	*0*	*0*	0	*0*	0	*0*	0	*0*
Scaup	0	*0*	31	*31*	*25*	*27*	0	*0*	0	*0*	55	*58*
Ring-necked Duck	1084	*388*	1013	*551*	*1279*	*1057*	513	*176*	466	*305*	4355	*2477*
Bufflehead	2224	*604*	1197	*503*	*295*	*234*	449	*174*	466	*433*	4631	*1948*
Common Merganser	0	*0*	1197	*557*	295	*334*	64	*59*	62	*68*	1618	*1018*
Wood duck	612	*435*	552	*198*	*49*	*53*	128	*118*	0	*0*	1341	*804*
TOTAL DUCKS	**20354**	***3828***	**27157**	***5025***	***5214***	***1622***	**4134**	***734***	**5126**	***2109***	**61986**	***13321***
American Coot	139	*85*	0	*0*	*0*	*0*	0	*0*	31	*32*	170	*117*
Canada goose	1557	*391*	1227	*364*	*148*	*115*	513	*259*	280	*199*	3725	*1328*

Table 7. Weighted pond index from transects within the Pothole strata, eastern Washington, 1979-2011.

Year	Douglas	Okanogan	Omak	Lincoln	Far East	Total
1979	443	576	236	2475	1065	4795
1980	641	633	167	4378	935	6754
1981	809	675	344	3189	785	5801
1982	717	661	236	2808	935	5356
1983	1312	492	452	4283	1252	7792
1984	1312	815	482	5996	1514	10120
1985	1251	581	403	3046	1327	6608
1986	1099	591	334	4664	1458	8145
1987	824	478	315	2380	579	4576
1988	717	544	256	1142	449	3107
1989	794	520	216	1713	729	3972
1990	626	422	226	666	486	2426
1991	504	534	233	1047	673	2990
1992	275	394	157	904	430	2160
1993	855	366	157	3998	822	6197
1994	717	492	182	2046	729	4167
1995	1022	548	521	4902	1551	8545
1996	1236	633	442	5663	1645	9619
1997	1938	1125	678	9232	2691	15665
1998	1495	900	619	4949	1663	9627
1999	1389	998	550	7234	1757	11928
2000	1267	773	550	5330	1420	9341
2001	946	619	305	5330[1]	1420[1]	8620
2002	1022	520	246	2665	654	5108
2003	1541	675	216	3617	635	6685
2004	629	647	177	2147	673	4264
2005	336	492	177	904	617	2526
2006	1984	759	423	5378	1047	9590
2007	1190	773	374	3379	972	6688
2008	641	675	354	2760	1065	5495
2009	763	506	265	3093	1364	5992
2010	717	506	331	2617	1134	5306
2011	**1145**	**787**	**236**	**4759**	**1383**	**8310**
1979-2010 avg	969	623	332	3560	1077	6561
2011 vs. 2010	+60%	+56%	-29%	+82%	+22%	+57%
2011 vs. LTA	+18%	+27%	-29%	+34%	+28%	-27%

[1] 2001 field surveys were not completed; 2001 table values were determined by extending forward the 2000 values assuming no net gain in ponds.

Table 7. Weighted duck brood indices by species for the Potholes, Palouse, and Northeast areas of Washington, 2002-2011.

Species	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	79-10 Avg	% change from	
												2010	Average
Mallard	1183	1260	1284	1221	1200	1786	1419	1416	1035	1042	1680	1%	-38%
Gadwall	353	299	116	15	107	132	292	87	87	379	364	338%	4%
Wigeon	126	170	95	146	54	54	48	43	10	35	251	58%	-86%
Green-winged teal	143	158	14	26	118	94	151	183	176	233	143	31%	63%
Blue-winged teal	228	212	92	26	15	0	42	48	0	30	533	63%	-94%
Cinnamon teal	66	48	24	40	14	103	91	14	138	30	94	-770%	-68%
Northern shoveler	207	238	63	0	29	15	59	44	49	19	161	-69%	-88%
Northern pintail	199	158	20	0	0	0	0	0	0	0	118	-	-100%
Wood duck	0	14	42	33	82	107	28	28	42	33	41	-33%	-19%
Redhead	238	267	40	0	121	211	252	154	94	184	414	59%	-55%
Canvasback	77	128	26	15	65	26	90	0	32	0	33	-	-100%
Scaup	0	82	0	0	20	14	21	94	17	34	48	18%	-30%
Ring-necked duck	0	26	85	0	108	26	50	14	86	23	50	-443%	-53%
Goldeneye	26	26	266	163	438	444	412	331	275	391	173	35%	126%
Bufflehead	179	26	0	26	0	40	14	24	43	14	11	-121%	28%
Ruddy duck	0	167	86	110	201	222	219	183	104	86	223	-10%	-61%
Merganser	0	14	15	0	128	204	77	77	65	56	50	-12%	11%
TOTAL BROODS	**2757**	**3089**	**3166**	**1819**	**4085**	**3477**	**3265**	**2741**	**2253**	**2588**	**4393**	**12%**	**-41%**

Table 9. Weighted duck brood indices for eastern Washington and total brood counts for 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	No survey
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
LTA	2414	883	908	188	4393	155
2011 vs. 2010	64%	4%	-23%	0%	15%	20%
2011 vs. LTA	-52%	1%	-44%	-83%	-41%	-61%

Note: Discrepancies in calculations from previous reports have been corrected on this table.

Table 10. Goose nest surveys conducted in Washington.

Survey Area	Year Survey Initiated	Agency Conducting Survey	Frequency of Survey	Average Rate of Change Per Year (% nesting attempts) 84-88	89-93	94-98	99-03	04-08	09-12
UPPER COLUMBIA				+4.1%	+1.8%	-2.3%	+1.4%	-8.3%	-0.4%
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				+10.7%	+8.5%	-7.9%	-1.0%	+4.3%	+14.5%
Snake River	1975	Army Corps	Annual						
Snake River Cliff	1979	Army Corps	Discontinued						
LOWER COLUMBIA				+18.9%	+4.0%	-1.2%	0	-0.7%	-2.4%
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						
I-5 to Bonneville	1981	Army Corps	Periodic						
I-5 to Puget Island	1981	WDFW	Annual						
COLUMBIA BASIN				+7.1%	0	+1.0%	0	+11.1%	+12.1%
Moses Lake	1981	WDFW	Biennial						
Potholes Res.	1981	WDFW	Biennial						
Lenore, Alkali, Park	1981	WDFW	Periodic						
TOTAL				+8.9%	+1.9%	-2.1%	-1.0%	-3.3%	+2.3%
Geese counted on duck surveys		WDFW	Annual	+31.9%	+32.1%	+7.0%	+18.8%	-7.3%	-7.9%

Table 11. Canada goose nest surveys in important areas of Washington, (1974-2011) and weighted number of geese observed during duck population surveys (1979-2011).

	Number of Nests					Geese observed on breeding duck surveys
Year	Upper Columbia	Snake River	Lower Columbia	Columbia Basin	TOTAL	
1974	279	0	363	0	642	
1975	297	50	344	0	691	
1976	310	51	345	0	706	
1977	358	51	384	0	793	
1978	329	51	330	0	710	
1979	303	87	292	0	682	2570
1980	393	112	339	0	844	1925
1981	500	145	332	249	1226	4053
1982	509	160	495	484	1648	1203
1983	656	171	535	541	1902	3225
1984	618	132	481	601	1831	2305
1985	630	150	631	757	2168	6674
1986	641	136	580	765	2122	5225
1987	745	130	1024	702	2601	7938
1988	794	229	1076	742	2841	5426
1989	799	227	1154	500	2680	5605
1990	808	180	1161	518	2667	16695
1991	923	199	1282	414	2818	8483
1992	916	236	1164	538	2854	9483
1993	858	319	1293	628	3098	9190
1994	806	290	1251	595	2942	9396
1995	929	261	1302	477	2969	15017
1996	944	236	1321	501	3002	12758
1997	798	210	1286	676	2970	13019
1998	744	210	1215	610	2779	11199
1999	783	187	1273	315	2558	22598
2000	797	207	1235	313	2565	23449
2001	790	214	1331	539	2874	13307
2002	751	199	1321	629	2915	17179
2003	793	199	1232	374	2598	17596
2004	728	199	1260	350	2537	19137
2005	626	199	1157	584	2566	13022
2006	593	248	1242	544	2627	19253
2007	479	217	1139	442	2277	13244
2008	441	197	1167	485	2290	16342
2009	460	243	1171	594	2468	14858
2010	493	241	1153	544	2408	12014
2011	**499**	**259**	**1140**	**599**	**2497**	**16511**
1991-10 avg	733	224	1242	520	2465	14527
11 vs. 2010	+1%	+7%	-1%	+10%	+3%	-19%
11 vs 20-yr avg	-32%	+15%	-8%	+15%	-8%	-17%

WATERFOWL STATUS AND TREND REPORT: STATEWIDE
Winter Waterfowl Populations and Harvest

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Introduction

This report summarizes the 2010-11 Washington winter waterfowl surveys, waterfowl hunting regulations, waterfowl harvest, and waterfowl hunter trends. This summary compares current data with data collected over the past 25 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 1940's.

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.

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 2010-11 MWS in January 2011. Washington's midwinter index for total waterfowl and coots was estimated at 800,748, a decrease of 16% from the previous year and 19% below the 10-year average (2001-2010; Table 1).

The 2011 Pacific Flyway midwinter index for total waterfowl was 5.7 million. This represents a 9% decrease from 2010 (6.2 million), 14% below the 10-year average (6.6 million), and 14.5% below the long-term average (6.7 million; 1955-2010).

Ducks--The 2011 midwinter indices for total ducks in the 11 Pacific Flyway states was 4.4 million (Fig. 1), down 5% from the 2010 count (4.6 million), -14% below the 10-year average (5.1 million), and 22% below the long-term average (5.6 million; 1955-2010).

In Washington, the 2011 total wintering duck population was 662,516, down 9% from 2010 levels and 13% below the 10-year average (Fig. 2). The Washington total duck count represents 15.1% of the Pacific Flyway wintering population, 0.2% above the state's 10-year average of 14.9% (Fig. 3). The highest ratio of Washington ducks to total Pacific Flyway ducks in the MWS was in 1991 (28.6%).

The 2011 mallard total for the Pacific Flyway was 717,687, down 23% from 2010, 30% below the 10-year average (2001-2010), and 54.5% below the long-term average (1955-2010). The total number of mallards counted in Washington in 2011 was 349,790, a 14% decrease from the previous year, and 8% below the 10-year average (Table 1). Washington typically holds a high percentage of the Pacific Flyway mallard population with a 10-year average of 37.1% (Fig. 4). In 2011, Washington held 48.7% of the Pacific Flyway mallards during the MWS.

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 2011 MWS for Canada geese in the Pacific Flyway was 285,428. The count declined 31% from 2010, fell below the 10-year average by 31.5%, and was 19% below the LTA.

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 2011 total of 26,999 was down 49% from 2010, a record low. This count was 47% below the 10-year average (Table 1, Fig. 5).

Snow geese--The northern population of snow geese from 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. Nesting conditions in 2010 at Wrangel Island's Tundra River colony were reported as poor with only 18% nest success. The 2010 spring population was estimated at 150,000 adults. Juvenile snow geese comprised only 5% of the wintering population in the Fraser and Skagit River Deltas in December 2010. Juveniles typically comprise 25% of the population. Midwinter snow goose aerial photo counts by Canadian Wildlife Service in January 2011 numbered 63,641. This represents a 14% decrease over the January 2010 count of 73,964 snow geese, 11% below the 10-year average. (Table 1, Fig. 6).

Brant--The number of brant counted in Washington during the 2011 midwinter survey was 21,457, a 44% increase from 2010, and 37% above the 10-year average (Table 1, Fig. 7). The number of brant counted during the northern Puget Sound midwinter aerial survey on January 3, 2011 was 15,396, up 48% from the previous year. The largest concentrations of brant were in Lummi Bay (34%), Samish Bay (33%), and Padilla Bay (22%). All brant counted in Skagit County are considered to be Western High Arctic (WHA) brant. However, color composition surveys were discontinued in 2004-05. Starting in the 2006 hunting season, breast color measurements were taken from brant at Skagit County check stations collecting avian influenza samples. In 2010-11, 49% of harvested birds (n = 196) were gray-bellied (WHA) brant (Munsell 4-8). Since 2006, the WHA harvest composition has ranged from 21-52%. These results call into question the assumption that all brant counted in Skagit County during the MWS are WHA brant.

Swans--The 2011 northern Puget Sound (Skagit, Whatcom, Snohomish, and San Juan counties) trumpeter swan MWS totaled 10,529 (Table 2), up 14% from the 2009 count of 9,263. The 2011 survey is the highest count on record for trumpeter swans wintering in north Puget Sound, exceeding the 10 year average by 75%. Juveniles accounted for 14.4% of the 2011 survey (Table 2), slightly below (-1.6%) the 2001-2010 average of 16.0%.

The 2011 northern Puget Sound tundra swan midwinter index was 2,285, 13% above the 2010 index and 1% below the 10-year average. Juveniles represented 17.7% of the population (Table 2), the highest ratio on record for this survey, exceeding the 10-year average by 3.6%.

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 2,442 carcasses collected from 2000-2010, the majority of deaths were lead-related (68%). An average of 19 lead and 7 steel pellets were recovered per gizzard of lead exposed swan. 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, 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, Yakama Nation, and WDFW (Table 2).

North Puget Sound--The highest count during the North Puget Sound monthly surveys took place during January 2011, totaling 323,695 dabbling ducks. The record high count 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.

