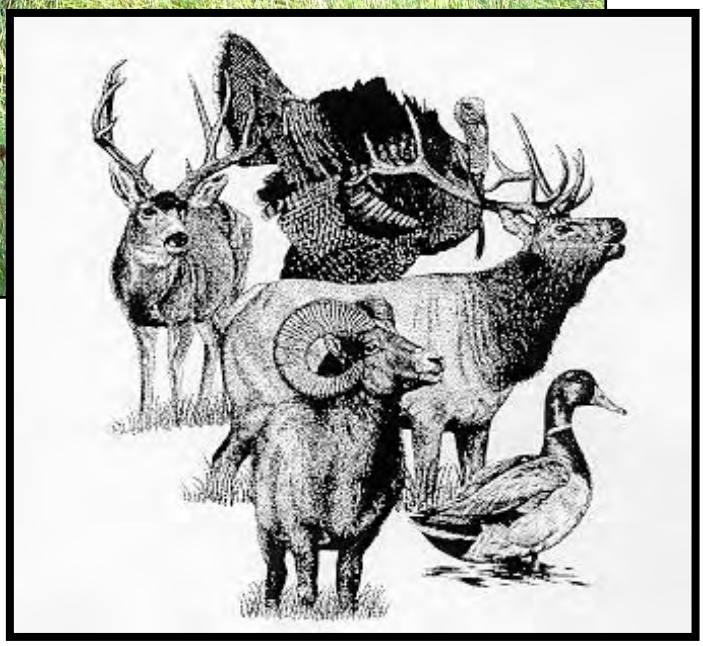
STATE OF WASHINGTON

2009 Game Status and Trend Report



Washington Department of FISH and WILDLIFE

AN OFFICIAL PUBLICATION OF THE STATE OF WASHINGTON

2009 GAME STATUS AND TREND REPORT

July 1, 2008 – June 30, 2009

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

STATE OF WASHINGTON
Chris Gregoire
Governor

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE
Phil Anderson
Interim Director

WILDLIFE PROGRAM
Dave Brittell
Assistant Director

GAME DIVISION
Dave Ware
Game Division Manager

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

This report should be cited as:

Washington Department of Fish and Wildlife. 2009. 2009 Game status and trend report. Wildlife Program, Washington Department of Fish and Wildlife, Olympia, Washington, USA.

TABLE OF CONTENTS

Deer

DEER STATUS AND TREND REPORT: STATEWIDE

JERRY NELSON, Deer and Elk Section Manager

Population Objectives and Guidelines

This report covers the time period July 2008 to June 2009. The goal set by Washington Department of Fish and Wildlife (WDFW) for the management of black-tailed deer (*Odocoileus hemionus columbianus*), mule deer (*O. h. hemionus*), and white-tailed deer (*O. virginianus*) populations in Washington is to maintain numbers within habitat limitations. Landowner tolerance, a sustained harvest, and non-consumptive deer opportunities are considered within the land base framework. Specific population objectives call for a post-hunt buck:doe ratio of 15:100 (WDFW 2003). Some Game Management Units (GMUs) are managed for limited entry buck only harvest, providing higher quality animals for harvest on a limited basis. Limited entry GMU objectives for post-hunt buck ratios vary but can range as high as 20 to 25 bucks:100 does. Most management actions that the Department undertakes will not likely have a direct influence over fawn survival. The approximate desired post-hunt fawn:doe ratio is $\geq$ 40 fawns:100 does depending on the overall mortality of the population in question and the desire to have a particular population grow or remain stable. In the case of extreme deer damage situations, a reduced local sub-population may be the goal.

Surveys

WDFW conducts composition surveys from the air and the ground to index buck, doe, and fawn ratios. Depending on the species, location and terrain involved, deer composition surveys are conducted in the spring, the summer, pre-hunt in the early fall and post-hunt in the early winter prior to deer shedding their antlers. Population estimates are also conducted for mule deer using the visibility bias model initially developed in Idaho for elk (Samuel et al. 1987). Variants of the model have been developed for a variety of other species including mule deer.

In western Washington, black-tailed deer surveys are coupled with hunter check station information and harvest data to model populations.

Pre-hunt and post-hunt surveys are conducted in eastern Washington for both white-tailed deer and mule deer. Deer populations in selected areas are surveyed again in March and April to assess winter survival and recruitment.

White-tailed deer are surveyed in summer to determine pre-hunting season fawn and buck ratios and again in spring to determine recruitment. Hunter check stations and mandatory report data are used to monitor age distribution of whitetail bucks in the harvest.

Hunting Seasons and Harvest Trends

Total deer harvest for 2008 for the general season and special permit hunts combined was estimated at 35,048 not including harvest from multiple weapon special permits (Table 1, Figure 1). Historically, Washington deer hunting was managed under any legal buck, hunting seasons with licenses sold over the counter with no quotas. As hunting pressure became more intense over the years, the harvest, crowding, and hunter pressure were managed in a variety of new ways. Currently deer licenses are sold over the counter and there is no quota on licenses sold. Deer hunters are required to choose a weapon type and hunt only during that hunting season. General season modern firearm, archery, and muzzleloader success rates have all varied depending on the year. For the 2008 general hunting season, modern firearm hunter success was 22.8 %. Muzzleloader hunter success was 25.3 % and archery hunter success was 22.4 % for the general hunting season.

Table 1. Statewide deer harvest for general season and special permit season by weapon type and deer class for 2008.

General Season	Antlered	Antlerless	Total
Modern Firearm	22,003	2,400	24,403
Muzzleloader	1,493	788	2,281
Archery	2,484	2,413	4,897
Sub-Total*	**25,980**	**5,601**	**31,581**
Special Permits	**Antlered**	**Antlerless**	**Total**
Modern Firearm	873	2,131	3,004
Muzzleloader	63	184	247
Archery	66	150	216
Sub-total*	**1,002**	**2,465**	**3,467**
Grand Total*	**26,982**	**8,066**	**35,048**

*multiple weapon estimates not available at this writing

Population Status and Trend Analysis

White-tailed deer and mule deer populations are influenced significantly by winter severity in central and eastern Washington. Populations tend to build during mild winters and experience major declines in severe winters or protracted winters with below normal temperatures and above normal snow depths.

Deer populations in central and eastern Washington have recovered from the most recent severe winter of 1996-97. In general from a statewide perspective, mule deer and white-tailed deer populations have been increasing. Mule deer populations are doing well along the Snake River breaks and the foothills of the Blue Mountains. Mule deer in the Blue Mountains also seem to be increasing but at a slower rate. White-tailed deer in eastern Washington did experience some localized declines due to outbreaks of epizootic hemorrhagic disease (EHD) in late summer early fall and deep snow conditions in the winter.

WDFW has collected samples of exotic lice from mule deer in Region 3 and reports of mule deer exhibiting hair loss, similar to Westside black-tailed deer have increased. Mule deer suffering from hair loss syndrome would have a much more difficult time surviving the winter.

Black-tailed deer in western Washington are negatively influenced by loss of habitat to human development, the reduction in timber harvest, and habitat progressing in successional age and becoming less able to provide high quality forage (Nelson et al. 2008). Black-tailed deer experience some winter loss during a normal winter even though extreme cold temperatures or snow depth may not be an issue. Deer on low

quality forage and constantly exposed to cold, rainy conditions can become hypothermic and die.

Black-tailed deer continue to suffer mortalities due to hair loss syndrome. Research conducted in Oregon suggests that there may be a link to hair loss syndrome and non-native, Old World lice that have been found on afflicted black-tailed deer. Deer groom excessively in response to the lice, which causes the hair loss. Deer suffering from hair loss typically weaken and lose weight dramatically. Some deer survive but many die from hypothermia or from pneumonia caused by internal parasites that deer also commonly carry. Fawns seem to be the first age class impacted by the syndrome. The next most susceptible age/sex class is adult does, and lastly adult bucks may exhibit hair loss. Because young-of-the-year, and adult does seem to be the first to be impacted by hair loss syndrome, there is a potential that mortalities caused by this syndrome may be having an impact on population growth or decline. Recruitment of young and survival of reproductive age females are two of the most important rates that influence ungulate population dynamics.

Augmentations

No augmentation efforts for deer were conducted by WDFW during the time period covered by this report.

Habitat Condition and Trend

In general deer benefit from habitat in early to mid-successional stages. Deer herds in western Washington benefited from new growth after timber harvest in the 1960s, 70s, and early 80s. Much of the U. S. Forest Service land in western Washington is now shifting toward late successional reserves (LSR) and mature growth forest. This change will greatly diminish the carrying capacity of these habitats for deer. The long-term trend in deer carrying capacity is down on public lands managed by state and federal agencies.

Timber management on industry-owned forest is generally shifting toward smaller scale cuts and selective cuts. While this may be beneficial to deer, restrictive understory management and other silvicultural practices may be having a negative impact on deer forage and it's availability.

One of the major benefits to mule deer and white-tailed deer has been the Conservation Reserve program (CRP). The benefits to deer from CRP include taking agricultural land out of production, planting sites with native vegetation, and allowing vegetation on sites to grow taller and thicker providing both forage and sometimes security cover for fawning.

Excessive road density limits habitat suitability for deer on most managed public and private forests. High road densities increase disturbance during fawning and breeding. High road densities also make deer more vulnerable during the hunting season as well as to poaching. In general, when all other necessary habitat components are in place, active road management programs that limit road density to approximately one linear mile of road per square mile or less create conditions more favorable for deer.

WDFW is completing a cooperative mule deer research project in central and eastern Washington, partnering with other agencies, public utilities, and universities. One aspect of this multi-faceted project is to investigate the influence of habitat quality as it relates to deer body condition, fawn production, and recruitment. Other aspects of the study include assessments of seasonal habitat use, deer movements, herd delineations, home ranges, and survival across the varied landscapes of eastern Washington. This project will be completed in 2010.

Wildlife Damage

WDFW is mandated by law to address agricultural damage caused by deer. In response to landowner complaints, WDFW tries to alleviate damage problems without reducing deer populations. One of the biggest challenges the Department faces is managing deer populations in balance with landowner tolerance. Regardless of deer densities, wherever deer and agriculture overlap there are going to be some damage complaints. The level of deer damage is usually a function of local deer densities all year and the intensity of winter when snow and cold temperatures force deer to use agricultural lands at a higher rate.

Where white-tailed deer and mule deer have been increasing in numbers in localized areas in central and eastern Washington, agricultural damage complaints due to deer have been increasing slightly. New vineyards are being established in southeastern Washington and have the potential to host new conflicts between deer and agriculture. Mule deer activity in Whitman and Garfield Counties seems to be increasing and damage complaints may increase in those areas in the near future. In northeastern Washington, damage to alfalfa fields by white-tailed deer is the most prominent problem. This may be reduced somewhat as deer numbers were reduced due to deep snow conditions last winter. Damage by black-tailed deer in western Washington also occurs but is less of a problem.

Management Conclusions

Black-tailed deer management by WDFW in western Washington generally tries to achieve a sustained yield of antlered and antlerless deer where appropriate without negatively impacting the population's health and viability. In some locations, limited antlerless tags are issued through the special permit process to keep those populations in check that may be causing some local damage concerns. Deer management in eastern and central Washington, which deals with both mule deer and white-tailed deer, is more dependent on climate. Mule deer and white-tailed deer populations tend to do well in central and eastern Washington when average and below average winter severity allows. Cyclic, severe climatic events, such as the heavy snowfall last winter, happen every 5 to 8 years. Severe winter effects are sometimes localized but often times are more broad in scale. Broad scale severe winters result in high winter die-offs. Several years are then required for deer populations to rebound from those depressed levels.

In many locations in the state, Indian Tribes exercise their hunting rights as spelled out in various treaties on open and unclaimed lands as defined by the state Supreme Court. These lands are for the most part public lands managed by the U. S. Forest Service, Bureau of Land Management, the Department of Natural Resources and WDFW. Some of that Tribal hunting effort involves deer. When possible, the State attempts to obtain harvest records each year for deer harvested by Tribal members. State and Tribal wildlife managers are continually working toward improved co-management agreements that ensure conservation of deer populations, a sustainable harvest, and habitat improvements.

Literature Cited

Samuel M. D., E. O. Garton, M. W. Schlegel, and R. G. Carson. 1987. Visibility bias during aerial surveys of elk in north-central Idaho. J. Wildl. Manage. 51:622-630.

Nelson, J., D. Cottam, E. W. Holman, D. J. Lancaster, S. McCorquodale, D. K. Person. 2008. Habitat guidelines for black-tailed deer: coastal rainforest ecoregion. Mule Deer Working Group, Western Association of Fish and Wildlife Agencies.

Washington Department of Fish and Wildlife. 2003. Game Management Plan. Washington Dept. of Fish and Wildlife, Olympia, WA, USA

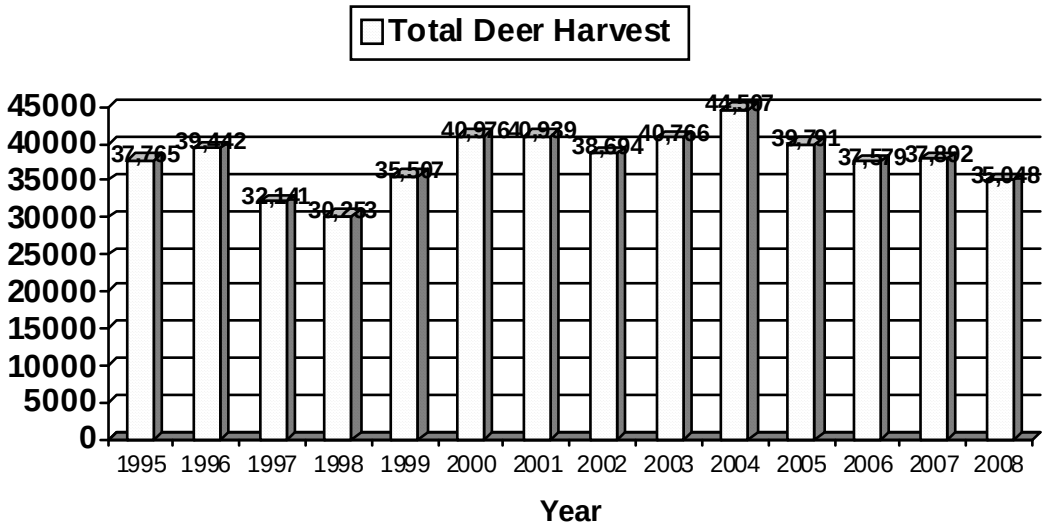


Figure 1. Estimated total deer harvest from 1995 to 2008.

DEER STATUS AND TREND REPORT: REGION 1
PMU 11 – GMU 101
PMU 13 - GMUs 105, 108, 111, 113, 117, 121, 124

DANA L. BASE, District Wildlife Biologist

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. 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 at least 15 bucks per 100 does in the post-hunting season population, and increase productivity and population levels.

Hunting seasons and harvest trends

Figure 1 depicts the trend in total estimated deer harvested by hunters within the Colville District, Game Management Units (GMUs) 101 - 124 from 2001 through 2008. The total harvest decreased by 7% from 2007. In addition all hunting methods showed a modest decrease in participation from 2007 to 2008 (Figure 2). The number of days hunted per deer harvested went up slightly from 18 days in 2007 to 19 days in 2008 (Figure 3).

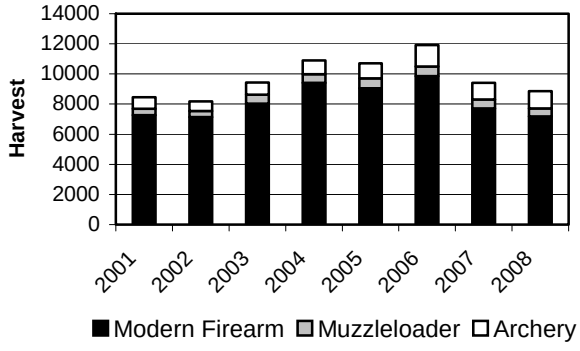


Figure 1. Trend in the total deer harvest for GMUs 101-124.

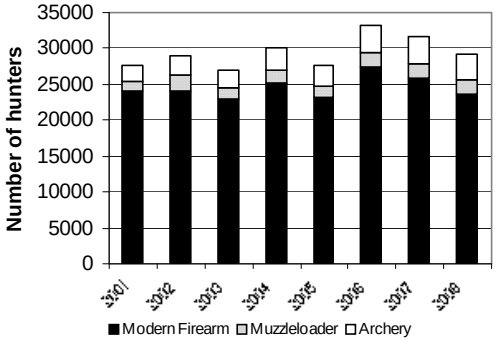


Figure 2. Trend in the number of deer hunters for GMUs 101-124 from 2001-2008.

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 considerably from 2001 through 2004, however, it declined in both 2005 and 2006 only to increase again in 2007. In 2008 the mule deer buck harvest declined slightly (Table 1).

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

Year	A	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%

The antlerless white-tail harvest was 3,602 and a total of 6,079 white-tail bucks were taken within PMUs 11 and 13 combined (GMUs 101-124) during the 2008 season (Table 2). Harvest of white-tail bucks dropped from 6,507 taken in 2007. As in 2007 Youth, Senior, and Hunters with Disability (Y/S/D) were allowed to take any white-tail (including antlerless) within GMUs 101-124 during both the Early and Late Modern Firearm Deer Hunts within GMUs 105-124 in 2008. There were 2,155 antlerless white-tailed deer permits allocated for deer hunters within GMUs 101-124 in

Table 2. Hunter harvest of antlered and antlerless white-tailed deer by Population Management Unit in 2008.

		Antlerless						Antlerless per
PMU	GMU	Archery	Permit	Y/S/D**	Muzzleloader	Total****	Antlered	100 Antlered
11	101	48	9	241	56	354	462	77
13	105	9	11	156	8	184	332	55
	108	22	13	124	7	166	253	66
	111	4	N/a	129	11	144	339	42
	113	3	N/a	99	48	150	319	47
	117	61	26	355	42	484	964	50
	121	87	51 + 61**	631	61	891	1419	63
	124	202	79 + 162**	681	39	1163	1991	58
	Northeast*	--	66	N/a	--	66	--	N/a
Total:		**436**	**478**	**2416**	**272**	**3602**	**6079**	**59**

* Northeast = second deer archery permits for antlerless white-tailed deer within GMUs 105, 108, 121, and 124.
** The second value is for second deer permits for anlterless whitte-tailed deer only within GMUs 121 and 124.
*** Y/S/D = Youth/Senior/Hunter with Disability
**** Totals include Multi-method permits.

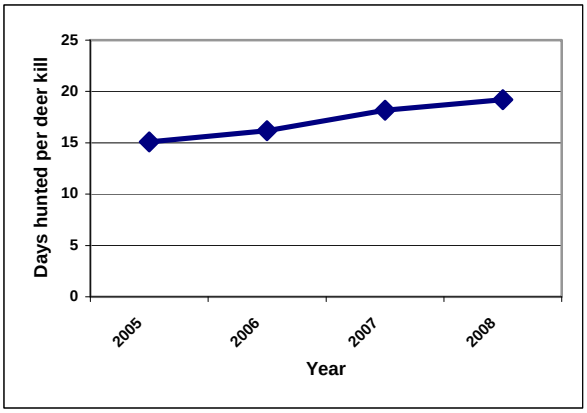


Figure 3. Three-year trend in the number of days hunted per deer harvested within GMUs 101-124.