Columbia Basin—Due to weather constraints, there was only one survey in the North Columbia Basin during 2010-11. The January MWS flight totaled 110,126 total waterfowl. For the South Columbia Basin the highest count was in January, with 160,795 total waterfowl. The Yakama Nation conducts monthly winter aerial surveys of the Yakima Basin. The highest count on this survey took place in January, with 34,840 total waterfowl.

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. Observers counted a combined total of 11,450 small Canada geese on the two lakes in October 2010. This count was 52% below the long-term average (1976-2009) of 24,097 (Fig. 8). 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 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 as early as 2012.

Hunting Season Regulations

The 2010-11 waterfowl harvest was conducted under Washington State regulations (Table 3). The federal framework allowed the maximum (107 days) number of days under the Migratory Bird Treaty. Washington’s season length was 105 days statewide with two additional days for the statewide Youth Hunt on Sept. 25-26. The reduced scaup season ran from Nov. 6 - Jan. 30. The daily bag-limit was 7 ducks, to include not more than with 2 hen mallard, 2 pintail, 3 scaup, 2 redhead, 1 canvasback, 1 harlequin (season limit), 2 scoter, 2 long-tailed duck, and 2 goldeneye (Table 3).

Substantial waterfowl populations in the Pacific Flyway over the last 15 years have allowed for liberal seasons and bag limits (Table 4). 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. (Table 4).

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. For the 2002-03 hunting season, the Washington Migratory Bird Stamp 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 federal migratory bird stamp remained at $15.00 (Table 4).

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 2010-11 (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 1970's; 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 5. A special late season damage control hunt initiated in 1995-96 was continued in Area 2A during 2010-11. The season was open Saturdays and Wednesdays during February 5 – March 9, 2011 with a season quota of 5 duskys for the area. The season is open to WDFW Master Hunters and youth hunters.

For the 2010-11 season, the Aleutian goose daily bag limit remained 1 in Area 2B (Pacific County), 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 are available as Feel Free to Hunt or Register to Hunt. During the 2010-11 hunting season, a drawing was held for Saturday hunts only. Numerous complaints of public safety concerns due to unethical snow goose hunting led to special restrictions in Skagit County. During 2010-11, snow goose hunters were required to hunt over at least 24 snow goose decoys set up in a realistic pattern, and not leave them unattended. 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 2010-11 and the subsequent season.

The January-only brant season took place in 2011, with 8 hunt days allowed in Skagit County and 10 days in Pacific County (Table 3). The Skagit County brant hunt is dependent on a pre-season January count of at least 6,000 brant. In 2011, the

Skagit County survey estimated 8,519 brant (Table 2).

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 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. 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 reminders are included as the ‘second wave’, and then the harvest estimates are computed accounting for the non-response bias. Hunters were required to report harvest by species and county with mandatory harvest report cards by February 15, 2011.

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 ≤5) with a culmen length of 40-50 mm. Cacklers were classified at the check stations using culmen measurements of ≤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 ≤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. In this program, hunters study a goose identification workbook and 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 2010-11 Washington duck harvest of 388,716 decreased 11% from the 2009-10 harvest of 438,338. The duck harvest in Washington declined steadily from over 1,000,000 in the late 1960's, 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 433,000 birds annually.

Mallards made up 44% of Washington’s 2010-11 harvest, followed by American wigeon (13%), American green-winged teal (11%), and northern pintail (6%) (Table 6).

The total Canada goose harvest for 2010-11 was 55,380, up slightly (+1.4%) from the 2009-10 harvest of 54,621. A record low harvest of 26,479 occurred in 2004-05; the record high harvest (n = 72,721) was took place in 2006-07. During recent years, the presence of resident large Canada geese increased in Washington and has likely contributed to the increased harvest during the period from 1987 to 2001 (Fig. 10). The 2010-11 large Canada goose harvest (n = 24,018) was down 30% from the previous year and 5% below the long-term average.

The harvest of small Canada geese in 2010-11 (n = 17,000) decreased 17% from the previous year, 35% below 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 (n = 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 7 and Fig. 12. Region 2 has traditionally represented the highest percentage of the state's waterfowl harvest. For the 2010-11 season, Regions 2, 3, and 4 each accounted for 21% of the harvest followed by Region 6 (15%), Region 1 (12%), and Region 5 (10%), respectively. The proportion of duck harvest was highest in Region 4 (23%), followed by Region 3 (21%), and Region 2 (20%). Region 2 accounted for the highest proportion of goose harvest (29%), followed by Region 3 (23%), and Region 1 (18%).

Mandatory Harvest Reporting Results

Bag limits for most sea ducks were reduced by half for western Washington in 2010-11 and included a special limit for goldeneyes for the first time in 7 years of mandatory harvest reporting. 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 2,182 scoters, long-tailed ducks, and harlequin ducks and 713 goldeneyes (Fig. 13, Table 8). The sea duck harvest was dominated by surf scoters (54%), followed by white-winged scoters (22%), long-tailed ducks (12%), harlequin ducks (6%) and black scoters (6%). The reported goldeneye harvest was 50% common goldeneye and 50% Barrow's goldeneye. From a total of 2,848 authorizations, an estimated 688 hunters were successful and hunted a total of 1,030 days. Sea duck harvest was reported in 14 counties with Whatcom County reporting 25% of the harvest followed by Skagit County (20%), Island County (15%), and Mason County (14%). Mason County comprised the highest proportion of goldeneye harvest (23%), followed by Pierce County (20%), and Island County (14%).

The 2010-11 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 378, 34% below the 2010-11 estimate of 576 (Fig. 14, Table 9).

The 2010-11 snow goose harvest was estimated at 4,420, down 66% from the 2009-10 harvest. The Wrangel Island snow goose flock had a poor production year, resulting in few young birds that were susceptible to harvest. In addition, snow geese spent most of the winter away from major harvest areas on Fir Island in Skagit County. Snow goose harvest in Washington is historically variable (Table 10, Fig. 15). These geese have recently expanded their wintering range in northeastern Washington to portions of Snohomish and King counties. The harvest of snow geese in northern Puget Sound is weather dependent. Cold and windy weather forces geese from estuaries to forage inland where they are more vulnerable to hunters. 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).

In the SW Washington goose season, hunters who passed the identification test in 1996-2010 and didn't take a dusky in 2009-10 were authorized to hunt in 2010-11. New hunters and those harvesting duskys in 2009-10 were required to take a new test to obtain an authorization. A total of 2,209 permits were issued in 2010-11, but not all hunters who were authorized obtained a permit. Zone 1 (Ridgefield NWR) was closed after November 23, 2010, completing 5 hunt days before exceeding the 5 dusky quota. The regular season ran to completion in Zones 2-5. The percentage of duskys in the harvest was 1%, unchanged from 2009-10. A total of 2,429 geese were checked during the regular season, a decrease of 13% from 2009-10 and 16% below the 5-year average of 2,890 (Table 11, Fig. 16). A total of 443 individuals (down 4% from the 2009-10 season) checked birds at check stations. The 2011 late season had 75 Advanced Hunter Education (AHE) program participants, of which 44 checked geese at check stations. Total late season harvest was 153 geese, which was 18% below the 2009-10 late season estimate and 24% below the 5-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 is used to estimate the number of waterfowl hunters in the state. During the 2010-11 season, an estimated 24,404 hunters participated in the Washington waterfowl season, down 5% from 2009-10 (Fig. 17). The decline in waterfowl hunters follows a slight increase of hunters through the 1990's. Prior to that, there was a steady decline in hunters through the 1980's (Fig. 17). The 2004-05 estimate of Washington waterfowl hunters (n = 23,078) is the lowest on record.

The estimated average number of ducks harvested per hunter in 2010-11 was 15.9, approximately 1 duck less per hunter than the 5 year average, but higher than all other 5 year time periods on record. 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 the most 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-1980's (Table 4). This may have contributed to the reduced hunter participation (Fig. 17), but the downward trend in hunter numbers began in the early 1980's 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 4). 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 2010-11 there were 4 regulated access areas (RAA) on WDFW lands, including Winchester Ponds and Frenchman Ponds in Region 2, and Bailie Youth Ranch and Windmill Ranch in Region 3. WDFW also continued the Fir Island Snow Goose Quality Hunt and greatly expanded a private lands access program for waterfowl hunting in Region 4. All programs featured some type of limited access system 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.

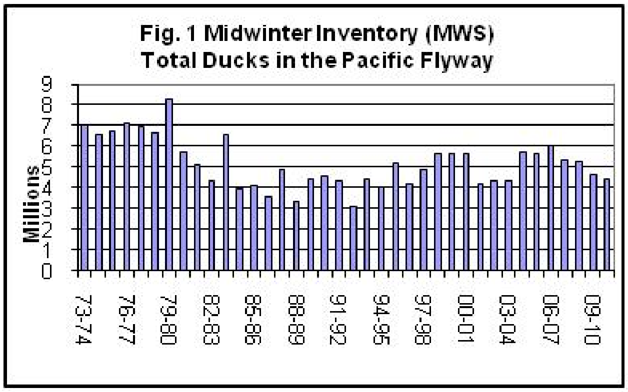


Fig. 1 Midwinter Inventory (MWS)
Total Ducks in the Pacific Flyway
Millions

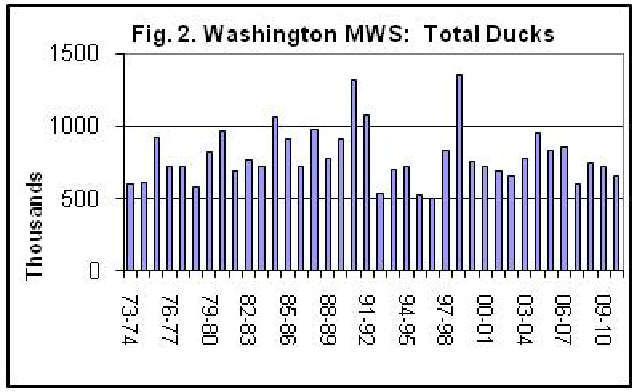


Fig. 2. Washington MWS: Total Ducks
Thousands

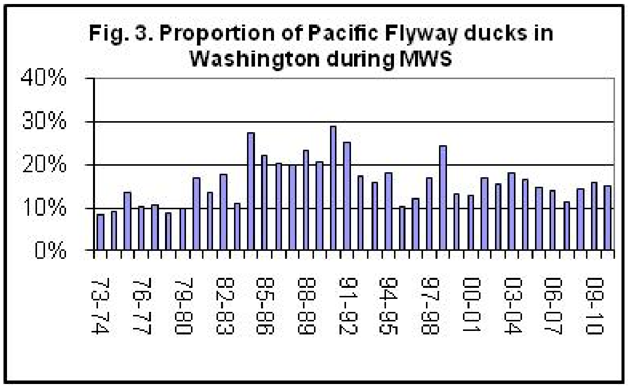


Fig. 3. Proportion of Pacific Flyway ducks in Washington during MWS

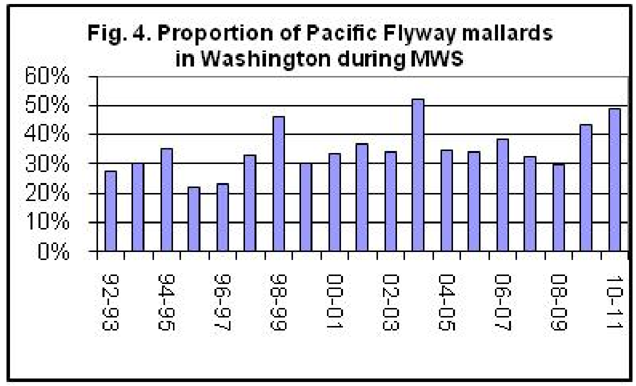


Fig. 4. Proportion of Pacific Flyway mallards in Washington during MWS

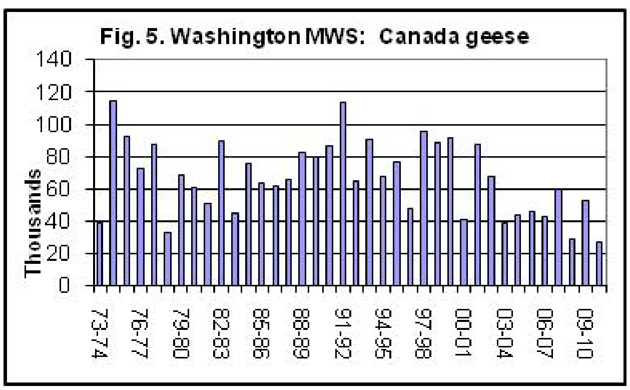


Fig. 5. Washington MWS: Canada geese
Thousands

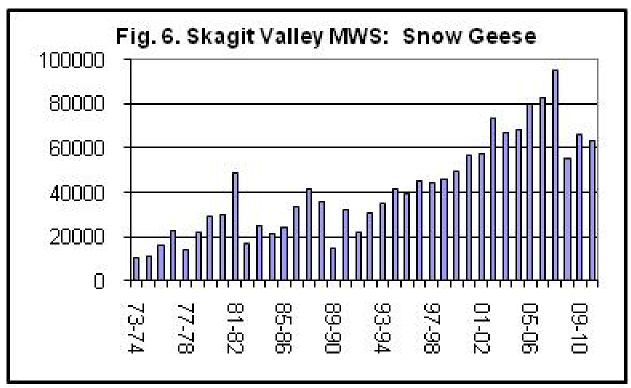


Fig. 6. Skagit Valley MWS: Snow Geese

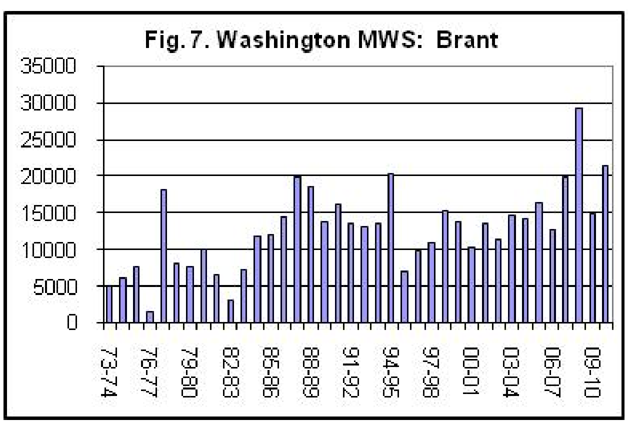


Fig. 7. Washington MWS: Brant

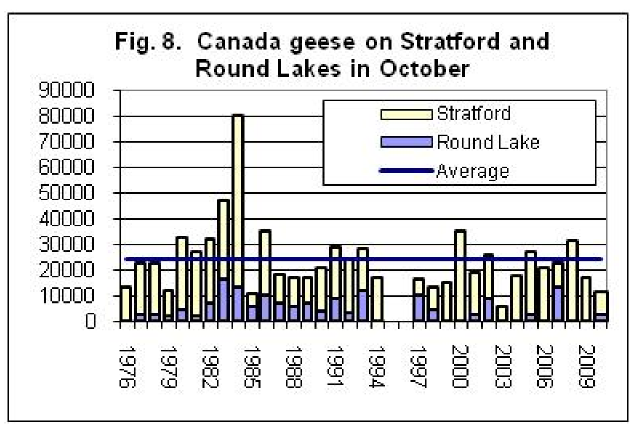
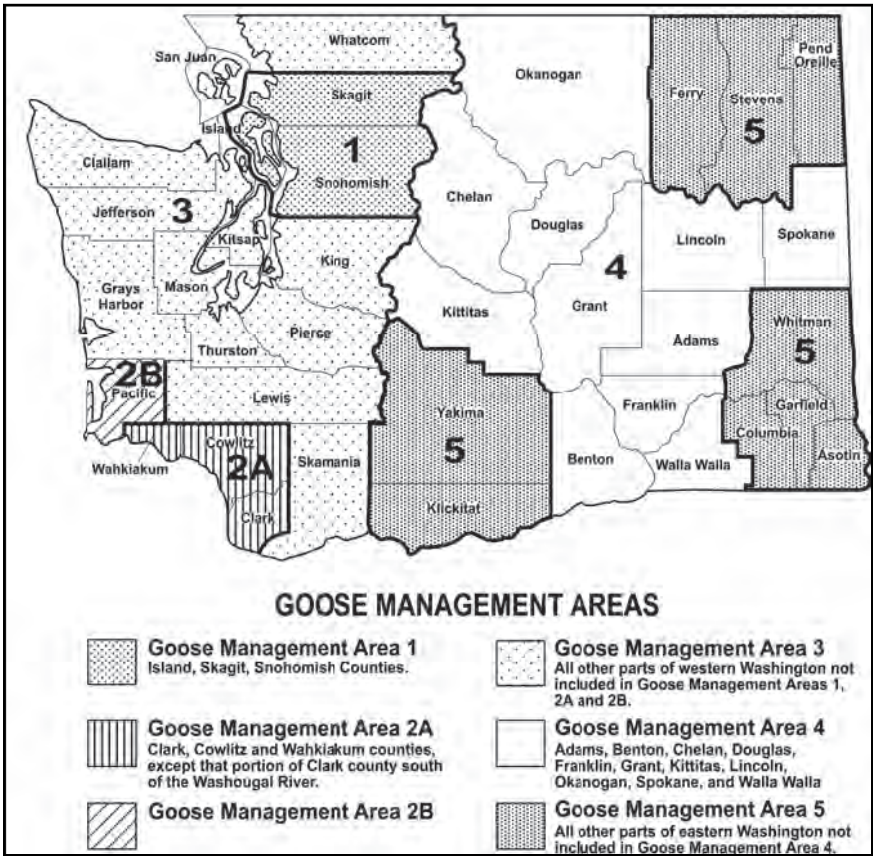


Fig. 8. Canada geese on Stratford and Round Lakes in October
Stratford
Round Lake
Average

Figure 9. Washington Goose Management Areas



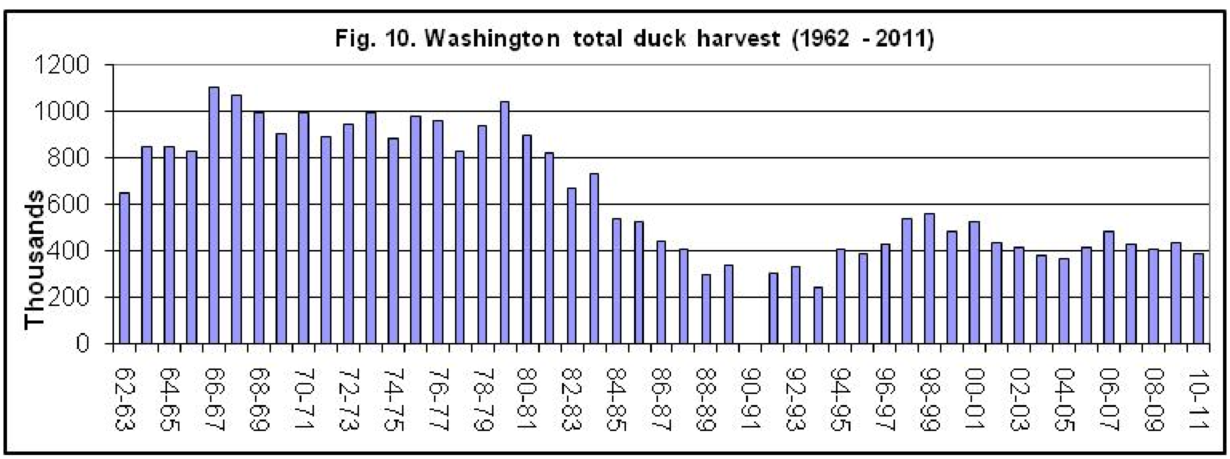


Fig. 11. Washington Canada Goose Harvest

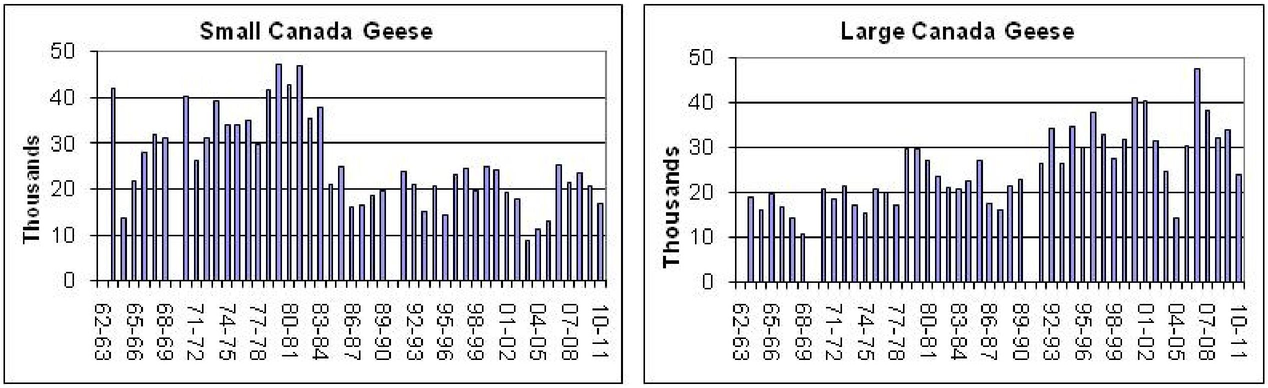


Fig. 12. Waterfowl Harvest by Region

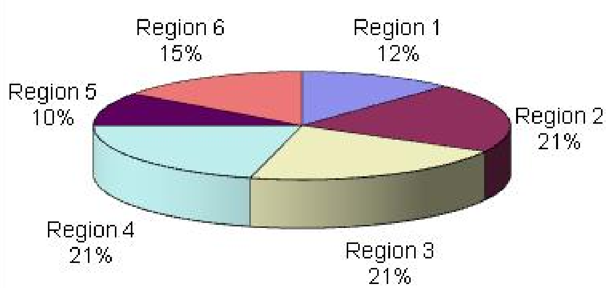


Fig. 13 Sea Duck Harvest (2010-11)

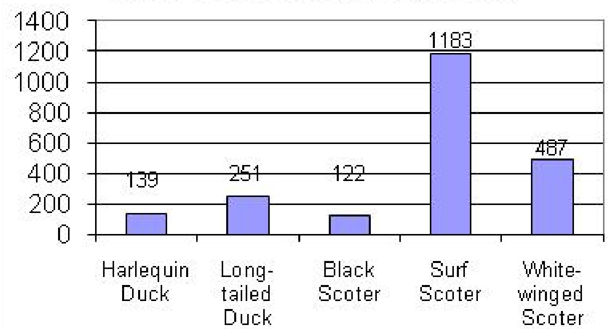


Fig. 14. Washington brant harvest

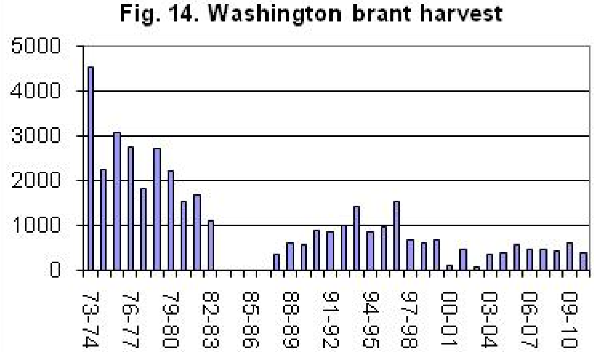


Fig. 15. Skagit snow goose harvest

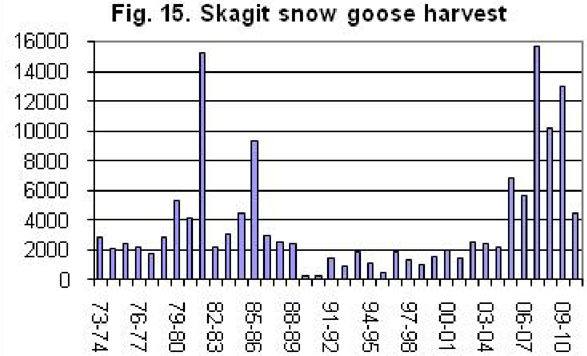
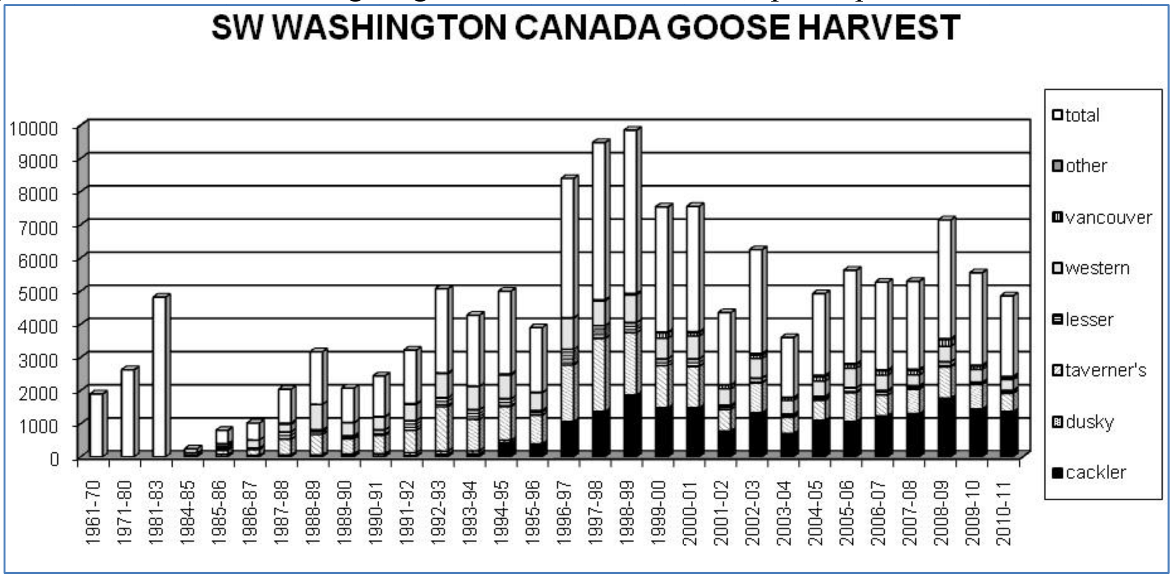
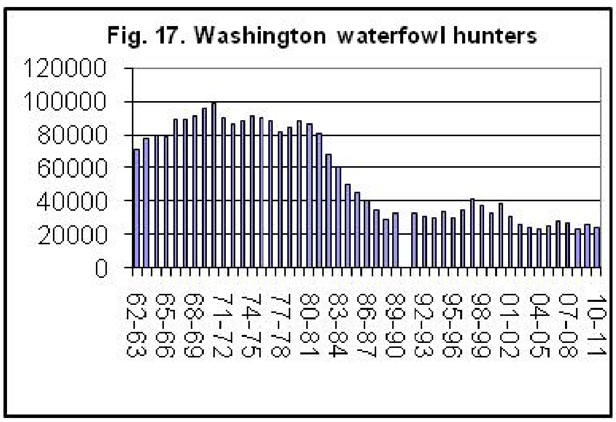


Figure 16. Southwest Washington goose harvest, 1970-2009, special permit zones 2A and 2B.