2008, a decrease of about 37% from 2007. These permits included "Second Deer Tags" issued for two units, GMU 121 (150 tags in 2008), and GMU 124 (450 tags in 2008). Archers could apply for Second Deer Tags with 400 permits once again allocated for the "Northeast Hunt" in 2008, which included GMUs 105, 108, 121, and 124. These Second Deer Tags allowed the permittee to take a white-tail antlerless deer *in addition to their regular deer tag.* These tags provide an effective management tool as well as a useful means for increasing hunter opportunity. The harvest of antlerless white-tails from permits decreased substantially, dropping 56% in 2008 from 2007. Meanwhile the estimated harvest of antlerless whitetails by youth, senior, or disabled hunters (Y/S/D) increased by 29% in 2008 from 2007. Archers also exhibited an increase in harvest going up 12% from 2007 to 2008. Muzzleloaders were closer in antlerless harvest between the two years, declining 7% from 2007 to 2008. As in both 2006 and 2007 archery and muzzleloader hunters accounted for slightly less than 20% of the total antlerless white-tail harvest again in 2008.

Surveys

Age, antler, and sex ratio data are collected from harvested deer for monitoring deer populations and developing season recommendations. One way that the ratio of mature white-tail bucks in the population is monitored is by sampling the proportion of adult bucks (yearlings excluded) that are 4 years or greater. Ages of hunter-harvested deer as determined by tooth samples collected in the 2008 season were not available at the time this report was written. In 2007 this proportion dropped to 18% from 28% in 2006 (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 2008 yielded 13% and 18% respectively of all bucks harvested as having 5 points or more for the overall white-tail harvest within GMUs 101-124 (PMUs 11 & 13). These data seem to support an apparent increase of mature bucks represented in the harvest since a low of 12% from hunter reports in 2001 (Table 3 and Figures 4 & 5).

The proportion of white-tail yearling bucks brought to hunter check stations increased moderately from 2007 to 2008 (Table 3). The total checks in 2008 included 37% (n = 65) yearling white-tail bucks and 15% (n = 20) yearling white-tail does. Fawns made up 20% of the total antlerless harvest checked in 2008. The mean age of adult white-tail bucks (yearlings excluded) checked in 2007 was 2.9 years, which is down from the previous 3-year average age of 3.2.

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%

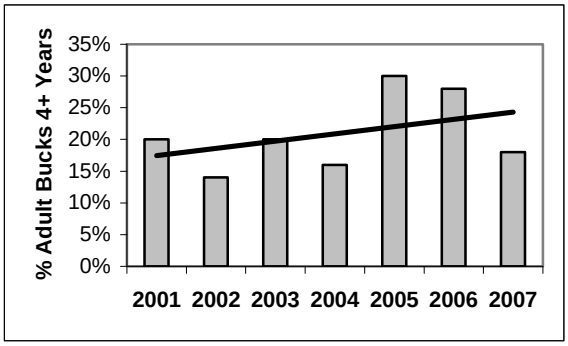


Figure 4. Percent of adult white-tail bucks 4 years and older from hunter check stations.

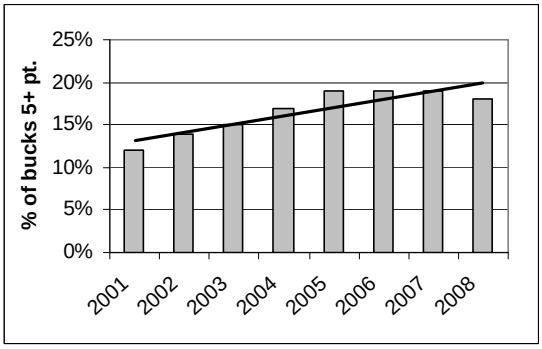


Figure 5. Percent of PMU 13 (GMUs 105-124) white-tail bucks 5 point or better from hunter reports.

For GMUs 105-124 (PMU 13) white-tail buck:doe ratios for summer 2008 dropped from 2007 going from 27 to 24 bucks per 100 does (Table 4). In 2008 the fawn to doe ratio remained low at only 48:100. The percentage of yearling bucks observed in the August 2008 surveys was 54% of all bucks, the same proportion as observed in August of 2007.

Late summer mule deer surveys are conducted primarily in GMU 101 (northern Ferry County). A sample of 269 classified mule deer in 2008 yielded a buck ratio of 26 bucks per 100 does, a decline from the previous years. The fawn ratio also declined, going from 77 in 2007 to 55 fawns per 100 does in 2008. (Table 5).

Population status and trend analysis

The total 2008 deer harvest declined about 7% from 2007. The antlerless deer harvest increased in 2008, but the antlered buck harvest, particularly for white-tails, declined. The 2008 buck harvest was about 7% lower than in 2007.

Both the Modern Firearm and Muzzleloader deer harvest levels decreased by 7% from 2007 to 2008. The level of harvest for Archery hunters rose slightly at 3% in 2008 from 2007. Total deer hunter numbers

Table 4. White-tailed deer late summer composition surveys by Population Management Unit (PMU).

PMU	*Year*	August		September	
		Sample Size	Bucks per 100 Does	Sample Size	Fawns per 100 Does
11	2001	241	35	311	50
	2002	190	35	328	63
	2003	113	47	228	69
	2004	47	42	207	74
	2005	181	21	149	104
	2006	228	31	263	57
	2007	203	16	185	54
	2008	204	30	115	72
13	2001	1185	29	720	57
	2002	955	22	779	55
	2003	1064	31	927	51
	2004	1244	31	925	68
	2005	1250	27	1178	64
	2006	969	28	1055	55
	2007	969	27	848	47
	2008	576	24	884	48

decreased about 8% in 2008 from 2007 with most of this decline in the number of Modern Firearm hunters.

Table 5. Mule deer buck and fawn ratios per 100 does from summer composition surveys within the Colville District from 2001 through 2008.

Year	Buck:Doe	Fawn:Doe	Total Classified
2001	42:100	46:100	286
2002	33:100	53:100	330
2003	34:100	66:100	801
2004	30:100	61:100	502
2005	31:100	67:100	470
2006	35:100	54:100	241
2007	29:100	77:100	323
2008	26:100	55:100	269

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). Nevertheless at this time we still appear to be at a level that has reasonably good representation of mature bucks in the white-tail population. Almost 1 in 5 white-tail bucks harvested is 5 point or better.

The total antlerless white-tailed deer harvest increased dramatically in 2006 and improved the ratio of antlerless taken per 100 bucks from 40:100 in 2005 to 52:100 in 2006. This level was maintained in 2007 with a harvest ratio of 53:100 and then rose even higher in 2008 to 59:100. Almost all of the GMUs now have a relatively adequate antlerless whitetail harvest ratio at or above 42 taken per 100 bucks (Table 2). The lower fawn to doe ratio of 48:100 for white-tails within PMU 13 in 2008 (Table 4) may suggest needed caution given the increased hunter effort.

Disease and Predators

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

Cougar populations in northeast Washington were exceptionally high in the middle to late 1990's but hunter harvests and special hound hunting opportunity to reduce populations for protection of livestock and human safety appear to have reduced cougar numbers in recent years. 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 established new packs within Washington including one pack in Pend Oreille County where there is a prey base of elk and moose as well as deer.

Habitat condition and trend

Like the winter before, the winter of 2008-09 was above average in severity. Snow cover was especially deep early in the season, but not as prolonged into the spring as the winter of 2007-08. Over winter deer survival was likely less impacted this last winter than in 2007-08.

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 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

The total deer harvest in the Colville District decreased in 2008, as did the overall deer harvest per unit effort. The ratio of 59 antlerless white-tails harvested per 100 antlered deer taken in 2008 sustained the improvement over the 40:100 ratio from 2005. As in 2007 the most dramatic increases in antlerless harvest were in the units with the lowest buck ratios and the most agricultural damage including GMUs 108 and 121 at 66:100 and 63:100 antlerless deer harvested per antlered deer, respectively.

The ratio of mature white-tail bucks in the harvest appears to be maintaining a reasonable level of 17-19%. The overall trend in the white-tail buck harvest has declined, however, so any substantial increase in the opportunity to take bucks such as extended seasons during the rut would impact the escapement of mature bucks. This would negate the gains made in recent years to improve the proportion of mature bucks. Maintaining adequate hunter field checks (check stations) along with similar efforts will be necessary to continue monitoring the age structure and antler classes of the deer population.

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

The Game Management Units (GMUs) 127 through 142 make up 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 (Oct. 11-19) for both mule and white-tailed deer. The general late white-tailed deer season was removed in 2006 and replaced with a special permit late white-tailed buck hunt (Nov. 3-19). A total of 625 permits were offered for the block hunt, which allowed permitees to hunt within any of the six GMUs. In addition, special permit hunts are offered in all six GMUs for antlerless white-tailed or mule deer and second deer tags are offered for antlerless deer in GMU 127 and GMU 142.

Archers are offered both early and late hunting seasons. The early archery mule deer hunt runs from Sept. 1-30. Legal deer regulations vary by GMU; 3-point minimum for GMU 127, 3-point minimum or antlerless for GMU 142, and for GMUs 130-139 a 3-point minimum from Sept. 1-15 and a 3-point minimum or antlerless from Sept.16-30. A late archery white-tailed deer season is open from Nov. 20 to Dec. 15 in GMU 127 with a 3-point minimum or antlerless deer legal. A late season, 11-day hunt (Nov. 20-30) for antlerless only white-tailed and mule deer was created for GMUs 133 and 136 to aid with depredation issues in those units.

Early season Muzzleloader hunts (Oct. 4-10) are offered in GMUs 133 and 142 for both white-tailed and mule deer with a 3-point minimum or antlerless regulation. A late muzzleloader white-tailed deer season runs from Nov 20-30 in GMUs 130 and 139 with 3-point minimum and antlerless deer legal. An additional late muzzleloader antlerless only mule deer season is offered in GMU 130 from Nov. 20-30.

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	1195	295	1490	1543	358	1901
2002	1391	252	1643	1639	344	1983
2003	1386	381	1767	1444	501	1945
2004	1493	386	1879	1371	467	1838
2005	1547	337	1884	1500	421	1921
2006	1102	361	1463	1080	257	1337
2007	1246	361	1607	1290	277	1567
2008	1433	441	1874	1565	333	1898
AVERAGE	1349	352	1701	1429	370	1799

Harvest trends

Total deer harvest in PMU 14 does not differ substantially from PMU 15; however harvest in PMU 15 was consistently higher from 2001-2003 (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 permitted hunt. Harvest has rebound in 2008, reaching pre 2006 levels in antlered harvest in both PMUs and antlerless harvest in PMU 14. However, antlerless harvest in PMU 15 remains below the pre 2006 average.

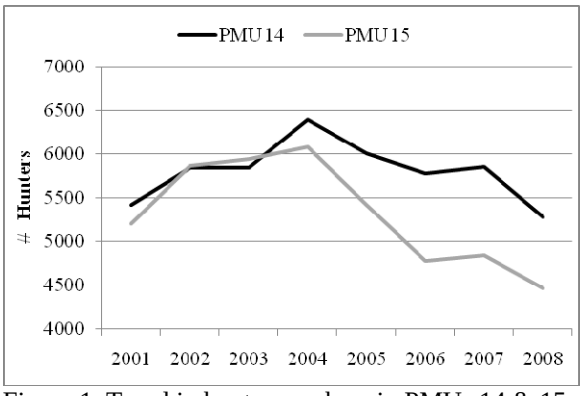


Figure 1. Trend in hunter numbers in PMUs 14 & 15.

Across both PMUs combined, the mule deer and white-tailed deer components of harvest are effectively equal (48% versus 52% respectively). However, mule deer comprise a greater portion (55%) of the harvest in PMU 15, while white-tailed deer comprise a greater portion (59%) of the harvest in PMU 14.

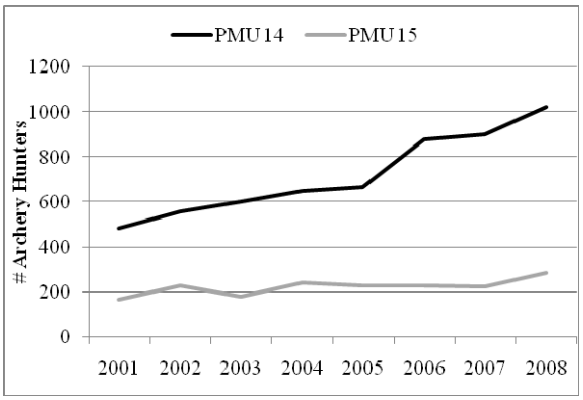


Figure 2. Trend in archery hunters in PMUs 14 & 15.

Overall hunter participation increased from 2001 through 2004, but has declined since 2005 (Fig. 1). Number of modern firearm hunters mirrors this trend in both PMUs. Number of archery hunters is increasing in PMU 14 and remains stable in PMU 15 (Fig. 2). Muzzleloader numbers remain stable in both PMUs 14 and 15, averaging 676 and 322 respectively.

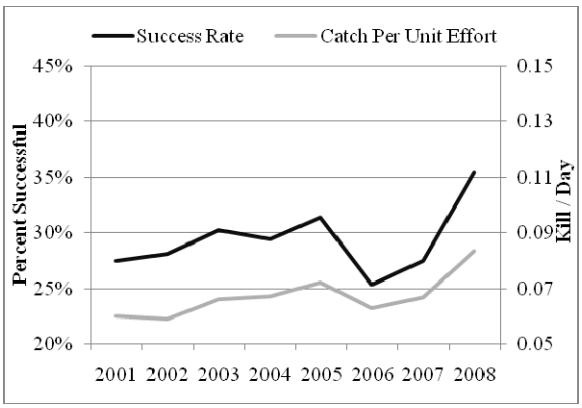


Figure 3. Hunter success rates and effort for PMU 14.

Hunter success rates in PMU 14 and 15 average 29% and 34%, respectively, over the past eight years. There is no observable trend over the past eight years, reflective of the complex combination of variables (deer availability, hunting conditions, access, time-off, etc) that affect hunter success each year (Fig. 3 & 4). There is 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. 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 eight year. However, in 2008 catch per unit effort increased to its highest point in the past eight year for both PMU (Fig. 3 & 4), 0.03 above the mean for PMU 15.

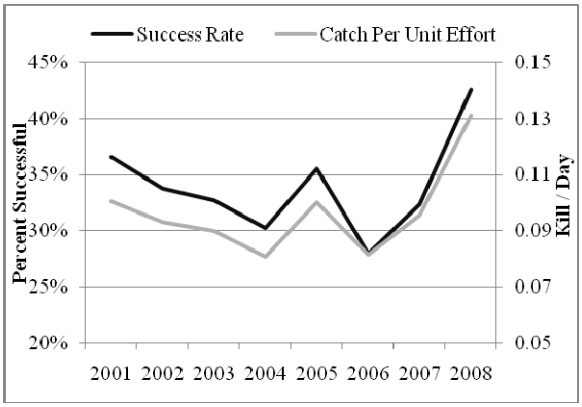


Figure 4. Hunter success rates and effort for PMU 15.

Results for the first three years of the Palouse special hunt show higher success rates than in the general hunt (Table 2). If we include those permit hunters that successfully harvested a buck in GMUs 127-142 during the earlier general season then success increases to 65%, 51%, and 66% in 2006, 2007, and 2008, respectively. Additionally, 4+ and 5+ bucks make up a greater percentage of the harvest when compared to the general season (72% 4+ and 25% 5+ bucks).

Table 2. Palouse special permit hunt results

	2006	2007	2008
Num. Of Hunters*	342	395	344
Hunter Success**	57%	42%	59%
Percent 4+ bucks**	85%	88%	89%
Percent 5+ bucks**	29%	37%	37%

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

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

Surveys

Deer in PMU 14 and 15 have been surveyed by both ground and aerial methods. Available resources impact WDFW's ability to conduct surveys over the entire district. Pre-season ratios come from ground surveys conducted during August and September. Pre-season surveys provide an accurate reflection 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 and the hunting pressure of the late buck seasons, the post-season buck:doe ratio figure is probably a conservative measure of composition when available.

The 2008 pre-season ratio for white-tailed deer is equivalent to the seven year average, 28 bucks and 64 fawns to 100 does (Table 3). Pre-season mule deer ratios in 2008 show an increase in both buck and fawn numbers over the seven year average, 34 bucks and 63 fawns per 100 does. Post-season ratios in 2007 and 2008 were based on a limited number of flights and therefore may not accurately reflect the composition of the deer herd for the entire district (Table 3). In 2007 one post-season flight was conducted in GMU 142, compared to 2006 post season survey of mule deer in GMU 142 (14 bucks : 100 does : 64 fawns) there is an increase in bucks and a slight decrease in fawns in 2007. In 2008 two post-season flights were conducted one in GMU 142 and one in GMU 133. When compared to 2006 post season there has been a decrease in fawn numbers, but buck number have remained stable (Table 3). When limiting the post season analysis to legal (3+) mule deer bucks results in a buck:doe ratio of 3:100, 3:100, and 1:100 for 2006, 2007, and 2008. This indicates that the current mule deer harvest is sustained by recruitment of yearling and 2.5 year old bucks.

Table 3. Deer sex and age composition ratios.

		(Buck : Doe : Fawn)	
Species	Year	Pre-season	Post-season
Mule Deer	2002	33:100:64	20:100:67
	2003	36:100:54	*
	2004	29:100:58	*
	2005	32:100:55	*
	2006	33:100:63	22:100:73
	2007	32:100:76	22:100:59[1]
	2008	41:100:74	22:100:52[2]
White-tailed Deer	2002	24:100:50	*
	2003	36:100:87	*
	2004	23:100:82	*
	2005	33:100:43	*
	2006	20:100:61	8:100:65
	2007	30:100:64	10:100:44[1]
	2008	29:100:62	**

* No post-season surveys.

** Insufficient number of deer observed

[1] Based on one flight in GMU 142

[2] Based on one flight in GMU 142 and one in GMU 133

Habitat and Disease

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 was up. Additionally emergency haying and grazing of CRP acreage may be in response to a severe drought or similar natural disaster, the frequency of which are predicted to increase. 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 continues to occur in both PMUs, especially in GMU 127 and 130 with the redistribution of urban populations outward into rural settings. Current habitat conditions support existing populations, however, an extended drought in these PMUs can increase stress, reduce productivity and increase mortality across sex and age classes.

Drought conditions are coincident with white-tailed deer mortality and outbreaks of Epizootic Hemorrhagic Disease (EHD) in District 2. EHD mortalities in PMUs 14 and 15 were high in 1998, 1999, 2003, 2004, but almost nonexistent in 2006, 2007, and 2008. These last three years have allowed local white-tailed deer populations to recover some from past years of high mortality. There are some indications that mule deer increased in areas that were occupied by white-tailed deer before 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 Idaho which has several game farms nearby. 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 over the past three years indicate that our harvest is being sustained 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 population declines due to our harvest being heavily weighted toward older age-class bucks. Discussions on long-term management of mule deer in Washington will most likely address these and similar issues. Short-term recommendations would be to continue monitoring buck escapement and to propose restrictions in hunting opportunity if declines in populations are observed.

We are not meeting the Game Management Plan guidelines for buck escapement for white-tailed deer. The 95% Confidence intervals for 2006 and 2007 post season white-tailed buck to 100 doe ratio are ±3.7 and ±4.4, respectively. Taking this error estimate into account we are still below the 20 bucks to 100 doe goal set by the Game Management Plan. However, white-tailed bucks are difficult to survey because of the forested habitats they occupy and their nocturnal behavior, which hunting tends to intensify. Considering the post season buck ratios as a conservative measure, the relatively stable and robust pre season buck ratios, and the late season having been recently converted to a permit only season, we are not considering further limits to the general white-tailed deer season at this time, but are looking into methods to improve our post season surveys.

Those units near urban centers continue to receive high hunting pressure and will need to be closely watched to avoid over or under harvest. Thus 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 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 whitetail antlerless opportunity for archery, muzzleloader, youth, senior, and disabled hunter seasons in units near the urban area of Spokane for white-tailed deer.