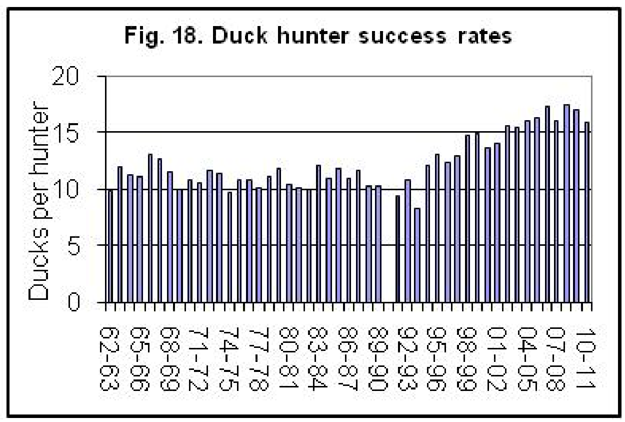


Figure 19. The waterfowl regulated access program promotes quality hunting opportunities by reducing hunting pressure.

TABLE 1. WASHINGTON DEPARTMENT OF FISH AND WILDLIFE ANNUAL WATERFOWL SURVEY - JANUARY 2011

SPECIES	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	11 vs.10	01-10 avg.	11 vs. avg.
Mallard	356830	348841	325459	432570	470186	374881	494597	313871	254655	405604	349790	-14%	377749	-7%
Gadwall	10571	10595	11391	9252	10904	5780	5314	5854	5324	6877	4149	-40%	8186	-49%
Wigeon	133465	124301	113838	151981	195798	170491	90734	89614	207236	126059	106149	-16%	140352	-24%
Green-winged Teal	6098	13695	8083	14565	33358	29492	30947	15506	15175	11554	18795	63%	17847	5%
B.W. & Cinn. Teal	0	484	57	11	4	5	272	2	12	20	335	1575%	87	286%
Shoveler	1358	1852	5801	3445	2553	4130	8763	2210	2671	2474	919	-63%	3526	-74%
Pintail	75597	72106	57465	49567	117296	94327	113949	45848	117235	40787	71083	74%	78418	-9%
Wood Duck	206	356	59	132	472	173	99	378	309	1406	501	-64%	359	40%
Redhead	27918	11353	6867	2621	4795	13026	3645	2443	4668	3550	4015	13%	8089	-50%
Canvasback	6020	3272	2131	3350	2929	2504	1501	3790	3239	3789	3148	-17%	3253	-3%
Scaup	28833	31970	41832	40744	34884	52519	29711	35052	40306	43003	31118	-28%	37885	-18%
Ringneck	6386	7306	6457	4583	8358	8507	12642	16568	19740	8763	5192	-41%	9931	-48%
Goldeneye	17177	15711	20098	14035	15941	19184	13973	15106	15976	14578	14457	-1%	16178	-11%
Bufflehead	20647	20266	26426	20009	23293	21857	17511	21230	25510	21609	19451	-10%	21836	-11%
Ruddy Duck	3075	3457	4966	2936	1937	1718	2179	3096	1508	1428	1180	-17%	2630	-55%
Scoter	15932	16597	14125	15876	16753	18265	15307	16742	12585	10445	11944	14%	15263	-22%
Long-tailed Duck	559	423	573	478	654	927	804	504	547	439	663	51%	591	12%
Harlequin	603	653	797	963	793	1015	733	902	670	839	692	-18%	797	-13%
Merganser	9535	10564	12325	10495	10202	8355	7443	6377	6523	7894	8775	11%	8971	-2%
Unidentified Ducks	1539	1606	3552	2660	5869	7458	4731	2515	9981	13440	5507	-59%	5335	3%
Snow Goose*	47743	55480	73363	66801	47111	80060	75141	82583	55016	66176	27550	-58%	64947	-58%
White-fronted Goose	34	21	2	5	27	17	82	42	119	22	113	414%	37	205%
Canada Goose	41351	88092	67941	39301	43908	45857	42759	60131	28629	53259	26999	-49%	51123	-47%
Brant	10197	13478	11455	14544	14286	16305	12712	19775	29243	14895	21457	44%	15689	37%
Tundra Swan**	4597	2521	6393	1447	2778	3422	3548	3570	3380	3211	2544	-21%	3487	-27%
Trumpeter Swan**	4047	4562	4263	3996	5508	7904	9104	7747	9852	9457	9984	6%	6644	50%
Unknown Swan**	49	254	168	2432	2381	232	842	292	1100	540	221	-59%	829	-73%
Coot	74250	80631	91284	91387	105522	119856	72265	69305	101951	84543	54017	-36%	89099	-39%
TOTAL	904617	940447	917171	1000186	1178500	1108267	1071308	841053	973160	956661	751391	-21%	989137	-24%
*B.C. Snow Geese	879	8675	1770	0	21030	0	8007	12276	2495	7788	38,974	536%	6126	400%
Skagit/B.C. Total	48622	64155	75133	66801	68141	80060	83148	94859	57511	73964	63259	-8.5%	69551	-14%

**Comprehensive western Washington swan surveys in 1989, 1991, 1996, 2001, 2006

Table 2. 2009-10 waterfowl surveys conducted in the Columbia Basin; waterfowl surveys, snow goose photo counts, aerial brant surveys, age-ratio counts conducted in Northeastern Puget Sound.

North Columbia Basin	**Oct.**	**Nov.**	**Dec.**	**Jan. 4, 10, 11**
Mallards				43,514
Total Ducks				78,141
Total Geese				5,700
Total Swans				102
Total Coots				26,183
SURVEY TOTAL				110,126
	No survey	No survey	No survey	
South Columbia Basin	**Oct.**	**Nov.**	**Dec. 7**	**Jan. 6**
Mallards			44,255	100,229
Total Ducks			66,268	124,570
Total Geese			1,573	19,307
Total Swans			64	94
Total Coots			9,596	16,824
SURVEY TOTAL			77,501	160,795
	No survey	No survey		
Yakima Basin	**Oct.**	**Nov.**	**Dec. 6**	**Jan.**
Mallards			19,980	25,209
Total Ducks			22,261	33,201
Total Geese			477	1,603
Total Swans			44	36
Total Coots				2,901
SURVEY TOTAL			22,782	34,840
	No survey	No survey		
Northern Puget Sound	**Oct.**	**Nov. 4**	**Dec. 2**	**Jan. 4**
Mallards		32,880	122,576	190,865
Northern pintail		55,010	34,360	57,020
American wigeon		38,765	44,380	66,715
Green-winged teal		13,087	10,815	9,095
Brant				
TOTAL DABBLERS		138,432	212,127	323,695
	No survey			

Snow Goose Aerial Photo Counts	**Date**	**Skagit/ Snohomish**	**Fraser**	**Total**	**% Young**
	12/10/10	25,942	37,699	63,641	4.4%
	1/18/11	40,340	7,310	47,650	4.6%
	1/26/11	24,285	38,974	63,259	-
Brant Aerial Surveys	**Date**	**Skagit Co.**	**Whatcom Co.**	**Total**	
	12/3/10	1,822	1,298	3,120	

Age-ratios obtained from field observations – Northern Puget Sound

Species	**Date**	**Sample size**	**Juveniles**	**% Young**
Trumpeter Swan	1/13-15/10	9,263	1,408	15.2%
Tundra Swan	1/13-15/10	2,301	357	15.5%

Table 3. Waterfowl hunting season regulation summary 2010-11.

	Area	SEASON DATES (inclusive)	Daily Bag Limit	Possession Limit
DUCKS (except Scaup) (d)	Statewide	Sept. 25-26, 2010 (Youth hunting only) (a)	7 (b)	14 (b)
		Oct. 16-20 and Oct. 23, 2010 – Jan. 30, 2011	7 (b)	14 (b)
Scaup	Statewide	Sept. 25-26, 2010 (Youth hunting only) (a) and Nov. 6 - Jan 30	3	6
Coots	Statewide	Same as duck seasons (including youth hunt) (a)	25	25
Snipe	Statewide	Same as duck seasons (except youth hunt)	8	16
GEESE (except Brant and Aleutian Canada Geese) See Fig. 1 for Goose Mgmt. Areas	Goose Mgmt. Areas 1 & 3	Sept. 10-15, 2010	5 Canada geese	10 Canada geese
	Goose Mgmt. Area 2A	Sept. 10-15, 2010	3 Canada geese	6 Canada geese
	Goose Mgmt. Area 2B	Sept. 1-15, 2010	5 Canada geese	10 Canada geese
	Goose Mgmt. Areas 4 & 5	September season closed	3 Canada geese	6 Canada geese
	Statewide, except Goose Mgmt. Areas 2A & 2B	Sept. 25-26 (Youth hunting only) (a)	4 Canada geese	8 Canada geese
	Goose Mgmt. Area 1 (d)	Oct. 16-28 & Nov. 6, 2010-Jan. 30, 2011, except snow, Ross', or blue geese may be taken Oct. 16, 2010-Jan. 30, 2011.	4	8
	Goose Mgmt. Area 2A (d)	Except Ridgefield NWR: 8am – 4pm, Sat., Sun., & Wed. only, Nov. 13-28 & Dec. 8, 2010-Jan. 30, 2011 except closed Dec. 25 & Jan. 1. Ridgefield NWR: 8am - 4pm, Tues., Thurs., and Sat. only, Nov. 13-27 and Dec. 9, 2010-Jan. 29, 2011, closed Nov. 25, Dec. 25, and Jan. 1.	4 (c)	8 (c)
	Goose Mgmt. Area 2B (d)	8 a.m. – 4 p.m. Sat. and Wed. only, Oct. 16 - Dec. 22, 2010, and Jan. 5-15, 2011; Dec. 26, 29; Jan. 2	4 (c)	8 (c)
	Goose Mgmt. Area 3	Oct. 16-28 and Nov. 6, 2010-Jan. 30, 2011	4	8
	Goose Mgmt. Area 4	Sat., Sun., Wed. only, Oct. 16, 2010-Jan. 23, 2011; Nov. 11, 25, 26, Dec. 27, 28, 30, 31, 2010; Jan. 17, 2011, and every day Jan. 24-30, 2011.	4	8
	Goose Mgmt. Area 5	Oct.16-20, & Oct. 23, 2010-Jan. 30, 2011	4	8
Brant (d,e)	Skagit Co.	Jan. 15, 16, 19, 22, 23, 26, 29, 30, 2011	2	4
	Pacific Co.	Jan. 15, 16, 18, 20, 22, 23, 25, 27, 29, 30, 2011	2	4
Swans	Statewide	Closed statewide		

a) **Special youth hunting season** open to hunters under 16 years of age (must be with adult at least 18 years old who is not hunting).
b) **Daily bag limit:** 7 ducks – to include not more than 2 hen mallard, 2 pintail, 3 scaup, 1 canvasback, and 2 redhead statewide, and to include not more than 1 harlequin, 2 scoter, 2 long-tailed duck, and 2 goldeneye in western Washington.
Possession limit: 14 ducks – to include not more than 4 hen mallard, 4 pintail, 6 scaup, 2 canvasback, and 4 redhead statewide; and not to include more than 1 harlequin, 4 scoter, 4 long-tailed duck, and 4 goldeneye in western Washington.
Season limit: 1 harlequin in western Washington.
c) **Daily bag limit:** 4 geese – to include not more than 1 dusky Canada goose and 2 cackling geese in Areas 2A & 2B; and to include not more than 1 Aleutian goose in Area 2B.
Possession limit: 8 geese – to include not more than 1 dusky Canada goose, 4 cackling geese in Areas 2A & 2B, except 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 goose with a culmen (bill) length of 32 mm or less.
d) **Written authorization**: required to hunt sea ducks (harlequin, scoter, long-tailed duck, goldeneye) in western Washington, brant and snow geese in Goose Mgmt. Area 1, and Canada geese in Goose Mgmt. Areas 2A and 2B (except for the September goose season).
e) If the pre-season wintering population in Skagit County is below 6,000 (as determined by the January survey) the brant season in Skagit County will be canceled.

Table 4. Significant historical changes in duck hunting regulations.

	Season		Bag Limit		Special Limits		Stamp Fees		Hunting License	Steel shot Regulation
Year(s)	East	West	East	West	Mallard	Pintail	State	Federal		
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	

[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)

Table 5. 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 5. 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 (27/27)
	Late	New	5	2A: Feb. 5 – Mar. 9 (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 6. Waterfowl harvest by species in Washington (2010-11)[1]

Species	Harvested	Composition
Mallard	170,342	43.8%
Northern pintail	25,077	6.5%
American wigeon	51,964	13.4%
Green-winged teal	42,388	10.9%
Total ducks	388,716	
Large Canada	24,018	53.3%
Small Canada	17,000	37.7%
White-fronted	887	2.0%
Snow	2,515	5.6%
Brant	654	1.5%
Total geese	55,380	
Total waterfowl	444,096	

[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 7. Waterfowl harvest by region (2010-11)

Regions	Ducks Harvested	% of State Total Ducks Harvested	Geese Harvested	% of State Total Geese Harvested
Region 1	44,264	11.4%	10,268	18.5%
Region 2	77,461	19.9%	16,085	29.0%
Region 3	80,089	20.6%	12,528	22.6%
Region 4	90,707	23.3%	4,712	8.5%
Region 5	36,948	9.5%	5,564	10.0%
Region 6	59,247	15.2%	6,223	11.2%

Table 8. Sea duck harvest, 2010-11[1].

Species	Harvested	Harvest composition excluding goldeneye	Harvest composition including goldeneye
Harlequin duck	139	6.4%	4.2%
Long-tailed duck	251	11.5%	8.7%
Black scoter	122	5.6%	4.2%
Surf scoter	1183	54.2%	40.9%
White-winged scoter	487	22.32%	16.8%
ALL SCOTERS	1792	82.1%	61.9%
TOTAL	2182		
Common goldeneye	355		12.4%
Barrow's goldeneye	358		12.3%

[1] These figures are based on analysis of mandatory report returns, corrected for non-response bias.