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

PAT FOWLER, District Wildlife Biologist
PAUL WIK, Wildlife Biologist

Population Objectives and Guidelines

The mule deer (*Odocoileus hemionus*) population has declined along the breaks of the Snake River, due to low fawn production and survival over of the last six years, but appears to be stabilizing. Mule deer populations in the mountains are still depressed, but are slowly improving. White-tailed deer (*Odocoileus virginianus*) populations have also declined due to EHD outbreaks and antlerless harvest, but are still near objectives.

Hunting seasons and harvest trends

The general buck season in the Blue Mountains district has been under a three-point regulation since 1990 for mule deer and 1991 for white-tailed deer. This regulation was intended to improve buck survival and increase the post-hunt buck:doe ratio, which was extremely low (2-5 bucks/100 does) prior to the regulation. The implementation of the 3-point regulation was successful in bringing buck:doe ratios up to management objective (15 bucks:100 does). The accuracy of harvest data has been improved since implementation of the mandatory hunter report in 2001. From 1998-07 the District-3 buck harvest averaged 2248 bucks/year, and ranged from a low of 1789 to 2750. In 2008, hunters harvested 2032 bucks (Table1), slightly below the 10-year average. In 2008, the four-point or better mule deer buck harvest was 53% of the total buck harvest, which exceeds the 10-year average of 51%.

Three user groups have general seasons in the Blue Mountains: archery, muzzleloader, and modern rifle. The number of modern firearm hunters has gradually declined since 1996, from a high of 13,423 to 6,657 in 2008. Modern firearm (MF) hunters harvested 2,166 deer in 2008; 1761 bucks and 405 antlerless deer. General season hunter success was 28%.

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 442 participating in 2008. The ML deer harvest increased from 41 deer in 2000, to 195 deer in 2008; 153 bucks and 42 antlerless deer. Muzzleloaders enjoyed a success rate of 38%, which is the highest success rate for any user group.

Table 1. Deer harvest summary, 1990-2008, Blue Mtns.

Year	Antlered	Antlerless	Total	Mule deer % ≥ 4 point*	Antlerless deer:100 Antlered
1990	1209	771	1980	34%	64
1991	1317	1088	2405	38%	64
1992	1588	875	2463	47%	55
1993	2012	766	2778	50%	38
1994	2231	1252	3483	46%	56
1995	1451	930	2381	43%	64
1996	2332	816	3148	52%	35
1997	2418	768	3186	51%	32
1998	2366	591	2957	54%	25
1999	2484	791	3275	53%	32
2000	2750	827	3577	50%	30
2001	2399	1127	3526	50%	47
2002	2599	1150	3749	47%	44
2003	2254	1497	3751	50%	66
2004	1994	1240	3233	48%	62
2005	1929	904	2833	53%	47
2006	1919	721	2640	55%	38
2007	1789	572	2361	51%	32
2008	2032	572	2604	53%	28

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

Archery hunter numbers increased slightly to 1,021 in 2008, which is slightly above the 2002-2006 average of 927. Archers harvested 233 deer (110 bucks, 123 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 22%.

Species composition of the buck harvest changed slightly in 2008, with 63% mule deer and 37% white-tailed deer. The increase in mule deer may be due to slightly increasing mule deer populations in some units, and declines in white-tailed deer due to EHD.

The antlerless harvest consisted of 32% mule deer, which is a slight increase from previous years, however, most of the antlerless harvest is focused on white-tailed deer through special permits and general season hunts.

From 1997-2006, the antlerless harvest averaged 961 deer per year. A total of 285 general antlerless permits along with 470 permits for white-tailed deer were issued in 2008.

Table 2. Late White-tailed Permit Hunt Summary, MF & ML, Blue Mtns., WA.

Year	Permits	Bucks	Does	Total	Success Rate	%Harvest ≥ 5 pt.*
1991	120	48	22	70	68%	24%
1992	140	62	24	86	58%	18%
1993	140	66	22	88	69%	22%
1994	200	68	49	117	69%	18%
1995	200	74	18	92	56%	16%
1996	200	74	14	88	56%	21%
1997	220	79	17	96	66%	24%
1998	175	57	14	71	63%	20%
1999	175	62	10	72	59%	20%
2000	260	82	26	108	68%	17%
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%

* Note: Note: % 5 pt. in 2005-08 listed for late permit hunt, average of all seasons prior to 2005.

The permit controlled and general season antlerless harvest totaled 572 antlerless deer (general season 369, permit season 203). Species composition of the modern firearm antlerless harvest consisted of 74% white-tailed deer, and 26% mule deer. Antlerless hunting pressure on mule deer has been reduced over the last few years due to drought impact on mule deer fawn production/survival, while pressure on antlerless white-tailed deer has increased in order to stabilize white-tailed deer populations.

All antlerless deer combined were harvested at a rate of 28 antlerless deer per 100 bucks; mule deer antlerless harvest was 15 antlerless:100 bucks and white-tailed deer antlerless harvest was 48 antlerless:100 bucks.

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 361 mule deer classified.

Post-hunt surveys were conducted from the ground and air resulting in 2,386 mule deer classified (Table 3). December fawn:doe ratios ranged from 44-65 fawns:100 does and averaged 48 fawns:100 does. Fall green-up improved during 2008, but winter conditions were more severe than usual, with more snow in the foothills and mountains than normal.

Table 3. Post-hunt mule deer surveys 1989-08, Blue Mtns., Washington

	Bucks					Per 100 Does
Year	Ad.	Yearl.	Doe	Fawn	Total	F:100:B
1989	6	23	790	234	1053	30:100:4
1990	15	111	1358	544	2028	40:100:9
1991	17	133	943	455	1548	48:100:16
1992	40	153	1231	431	1868	35:100:17
1993	45	119	995	559	1718	56:100:17
1994	20	163	879	381	1443	43:100:21
1995	43	69	693	264	1069	38:100:16
1996	51	85	993	697	1826	70:100:14
1997	47	157	822	489	1515	60:100:25
1998	81	117	705	460	1363	65:100:28
1999	72	180	1316	796	2364	61:100:19
2000	8	20	98	52	178	53:100:29
2001	71	109	876	471	1529	53:100:21
2002	77	158	1651	581	2465	35:100:14
2003	34	70	979	467	1550	48:100:11
2004	85	112	1440	719	2363	50:100:14
2005	85	229	1870	688	2872	37:100:17
2006	80	147	1350	645	2231	48:100:17
2007	80	112	1166	505	1862	43:100:17
2008	113	132	1444	697	2386	48:100:17

The post-hunt mule deer buck:doe ratio did not change compared to the last three years, and remained at 17 bucks:100 does (Figure 1). Although data on post-hunt herd composition for white-tailed deer is limited, buck ratios have averaged 22 bucks/100 does since 1995 and appear to be stable.

Population Status and Trend

The mule deer population appears to be stabilizing in the lowlands and along the Snake River breaks, but is still below the population levels that occurred from 1996-2003.

White-tailed deer populations have declined slightly. White-tailed deer suffered an EHD outbreak in the late summer of 2008. The die-off was localized in the Touchet River drainage from the town of Touchet upriver to approximately 4 miles east of Dayton. An estimated 500 deer were lost during the die-off. Periodic EHD die-offs are becoming more frequent as hot, dry summers are more common.

Habitat Condition and Trend

Summer-fall drought has occurred five out of the last eight years (2001-2003, 2005, 2007), which had a negative impact on fawn production and survival. 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 natality. 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. The spring and summer of 2008 was normal, and fall green-up was adequate.

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 continuous habitat provide connectivity between sub-herds, good forage, and fawning areas where little existed prior to this program. Unfortunately, it appears large acreages of CRP may be lost as old contracts expire and are not renewed. The increased habitat provided by the CRP program has been a contributing factor to the increase in the mule deer population during the 1990's. If CRP acreage declines significantly, we can expect a similar decline in mule deer populations in the Snake River breaks and 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. 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. The School Fire burned 53,000 acres in GMUs 162, 166, 175, and 178 in 2005. This fire was extremely hot, destroying much of the thermal and security cover. The Columbia Complex Fire burned 101,000 acres in GMUs 154, 162, 166, and 169. This fire burned slowly and in a mosaic pattern that greatly reduced old decadent under-story and fuels that had accumulated over many years. The Columbia Complex Fire produced excellent conditions for habitat regeneration over 80% of the acreage burned.

Augmentation/Habitat Enhancement

No habitat enhancement projects have occurred in southeast Washington, other than large acreages of CRP. The wildfires of 2005 and 2006 will have a positive impact on deer habitat in GMU's 154, 162, 166, 178, and portions of 169.

Wildlife Damage

Damage complaints attributed to deer have been minimal in southeast Washington, compared to deer densities. However, the development of vineyard acreage continues to increase in southeast Washington. Over the last year, the WDFW has received several complaints of deer damage to vineyards. This problem will continue to increase as vineyard acreage expands in southeast Washington.

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 considerably below management objective, but are improving slowly.

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 2008 was comparable to recent years (Table 3).

The post-hunt mule deer buck ratio remained the same in 2008 at 17 bucks:100 does. Low fawn production/survival and increased hunting opportunity are factors that contribute to lower post-hunt buck:doe ratios.

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.

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

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 2008, we reduced antlerless only permits for youth, disabled, and senior hunters in response to declining fawn recruitment and population size. Conversely the number of b-tag antlerless permits for the private land hunt on the Methow Valley floor increased to 100 to address ongoing damage issues.

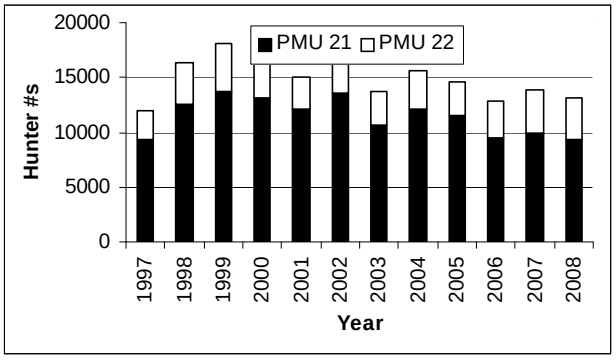


Figure 1. Trend in Hunter numbers in PMUs 21 & 22.

Hunters contended with unseasonably warm and dry weather in 2008. The combination of unfavorable weather, declining overall herd size, reduced antlerless permits and a slight decrease in hunter numbers led to corresponding declines in success rates and harvest across the district (Figures 1-3).

WDFW Check station personnel surveyed 795 hunters and examined just 40 deer in 2008 (Table 1). No chronic wasting disease monitoring occurred in this district due to limited resources being allocated to higher risk areas.

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 $\geq$ 3-pt buck, < 3-pt buck, doe, or fawn.

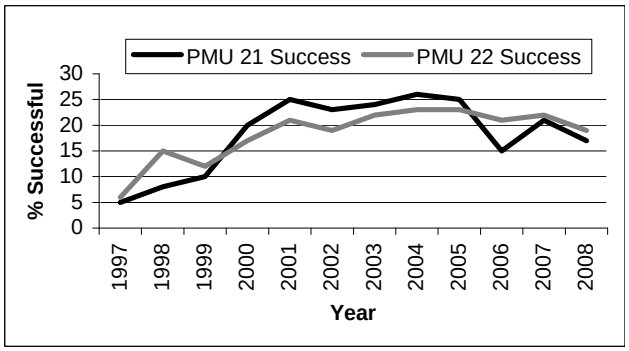


Figure 2. Hunter success trend in PMUs 21 & 22.

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. Traditionally, these efforts have been restricted to PMU 21 due to limited resources and sample size problems; however, biologists conducted post-season surveys in PMU 22 in 2007. A new land acquisition and an associated limited entry hunt prompted this effort. The survey produced satisfactory sample sizes, particularly for white-tailed

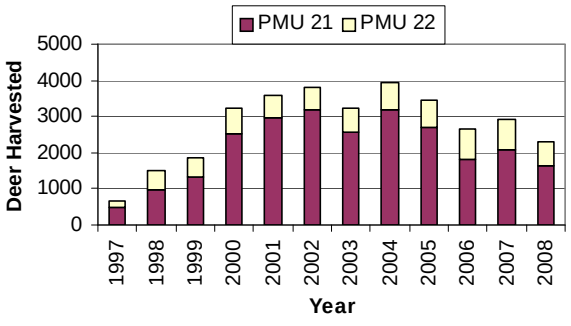


Figure 3. Trend in harvest in PMUs 21 & 22.

deer, but the majority of animals seen came from one 6000 acre portion of the landscape, so results are not likely representative of the PMU as a whole. Limited financial resources precluded aerial surveys of PMU 22 in 2008, and ground survey attempts yielded inadequate sample sizes. Additional aerial survey attempts of this unit will depend on funding availability.

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

Biologists classified almost 2,900 mule deer during helicopter surveys of PMU 21 in early December 2008 (Table 2). The counts yielded overall buck:doe and fawn:doe ratios of 17:100 and 75:100 respectively. Buck ratios fell continue to hover a little above the minimum management objective of 15. Fawn production continued to improve (Table 3), likely a result of a declining population and reduced competition for limited winter forage.

Table 2. Post-season mule deer population composition counts in PMU 21 from 2008, 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	74	89	988	694	1845	70:100:16
Okanogan	31	57	88	511	425	83:100:17
Total	105	146	1499	1119	2869	75:100:17

Fawn recruitment improved, particularly in the Okanogan Watershed, but remains below the historical average and below the level needed to create significant herd growth at the PMU level (Table 4 & 5). The preceding winter brought below average snow depths, but an extended period of below average temperatures.

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 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

For roughly the last 35 years, harvest data and populations estimates suggest a gradually declining population. This is likely a function of the reduced 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.

Table 4. Spring mule deer population composition counts from 2009, by area for PMU 21. F:100A is fawns per 100 adults.

Area	Adult	Fawn	Total	F:100A
Methow	1354	415	1769	31:100
Oka	210	88	298	42:100
Total	1564	503	2067	32:100

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). Herd size had been in decline for three years as a result of poor over-winter fawn recruitment in response to harsher winter conditions, but stabilized in response to last winters improved fawn survival.

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 be stabilizing. Whitetail also sustained significant winter losses in the 90s, but populations rebounded with milder winters.

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

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, 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.

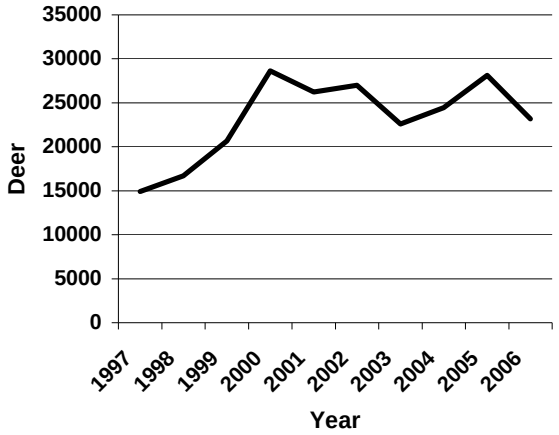


Figure 4. PMU 21 modeled deer population.

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 attempts to reverse protections for roadless areas nationally, 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, three moderately tough winters have reduced recruitment and led to a significant herd decline. As a result, we reduced antlerless permits for 2008 and implemented further reductions in 2009. Even so, population recovery is likely to be less vigorous than in the past unless long-term, chronic reductions in habitat quantity and quality are not halted.

Whitetail 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 whitetail 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-tail tend to concentrate.

For deer in the short term, minimal fawn recruitment in 2006-2008 will mean continued reduced legal buck availability that began in 2007 and will likely continuing at least through 2010. Mediocre recruitment in 2009 likely stopped the decline, but is not robust enough to generate increases for 20011. The recent shortening of the general hunting season and corresponding earlier closing date may improve buck escapement and raise the post-season buck:doe ratio.

Over the last decade or two, populations of resident deer on the Methow Valley floor have increased significantly to problematic levels. Nuisance/damage complaints have risen sharply and population levels have 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 we initiated an antlerless permit season on resident, valley-bottom deer on private land. This was needed to alleviate the nuisance/damage issues. To date, the program is operating smoothly and permit levels remain at 100 for 2009. Deer nuisance/damage complaints appear to be down somewhat. Ultimately, 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
JON GALLIE, Wildlife Biologist

Population objectives and guidelines

The vast majority of deer in the Wenatchee District are mule deer, although white-tailed deer occur at low density. Management objectives for Population Management Unit (PMU) 23, Douglas County, are to maintain the mule deer population within landowner social tolerances and a post-hunting season minimum objective of 15 to 19 bucks per 100 does. Management objectives for PMU 26, Chelan County, are to maintain deer populations in balance with winter forage, limit conflicts with agriculture, and maintain the post-season buck:doe ratio above the minimum objective of 25 bucks per 100 does. Composition surveys, harvest estimates, population modeling, and end of winter browse observations are used to monitor population progress toward objectives. Game Management Unit 243 (Manson), while managed in the Wenatchee District, is a part of the Methow PMU (21). This GMU lost most winter-range shrub habitat to wildfire in 2001 and 2002; deer numbers are expected to remain low until habitat recovers.

Hunting seasons and harvest trends

The 2008 deer hunting seasons were comparable to 2007, and are very conservative compared to seasons prior to 1997. All general mule deer seasons are restricted to the harvest of 3-point minimum bucks, while white-tailed deer seasons allow the take of any buck. In addition, there were any deer permit harvest opportunities in several GMUs for youth, senior and disabled hunters. Deer season began with September early archery general deer season. The modern firearm and muzzleloader high buck season ran 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 is occurs within a portion of GMUs 244, 245 and 249 in Chelan County. Early muzzleloader general deer season was open in six GMUs for seven days in 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 30 days in most GMUs, and late archery general season deer hunting was open in 2 GMUs in late November and early December. There were no general, late, muzzleloader or modern firearms seasons offered.

Limited-entry, special permit hunting was offered for all user groups. One hundred sixty three November modern firearms any deer permits were offered in six GMUs, down from the 203 permits offered in 2007. Three November muzzleloader any deer permits were offered in GMUs 245 and 274 November and/or December archery any deer permits in three GMUs. One hundred sixty eight antlerless and youth antlerless permits were issued in GMU 251 along with 12 any deer permits for senior and 20 for disabled hunters, during the general season time frame. Four hundred eighty modern firearm, 200 muzzleloader, 30 archery, 225 youth, and 30 senior antlerless permits were offered in Douglas County in 2008. In addition, 50 any deer permits were issued in Douglas County GMUs for muzzleloader and disabled hunters.

District-wide, buck harvest reached at least a 7-year low in 1997, with 644 bucks harvested, and had increased each season until 2004, when 2,028 bucks were harvested (Fig. 1). In 2008, buck harvest was to 1,203, a 20.0% decrease over 2007.

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 harvest decreased dramatically from 1996 to 1997, but increased through 2002. Total increased every year from 486 in 1997, to 1,348 in 2002, and has declined since. Total Douglas PMU harvest in 2008 was 623 deer, comprised of 507 bucks and 116 antlerless deer. Total harvest decreased by 29% deer in 2008; buck harvest decreased by 19%, while antlerless harvest decreased 58%. While some of this decrease is likely due to reduced participation and changing from general to permit only youth, senior and disabled

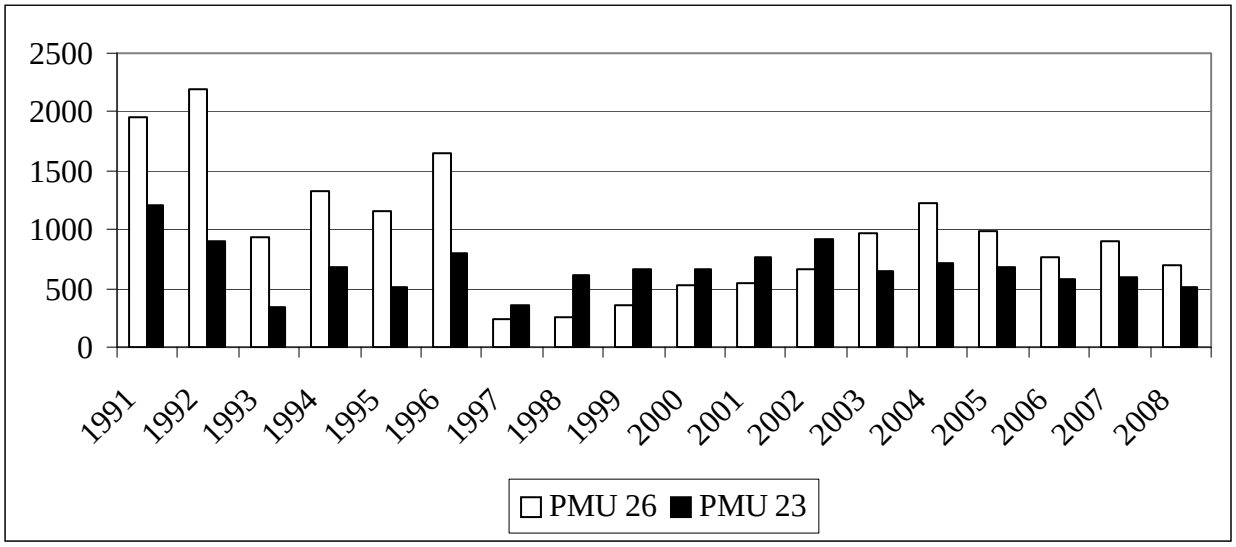


Figure 1. Antlered deer harvested from PMU 23 and PMU 26, 1991 through 2008.

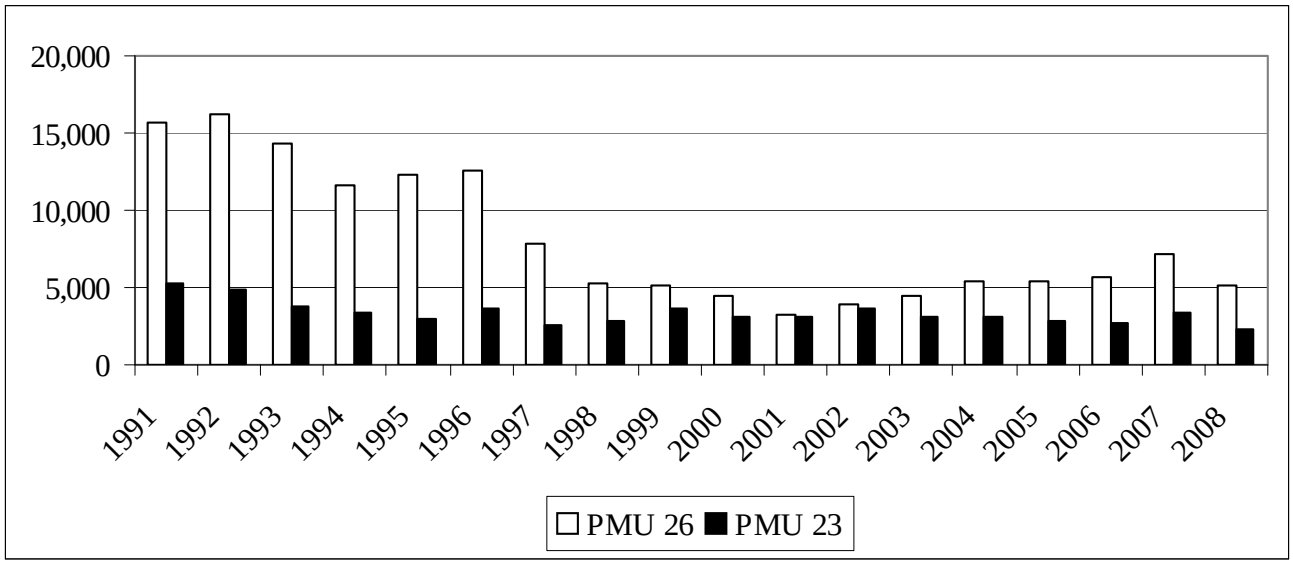


Figure 2. Numbers of hunters reported from PMU 23 and PMU 26, 1991 through 2008.

hunting opportunities in 2005, it appears deer numbers have also decreased, 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 when populations reach the 1992 level. During 2008, 700 bucks and 225 antlerless deer were harvested in Chelan County, a decline of 26% overall.

The number of deer hunters in the Wenatchee District declined dramatically from 21,082 in 1992, to 6,438 in 2001. General season hunter numbers in 2008 were 7,438, a 26% decrease from 2007 (Figure 2).

Hunter numbers decreased in the Douglas PMU (28%), and decreased in the Chelan PMU (25%).

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 wildlife fence along S.R. 97A will reduce annual vehicle collisions.

Surveys

Both helicopter and ground surveys are used to monitor population composition. December surveys are done after deer have begun concentrating on winter range but before most antlers are dropped. These surveys are 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 the Chelan PMU, observed postseason ratios were 27 bucks and 87 fawns per 100 does. Adult (age 2+) bucks comprised 79% of Chelan bucks, while yearling (age 1+) bucks comprised 21% of observed bucks in Chelan. The observed winter/spring fawn:adult ratio for the Douglas PMU was 42:100 and for the Chelan PMU, 44:100 .These ratios were derived from a total count of 362 and 779 deer respectively.

Population status and trend analysis

Deer population status is quite different between the two PMUs that make up the Wenatchee District. 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 to slow overall declines. In the Chelan PMU, conservative seasons since 1997 allowed this population to increase steadily trough 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 116 antlerless deer in 2008. Antlerless permits in the Chelan PMU in 2008, resulting in 225 antlerless 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. Survey conditions may have played a role in producing these low results. Continuing surveys will allows us to determine if the population is trending to a lower percentage of adult bucks or if the 2007 survey was an anomaly. In 2008, total bucks per 100 doe ratios in the Chelan PMU were similar to 2007 at 27 bucks per 100 does. While it appears harvest rates on legal bucks are increasing, this is still a high rate of buck escapement. However, harvest of 4-point bucks declined from 49% in 2005 to 17% in 2006, and then increased to 41% in 2007 in the Chelan PMU. In 2008, harvest of 4-point bucks was 38%. 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 support perceptions that many deer are unavailable for harvest under the current, early modern firearms general season structure.

POP-II (Fossil Creek Software, v. 1.2.11) models have been created for both the Chelan and Douglas PMUs. The Chelan model simulation aligns well with observed data and is considered a reliable indicator of trend. Model simulations indicate this herd nearly quadrupled between spring 1998 and spring 2006. Historically, the Chelan PMU has supported much higher hunter numbers and harvest, and there is potential for some additional future herd growth without negatively impacting habitat, as winter range forage production increases. The Douglas model aligns less precisely, indicating further modeling and/or data needs, and is interpreted cautiously; however, the simulation supports harvest trends and field observations that suggest rapid recovery following 1997, a slight decrease from 2001 to 2003, and stabilization 2004 to 2007.

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 snow accumulations at higher elevations. The Manson GMU in particular has been severely impacted by the 2000 Rex Creek fire and 2001 Deer Point fire, which collectively consumed 100,000 acres and have severely reduced winter browse. This herd segment is likely to be depressed for several years until shrub browse recovers. 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 can 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 move down 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. It is necessary to phase in increased antlerless hunting opportunities as well. However, this population can be strongly regulated by winter conditions, and is susceptible to weather-related declines. For the 2006-2008 general season, modern firearm hunting season length was reduced from 9 to 14 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.

Model simulations of the Douglas PMU have 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.

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

BROCK HOENES, 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 2008, only 4%, 2%, and 8% of the estimated total deer harvest in GMUs 272 (Beezley), 278 (Wahluke), and 284 (Ritzville), respectively, were white-tailed deer. Consequently, management objectives and harvest data from this region are primarily limited to mule deer. In PMUs 24 and 25, 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 $\geq$ 15:100, while maintaining or increasing hunt opportunity and hunt quality.

Although GMU 290 (Desert) is located within PMU 24, overall management goals for this deer herd differ from those outlined above. In general, hunt opportunity is limited to permit holders with primary objectives of maintaining a post-hunt buck:doe ratio of $\geq$ 30:100 and ensuring that at least half of the male segment of the population is comprised of bucks $\geq$ 2.5 years old. Additional objectives are to maintain populations within the limitations of available habitat without increasing depredation complaints on agricultural lands adjacent to the Desert Wildlife Area.

Similar to GMU 290, the Buckrun Landowner Hunting Program (BuckRun) is located in GMU 272 and has management goals that differ from those outlined for PMU 24. Management goals for BuckRun were determined thru a cooperative agreement between BuckRun managers and WDFW biologists.

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 278 and 284.

All permit opportunities in GMU 272 were restricted to antlerless permits in Deer Area 2011 (Lakeview) and on BuckRun. 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 2008 were available for modern firearm, muzzleloader, and archery hunters. Youth permits were also available for each hunt type.

GMU 272.—Harvest estimates in GMU 272 have only varied by 24 deer since 2005 and with the exception of the 2004 season, have only varied by 60 deer over the past 8 years (Table 1). The consistent trend in harvest levels has occurred despite the fact hunter numbers have been quite variable during this same time period and increased by 12% from 2007 (1,210 hunters) to 2008 (1,350 hunters).

The decrease in overall hunter success and increase in days/kill during the 2008 season (Table 1) were both likely related to the increase in hunter numbers. Only 12 white-tailed deer were harvested in GMU 272 during the 2008 season. Since 2001, hunters participating during the general modern firearm season have, on average, accounted for 76% of the total harvest in GMU 272. In 2008, harvest during the modern firearm season again constituted the majority (76%) of harvest (Figure 1). Conversely, although archers were only slightly more successful during the 2008 season (20% success rate in 2008 *vs.* 18% success rate in 2007), they accounted for 19% of the overall harvest (Figure 1), which was significantly higher than the 8-year average of 14%. The number of deer harvested on BuckRun has been steadily declining since 2005 (Table 1). Only 38 deer were harvested in 2008 which only accounted for 12% of the total harvest compared to 30% in 2005. Declining trends in harvest levels on BuckRun have been a result of decreases in available permits and

landowner harvest rather than decreases in local deer herds.

Table 1. Estimated number of deer harvested in GMU 272, number of hunters, overall hunter success (Suc), and days/kill (D/K), 2001–2008. 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
Avg.	297	54	350	68	1,377	0.26	15.2

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

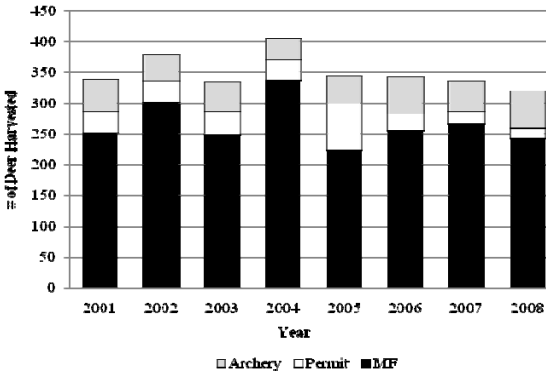


Figure 1. Estimated number of deer harvested by permit holders (permit), during the general modern firearm season (MF), and during the general archery seasons in GMU 272, 2001–2008. Data includes deer harvested on BuckRun LHP.

GMU 278.—With only 42 mule deer and 1 white-tailed deer harvested in GMU 278 during the 2008 season, harvest levels remained low. Hunter numbers have steadily increased from 158 in 2001 to 271 in 2008. Compared to 2007 (234 hunters), hunter numbers increased by 16%. Overall hunter success was 16% and slightly below the 8-year average of 18%.

GMU 284.—Since late season muzzleloader opportunities were removed following the 2002 season, harvest levels in GMU 284 have shown a slight downward trend, but increased marginally in 2008 compared to 2007 (Figure 2). Hunter numbers had shown a similar downward trend until 2008 when they increased by 11% compared to the 2007 season (Table 2). Only 18 white-tailed deer were reportedly harvested in GMU 284 during the 2008 season.

Harvest during the general modern firearm season accounted for 75% of the overall harvest in 2008, which was slightly below the 6-year average of 79%. Although overall hunter success remained relatively stable in 2008 (Table 2), success rates during the general archery (27% in 2007 vs. 37% in 2008) and muzzleloader (20% in 2007 *vs*. 45% in 2008) seasons significantly increased.

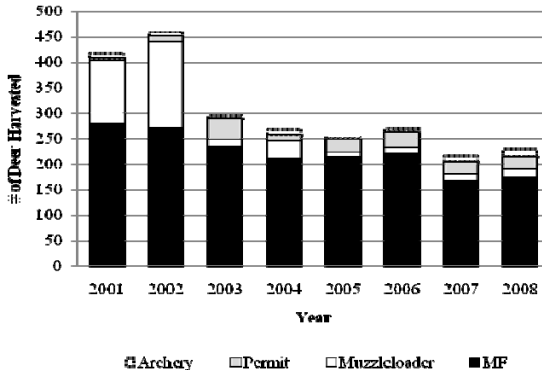


Figure 2. Estimated number of deer harvested during the general modern firearm (MF), archery, and muzzleloader seasons and by permit holders in GMU 284, 2001–2008.

Table 2. Estimated number of mule deer harvested, number of hunters, hunter success rate (Suc), and days/kill (D/K) in GMU 284, 2001–2008.

	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
Avg.	261	40	301	785	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.

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, 1997–2008. Values in parentheses are the number of permits that were issued to hunters.

	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)
Average	17	15	32	0.93	0.66	0.16	0.33	0.62

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

GMU 290.—Hunters harvested 17 bucks and 28 does in 2008 (Table 3). Success rates remained high during the modern firearm any deer season where 86% of hunters reported harvesting a deer. Success rates during the modern firearm antlerless season (67%) decreased by 9% in 2008 and were only slightly above the 12-year average of 66% (Table 3). Hunter participation during the antlerless season continues to be a management issue difficult to address, as only 53% of the hunters issued permits for this hunt chose to participate. Success rates were high for youth hunters in GMU 290 during the 2008 season, while success rates for archery and muzzleloader hunters continued to be highly variable (Table 3). Variability in the success of archery and muzzleloader hunters is likely been related to the limited amount of permits available and variability in season dates.

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, 290, and 284. Collectively, this data allows managers to evaluate the current status of mule deer populations. Due to the extremely limited occurrence of any deer species in GMU 278 post-hunt surveys are not conducted. Instead, biologists rely on harvest data to identify trends in population size and status.

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. In 2008, post-hunt surveys were conducted in late-October using ground based road surveys. A total of 695 deer were classified with a resulting buck:doe:fawn ratio of 21:100:69. Both fawn:doe and buck:doe ratios increased slightly from 2007 (Table 4). Although the buck:doe ratio increased, the proportion of bucks observed that were classified as being $\geq$ 2.5 yr old decreased by 7% and was slightly below the 13-year average of 35% (Table 4).

GMU 284.—Post-hunt surveys in GMU 284 were conducted using fixed-wing aircraft from 2000 thru 2007. However, due to limited funds, surveys were not conducted in 2005 or 2006 and were conducted using ground based road surveys in 2008. In 2008, post-hunt surveys were conducted in late-December and survey conditions were ideal. Temperatures were in the low teens, wind was calm, and cloud cover was 0%. Deer were readily located on south facing slopes and were highly visible to observers. As a result, 416 deer were observed during 13 survey hours.

Of the 416 deer observed, biologists were able to classify 385 resulting in a post-hunt buck:doe:fawn ratio of 24:100:58 (Table 5). Because of the poor survey conditions present during 2007 surveys, few deer were observed and smaller bucks were not readily visible from an airplane.

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 $\geq$ 2.5 yr old (%), 1996–2008.

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
Avg.	63	335	213	-	612	20:100:66	0.35

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

Consequently, data from 2007 is likely biased low for both bucks and fawns and observed trends from 2007 to 2008 are likely to be misleading. In fact, with the exception of 2007 data and missing data from 2005 and 2006, it appears post-hunt fawn:doe ratios over the past 9 years have been relatively stable in GMU 284 (Table 5). Post-hunt buck:doe ratios have increased slightly from low points in 2003 and 2004, but the percentage of bucks classified as $\geq$ 2.5 yr old appears to have decreased when compared to historical data and the 6-year mean of 48% (Table 5).

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 $\geq$ 2.5 yr old (% Adults), 2000–2008. Surveys were not conducted in 2005 and 2006 due to limited funds 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
Avg.	52	257	159	-	480	24:100:63	0.48

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

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, quad, etc.) depending on what is most suitable in their assigned area and most convenient for them.

In 2008, 80 volunteers were originally scheduled to assist with surveys. However, a severe winter system began moving thru the region the night before, creating hazardous road conditions and preventing 30 volunteers from participating.

Although weather conditions were less than ideal (temperatures in the teens, windy, and snowing) 50 volunteers were able to survey >48,000 acres and classified 455 mule deer (Table 6). The resulting buck:doe:fawn ratio was 50:100:58, which was a slight increase from that observed in 2007. Although the proportion of adult bucks in the male segment of the population has been gradually decreasing since 2006, the overall buck:doe ratio has increased by 56% (Table 6). Fawn:doe ratios suggest productivity rates were relatively stable from 2004 thru 2007 and increased slightly in 2008 (Table 6).

Population status and trend analysis

GMU 272.— Both harvest and survey data suggest mule deer populations in GMU 272 have remained relatively stable. The average post-hunt fawn:doe ratio from 2003–2008 has been 56:100 and showed little variability [Coefficient of Variation (CV) = 13%], which suggests herd productivity has been relatively similar for the past 6 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.

Dissimilar to herd productivity, post-hunt buck:doe ratios have consistently shown moderate amounts of annual variation since 1996 (CV = 29%)

However, average buck:doe ratios for the past 5 years have been 19:100 and have shown a more stable trend (CV = 17%). Additionally, the proportion of adult bucks ($\geq$ 2.5 years old) observed during post-hunt surveys (2004–2008 average = 35%) suggests the age-structure of the male population has also been relatively stable for the past 5 years (CV = 13%).

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 = 8%).

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, 1998–2008.

Year	Vol.	Acres	Bucks	Does	Fawns	UNK[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
Avg.	36	36,387	102	235	117	31	486	44:100:51	0.56

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

Although hunter effort (days/kill) has shown a slightly increasing trend over the past 3 years, variability in this estimate has also been minimal (CV = 12%). Moreover, because harvest is mostly restricted to 3-point minimum bucks, hunter effort is more likely to reflect trends in the number of adult bucks rather than trends in overall population size.

GMU 278.— Because post-hunt surveys are not conducted in GMU 278, harvest trends are the only indicators of population size. Harvest levels have historically been low (< 55 deer harvested annually since 2001), but have shown a significant degree of variation since 2001 (CV = 29%). Nonetheless, this data indicates that deer populations in GMU 278 continue to exist at extremely low densities and rates of increase have likely been low in recent years.

GMU 284.— Both harvest and survey data suggest relatively stable deer populations in GMU 284. The number of fawns:100 does has averaged 63:100 since 2001 and has shown minimal amounts of annual variation (CV = 8%; Table 5). This suggests that herd productivity has remained relatively consistent over the past 8 years. In conjunction with relatively stable harvest levels since 2003 (total harvest CV = 11%), it is likely the rate of increase for this deer herd has also remained relatively stable during this same period.