Table 9. Brant harvest report summary[1]

WASHINGTON BRANT HUNTING AUTHORIZATION: HARVEST REPORT SUMMARY						SKAGIT CO. HARVEST	WHATCOM CO. HARVEST	PACIFIC CO. HARVEST	TOTAL HARVEST
YEAR	MONTH	PERMITS ISSUED	SUCCESSFUL HUNTERS	HUNTER DAYS	SEASON DAYS				
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	7	328	0	81	409
2009	JAN	1681	232	510	8	545	0	31	576
2010	JAN	1030	200	387	8	253	0	125	378

[1] These figures are based on analysis of mandatory report returns, corrected for non-response bias.

[2] Days hunted estimate from 1990-2008 included successful hunters only

Table 10. Snow goose harvest report summary[1]

WASHINGTON SNOW GOOSE HUNTING AUTHORIZATION: HARVEST REPORT SUMMARY				ISLAND CO.	SKAGIT CO.	SNOHOMISH CO.	TOTAL
YEAR	PERMITS ISSUED	SUCCESSFUL HUNTERS	DAYS HUNTED[2]	HARVEST[3]	HARVEST[3]	HARVEST[3]	HARVEST[3]
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

[1]These figures are based on analysis of mandatory report returns, corrected for non-response bias
[2]Days hunted estimate from 1993-2008 included successful hunters only
[3]Harvest estimates do not include estimated wounding loss

Table 11. Southwest Washington Canada goose harvest summary

Season	Period	Aleutian	Cackler	Dusky	Lesser	Taverner	Vancouver	Western	Other	Total CAGO
1961-70	10 Year Average									1894
1971-80	10 Year Average									2624
1981-83	3 Year Average									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
1995-96	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
1996-97	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
1997-98	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
1998-99	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
1999-00	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
2000-01	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
2001-02	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
2002-03	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
2003-04	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
2004-05	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
2005-06	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
2006-07	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
2007-08	Season Total	2	1282	22	113	729	125	323	51	2647
2008-09	Regular Season	4	1636	43	154	887	195	406	41	3366
	Late Season		87	2	4	59	3	52	0	207
2008-09	Season Total	4	1723	45	158	946	198	458	41	3573
2009-10	Regular Season	13	1301	28	73	706	75	358	41	2595
	Late Season		111	4	3	30	12	25	1	186
2009-10	Season Total	13	1412	32	76	736	87	383	42	2781
2010-11	Regular Season	4	1245	17	94	525	57	297	37	2276
	Late Season	1	100	3		22	2	25		153
2010-11	Season Total	5	1345	20	94	547	59	322	37	2429

Note: Mandatory check stations initiated in 1984-85 season, prior estimates from USFWS harvest survey

Wild Turkey

WILD TURKEY STATUS AND TREND REPORT:

STATEWIDE

Joey J. McCanna, Upland Game Bird Specialist
Mick Cope, Upland Game Section Manager

Population objectives and guidelines

Turkeys were introduced in Washington over 70 years ago. Population augmentation in the 1980's and 1990's resulted in increased distribution (Figure 1) and increased hunting and wildlife viewing recreation.

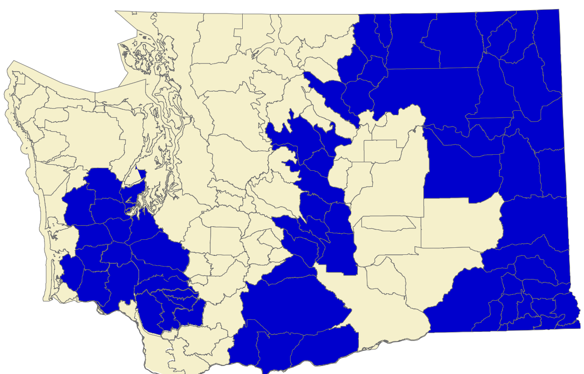


Figure 1. Primary current distribution of wild turkeys in Washington based on Game Management Units.

Very few translocation activities have occurred in recent years. As outlined in the WDFW management plans, trapping and translocation is used as a response to damage and nuisance complaints, however, none occurred during the 2010 reporting period.

In January 2006, the Department adopted a statewide turkey management plan. Population management strategies are included in the plan.

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 supposed 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 estimates made in the past.

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 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.

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. In 2008 a late fall permit hunt was added for Game Management Units in Okanogan County (218-231 and 242). All late fall seasons are either sex.

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. 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 legal. 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 2010, a total of 14,675 people hunted turkeys, taking a total of 5,737 turkeys during the spring and fall seasons combined. Turkey harvest in 2010 saw a 17% increase from 2009 and was 14% higher than the most recent 10 year average (Figure 2).

Game Management Units are 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).

Table 1. Game Management Units included in each Population Management Unit.

PMU	GMUs Included
P10	101-136
P15	139-186
P20	All 200 GMUs
P30	All 300 GMUs EXCEPT GMU 382
P35	GMUs 382,388,578,574,572,568
P40	All 400 GMUs PLUS GMUs 601-627
P50	All 500 GMUs EXCEPT 568-588 PLUS GMUs 633-681

In 2010, spring turkey harvest increased from 2009 in every PMU other than PMU P15 where harvest decreased by 4% (Figure 3). Hunters showed the largest increases in harvest in P20 (North Central), P 30 (south-central), and P35 (Klickitat).

Surveys

Between 2004 and 2010 the Colville District carried out pilot an annual winter survey of wild turkeys in northeastern Washington (PMU P10). 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.

District wildlife biologists ran three replicate counts on the most productive established transects during the December 15, – January 31 time period recommended in the summary report from the pilot project. The timing of the routes worked well for observing turkey flocks and usually a volunteer accompanied as a second observer and recorder.

Population Status and Trend

Using a combination of winter survey results and harvest estimates in P10 we can show that turkey numbers in P10 are likely down compared to the early 2000's. However, harvest trend information shows a slight increase in population from 2009.

Based on harvest trends (Table 2, Figure 3), the Blue Mountains population has expanded substantially over the past 10 years. The Blue Mountain foothills seem to provide excellent habitat conditions for Rio Grande turkeys as does the northern half of Lincoln County, which is in P10.

Turkey populations in Region 1 reached some level of population stability between 2000 and 2007, suffered a high winter kill in 2008, and recovered somewhat in 2010 (Table 2, Figure 3). Generally, available habitats in this region are occupied.

The turkey population in Chelan County and northeastern Kittitas County may be stabilizing based on counts of turkeys at winter concentration areas and trends in gobbler harvest during the spring season. While the harvest trends indicate some stability, local hunters continue to report concern over decreasing populations. Harvest in PMU P20 increased 81% in 2010 from 2009 (Table 2).

The turkey population in Okanogan County has been increasing in recent years, especially evident in areas where housing is increasing. Additional fall hunting opportunity will continue be available to permit holders.

Region 3 turkey populations appear to have stabilized from 2004-2009 with an increase in harvest in 2010.

Table 2. Estimated spring turkey harvest in each turkey Population Management Unit (PMU) 2001-2010.

PMU	2001 *	2002	2003	2004	2005	2006	2007	2008	2009	2010
P10	2382	3418	3333	3401	3445	3571	3660	2677	2845	2861
P15	376	533	443	471	480	730	605	578	761	731
P20	78	119	176	209	215	220	258	232	228	412
P30	73	105	123	178	182	169	221	172	245	417
P35	190	300	329	301	345	362	487	370	447	863
P40	2	7	9	15	10	8	9	3	5	13
P50	47	54	52	54	53	77	62	50	65	68
Total	3148	4536	4465	4629	4730	5137	5302	4082	4596	5365

* = first year of mandatory reporting system

PMU P30 harvest estimates show an increase of 33% in 2009 over the 5 year average and 70% harvest increase in 2010 from 2009 (Table 2, Figure 3).

Turkey harvest in PMU P35 peaked in 2007 with an all-time high spring harvest of 487 turkeys. Turkey harvest in 2009 returned to an above average level at 447, and increased 148% in 2010 above the average harvest of 348 (Table 2, Figure 3). These units provide the best habitat in Southwest Washington and make up the majority of turkey harvest in Region 5. Recent harvest trends indicate a healthy turkey population in this part of the region.

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 release sites. In addition, turkeys continue to be harvested throughout the season. The 2010 harvest was similar to the 10-year average for the PMU (Table 2, Figure 3). These factors, considered together, suggest wild turkeys may be reproducing at low levels and perhaps maintaining a viable population in PMU P50.

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 P30 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 improved the turkey population and hunting has improved to current levels. Winter conditions during 2004-2008 were moderate and no impacts were seen to the resident turkey population.

Although we do not specifically survey habitat conditions related to turkeys in Region 6, 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 2010. The 2005-2009 Wild Turkey Management Plan identified a potential introduction area in Skagit and Whatcom counties. Potential release sites were identified in 2009 and an extensive evaluation of the preferred site (near Van Zandt Dike) was conducted using the process outlined in the management plan. In addition to a habitat evaluation and investigation of potential inter-specific conflicts, several public meetings were held near the potential release site. As a result of this thorough process, WDFW decided not to introduce wild turkeys into the preferred release site. While the evaluation did not identify negative biological impacts to species or habitats of concern, it did identify other concerns related to potential negative economic impacts to local farming operations as well as substantial opposition from landowners and others living and working in the area surrounding the potential release site.

While WDFW did not think that an introduced turkey population in Whatcom County would ever reach the same level as those found in northeastern Washington, the concerns raised were substantial enough that moving ahead with an introduction was not an appropriate action at this time.

Habitat enhancement priorities are identified in the Wild Turkey Management Plan and 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.

During the last several years in Chelan County, the U.S. Forest Service and the Washington State Department of Natural Resources have thinned forests near communities to reduce the spread of wildfire. This thinning should enhance habitat for turkeys by opening the understory to increased light, which will increase forage for turkeys.

Management conclusions

Once again, PMU P35 and PMU P20 hunters experienced the highest success rates in the state with 46% and 43% harvest success respectively. Management decisions will focus on retaining good hunter success in this area while also addressing nuisance issues.

Habitat enhancement activities for wild turkeys will continue to focus on winter food enhancements, likely increasing available grain, clovers, fruiting shrubs, and mast producing trees. The Klickitat Oak Habitat Initiative will continue to strive to improve winter habitat for turkeys and other oak dependent species in PMU 35

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.

The turkey population in Chelan County is expected to gradually increase through natural production until it reaches the long-term carrying capacity of the habitat. The population will likely fluctuate due to wet springs, dry summers, or harsh winter conditions. The population of turkeys in south-central Okanogan County appears to be stable and increasing following several mild winters. While no changes in the harvest are recommended at this time in Chelan County.

Nuisance problems caused by turkeys are 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 season has been created for the Methow watershed to reduce nuisance conflicts with turkeys.

In 1994, regulations were changed to allow the harvest of up to 3 turkeys per year. Harvest and hunter participation projections 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 (southwestern Washington). There are no plans for further translocations in the near future.

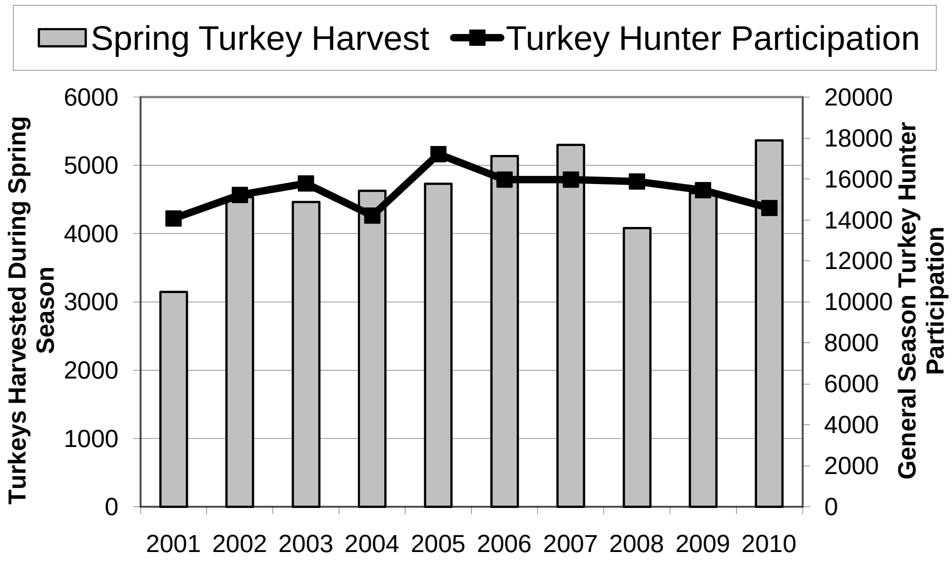


Figure 2. Estimated statewide spring turkey harvest and hunter participation 2001-2010.

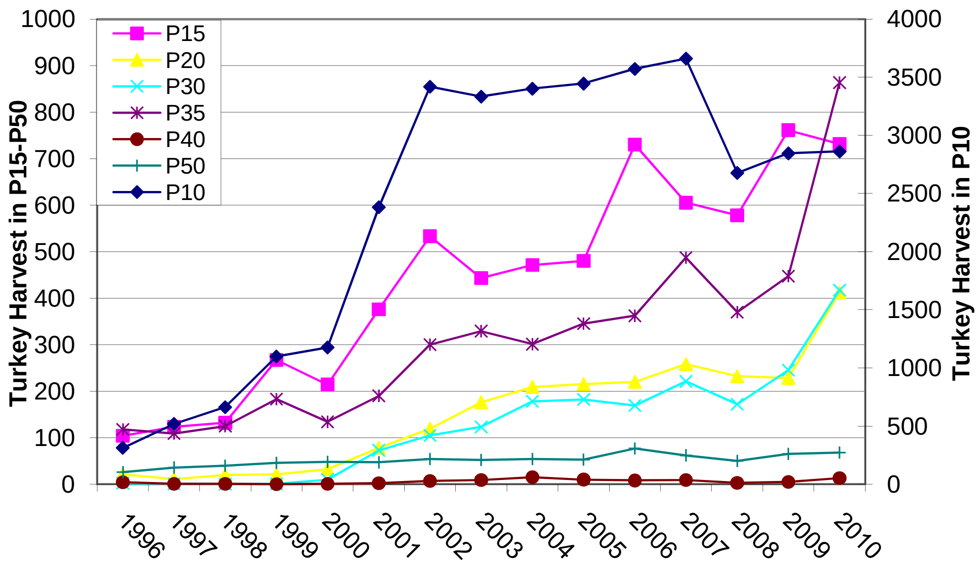


Figure 3. Estimated spring turkey harvest in each turkey Population Management Unit (PMU), 1996-2010.