This is further substantiated by estimated trends in hunter effort (days/kill). Although hunter effort decreased slightly during the 2005 and 2006 seasons, indicating a minimal increase in population size, trends have been relatively stable the past 5 years (CV = 12%) and were nearly identical in 2007 and 2008 (Table 2). However, due to the point restrictions currently in place, trends in hunter effort are interpreted with caution as this estimate is likely to reflect trends in the number of adult bucks rather than overall population size.

Although data suggests a stable overall population size, adult sex ratios (buck:doe ratio; CV = 32%) and age structure of the male segment of the population (% of bucks ≥ 2.5 year old; CV = 32%) have both shown significant amounts of annual variation since 2000. Prior to 2005 when surveys were not conducted, it appeared buck:doe ratios were gradually decreasing (Table 5). However, buck numbers have apparently increased over the past 5 years as the estimated buck:doe ratio in 2008 (24:100) was similar to estimates observed from 2000–2002 (Table 5).

GMU 290.— Because GMU 290 is managed under permit only guidelines, the ability of harvest data to adequately reflect trends in population size is limited. Nonetheless, 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 the Basin and success rates during the any deer season may also be largely influenced by hunter selectivity.

Survey data also suggests a stable to slightly decreasing population in GMU 290. Fawn:doe ratios indicate productivity rates for this herd declined by nearly 50% from 2000 to 2001 and have remained at moderately low levels since 2003 (Table 6). Assuming an overwinter survival rate of 85% for adult females and 75% for fawns, estimated fawn:doe ratios suggest this herd increased at a rate of 12% in 1998, decreased by 2% in 2001, and increased at an average rate of 2% from 2002–2008 (White and Bartmann 1998). Moreover, an estimated fawn survival rate of 75% is probably somewhat liberal (Lukacs et al. 2009, Gaillard et al. 2000, Unsworth et al. 1999) which means the actual rate of increase for this herd could have even been lower.

Buck:doe ratios continued their increasing trend and were slightly higher in 2008 (50:100) compared to 2007 (46:100) although this difference is not likely to be statistically significant. Regardless, buck:doe ratios appear to be well above the management objective of 30 bucks:100 does. Conversely, the proportion of bucks observed during surveys that were $\geq$ 2.5 years old has been declining since 2006 (Table 6), which suggests the age structure of the male population is declining. It should be noted however, the proportion of bucks that were classified as adults was still estimated at 50% in 2008.

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 plant species include big sagebrush (*Artemisia tridentata*), rabbitbrush (*Chrysothamnus nauseosus*), greasewood (*Sarcobatus vermiculatus*), and spiny hopsage (*Grayia spinosa*). Bitterbrush (*Purshia tridentata*), a highly important deer browse species, 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 cheatgrass (*Bromus tectorum*) and 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 to meet their metabolic demands during winter months and are most often located near shrub-steppe/agricultural interfaces. The threat of losing more native shrub-steppe is always present, but significant loses 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. Therefore, it is fair to say most mule deer habitat is comprised of wetlands and shrub-steppe. Dissimilar to other GMUs in this region, bitterbrush occurs in relatively large stands and is an important food source for this herd during winter months. However, anecdotal observation suggests 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 is likely to decrease the winter carrying capacity of habitats.

Wildlife damage

Deer related damage complaints in the Columbia Basin GMUs 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 serious types of damage to private property in the Columbia Basin, and historically have elicited the majority of claims/complaints. Orchard damage and the potential for it, is most prevalent in GMUs 272 and 278. Depredation issues related to orchards and haystacks have been marginal in recent years and were again low in 2008.

The most common depredation issue in 2008 was related to damage complaints in winter-wheat fields. However, the number of complaints was small and only occurred in GMUs 272 and 284.

The number of deer complaints relating to the depredation of ornamental shrubs was unusually high in Electric City which is located in GMU 272. However, it is believed that this occurred due to the unusually harsh winter weather conditions experienced in the northern portion of the Columbia Basin. Typically, winter-wheat fields supply a substantial portion of the winter foods available to deer during winter months. However, snow depths were uncharacteristically deep which likely limited the availability of this food source. Consequently, deer were likely attracted to the small community in search of food

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 $\geq$ 15 bucks:100 does. Damage complaints associated with these herds have also been relatively low in recent years, indicating they have not exceeded the social carrying capacity that exists in agricultural settings. Consequently, current harvest restrictions and season lengths appear to be appropriate for these herds and will likely change little in the near future. Although the male segment of these herds continues to be dominated by younger age classes, this is not likely to change under current harvest strategies (i.e., general season hunts and 3-point minimum antler restrictions).

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 has been moderately low since 2001, which may be an indication this population has been approaching the carrying capacity of this habitat. After increased levels of harvest occurred 2006–2008, fawn:doe ratios increased by 42% compared to 2007 providing further evidence this deer herd was approaching the carrying capacity of available habitat in GMU 290.

However, because the majority of increased harvest from 2006–2008 consisted of females, the buck:doe ratio is much greater than the management goal of 30:100. Consequently, an increase in buck harvest is likely warranted to produce buck:doe ratios that are more reflective of management goals.

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.

Literature Cited

Fowler, C. W. 1981. Comparative population dynamics in large mammals. Pages 437–413 *in* C. W. Fowler and T. D. Smith, editors. Dynamics of large mammal populations. John Wiley and Sons, New York, New York, USA.

Gaillard, J. M., M. Festa-Bianchet, N. G. Yoccoz, A. Loison, and C. Toigo. 2000. Temporal variation in fitness components and population dynamics of large herbivores. Annual Review of Ecology and Systematics 31:367–393.

Lukacs, P. M., G. C. White, B. E. Watkins, R. H. Kahn, B. A. Banulis, D. J. Finley, A. A. Holland, J. A. Martens, and J. Vayhinger. 2009. Separating components of variation in survival of mule deer in Colorado. Journal of Wildlife Management 73:817–826.

Unsworth, J. W., D. F. Pac, G. C. White, and R. M. Bartmann. 1999. Mule deer survival in Colorado, Idaho, and Montana. Journal of Wildlife Management 63:315–326.

White, G. C., and R. M. Bartmann. 1998. Mule deer management – What should be monitored? Pages 104–118 *in* J. C. deVos, Jr., editor. Proceedings of the 1997 Deer/Elk Workshop, Rio Rico, Arizona. Arizona Game and Fish Department, Phoenix, Arizona, USA.

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 2008 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. Deer in GMU 379 have been liberally managed to prevent crop damage. 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. Since 2006, a late archery season for 3-point minimum or antlerless deer has occurred in GMU 381.

Muzzleloader general seasons were first established in 2001 in PMU 31. In 2008, a 7-day early season occurred with any white-tailed or mule deer restriction in GMU 379 and 3-point minimum or antlerless restriction in GMU 381. In 2008, GMU 379 had a 19-day late muzzleloader season with any deer legal to harvest. Fifty muzzleloader special permits were issued for 20 November through 8 December for any deer in GMU 381.

The modern firearm general season was 9 days long (11-19 October) with a 3-point minimum restriction for mule and white-tailed deer in GMU 381 and an any mule or white-tailed deer restriction in GMU 379. Fifteen youth, 10 senior and 10 disabled special modern firearm permits were issued. In addition, 50 modern firearm antlerless permits were issued for mid-December in GMU 381.

Total deer harvest has averaged 293 (range 147 - 388; SE = 22.0) since 2000. The 2008 harvest was the highest for the 9-year monitoring period (Table 1). Modern firearm general season hunters harvested more deer overall (62% of total) and more bucks (73% of total) than all other hunters combined. Harvest contributed by muzzleloaders increased from 18% in 2007 to 23% in 2008. Archery harvest remained minimal (7%) despite abundant opportunity (early and late general seasons). In 2008, success was highest for special permit hunters (69%), second for general modern firearm (32%), third for general muzzleloaders (29%), and lowest for general archers (23%).

Table 1. Deer harvest and hunters in PMU 31 during 2000 - 2008.

	Harvest			Hunters	
Year	Buck	Doe	Total	Success	Number
2000	119	28	147	10%	579
2001	205	72	277	34%	699
2002	239	99	338	38%	808
2003	220	60	280	53%	913
2004	214	67	281	41%	1125
2005	251	62	313	45%	997
2006	190	86	276	36%	1017
2007	235	93	328	38%	1148
2008	303	85	388	33%	1096
Avg.	220	73	293	42%	942

Surveys

Surveys to estimate population size have not been conducted in PMU 31. In 2007 fixed-wing transects were flown in GMU 381 to delineate deer distributions and initiate collection of population trend data. A total of 2,008 deer were observed. Deer were not classified according to sex, age or species.

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 December/January prior to antler drop. Surveys in winter 2008/2009 yielded estimates of 17 bucks and 48 fawns per 100 does. Both the buck and fawn ratios decreased from 2007/2008 estimates. However, the total number of deer classified increased by over 40% (Table 2).

Over 80% of the bucks observed during 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. Another factor that may influence buck to doe ratios is the possibility that a portion of yearling bucks (spikes) were misclassified as does during surveys. Lighting conditions are less than optimal in winter and spike antlers can be difficult to see. Given the likelihood of uncounted and misclassified bucks, the actual buck to doe ratio was probably higher than is reported here.

Table 2. Post-hunt deer surveys in GMU 381 during 2004 - 2008.

					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

Population status and trend analysis

In the absence of population survey data it is difficult to assess the status of the deer herd. Harvest and post-hunt composition data are used as an index to status and trends. Assuming these data are adequate indices, it appears that total harvest has remained at a sustainable rate (Table 1).

Each fall/winter, deer migrate into GMU 381 from the north. Landowners reported that migratory deer arrived earlier and in greater numbers in 2008 than in recent years. Both harvest and total deer observed during post-hunt surveys corroborated these observations. It is unclear if the deer population increased in 2008 or if more deer migrated due to environmental factors. Winter conditions in 2008/2009 were severe compared to recent years and may have influenced deer migration patterns.

Composition surveys indicated that buck escapement was the lowest recorded since 2004, but still within the standard 15 to 19 per 100 does objective. Fawn ratios were substantially lower than they have been for the last 5 years (Table 2). Severe winter conditions in December may have already reduced the fawn population by the time surveys were conducted in mid- to late- December. Alternatively the cold, dry spring in 2008 may have reduced fawn production and/or early survival.

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 cover and 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. 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. Recent changes with the 2008 Farmbill may result in reduced CRP acreage in the future. If this happens deer habitat will be reduced.

Management conclusions

Data for PMU 31 are still preliminary given its recent establishment in 2000. Conclusions related to affects of harvest on population status and trends should be viewed with caution. Because total harvest rates have remained stable or increased, it is assumed that the deer population has also remained stable.

Current survey data may not be completely reflective of the hunted population. It is not known what portion of the deer surveyed in winter is present during the hunting season and what portion migrated to the area following the hunting season. Most harvest occurs during the modern firearm general season in mid-October. Therefore, if a large portion of the deer observed during post-season surveys migrate after the modern firearm seasons closes, then survey data will not give a clear picture of the effects hunting regulations are having on resident deer. The survey data may more accurately reflect deer population status of the bordering GMUs to the north.

Information on migration timing, abundance of deer migrating into the area, and what GMUs the deer are migrating from is needed to fully understand the population status. In order to understand hunting impacts on resident deer, surveys could be conducted immediately following the modern firearm general season. Conducting surveys during this period would provide a better estimate of resident buck escapement. However, estimates of fawn ratios may not provide an accurate estimate of fawn recruitment since the winter period will be just beginning. Obtaining accurate estimates of fawn survival of resident deer will be difficult because of the presence of migratory deer into late winter/early spring. Additionally the 2008 fall/winter demonstrated that deer migration could occur as early as October in some years. Proper timing of surveys then becomes even more difficult. Ultimately proper survey design would involve a coordinated effort with deer managers in bordering GMUs to the north.

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. In 2008, the permit season in GMU 371 was closed due to military training. 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 in 2008, were below the 10-year average, and about 60% below the highs in the early 1990s (Table 1). A severe winter in 1996-97 reduced deer numbers and a 3-point restriction was implemented. Hunter started to slowly return, but have now decreased with the deer populations.

Harvest had steadily increased from 1997 to 2005, but has decreased substantially 2005-2008 (Table 2). The 2008 buck harvest was 32% below average, down 49% from 2004, and ~80% from the early 1990s. The decline has been most severe in PMUs 32, 33, 35, and 36. The 2008 decrease in PMU 34 was due to GMU 371 being closed to hunting.

Surveys

In December of 2008, ground surveys in portions of PMU 32, 33, and 36 were made. The purpose of the December surveys was to estimate fawn and buck ratios (Table 3). Lower deer populations have made it difficult to get adequate samples in each PMU. Pooled, the data suggests buck ratios are at objective and fawn ratio above average in December 2008.

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

Year	Modern Firearm	Muzzle-loader	Archery	Total	Success Rate (%)
1991	28,873	1,104	6,736	36,713	15
1992	30,159	1,546	7,602	39,310	12
1993	24,190	1,038	7,070	32,390	6
1994	23,022	756	6,343	30,122	8
1995	19,641	631	5,025	25,297	8
1996	19,982	673	4,705	25,360	10
1997	14,555	155	3,086	17,796	3
1998	10,586	227	2,455	13,268	6
1999	11,174	242	3,445	14,861	6
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
10-yr avg	10,794	563	3,276	14,634	10

In April 2009, PMUs 35 and 36 were surveyed to estimate population. The survey indicated the population had decreased ~40% from 2005 in the PMUs.

Population status and trend analysis

Deer populations across all PMUs are declining. Population surveys and harvest indicates a 40-50% decline in PMUs 32, 33, 35, and 36 since 2003. No population survey data is collected in PMU 34, but harvest data suggests only a moderate decline in population.

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	1,545	364	1,588	294	178	29	990	130	611	164	4,912	981
1992	1,736	224	1,293	140	218	10	703	158	480	188	4,430	720
1993	509	124	678	133	98	10	82	53	43	59	1,410	379
1994	1,100	134	754	49	182	7	183	83	155	16	2,374	289
1995	746	85	781	45	95	5	200	31	154	17	1,976	183
1996	474	40	895	53	201	0	402	53	281	28	2,253	174
1997	230	0	56	0	137	0	27	0	14	0	464	0
1998	209	0	115	0	141	0	64	0	120	0	649	0
1999	303	2	314	1	142	17	71	0	86	0	916	20
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
10 yr avg.	437	104	373	110	156	29	113	36	128	36	1,207	314

There appears to be a strong relationship between the expansion of an exotic louse *Bovicola tibialis* and population decline. Deer with signs of hair loss (which is caused by the lice) were first seen in 2004 in PMU 33 in 2004. Observations or deer with hair loss have become common throughout the district. PMU 34 is not surveyed, but anecdotal information suggests hair-loss is not as common as severe as other PMUs. *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 population declines observed in the District may not be due just to lice infestations. Disease and weather may also be involved. In spring 2009, all the deer (N=8) on a small island near GMU 371 appeared to have died in a short time frame. Hair-loss or starvation did not appear to be factors in the mortality. Similar events have been noted on other islands on the Columbia River and adenovirus is one possibility.

Harvest is the only long-term index available to index deer populations. The decline in buck harvest from 4,900 in 1991 to 825(-85%) in 2008 is an obvious indication that the population has crashed. The impact of hard winters in 1992-93 and 1996-97 on harvest were clear. In both cases the decline was abrupt, but harvest steadily increased in following years. The change in harvest management from “any buck” to 3-point minimum regulation in 1997 likely further reduced buck harvest. The 50% decline in buck harvest since 2004 is not due to winter weather or regulation change. The winter of 2004-05 was one of the mildest on record. Fawns going through 2004-05 would have been expected to have been available for harvest in fall 2006. There have been droughts in the lower elevations, but no winter has been particularly severe since 1996-97.

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 like that seen in PMU 32 maybe 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 the last few years has likely impacted forage production. Houses are also being built in prime winter range.

Management conclusions

It is unknown how the lice will affect deer long-term, but the short-term outlook is bleak. It appears that 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. Increasing deer populations in PMUs 32, 33, 35, and 36 will be difficult if the impacts of lice and hair loss persist. Antlerless harvest was eliminated from PMUs 32, 33, 35, and 36, but populations have not rebounded. The District has not experienced a severe winter in over 10 years. When a hard winter does hit District 8, deer populations may go extremely low.

Managing the populations will also require good data. Determining what factors might be contributing to hair loss and deer mortality is important to at least understanding the problem. The current spring surveys provide a good index to the populations, but funding is lacking for adequate annual coverage.

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
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
1996	34	67	56	17
1999	34	120	54	20
2000	34	372	54	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

JENNIFER BOHANNON, Wildlife Biologist

Population objectives and guidelines

Our 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 2008 season totaled 1,613 animals (Table 1).

Table 1. Deer harvest summary for GMU's 407-437, 2007.

Harvest	Modern Firearm	Archery	MZL	Multiple Weapon	Special Permit	Total
Antlerless	120	177	28	3	31	359
Antlered	954	188	58	4	50	1254
Total	1074	365	86	7	81	1613

Antlerless harvest for the 2008 season totaled 359 animals (22% of total harvest) with antlered harvest totaling 1,254 animals (78% of total harvest). In 2008 the number of hunters in GMU 407 increased dramatically over 2007, and the number of deer harvested increased proportionally with hunter success basically unchanged at 26% (Figure 1). The number of hunters in GMU 410 also increased from 2007, and hunter success remained high at 43% (Figure 2). Starting in 2006, second deer tag hunt permits for GMU 410 were allocated by island, and second deer harvest increased 104% from 52 deer in 2005 to 106 in 2006. In 2008, second deer harvest decreased 49% from the 2007 harvest but was still 48% higher than the 2005 harvest (Table 2). In GMUs 418, 426, and 437, the number of hunters increased from 2007, but hunter success in 2008 was only 11%, down from 17% in 2007 (Figure 3).

Table 2. Second deer tag harvest results by island in GMUs 410 and 407 for 2008.

Island Name	Hunters	Antlered	Antlerless	Total	Success (%)
Shaw	6	3	1	4	66.7
Lopez	19	10	4	14	73.7
Orcas	30	16	7	23	76.7
Decatur	5	3	0	3	60
Blakely	10	9	1	10	100
Cypress	1	1	0	1	100
San Juan	5	3	1	4	80
Camano	2	0	0	0	0
Whidbey	32	1	14	15	46.9
Guemes	13	0	3	3	23.1

The proportion of deer harvested in 2008 within GMUs 407 – 437 (1,613 animals) as compared to the statewide harvest for the 2008 season (35,118 animals) indicates that these northern Region Four GMUs represent 4.6% of the statewide total harvest. This number is slightly higher than the 3.5% of the statewide total harvest that came from GMUs 407-437 in 2007. Tribal harvest in GMUs 407-437 for the 2008 season consisted of 8 bucks and 8 does harvested in GMU 407, 1 buck in GMU 410, 28 bucks and 15 does in GMU 418, 15 bucks and 12 does in GMU 437, and 1 buck and 1 doe in unknown GMUs.

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.

There was no Chronic Wasting Disease (CWD) sampling in 2008. In 2004, 172 samples from animals harvested in GMUs 407-437 were tested and all were negative for CWD. CWD remains undocumented in GMUs 407-437.

Population status and trend analysis

The only evidence of population status and/or trends in the mainland GMUs is the subjective 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 2008.

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.

Increased 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.
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.

Literature Cited

Long, E., K. Taylor, L. Davies, and S. Irvin. 2009. Estimating population size and movement patterns of black-tailed deer on Blakely Island, WA (*abstract*). The 8th Western States and Provinces Deer and Elk Workshop, April 27-30, 2009, Spokane, WA.

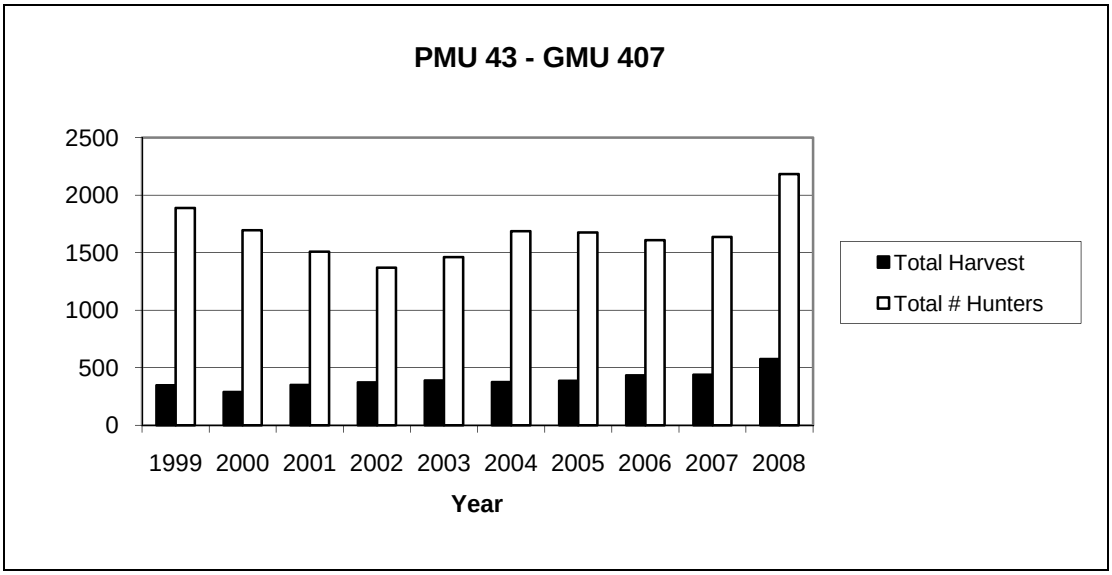


Figure 1. Deer harvest and number of hunters in PMU 43, 1999-2008.

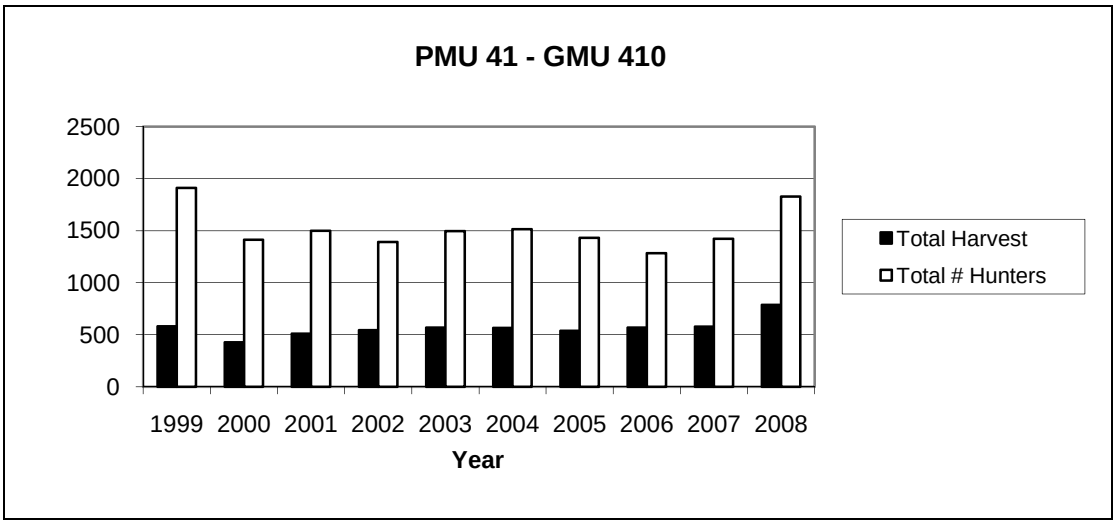


Figure 2. Deer harvest and number of hunters in PMU 41, 1999-2008.

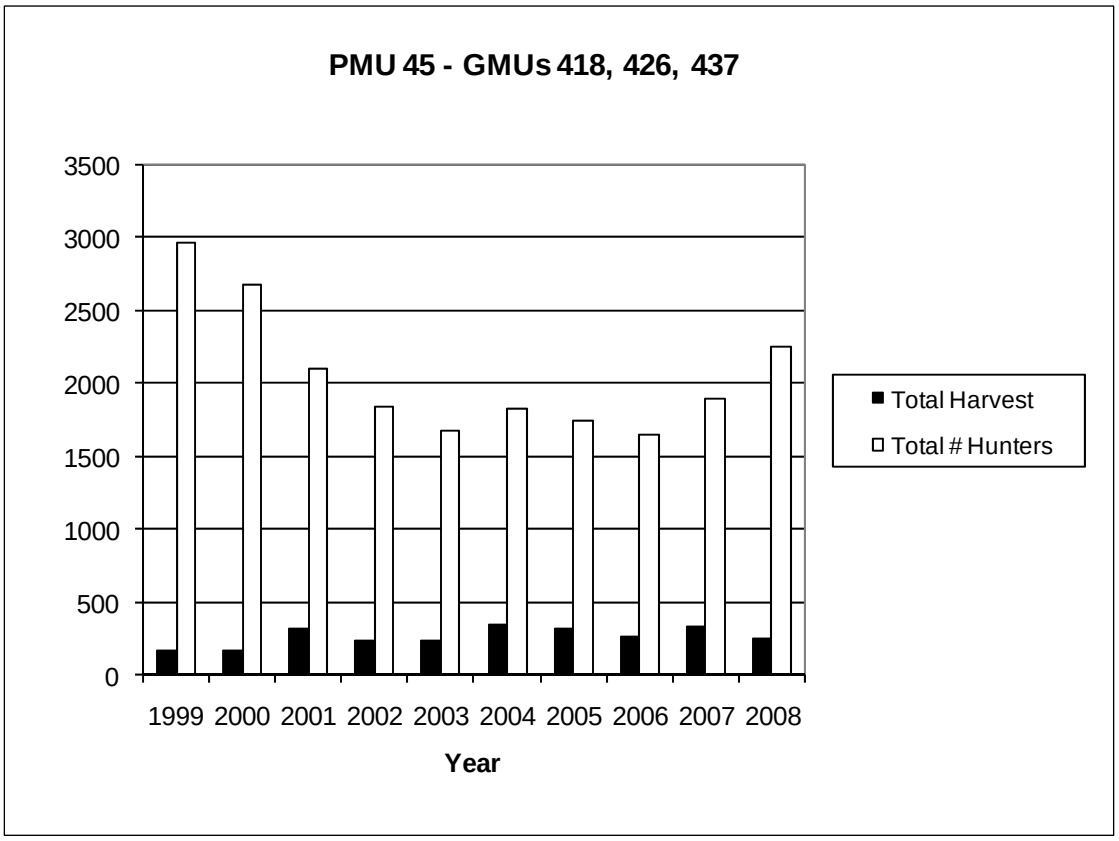


Figure 3. Deer harvest and number of hunters in PMU 45, 1999-2008.

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

RUSSELL LINK, 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 a level that helps prevent road kills and keeps damage complaints 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. It is unclear why modern firearm hunters have had such an increased success over the last 7 years. 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.

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. However, since 1998 the total deer harvest per year has remained well below the average (Fig. 4). The late buck season closure in 1998 certainly contributed to the 41% decline in total buck harvest compared to 1997.

Total deer harvest during the late season for the years 1984-1997, made up about 41% of the total annual harvest in GMU 460.

In GMU 460, total deer harvest began to decline in 1998 with buck take declining by more than 50% (Fig. 4). While archery and modern firearm buck take declined in this time period, 2004 showed resurgence in the modern firearm harvest, but in 2005 it went back down.

Data collected from check stations in GMU 460 showed >71% and >85% of deer checked to be yearling (1.5 years) in 1997 and 1998 respectively. Similarly, during 1999 about 72% of deer checked were yearlings. This exceeds harvest guidelines and likely contributed to the low buck:doe ratios observed during post season composition counts in 1996 and 1997 (Table 2). Hunter check station results for 2000 recorded only 46% yearling deer. The post-hunt buck:doe ratios for these years are below the recommended level of 15:100 (WDFW 2003).

The 1998 post-hunt count (18:100 buck:doe ratio) reflects the first post-hunting season count

since implementing the closure of the 4-day late buck season. Post-hunt composition in 1999 was similar at 16.3 bucks per 100 does. However, the decline in the fawn:doe ratio (49 to 100) is a concern. In 2000 pre and post-hunt ratios continued to decline (Tables 1 and 2). Higher branch antlered buck ratios may be confounded by the small sample of does classified, (n=21).

Access fees in Hancock Forest Management lands in GMU 460 have increased over time and may contribute to lower number of hunters. In addition, many long-time hunters of this unit have expressed their belief in a precipitous decline in deer numbers.

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

Year	Fawn	Spike	Branch Buck	Total Buck	Total (N)
1995	67.0	8.3	6.0	20.0	114
1996	61.5	19.2	3.8	23.0	48
1998	72.0	14.0	2.3	16.3	83
1999	71.7	12.8	10.3	23.0	76
2000	51.0	11.4	0.0	11.4	57
2001	No	Data			

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 Tribe (MIT) has conducted mid-winter population estimate surveys in GMU 485 since 2000 based on mark-resight/Lincoln Peterson using radio-collared deer.

In GMU 460, only a post-season survey was flown in 2001. More recent check station data provide little additional opportunity to gauge deer numbers due to low numbers of animals checked.

In 2003, both pre and post season composition flights in GMU 460 resulted in classifying only 25 and 20 deer respectively. One buck was seen on the pre-season and only two bucks were seen on the post-season flight. 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.

A 3-year buck mortality study to determine mortality sources occurred in GMU 460. Yearly survival rates (Sept. 1999-Sept. 2001) were 0.519 with legal harvest the leading cause of mortality (Bender et al. 2003). Predation was the second leading cause, in addition to malnutrition, that may predispose animals to predation. Bender et al. (2003) further demonstrated that the late buck season accounted for substantial additive mortality. The closure of the late buck modern firearm season in 1998 appeared effective in increasing postseason buck escapement and increasing late buck season ratios. Other factors including hair-loss syndrome, low fawn production, and habitat quality may all contribute to current population dynamics of GMU 460s deer herd and its apparent decline.

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)

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.

During the 2005 biological year survey in GMU 485 some bucks may have been classified as does. The buck:doe ratio was very low. Harvest, survival, and previous fawn crop do not justify such a low ratio. It is likely higher. A population increase was detected, although confidence intervals among years overlap. Radio-marked doe survival, previous fawn ratios, and low harvest do suggest that there should be a population increase (Vales unpubl. data 2006).)

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

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.

Fluctuations in deer numbers in GMU 466 may be because of a reduction in habitat quality and/or predation. Limited empirical data beyond harvest trend assessment belies our ability to estimate population changes.

Based on limited, primarily anecdotal information, deer in GMU 454 have exhibited little change.

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.

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 available to hunting 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.

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 prevent road kills and 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.

In GMU 460, continue the late buck season closure for modern firearms and measure response by monitoring post-hunt buck:doe ratios. Additional research looking at productivity, herd age structure, forage availability, and forest management practices as well as new methods to evaluate herd composition and estimate population would provide vital information in understanding the future outlook of deer in North Puget Sound and implications of industrial forest management on herd dynamics.

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

Literature Cited

Bender, L.C. and P.B. Hall. 2001. "Hair-slip syndrome" of Black-tailed deer: a description and population impacts. Final Report. Washington Department of Fish and Wildlife.

Bender, L.C., G.A Schirato., R.D. Spencer., K.R. McAllister, and B.L. Murphie. 2003. Survival, cause-specific mortality, and harvesting of buck black-tailed deer in Washington. Final Report. Washington Department of Fish and Wildlife.

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.

Washington Department of Fish and Wildlife. 2003. Game Management Plan, July 2003-June 2009.

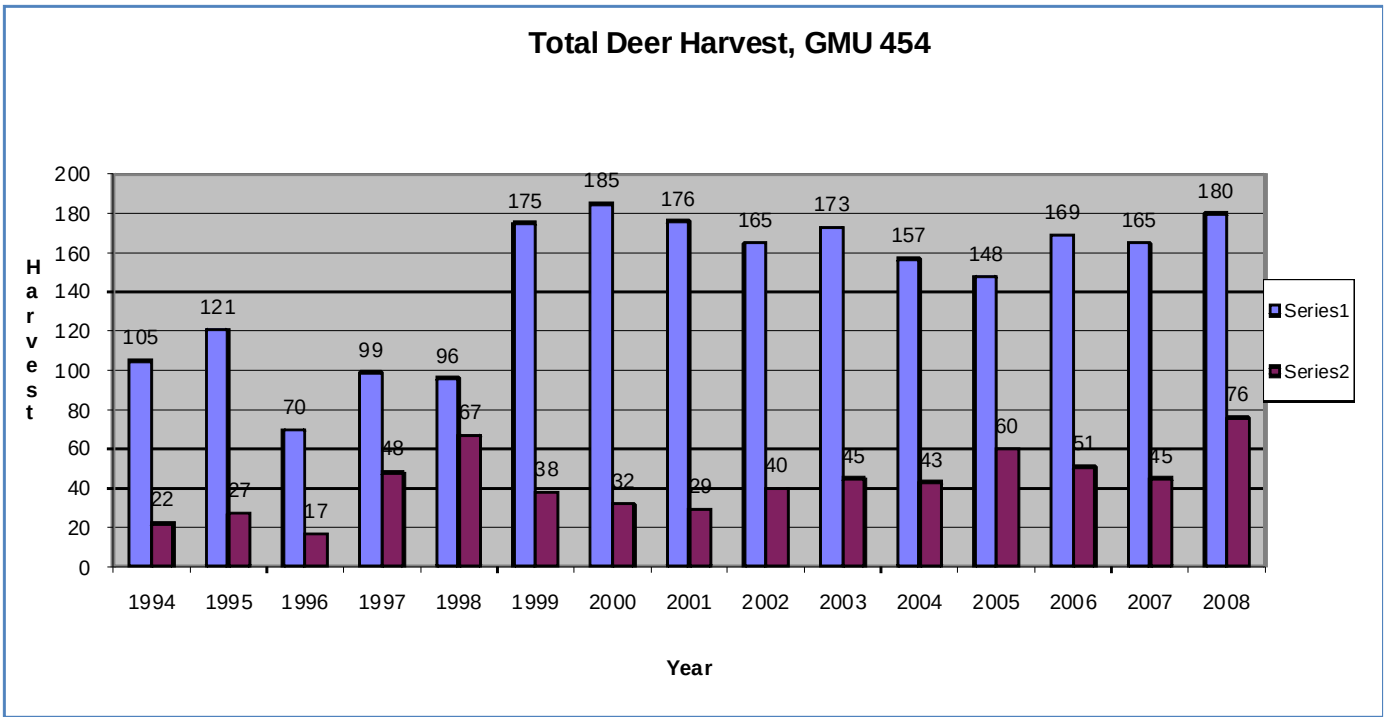


Figure 1. Annual deer harvest in GMU 454, all weapon types, 1994-2008.
*2004 harvest reflects uncorrected raw data reported from hunter report.

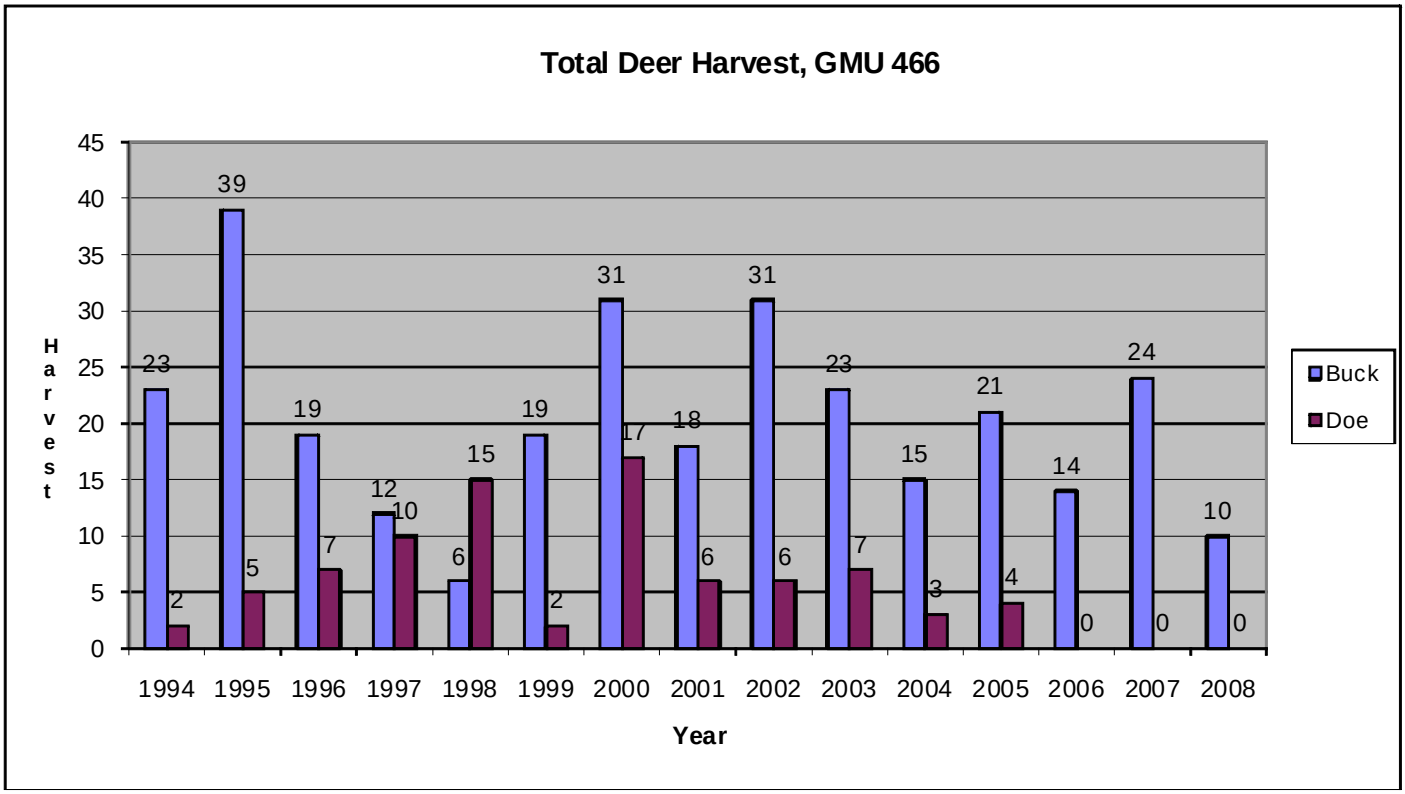


Figure 2. Annual deer harvest in GMU 466, all weapon types, 1994-2008.
*2004 harvest reflects uncorrected raw data reported from hunter reports.