Pheasant

PHEASANT STATUS AND TREND REPORT
STATEWIDE

JOEY J. MCCANNA, Upland Game Bird Specialist

Population objectives and guidelines
Pheasant management objectives are outlined in the Game Management Plan (WDFW 2008). Management goals are to preserve and perpetuate pheasants and their habitats to ensure healthy productive populations for a sustainable harvest.

Population Status
Pheasant harvest has varied widely over the past 50 years. Statewide harvest was at its highest during the mid-to-late 1960's with another peak in the late 1970's 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 1960's and 1970's. Surveys (crowing count and brood index) conducted between 1982 and 1998 also indicate a decrease in pheasant numbers in eastern Washington (Rice 2003).

Harvest estimation between 1984 and 2010 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.

A primary pheasant management zone exits in Washington where populations have been historically high (Figure 2). Within this primary zone, WDFW has delineated a pheasant focus area in southeastern Washington (Columbia, Garfield, Walla Walla, and Whitman Counties) to focus pheasant management efforts where adequate rainfall (i. e., 14 inches and over) is conducive to supporting desirable, appropriate plant communities.

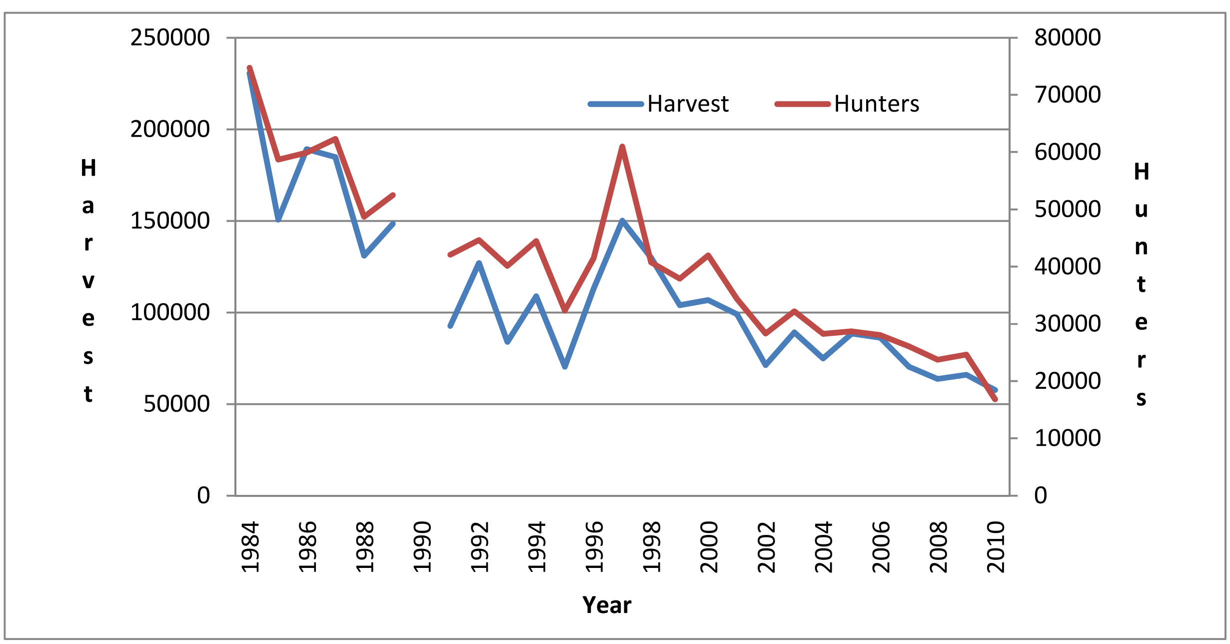


Figure 1. Estimated annual pheasant harvest and annual hunter participation in Washington 1984-2010.

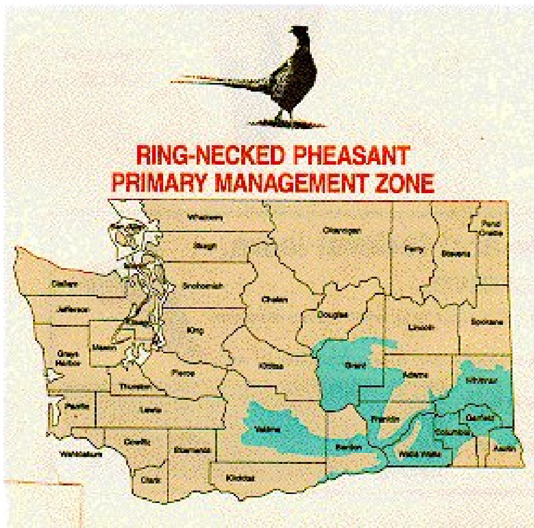


Figure 2. Washington State ringed neck pheasant primary management zone.

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 since 1997, and therefore the current population of wild pheasants may be lower than indicated in Figure 1.

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. In 2010 the department released 16,292 pheasants which is a reduction from the 2009 releases of 21,708 pheasants. Funding now allocated to habitat enhancements will help address Objective 98 in the 2009-2015 Game Management Plan; to double the number of acres of quality pheasant habitat by 2014.

Harvest estimates for the Columbia, Snake River, and Yakima Basins reflect decreasing trends in populations from 2001 to 2010 (Figure 3), similar to the statewide harvest trend (Figure 1). While this data has not been statistically tested at this time, differences in pheasant harvest are apparent. 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.

The 2010 estimated harvest in the Snake River Basin of 23,911 was a 9% decrease from 2009, and still 23% below the ten year average of 12,083. A 22% decrease was also estimated in the Columbia River Basin with 18,133 pheasants harvested, still 30% below the ten year average of 25,745. The Yakima River Basin decreased harvest by 12%, the 8,802 pheasants harvested remains 21% below the ten year average of 11,096 (Figure 3).

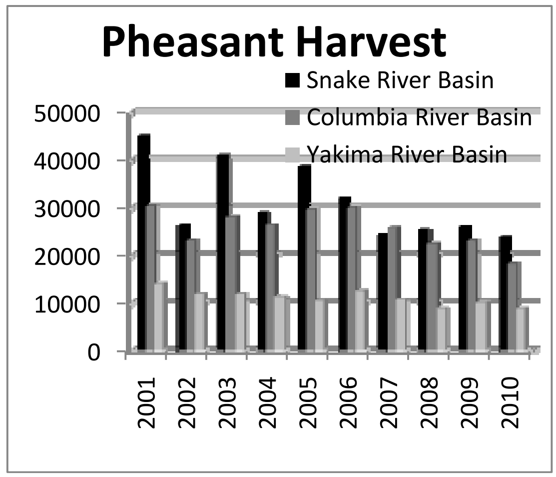


Figure 3. Estimated annual pheasant harvest for eastern Washington river basins between 2001-2010.

Hunters

Hunter numbers have also dropped dramatically 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).

The estimated hunter participation in the Snake River Basin in 2010 decreased by 11% and is 11% below the ten year average of 8,600. Columbia River Basin pheasant hunters decreased by 17% and dropped to 24% below the ten year average of 10,338. The Yakima River Basin decreased hunter participation by 7% and is remains 19% below the ten year average of 4,554 (Figure 4).

Habitat Trend

According to Farm Service Agency (FSA), approximately 35% of Eastern Washington

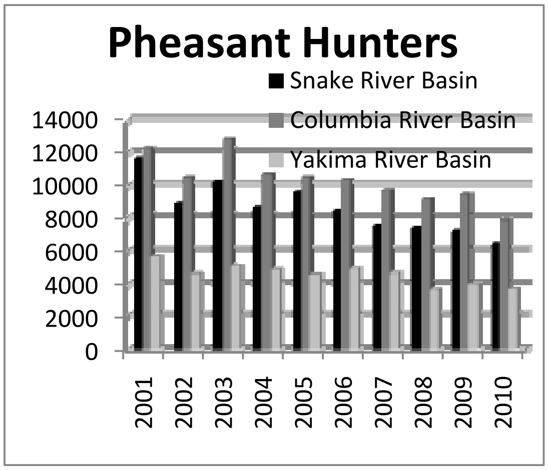


Figure 4. Estimated annual pheasant hunters for eastern Washington river basins during the period 2001-2010.

Conservation Reserve Program (CRP) will expire in the next two years. Washington currently has 1.46 million acres of CRP (USDA 2011). 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. Region 1 staff continues to work with three SAFE cooperators in Whitman County and Region 2 staff is assisting 25 landowners who enrolled 38,000 acres. Region 2 staff also spent over 100 hours on three Landowner Incentive Program projects in Douglas County.

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 provided technical assistance to over 125 landowners consulting about wildlife habitat and review exceptions from FSA for the nesting season management of CRP. Private lands staff also planted 195 acres of high-diversity mixes of grasses and forbs, 6 acres of shrubs, 32 acres of food plots in Region 1, and 13 shrub plots totaling 5.15 miles with another 23 acres of grass planted in Region 2.

Cause of Decline

The cause of the decline in pheasant populations in Washington is undefined, 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 a negative impact on pheasants. During the 1970's, 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) is 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 experienced a cold wet spring 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 likely 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

Surveys 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 was conducted twice between April 15 and May 25 to develop a spring male pheasant breeding population index and track land use changes over time. The estimated percent change (mean of the posterior distribution) from 2010 to 2011 was a 7.25% decrease with a 95% Credible Interval of (-18.15% to +4.29%). The fall pheasant brood survey was discontinued in 2011 due to lack of survey days to meet the survey protocol. The Game Bird Specialist is working with Montana Fish, Wildlife and Parks to use climate models to evaluate brood production. This data will be provided to pheasant hunters with an annual forecast for the upcoming hunting season.
The spring pheasant crowing surveys will be extended throughout the primary management zone as staff time allows in the future.

Pheasant Management Workshop

In March of 2003, the Washington Department of Fish and Wildlife (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 were brought in from South Dakota, Kansas, Washington D. C., and Iowa along with local conservation experts from Washington Natural Resource Conservation Service and Pacific Northwest Direct Seed Association to discuss research findings and management strategies that may help address population declines in areas where pheasant populations have been historically high. Approximately 75 people attended the meeting, including both the general public and state agency personnel. A complete 2003 Pheasant Workshop meeting summary can be found at **http://wdfw.wa.gov/publications/pub.php?id=00414**

The question "What are the things Washington should look at to move forward with pheasant management?" was posed to the panel. A summary of key points from the panel for the "Future Pheasant Management in Washington" follows:

1) Focus your efforts in select areas to avoid spreading resources too thinly.

2) Work at a regional scale to impact whole populations.

3) Prioritize habitat improvements that address limiting factors of pheasant populations.

4) Pheasants require adequate nesting cover and sufficient insect abundance during brood rearing. Insects are associated with diverse plant communities with substantial forb components.

5) Pheasants flourish when15% to 25% of the landscape is in relatively undisturbed grass with a significant forb component.

6) Releasing pen-raised pheasants for population establishment is expensive and ineffective.

7) The Farm Bill has many programs that can help landowners improve habitat conditions for pheasants.

8) Retaining at least 12 inches, and preferably 15 inches, of wheat stubble after harvesting can result in higher pheasant densities. This is due primarily to an increase in the broad-leaf, weedy habitat that occupies the field after harvest.
9) Direct seeding (no-till drilling) can increase soil quality, reduce erosion and increase value of the property for wildlife.
10) Habitat improvements must be compatible with farming practices to be effective across working landscapes.

Management conclusions

Pheasant populations declined dramatically in the 1980s and currently remain at low levels. Causes of the decline are not known definitively, but habitat loss and alteration is thought to be the primary cause of the decline. Further, habitats are increasingly fragmented and isolated. In order to address this situation, the following action items will assist WDFW in accomplishing habitats for more productive pheasant populations.

1) Continued support for Upland Game Bird Specialist to focus on pheasant priorities.

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.

4) Continue working relationships with Pheasants Forever and Quail Forever.

5) Conduct 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.

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 CRP contracts expire over the next several years.

12) Continue efforts with Washington State University and the Pacific Northwest Direct Seed Association to retain stubble height.

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Chukar

CHUKAR STATUS AND TREND REPORT STATEWIDE

JOEY J. MCCANNA, Upland Game Bird Specialist

Population objectives and guidelines

Management objectives of 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 1and 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 current season is 2 October 2010 through 17 January 2011. In addition, a youth hunting weekend occurred on 25-26 September. Daily bag limits are 6 chukar and 6 gray partridge with 18 of each in possession during the general season.

The 2010 chukar harvest of 8,771 was a 30% decrease from 2009 dropping to 52% below the ten year average of 18,114 birds (Figure 1). A gray partridge harvest of 6,479 in 2010 indicated an increase of 19% but harvest remains 17% below the ten year average of 7,815. Chukar hunter numbers also decreased in 2010 by 10% and remain 24% below the ten year average of 4,983 (Figure 1).

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 harvest data for the past ten years in regions 1, 2, and 3 can be found in figure 2. Chukar hunter numbers in Region 1 decreased 3% in 2010, although estimated harvest decreased 40% from 2009, remaining 44% below the ten year average of 4,067. Region 2 chukar hunter numbers decreased 20% in 2010, with harvest decreasing by 36%, falling 61% below the ten year average of 8,873. A 31% decrease in chukar hunters was seen in Region 3 while only a 1% decrease in the 2010 harvest was recorded, still 38% below the ten year average of 4,757.

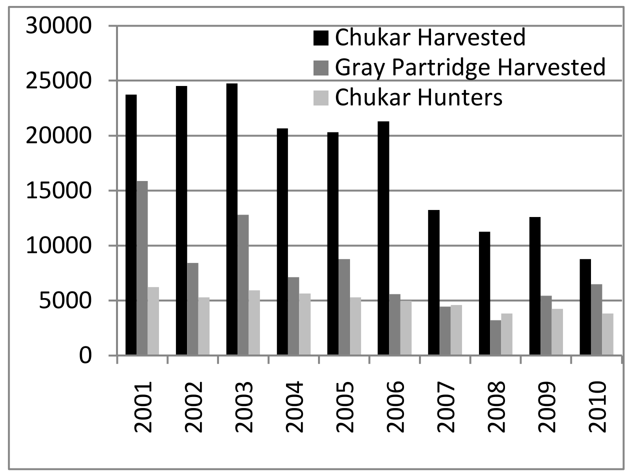

Figure 1. Chukar hunters, chukar and gray partridge harvest statewide for the period 2001 – 2010.

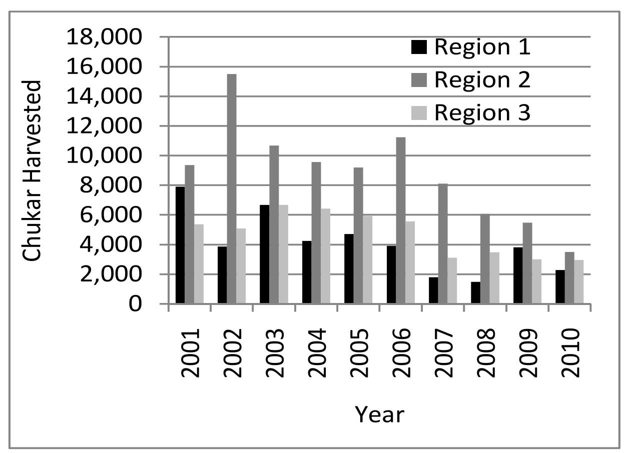

Figure 2. Estimated chukar harvest for Regions 1, 2 and 3 for the period 2001 – 2010.

Hunter participation peaked in the late 1970s and early 1980s, but has declined dramatically since then. Today, approximately 4,000 hunters pursue chukar throughout their habitats in the state of Washington (Figure 1).

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. For the fourth straight year, no chukars were observed during the driving routes. This has occurred four times in the past eleven years. The lack of chukars observed might be attributed to the reduced mileage of the driven routes from road closure occurring in 2007. Averages of 5.6 chukar were observed on each route from 1998-2008. Though recent surveys have failed to record chukars, their calls continue to be heard from the rocky habitats in the Region. In other regions, field personnel note the abundance of broods during regular field operations and other surveys.

Population status and trend analysis

Harvest and hunter effort are used as an index to population trends. These data are estimated through a post-season survey of hunters. Harvest data indicate the chukar population remains below the 10- and 25-year averages by 52% and 68%. The 2010 estimates show a 10% decrease in hunter participation and 30% decrease in harvest.

The chukar population crashed in the early 1980's and has continued a long-term decline since then. 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 recent spring drought conditions have 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 inundated with 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

Continued population declines indicate that either habitat is deficient in some unknown component or there may be a population health problem. 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 cheat grass. However, the loss of shrub habitat due to fires may be detrimental.

While no genetic studies have been conducted on chukar in Washington, a population health problem could be the result of low genetic diversity of remaining chukar. Westemeier et al. (1998) described the reduction of genetic diversity and fitness in a small, declining population of greater prairie chickens (Tympanuchus cupido). If chukar populations throughout Washington are isolated, then there could be a reduction of genetic diversity, which could lead to reduction in reproductive success and inability to adapt to changing environmental factors. With budget constraints, investigating this potential is not likely at this time.

Habitat in Region 1 continues to be invaded by yellow star-thistle in the far southeast corner. The amount of habitat in Region 2 is relatively stable due to the precipitous nature of the terrain. However, development is increasing (especially in the Wenatchee Valley area) which could impact localized populations. Habitat quantity in Region 3 had remained fairly constant until wildfires impacted large areas. In addition, residential development, irrigated agriculture, and wind energy facilities are creeping into chukar habitat and may reduce the amount of habitat in the future. Chukar populations can be expected to fluctuate annually in response to fluctuations in primary production. Improving chukar populations will likely require extensive research into currently suppressed population.

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Quail

QUAIL STATUS AND TREND REPORT

STATEWIDE

JOEY J. MCCANNA, Upland Game Bird Specialist

Population objectives and guidelines

Objectives for California quail (*Callipepla californica*) are to maintain 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).

Hunting seasons and harvest trends

The general hunting season for California quail and Northern bobwhite (Colinus virginianus) in Eastern Washington was 2 October 2010 through 17 January 2011. In addition, a youth hunting weekend occurred on 25-26 September. 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 Mountain quail (Oreortyx pictus) in Western Washington ran from 2 October through 30 November with a daily bag limit of 2 and a possession limit of 4. Mountain quail hunting was closed throughout eastern Washington.

The 2010 harvest of 92,631 represents little change from the 2009 harvest which has been on a downward trend since a peak of 190,062 in 2003 (Figure 1). Quail harvest in eastern Washington accounts for approximately 98% of the statewide quail harvest.

The 2010 harvest of 15,929 quail in Region 1 was an 8% increase from 2009 and 44% below the ten year average of 28,636 (Figure 2). Harvest in Region 2 increased 10% with 38,881 quail being harvested but is still 29% below their ten year average of 54,694 birds per year. The harvest of 36,685 quail was a decrease of 10% from 2009 for Region 3 and is still 23% below their ten year average of 47,642. Regions 4, 5 and 6 indicated a 14% increase in harvest for 2010.

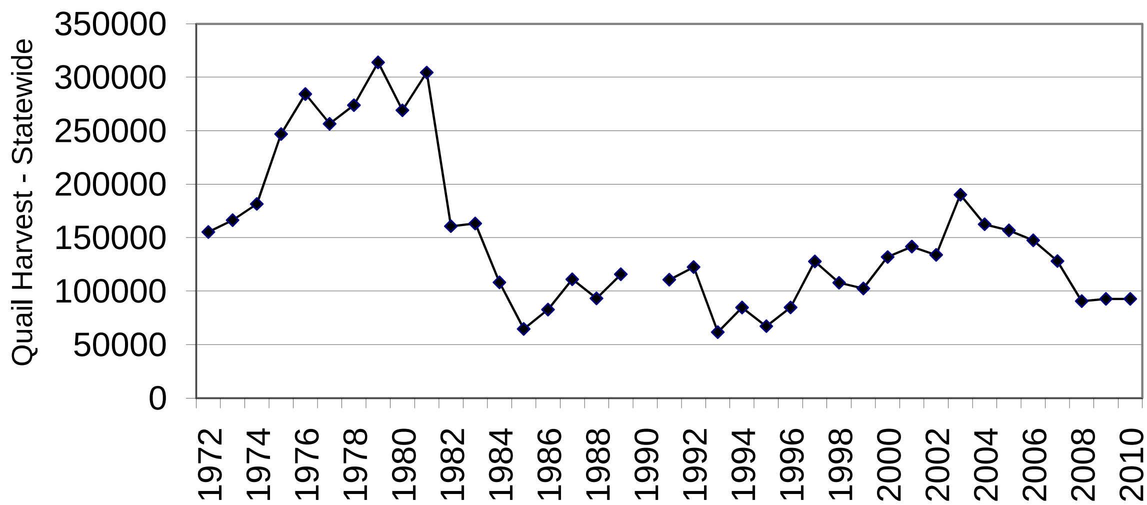

Figure 1. Washington State quail harvest data for the period of 1972 - 2010.

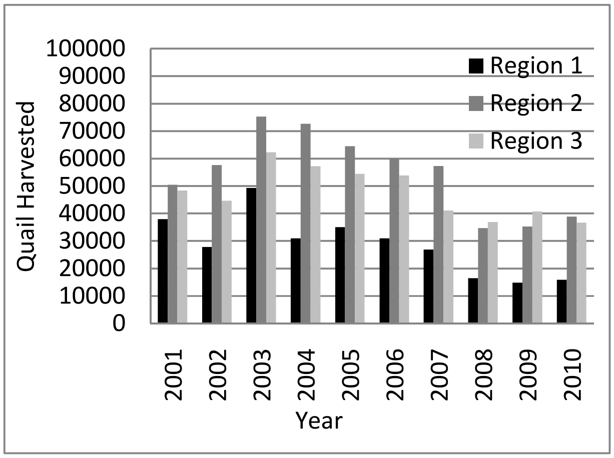

Figure 2. Quail harvest for regions 1, 2, and 3 for the period of 2001 - 2010.

Population status and trend

Using harvest as an index to population status, quail populations in Washington are currently much lower than they were in the late 1970's and early 1980's (Figure 1). The cause of the decline may be related to "clean" farming practices introduced in the early 1980's that encouraged the removal of shrubby cover along fence lines and in draws.

There is no clear cause for the decline in the quail population since 2003. While farming practices have not substantially changed during this time, hunters and biologists have reported seeing fewer quail in typical areas. Quail can be very productive if conditions are good, which may have been the key to the 2003 peak. According to harvest trend indicators, the current quail population is 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 has dramatically minimized and fragmented available habitat for upland game birds.

A food habit study conducted in southeastern Washington performed an analysis on 157California 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 unwanted weeds (Anthony 1970).

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).

In 2008 Farm Service Agency announced a new CRP program named State Acres for Wildlife (SAFE) which requires a diverse planting mixture of grasses and forbs including mid-contract management options to stimulate plant vigor during the contract life. This should provide additional quail habitat in Douglas, Lincoln, and Whitman counties.

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 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 is lower.

Augmentation and habitat enhancement

In previous years, Private Lands Biologists and Wildlife Area staff trapped California quail from urban populations to augment populations that appeared to be reduced. No California quail were trapped and relocated in 2010.

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 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.

Unfortunately, birds captured from southwestern Oregon during the winter of 2006/2007 all died in captivity in a holding facility in south-central Washington. There have been no birds released since the spring of 2006.

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. University of Idaho had originally established the routes with WDFW in 2005 using "Validation of a Mountain Quail Survey Technique" protocol (Heekin and Reese 1995). Mountain quail were either heard or observed on 2 of the 5 survey routes. Another supplemental release may be considered in the future, depending upon available stock.

Management conclusions

The mountain quail augmentation project for southeastern Washington may continue in the spring of 2012. The department will need to construct a holding facility so birds trapped during the winter in other areas (e.g., Oregon) can be held until the March release time.

The California quail is a major upland game bird species and a species of significant interest to wildlife viewers. Continuous programs in the CRP program will most likely benefit quail the most as these signups include Conservation Reserve Enhancement Program (CREP) and Riparian Forest Buffers. These riparian signups may consist of a mixture of shrubs, grasses, and forbs that should benefit quail.

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Forest Grouse

FOREST GROUSE STATUS AND TREND REPORT: STATEWIDE

Joey J. McCanna, Upland Game Bird Specialist
Mick Cope, Upland Game Section Manager
MICHAEL SCHROEDER, Grouse Biologist

Population objectives and guidelines

Forest grouse in Washington include dusky and sooty grouse (*Dendragapus obscures and Dendragapus fuliginosus respectively)*, ruffed grouse (*Bonasa umbellus*), which occur throughout the forested lands in Washington, and spruce grouse (*Falcipennis canadensis*), which are closely tied to higher elevation spruce/fir habitats. 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 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.

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 increasing opportunity. Since hunters average approximately 0.4 grouse per day hunted, which has been the case for over 50 years, increasing the bag limit should not impact overall populations.

Estimated hunter numbers and harvest have declined from the historic highs of the 1970’s (Figures 1 and 2). Statewide hunter harvest in 2010 was down 26% from the 5-year average. Harvest estimates continue to be closely tied to hunter participation (Figures 1 and 2). Increased restrictions in motorized travel, particularly in private industrial timberlands, may reduce hunter participation as well as grouse harvest.

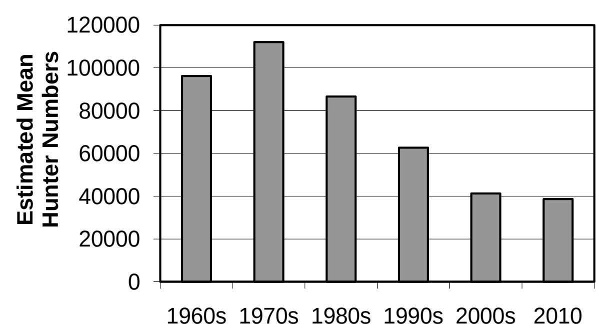

Figure 1. Long-term trend in grouse hunter numbers, 1963-2010.

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.

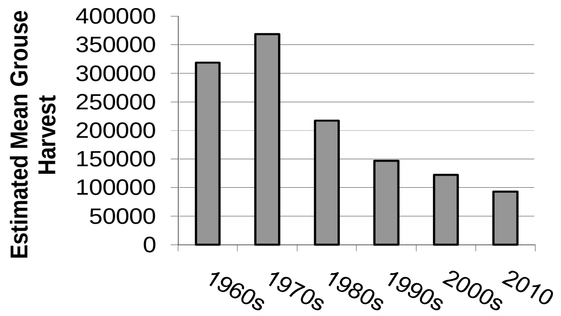

Figure 2. Long-term trend in grouse harvest, 1963-2010.