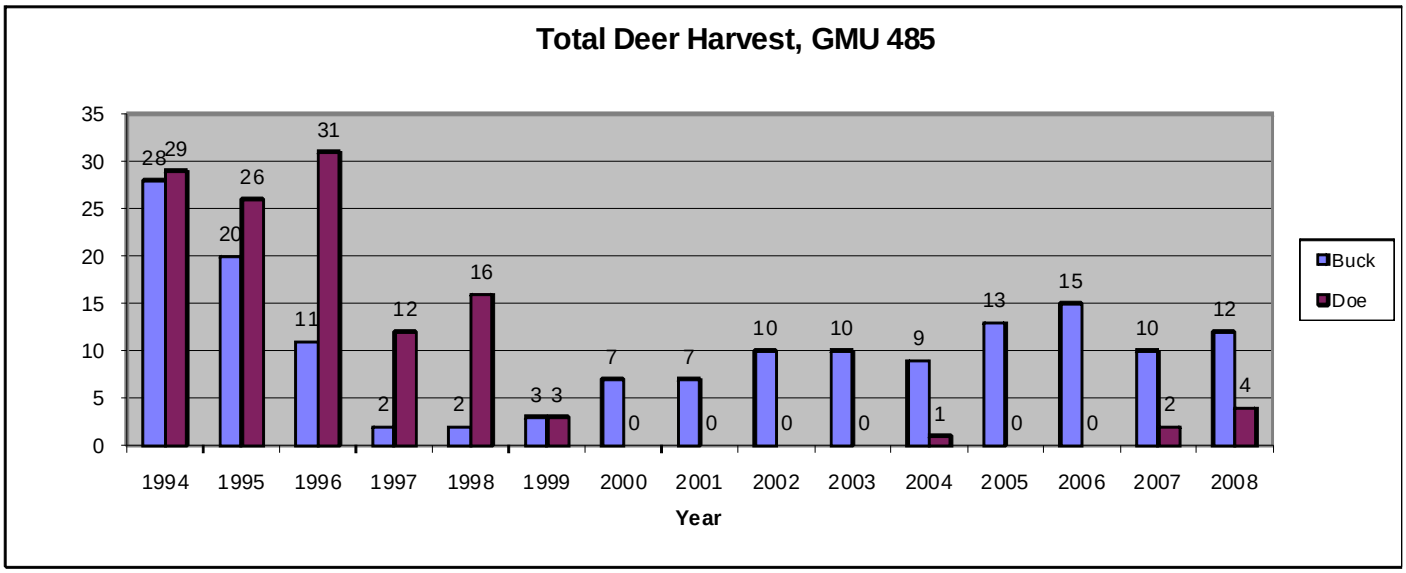


Figure 3. Annual state deer harvest in GMU 485, 1994-2008.

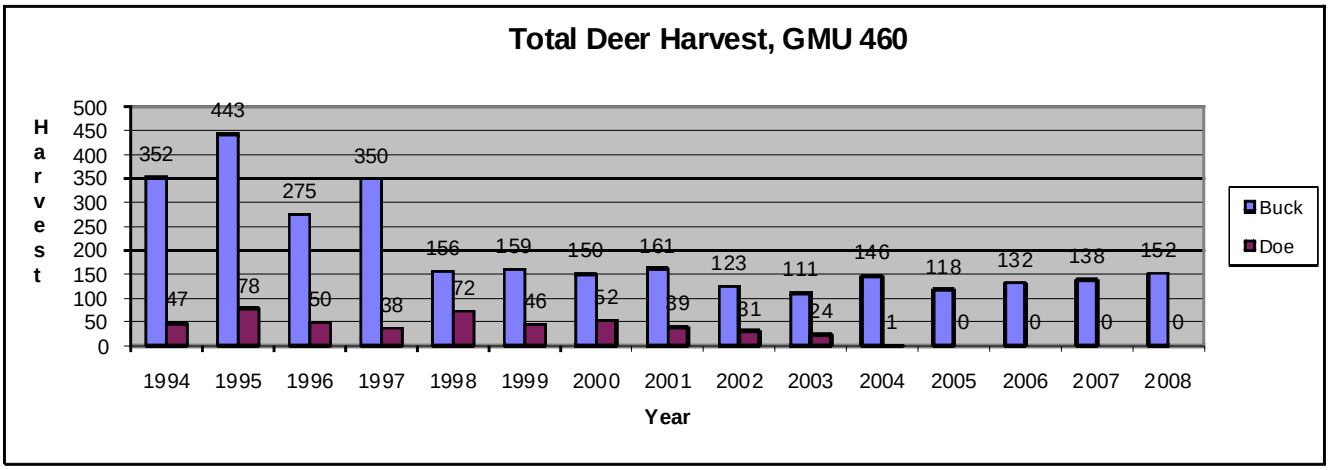


Figure 4. Annual deer harvest, GMU 460, 1994-2008, general season and special permit combined.
*1997 was last year of late buck hunt.
*2004 1st year of buck only archery hunt

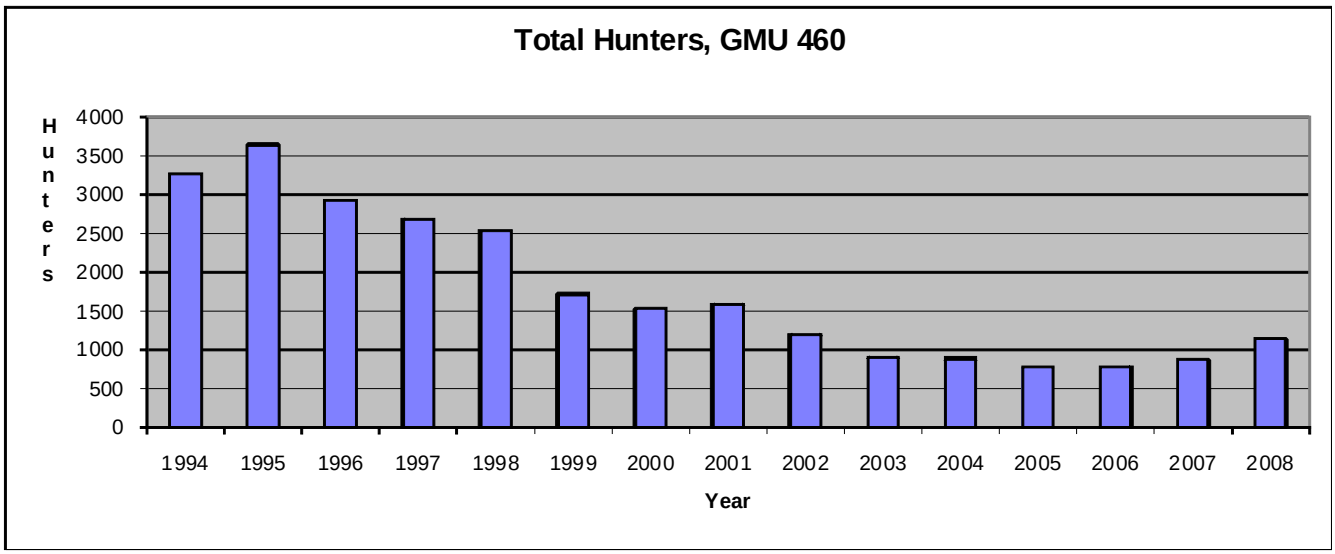


Figure 5. Number of deer hunters, GMU 460, 1994-2008, general season and special permit combined.
*1997 was last year of late buck hunt.
*2002 increase in access fee-Hancock Forest Management.

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 2008 hunting season in GMU 448 was similar to previous years, with the general modern firearm season open for any buck from Oct. 11-31, the early archery season open for any deer from Sept. 1-30, and the early muzzleloader season open for any buck from Oct. 4-10.

Hunter numbers increased in 2008 compared to 2007 in GMU 448. In 2008, 918 hunters hunted this GMU; however 674 hunters reported hunting the unit in 2007. Despite the increase in hunters for 2008, fewer deer were harvested compared to previous years, and hunter success decreased to 8%. In 2008, 81 animals were harvested but in 2007, 147 deer were harvested from the unit with a 22% hunter success rate. The trend of fewer people hunting in GMU 448 compared to a decade ago continues, and in 2008, hunter success was reduced for the first time in 7 years (Figures 1 & 2).

As in previous years, few people hunted in GMU 450. In 2008, 82 hunters harvested 10 bucks, for a 13% success rate. This is consistent with the 2007 harvest with 8 bucks harvested for a 12% hunter success rate. These numbers are consistent with the number of hunters and harvest success rate over the last several years.

Ten late buck season modern firearm permits are allotted to this PMU. For the 2008 season, 290 hunters applied for the permits and 5 deer were harvested.

In GMU 448, 84% of hunters used modern firearms, and this group harvested 78% of the deer in 2008. Archery hunters comprised 19% of hunters and took 22% of the deer. Muzzleloader hunters accounted for 1% of hunters, with only 11 people reporting that weapon type and 0 deer harvested. Seventy-nine hunters hunting in GMU 450 used modern firearms, 3 hunters used archery equipment, and 11 hunters used primitive weapons. Only modern firearm hunters were successful in GMU 450.

PMU 46 is hunted by the Stillaguamish, Tulalip, and Sauk Suiattle Tribes. The tribes report harvesting 3 bucks and 10 does from GMU 448 and no deer from GMU 450 in 2008.

Surveys

Population surveys were not conducted in GMUs 448 or 450 in 2008.

Population status and trend analysis

Insufficient data exist to model the deer population in PMU 46. Total harvest and hunter success decreased in 2008; however 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 hampered 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. 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

Conversations with hunters who choose to hunt in GMU 448 indicate that this GMU 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.

Figure 1. Number of Hunters in GMU 448: 1995-2008

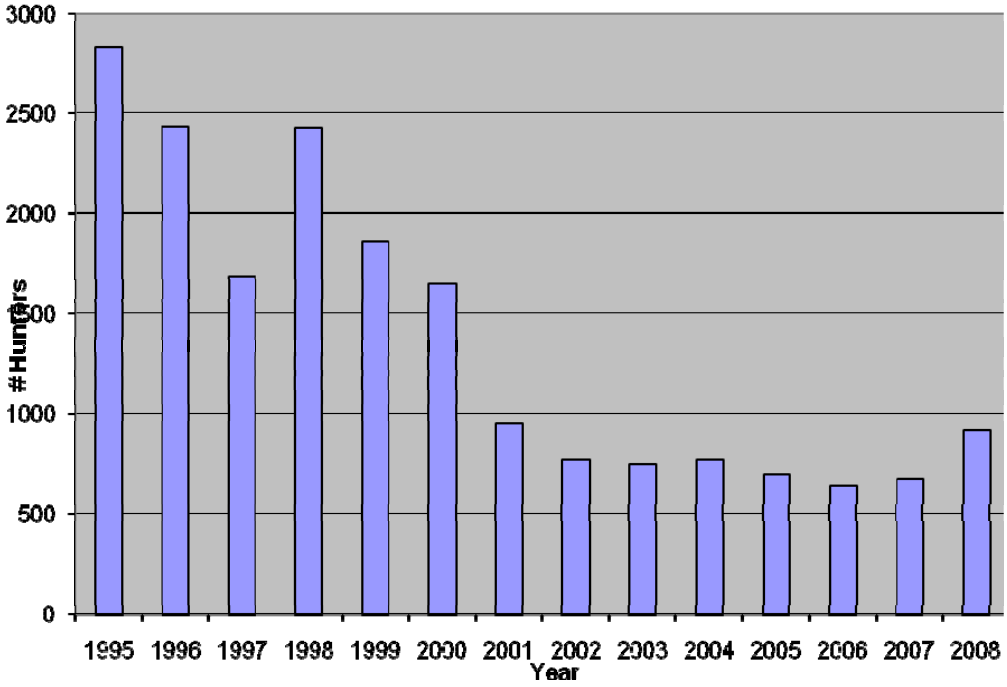
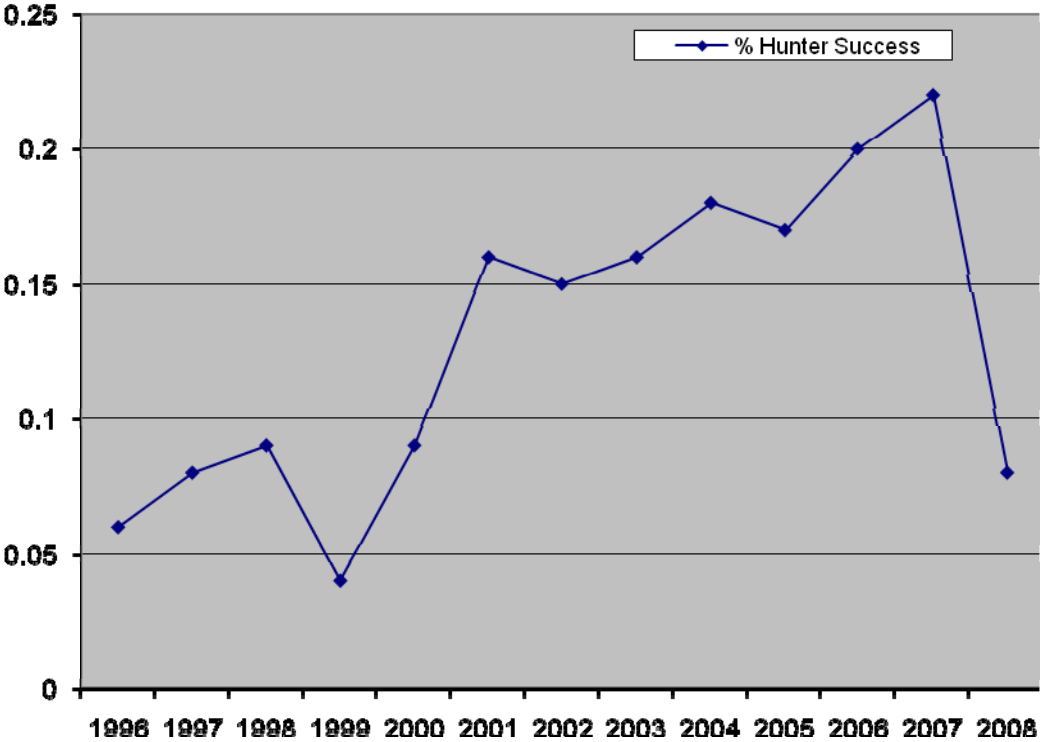


Figure 2. Percentage of Successful Hunters: 1996-2008



DEER STATUS AND TREND REPORT: REGION 5
PMU 51 – GMUs 578 (West Klickitat), 388 (Grayback)
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) GMU 382 (East Klickitat)

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 during the 2008 hunting season was obtained from WDFW's mandatory reporting system. Estimates of total harvest, hunter effort, and hunter success are based on reports submitted by hunters. The mandatory reporting system is believed to provide accurate estimations of hunter activity.

Deer throughout Washington are hunted under WDFW′s resource allocation strategy. Hunters must select a weapon type (modern firearm, muzzleloader, or archery) with which to hunt. Each weapon type has distinct seasons of varying lengths designed to provide equal opportunity. New for the 2006 hunting season, 1,500 Washington deer hunters were awarded special "multi-season" tags. These tags allow hunters to participate in any open general season with the weapon type appropriate for that hunt. These tags were offered again in 2007 and 2008. The fundamental structure of each hunting season is grouped into 3-year packages. 2008 concluded the 3-year package encompassing 2006-2008.

During the 2008 general deer season in Region 5, modern firearm hunters made up 73% of the hunters, archery accounted for 17%, and those choosing to hunt with a muzzleloader made up 9%. Finally, those utilizing "multi-season" tags accounted for roughly ½ of 1% of the Regional deer hunting effort.

Several harvest strategies are employed 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. Selected GMUs (574 and 578) are managed under a 2-point or greater harvest regime. New for the 2006-2008 3-year-package, former GMU 558 (Marble) was absorbed into GMU 560 (Lewis River). This change eliminated the two-point antler minimum in this geographic area. Additionally in 2006, GMU 588 (Grayback) was changed to "388" and managed as a mule-deer unit. GMU 382 (East Klickitat) has been managed in this manner for several years, i.e. with a 3-point antler restriction on all buck harvest and shorter modern-firearm seasons than the remainder of Region 5. Finally, GMU 382 has historically had a 9-day modern firearm season but this was lengthened to 14-days so that season length would match the neighboring Grayback GMU. Archers and those hunting with muzzleloaders are subject to the same branch-antlered buck restrictions as modern firearm hunters in GMUs with such regulations.

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 2008, an estimated 31,013 hunters spent a total of 204,116 days deer hunting in Region 5 (Table 1). Total general-season harvest in 2008 was 4,911 with a hunter success rate of 16% (Table 1). The percentage of hunters that harvested a deer in 2008 was slightly below the 10-year mean of 18%. Similarly, the total deer harvest was lower than the mean harvest of approximately 6,000 during the period from 1998-2007.

Table 1. Deer Hunter Numbers and Harvest Statistics for Region 5, 1999-2008.

Year	Hunters	Days	Harvest	Success (%)
1999	41,551	388,082	6,948	16
2000	34,672	226,550	6,454	18
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

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, 2008 Deer Hunters, Harvest, Kill / Square Mile, and Success / PMU.

PMU	Hunters	Total Kill	Kill/SQ Mile	Success (%)
51	4900	810	.78	15
52	4911	783	.72	18
53	1280	118	.32	14
54	4485	244	.14	03
55	1048	143	.32	08
56	8744	1001	1.00	11
57	6815	1084	.87	19
GMU 382	1829	728	.92	45

In addition to the general-season deer hunting effort and harvest discussed above, 1178 tags were offered for special hunts open only to permit holders in 2008. 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 are 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 2008.

Table 3. Region 5, 2008 Special Deer Permit Harvest Summary.

Permit Type	Antlered Kill	Antlerless Kill	Total Kill
Modern Either Sex	29	79	108
Modern Late Buck	63	0	63
Muzzleloader	14	19	33
Senior	8	12	20
Disabled	3	8	11
Youth	26	25	51
2ND Tag	0	11	11
SUM	143	154	297

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) 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.

One voluntary deer sampling station was staffed by a combination of Regional Staff and volunteers during the opening weekend of the general firearm deer season, October 11-12, 2008. The biological sampling station was located near Yacolt, primarily sampling deer from the northern portion of GMU 568 (Washougal). Deer encountered during these efforts were examined by WDFW personnel and/or qualified volunteers. Information on age, sex, number of antler points, and GMU of harvest was taken for each deer. Age was determined by tooth irruption and deer were grouped into one of three discrete categories (fawn, yearling, adult) at the discretion of the examiner. A total of 384 hunters with 5 male deer (3 yearlings, 2 adults) were checked through the course of the opening weekend.

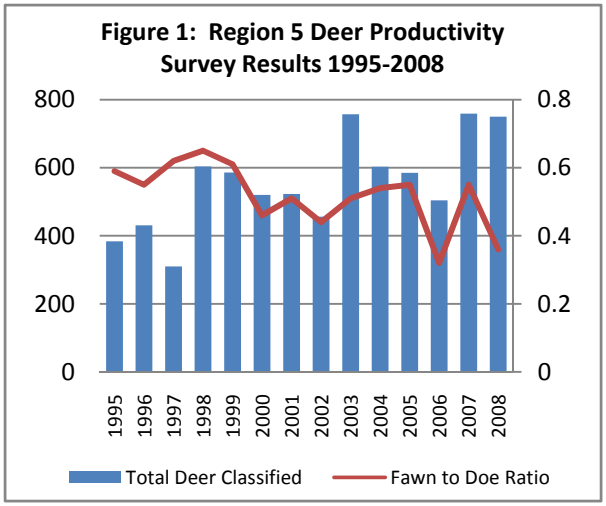
Historically, check station data were used to determine the percentage of yearling bucks in the total Regional buck harvest, i.e. Annual Yearling Buck Percentage (AYBP). In an age stable population, this percentage is assumed to be equal to the overall buck mortality rate. Essentially, yearlings are 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 2008 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 30-40% across the Region.