Although grouse hunter and harvest estimates have varied substantially over time, annual estimates of harvest per hunter (an indicator of hunter success) since have been relatively stable. Estimates of hunter success since 2000 remain higher than the 1980s and 1990s (Figure 3).

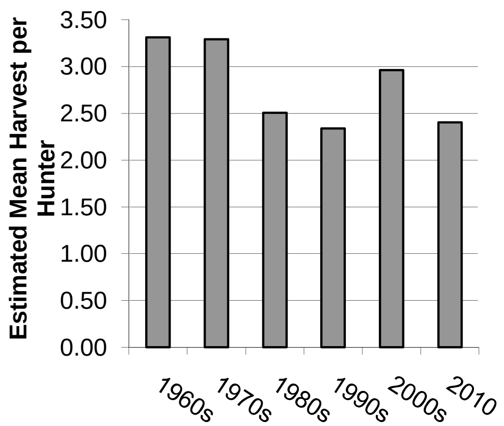

Figure 3. Estimated grouse harvested per hunter in Washington 1963-2010.

The estimated number of hunters pursuing forest grouse annually within Region 1 (far eastern Washington) has ranged from about 9,000 to 23,000 with an estimated 13,289 hunters in 2010, down 23% from 2009. The estimated annual harvest of all three forest grouse species combined within Region 1 has ranged from approximately 28,000 to 65,000 since 1991. In 2010, approximately 29,159 grouse were harvested (Table 1), which is down 39% from 2009 and14% from 2008. The 2010 grouse harvest in Region 1 was the lowest since 2004 when approximately 27,000 were harvested.

The cause of this decline is not definitively known, but a decline in hunter participation is a likely contributor. Hunters spent approximately 26% fewer days hunting Region 1 in 2010 than they did in 2009 (70,427 in 2010 and 94,685 in 2009). Hunter participation was down 3% in 2010 from 2009 in Region 1.

We estimate that ruffed grouse harvest is higher than blue grouse each year and spruce grouse harvest is consistently low as this species is the least common and most range-restricted forest grouse in Region 1.

Table 1. Number of forest grouse hunters and reported harvest by Region for 2010. *Note: total of regional estimates is higher than statewide total due to hunters hunting in multiple regions.*

Region	Est. No. of Hunters	Estimated Harvest
1	13,289	29,159
2	8,216	18,698
3	6,324	8,548
4	4,820	8,175
5	7,411	8,684
6	9,975	19,492
TOTAL:	50,035	92,756

Hunters harvested 18,698 forest grouse in Region 2 in 2010, which was a 24% decrease from 2009. Hunter numbers declined 17% in 2010.

In 2010, total grouse harvest in Region 3 (8,548 birds) was 15% below the 2009 estimate. The number of grouse hunters also decreased 10% in 2010 from 2009.

Few data on effects of hunting on grouse populations are available in Region 3. Harvest success for forest grouse in Region 3 is improving, but is still among the lowest of any of the upland bird species. While large annual population fluctuations appear to have occurred, the annual harvest per hunter trend over the last 10 years appears to be relatively stable (Averaging 1.4 and ranging between 1.1 and 1.9 grouse per hunter).

Grouse harvest in Region 4 during the 2010 season was 8,175. This was a 30% decrease from the 2009 season harvest total of 11,746. A 7% decline in hunter participation may explain the 2010 decline. The 2010 harvest in Region 4 represents 9% of the total 92,756 grouse harvested statewide. Grouse hunters report increased harvest success when hiking or mountain biking forest road systems behind locked gates.

In 2010, total grouse harvest (8,684) in Region 5 decreased 48% from 2009, the second decrease in three years. In addition, the number of hunters decreased in 2010 by 21% from 2009 levels. These hunter and harvest statistics indicate fluctuations in grouse populations in Region 5 over recent years.

Combined forest grouse harvest (ruffed and blue grouse) for Region 6 was estimated at 19,492 birds in 2010. This represents a 35% decline over the year 2009 season estimate. Annual fluctuations in harvest are greatly affected by survival of chicks right after hatching as it has been shown that over half of all harvested birds are juvenile birds. Reported number of grouse hunters decreased by 15% over the 2009 season. A large proportion of grouse hunting effort in Region 6 occurs incidental to other hunting activities, especially deer hunting. The three counties with the highest percentages of the Region 6 grouse harvest were: Clallam (27%), Grays Harbor (23%), and Mason (14%).

Region 1 typically has the highest number of both forest grouse hunters and birds harvested. While the percentage declined from 2009, the Region 1 grouse harvest was still the highest in 2010 with approximately 31% of the statewide grouse harvest (Table 1). Okanogan County had the greatest forest grouse harvest in 2010, followed by Stevens and Ferry counties. Clallam County has the highest harvest of any western Washington county, followed by Grays Harbor County.

Surveys

Statewide population surveys for forest grouse were not conducted in 2010; however, some surveys continue in north-central Washington. Forest grouse wings were collected in the same areas as previous years by placing barrels in strategic locations where hunters voluntarily deposited one wing from each grouse killed. Wings were 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. In 2008, 63.4% of the harvest was blue grouse, 16.6% spruce grouse, and 20% ruffed grouse (Figure 4).

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.

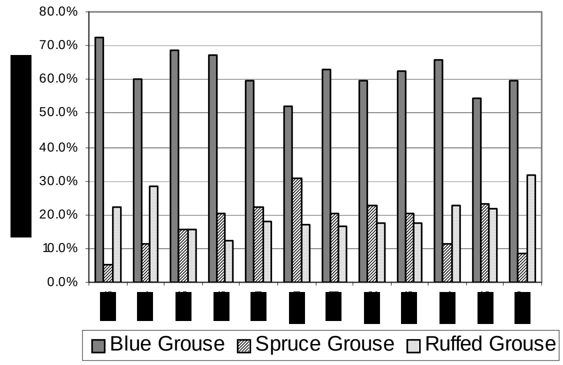

Figure 4. Forest grouse harvest species distribution in north-central Washington 1993-2008 (Schroeder, 2007).

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.

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. The fact that harvest per hunter has not varied much over time (Figure 3) may indicate that the number of grouse available to hunters has not changed dramatically. 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.

In fall 2006, several large fires in Chelan and Okanogan counties limited access by hunters, which likely reduced harvest. These fires have impacted grouse harvest and hunter distribution in these counties.

Habitat condition and trend

Timber harvest and wildfire are the most significant issues statewide for influencing habitat condition and forest grouse population trends. In general timber harvest activities are beneficial for most species of forest grouse. Silvicultural techniques play a significant role in the degree to which timber harvest provides 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.

Conditions are similar in eastern Washington, however 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.

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.

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 responds to Forest Practice Applications with recommendations to mitigate forest management impacts on grouse. 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

Management direction for forest grouse will include the following:

- Improving harvest estimation, especially on lands managed for wildlife.
- Development of population monitoring techniques for each species of grouse.
- Developing forest grouse habitat guidelines for public distribution.
- Evaluating harvest strategies.

Private Lands Access

PRIVATE LANDS ACCESS

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Purpose

The purpose of this job is to develop and maintain public access to private property for the purposes of outdoor recreation with an emphasis on hunting. This project is a cooperative effort between the Washington Department of Fish and Wildlife (WDFW), U.S. Fish and Wildlife Service, private landowners, and volunteers. Currently, the program has over 650 private landowners and over 1.28 million acres of private land under cooperative agreement in eastern and western Washington (Table 1). The program will continue to maintain a base of cooperative private landowner agreements and strive to increase hunting and other outdoor recreational opportunities through new initiatives and increased landowner outreach.

This program provides public access to private lands through negotiated agreements between WDFW and willing landowners statewide. It includes four basic access agreement types:

- Feel Free to Hunt – All private lands where WDFW has a management agreement with the owner to provide public access for hunting in exchange for services and materials (signs) for the posting and enforcement of regulations on these lands on an open and less restrictive basis.

- Register to Hunt – All private lands in which WDFW has a management agreement with the owner or organization where hunting is regulated by registration. Typical work includes: the annual sign-up of farmers, posting and changing signs as crops are harvested, continual monitoring of hunter use and pick up and analysis of registration forms. This is typically used on large circle-irrigation corporate farms.

- Written Permission Program – This includes all 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 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:

There are currently 333,632 acres in the Feel Free to Hunt, Hunting by Written Permission, and Register to Hunt programs within Region 1 (Table 2). A net loss of seven cooperators resulted in a decrease of 16,820 acres since the last reporting period (Table 3). Private lands access in Region 1 is focused on pheasant and deer hunting, with some elk and turkey hunting also provided.

Table 2. Acres of private land available for public recreational access in 2010-11 by region

Regional Totals - 2010-2011		
	Cooperators	Acres
Region 1	239	333,632
Region 2	249	458,442
Region 3	97	382,423
Region 4	51	4370
Region 5	15	106653
Region 6	10	1,845
Total	661	1,287,364

For this reporting period there were 458,442 acres in the Feel Free to Hunt, Written Permission, Register to Hunt, and Landowner Hunting Permit programs in counties within Region 2 (Table 2). There was a net gain of 4 cooperators in Region 2, although an overall decrease of 1,085 acres was noted (Table 3). Hunters access these lands primarily for deer hunting, although a substantial amount of upland bird hunting also takes place.

Table 3. Changes in cooperators and access acres available between 2009-10 and 2010-11

Change from 2009-10 to 2010-11		
	Cooperators	Acres
Region 1	-7	-16,820
Region 2	4	-1,085
Region 3	6	71,020
Region 4	37	2,689
Region 5	1	-5,905
Region 6	3	450
Total	44	50,349

Currently there are 97 cooperators in the access program in Region 3, with a total of 382,423 acres available to the public. Region 3 recorded the largest increase in acreage with six cooperators and 71,020 acres of access since the last reporting period (Table 3). 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.

Region 4 efforts were focused on waterfowl, snow goose, and pheasant hunting access. During this reporting period there were 51 cooperators in the Feel Free To Hunt program providing hunting opportunities on 5,027 acres increasing participation by 37 landowners and 2,689 acres of access (Table 3). Quality snow goose hunting opportunities have expanded into Snohomish and Whatcom Counties helping landowners address crop damage problems posed by large numbers of snow geese.

Region 3 staff managed hunter access in Klickitat County for many years, but it is now managed out of Region 5. With limited staff time allotted to the program, a net of one new cooperator was enrolled since the last reporting period, although a decrease of 5,905 acres of public access was seen (Table 3).

Klickitat County is among the top counties in Washington in providing private lands hunting opportunity with over 100,000 acres enrolled (primarily Feel Free to Hunt) (Table 1). Program lands primarily provide deer hunting opportunities, with a substantial amount of wild turkey hunting in the spring and fall.

In addition to Klickitat County, Region 5 staff worked with Weyerhaeuser Timber Company to continue their interim agreement to improve elk hunting opportunities on their ownership in Cowlitz County. Up to 12 volunteers per day assisted with implementing the program for additional motorized access on the Weyerhaeuser Company St. Helens Tree Farm. Eighty percent of the Margaret Game Management Unit and 100% of the Toutle and Coweeman Game Management Units GMU were made available for motorized access. These acres are available to the public, but are not currently included in the access acreage total (Table 1). They will be added when a formal agreement with Weyerhaeuser is completed.

Efforts to provide hunting access to private lands in Region 6 have been low due to lack of staff. A few waterfowl hunting opportunities are provided on private lands in Grays Harbor and Thurston Counties and pheasant hunting takes place on private lands in Mason and Kitsap counties.

Table 1. 2010-2011 Private Lands Access Cooperators and Acres.

	FEEL FREE TO HUNT		HUNT BY WRITTEN PERMISSION		REGISTER TO HUNT		LANDOWNER HUNTING PERMIT	
County	Cooperators	Acres	Cooperators	Acres	Cooperators	Acres	Cooperators	Acres
Adams	36	39,011	66	133,452	0	0	0	0
Asotin	4	3,327	22	33,037	1	1,617	0	0
Benton	20	83,636	2	20,425	2	8,320	1	66,985
Chelan	0	0	1	3,280	0	0	0	0
Clallam	1	216	0	0	0	0	0	0
Columbia	4	8,069	11	20,896	0	0	0	0
Cowlitz	1	1	0	0	0	0	0	0
Douglas	29	21,534	44	102,973	2	4,040	0	0
Franklin	36	60,139	10	19,310	0	0	0	0
Garfield	23	19,194	32	51,137	3	5,511	0	0
Grant	36	37,602	32	73,945	0	0	1	41,870
Grays Harbor	2	624	3	280	0	0	0	0
Jefferson	1	10	0	0	0	0	0	0
Kitsap	1	200	0	0	0	0	0	0
Kittitas	0	0	2	9,120	0	0	1	410
Klickitat	8	102,723	6	3,929	0	0	0	0
Lincoln	6	7,515	35	56,342	0	0	0	0
Mason	1	205	0	0	0	0	0	0
Okanogan	1	175	1	560	0	0	0	0
Pend Oreille	1	7,757	0	0	0	0	0	0
Skagit	35	2,840	0	0	0	0	0	0
Snohomish	8	780	0	0	0	0	0	0
Spokane	0	0	2	2,955	0	0	0	0
Stevens	0	0	8	2,548	0	0	0	0
Thurston	0	0	0	0	1	310	0	0
Walla Walla	40	72,526	3	3,832	0	0	0	0
Whatcom	8	750	0	0	0	0	0	0
Whitman	14	9,713	28	27,334	2	321	0	0
Yakima	16	24,231	4	10,200	0	0	3	79,647
Total	332	502,778	312	575,555	11	20120	6	188912
Total Cooperators		661						
Total Acres		1,287,364						rev 6-30-11