The long-term estimate of annual doe mortality rates in the Region is 0.22. A large-scale effort to characterize doe mortality rates was undertaken in 2001. Tooth envelopes and an explanatory letter were sent to all hunters possessing an antlerless permit in Region 5. Additionally, incisors were taken from any female deer checked at the check stations or recovered from meat lockers. In 2001 a sample of 96 harvested female deer from the western portions of Region 5 resulted in an annual doe mortality rate of 0.219. A sample of 68 females from PMU 51 (GMUs 578 and 588 (now 388)) resulted in an annual doe mortality rate of 0.132. Efforts to collect female deer teeth for ageing in subsequent years have relied on less expensive and less effective methods. These have included collection of doe teeth at check stations and meat lockers as well as from road-killed animals. These efforts (2002-2008) 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.

Summer deer productivity surveys were first established in 1995. In 2008, 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 2008 productivity surveys, a total of 750 deer were classified. The mean value of .36 fawns/doe is significantly below the historical average of .52 per doe for the Region (Figure 1). 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 surveyed during March 16-17, 2009 (Table 4). Transects were driven on the evening of the 16th and morning of the 17th. 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 277 deer were classified during the March 2009 Klickitat deer survey. The resulting fawn:adult ratio of 0.53 is indicative of average over-winter survival among the Klickitat deer population. The long-term mean (1980-2009) ratio for this area is 0.48.

Table 4. Historic Fawn:Adult Ratios for the Klickitat Spring Deer Survey, 1995-2009.

Year	Total Deer Classified	Fawn:Adult
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
1996	637	0.42
1995	607	0.56

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. First, since 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. 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 change of the Grayback GMU to a more conservative season structure (3-point minimum and abbreviated modern-firearm season), this relationship is no longer observable.

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 outlined in the Game Management Plan (WDFW 2008). 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.

Regional Wildlife Program Staff conducted 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 GMU 388 (former 588). The results of these post-season deer surveys are listed in Table 5.

Table 5. Post-Season Deer Composition Survey Summary, GMUs 388 and 382, 2003-08.

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
GMU	**Year**	**Total Deer Classified**	**Bucks:Does:Fawns**
382	2003	270	14:100:63
	2004	170	15:100:68
	2005	165	15:100:57
	2006	428	10:100:62
	2007	418	17:100:70
	2008	301	11:100:81

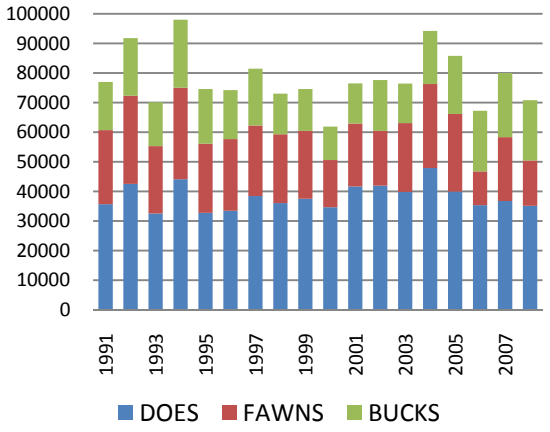
The results from these survey efforts indicate that 2006 changes in management regimes had a beneficial impact on the post-season buck to doe ratios in the Grayback GMU. Specifically, the change to 3-point minimum with a reduction to 14 days of modern firearm hunting appears to have had a positive effect on the post-season buck to doe ratio. 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=.00). Similarly, hunter days per kill has not changed (R^2=.04). In contrast, total deer harvest has steadily declined (R^2=.69) from roughly 8000 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. Biological data also indicate relative stability in the overall Regional deer population.

Polarization in the distribution of the Regional deer population was apparently exaggerated by the severe winter of 2007/08. Record snowfall was recorded in the Southern Cascades during this period and the snowpack persisted into the summer (OWSC 2009). A review of Table 2 sheds some light on the impact that the winter prior to the 2008 hunting season had on the Cascade Mountain deer population. Specifically, hunter success rates fell into the single digits and less than one deer was harvested per 5 square miles of available habitat over a vast geographic area in the Cascades. In contrast, deer hunters in the lower-elevation portions of Region 5 enjoyed success rates more consistent with historic averages and nearly one deer per square mile was the typical rate of harvest. An evaluation of estimated deer densities from population reconstruction (SAK Model), demonstrated this phenomenon as well. See Figure 2 for a graphic illustration of the estimated deer population in Region 5, generated from the Sex Age Kill Model.

Figure 2: Region 5 Estimated Pre-Season Deer Population 1991-2008



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 forest management activities. While forest canopy removal (natural or otherwise) generally increases forage production, certain aspects of forestry are detrimental to black-tailed deer. Specifically, herbicides are extensively used by both private and public forest managers to kill, suppress, and preclude the establishment of "competing" vegetation (WADNR 2005; WADNR 1997). The broadleaf shrubs, trees, and forbs eliminated by these efforts are the very plants that 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, helps assure that a significant growth of understory shrubs does not occur. 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, and a loss of thermal cover. In aggregate, these forest management activities cause reductions in forage production, community complexity, and early successional vigor. These impacts are detrimental to deer and 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 clear cut 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 (19-29 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 the 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 the East Klickitat (GMU 382) in the spring of 2006. Approximately 9% of the deer observed during the March 2009 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 2001-2003. 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).

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 skewed, with deer much more abundant in the lower elevation portions of the Region. Not surprisingly, this divergence was made more extreme by the severe winter of 2007-2008, when the Cascade Mountain deer population was further reduced from an already suppressed state.

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, significant changes to the Forest Practices laws relating to the use of herbicide, and the establishment (through cutting or burning) of tens of thousands of acres of early-successional forest on the federally-managed lands. Favorable habitat changes of these magnitudes are not realistic in the foreseeable future of western Washington State.

Literature Cited

Bernatowicz, J. A., K. Mansfield, J. W. Mertins, and W. Moore. 2008. Hair-Loss Syndrome in Deer in South Central Washington, in *Proceedings of the 8th Western States and Provinces Deer and Elk Workshop -2008.*

Bildfell, R.J., L.W. Mertins, J.A. Mortenson, and D.F. Cottam. 2004. Hair-loss Syndrome in Black-tailed Deer of the Pacific Northwest. Journal of Wildlife Diseases. 40 (4): 670-681.

Brown, E.R. 1961. The Black-tailed Deer of Western Washington. Washington State Game Department, Olympia, WA.

Crouch, G.L. 1981. Coniferous Forest Habitats –Food Habits and Nutrition, in *Mule and Black-tailed Deer of North America.* Olof C. Wallmo, editor. Wildlife Management Institute, University of Nebraska Press, Lincoln NE, USA.

Nelson, J., D. Cottam, E. W. Holman, D. J. Lancaster, S. McCorquodale, D. K. Person. 2008. Habitat Guidelines for Black-tailed Deer: Coastal Rainforest Ecoregion. Mule Deer Working Group, Western Association of Fish and Wildlife Agencies.

Office of the Washington State Climatologist. 2009. Mountain Snow Depth Plotting Tool. http://www.climate.washington.edu/snowdepth/

Pacificorps Energy, 2008. Lewis River Wildlife Habitat Management Plan. Lewis River Hydroelectric Projects Federal Energy Regulatory Commission Project NOS. 935, 2071 and 2011.

Powell, J. H. and Lindzey, F.G. 2004. Distribution, Habitat Use Patterns, and Elk Response to Human Disturbance in the Jack Morrow Hills, Wyoming, in *Proceedings of the 5th Western States Deer and Elk Workshop –2003.* S. A. Tessmann, editor. Wyoming Chapter of the Wildlife Society, Wyoming, USA.

Rowland, M. M., M.J. Wisdom, B.K. Johnson, and J.K. Kie. 2000. Elk Distribution and Modeling in Relation to Roads. Journal of Wildlife Management. 64 (3): 672-684.

Washington State Department of Fish and Wildlife. 2008. Game Management Plan. Washington Department of Fish and Wildlife, Olympia, Washington, USA.

Washington State Department of Natural Resources. 2005. Yacolt District 2005 Aerial Herbicide Applications. State Environmental Policy Act Lead Agency and Mitigated Determination of Non-Significance, file #05-051704. Olympia, Washington, USA.

Washington State Department of Natural Resources. 1997. Site Preparation, Regeneration, and Vegetation Management in *Final Habitat Conservation Plan.* Olympia, Washington, USA.

Woodin, R. S. 2004. Black-tailed Deer Hairloss Syndrome: Affliction Rates and Sources of Mortality, in *2004 Game Status and Trend Report.* Wildlife Program, Washington Department of Fish and Wildlife, Olympia, Washington, USA.

DEER STATUS AND TREND REPORT: REGION 6
PMU 61 – GMUs 658, 660, 663, 672, 673, 681, 684
PMU 62 – GMUs 652, 666, 667
PMU 63 – GMUs 642, 648, 651
PMU 64 – GMUs 621, 624, 627, 633
PMU 65 – GMUs 607, 615, 618, 636, 638
PMU 66 – GMUs 601, 602, 603, 612
PMU 67 – GMUs 653, 654

GREG SCHIRATO, District Wildlife Biologist
BRYAN MURPHIE, Wildlife Biologist

Population objectives and guidelines

Objectives are to maintain deer numbers at 2000 levels. Buck harvest is generally any antlered buck although Game Management Units (GMUs) 636, 654, and 681 are managed as 2 point or better units.

Hunting seasons and harvest trends

Based on an analysis of the Mandatory Reporting System, hunter success was similar to 2007 for the general deer season, while hunter numbers and hunter-days of participation increased slightly (Table 1). Actual success is even higher when permit hunting is incorporated. Region-wide harvest during the general season was 5,214 black-tailed deer in 2008; a decrease of 6% compared to 2007.

Table 1. Summary of four harvest parameters for Region 6, 1995-2008.

Year	Hunters	Hunter days	Success	Days/kill
1995	31,449	192,221	0.19	31
1996	27,733	192,717	0.20	30
1997	29,402	130,400	0.17	26
1998	35,333	145,523	0.12	34
1999	36,762	229,611	0.13	37
2000	38,259	172,331	0.14	33
2001	22,367	135,997	0.25	24
2002	23,666	159,414	0.23	30
2003	23,437	153,840	0.26	29
2004	29,633	153,840	0.27	21
2005	18,886	114,052	0.20	30
2006	24,323	148,451	0.19	32
2007	25,569	157,351	0.22	28
2008	25,999	183,242	0.22	32

Estimates of total annual mortality rates (i.e. from all sources) vary depending on the data source. The percent yearlings in the harvest as measured by tooth eruption at check stations can accurately estimate annual mortality rates if one assumes a stable deer population with a stationary age structure. For GMUs without check stations, the analysis of harvest data looking at antler size (spike vs. branch antlered) adjusted for older spikes and yearling 2 points determined a regional buck mortality rate from 0.3 to 0.41 for various Population Management Units (PMUs). An analysis of 203 antlered deer at the Vail check station showed that 40 % were yearlings. This is the same as 2007 and reflects a lower buck mortality rate than estimated from this check station over the past 15 years. An analysis of harvest data and antler size indicated a similar buck mortality rate, 0.41, for this GMU.

Antlerless harvest in GMU 667 provided an estimate of the average annual mortality rate for females of 10% (n=22). This mortality rate is within acceptable limits for adult females however it is not clear if the small sample size of does investigated accurately reflects mortality within this GMU. Additional restrictions in antlerless permits had been implemented to bring down the doe mortality rate from that estimated for females during 2001-2005 (0.32-0.50). In general these higher female mortality rates would lead to a decline in the population, which would ultimately be reflected in a lower buck harvest. The source of increased mortality for females in 2001-2005 was not explored.

Four GMUs- Satsop (651), Capitol Peak (663), Skookumchuck (667), and Wynochee (648), have had a limited, special permit, buck hunting season in November. This season overlapped with elk rifle season, but provided an opportunity to hunt black-tailed deer during the peak of the rut. These hunts are extremely popular and provide a high quality hunt for deer enthusiasts. These hunts have some of the highest success rates for special permits at over 60%. Because of the nature of the hunt, and the individuals seeking this opportunity, success for these buck only permits often exceeds the success rates of the antlerless, special permit hunters.

Little tribal input on deer management has been received. Tribal harvest and interest is focused more on elk.

Surveys

A pre-hunt helicopter survey was conducted in GMU 667 (Skookumchuck) with a total of 59 deer classified. Deer check stations were run at Vail on 4 weekends in 2008 with the help of the Eyes in the Woods volunteers.

Population status and trend analysis

Assuming that vital rates from the Vail check station could be applied throughout the Region, a Sex-Age-Kill Ratio (SAK) model was used to generate deer population estimates by PMU (Table 2). Population parameters were estimated from Vail check station data, antler harvest reports, as well as the aerial pre-season surveys. The fawn:doe ratio was 68:100. The doe mortality rate was .10 based on the Vail check station. The recovery rate was set at .75 to more closely reflect the data from the mortality study. One of the weaknesses of SAK is that over time, relatively minor changes in input ratios and mortality rates can result in wide swings in population estimates from year to year. Using one of the extreme examples, it is highly unlikely that the deer population in PMU 61 declined by 7,600 between years 2006 and 2007 and then increased by almost 12,500 deer between years 2007 and 2008. This is an inherent flaw of the statistical model. The Department is pursuing deer research to develop techniques that will better estimate black-tailed deer populations.

Table 2. Population estimates based on SAK Model by PMU.

	Year				
PMU	2004	2005	2006	2007	2008
67	5,460	4,509	10,821	8,447	12,185
66	2,606	1,556	4,578	3,851	7,139
65	2,653	1,997	5,123	4,102	6,462
64	9,189	5,663	18,805	14,746	21,914
63	11,767	6,564	18,135	12,539	20,270
62	13,463	6,774	24,762	15,235	26,756
61	11,490	6,658	20,906	13,307	25,797

Management conclusions

There are some general declines in deer numbers in some GMUs while others are expanding. This follows the pattern that would be expected from timber rotations and natural habitat succession, where large magnitude changes in population occur with stand age. Long-term declines are expected and occurring on USFS lands where there is little timber harvest and a push for older stand age classes. These areas have stabilized over the past decade.

Mortality rate estimation for SAK modeling assumes a stable population both in terms of growth/decline and age structure. If there has been a new mortality source such as hair loss or predation that affects recruitment disproportionately, rather than affecting all age classes in the same fashion, then it would show an apparent reduction in mortality rates when in reality there has been a decline in recruitment.

Recent research by the Makah Tribe within GMU 601 has shown an average annual fawn survival rate of 39% from 2006-2007 (McCoy and Murphie, 2007). Fawn mortality during the first 9 weeks of life was 50%; caused mostly by cougar predation (40%) (McCoy and Murphie, 2007). Preseason composition surveys would not detect this early mortality. The affect of hair loss on over-winter survival of fawns is still being evaluated.

WDFW will be expanding efforts to determine cause-specific mortality and survival rates among fawns and adult does in other GMUs within Region 6 beginning in 2009.

Literature Cited

McCoy, R. and S. Murphie. 2007. Factors Affecting the Survival of Black-tailed Deer Fawns on the Northwestern Olympic Peninsula, Washington. Progress Report. Makah Tribal Forestry Department. Neah Bay, WA, USA

Elk

ELK STATUS AND TREND REPORT: STATEWIDE

JERRY NELSON, Deer and Elk Section Manager

Population Objectives and Guidelines

This report covers the time period July 2008 to June 2009. The goal set by Washington Department of Fish and Wildlife (WDFW) for the management of elk (*Cervus elaphus*) populations in Washington is to maintain numbers within habitat limitations. Landowner tolerance, a sustained harvest, and non-consumptive elk opportunities are considered within the land base framework.

Specific management objectives call for post-hunt bull:cow ratios of 12 to 20 bulls:100 cows with a bull mortality rate from all sources of 50 % or less (Wash. Dept. of Fish and Wildlife 2003). Some limited-entry Game Management Units (GMUs) are being managed for 15 to 25 bulls per 100 cows in the post-hunt composition counts.

There are 10 recognized elk herds in Washington:

Table 1. General season bull elk harvest in Regions 1, 2, and 3 (eastern) and Regions 4, 5, and 6 (western).

Year	Eastern Bull Harvest	Western Bull Harvest
1991	2,342	2,750
1992	2,788	2,795
1993	1,711	2,093
1994	1,937	2,669
1995	1,477	2,045
1996	1,688	2,113
1997	1,471	1,993
1998	1,659	1,693
1999	1,956	2,362
2000	2,033	2,486
2001	1,581	2,339
2002	1,603	2,735
2003	1,431	3,075
2004	1,452	2,838
2005	1,307	3,115
2006	1,347	2,429
2007	1,254	2,758
2008	1.178	2.434

Blue Mountains, Selkirk, Colockum, Yakima, North Cascades, North Rainier, South Rainier, Mount St. Helens, Olympic, and the Willapa Hills. Population objectives for Washington elk herds allow for substantial population increases in the Blue Mountains, North Cascades, North Rainier, South Rainier, Willapa Hills, and the Olympic Peninsula. Although some herds may be below management objective, a re-distribution of current elk populations may still be required to alleviate elk damage complaints for the Blue Mountains, Willapa Hills, Colockum, Yakima, and potentially other herds.

Some herds can be allowed to increase but only in specific areas of the herd's range. Additional range expansion by the Selkirk elk herd will be tolerated in some areas of northeastern Washington within the limits of landowner tolerance. The Yakima herd is at the targeted population objective, but site-specific damage complaints still need to be addressed. The Colockum herd is below current population objective but damage complaints are still received for that herd. The Mount St. Helens herd is above population objective and will continue to be reduced over the course of the next three to five years.

In western Washington areas of eastern King, eastern Pierce, northern Skagit, and Whatcom Counties could likely support additional elk.

Hunting Seasons and Harvest Trends

Washington elk were historically managed under fairly aggressive hunting regulations with any bull being legal, over-the-counter license sales, and no quotas. Post-hunt bull ratios of 5 bulls per 100 cows or lower were not uncommon in eastern Washington herds.

Currently, WDFW manages the level of harvest and hunter distribution through a number of hunting season structures. These include, regulating the number of days hunted, requiring hunters to select an elk license for the eastern or western portion of the state, spike-only or 3 point minimum antler point restrictions, and requiring hunters to select a weapon type and hunt only during those seasons. Washington currently has no quota on elk licenses sold for the general season. Current population management objectives target a range of 12 to 20 bulls per 100 cows in post-hunt surveys and maintain total bull mortality from all sources at or below 50 %. Either one or both of these metrics may be used to assess bull subpopulation status for a given herd. Bull subpopulations in eastside elk herds are more likely to be assessed using the bull:cow ratios and bull subpopulations in westside elk herds are more likely to be assessed using the total bull mortality rate.

Due to low productivity in the Blue Mountains elk herd, the Fish and Wildlife Commission adopted a spike-only elk regulation for the general season beginning in 1989. Branch-antlered bulls were legal only through limited entry special permits. The regulations for the Colockum and Yakima herds were switched from any bull to a spike-only general season with branch-antlered bulls legal by special permit only, in 1994. As a result of reduced recruitment and

conservative seasons, the eastern Washington general season bull elk harvest declined in the early 1990s and has remained relatively stable for the past decade.

Improvements in harvest levels since the 1990s are likely a function of improved habitat condition resulting from timber harvest on private timberlands and increased road management on both private and public lands. These estimates do not incorporate male calves killed under antlerless, special permit regulations.

The statewide elk harvest for both the general season and special permits combined in 2008 was 6,812 elk not counting multiple weapon special permits which were not available at the time of this writing (Table 2).

Table 2. Statewide elk harvest* for general season and special permit season combined by antlered and antlerless class, 1991-2006.

Year	Antlered	Antlerless	Total
1991	5,092	3,554	8,646
1992	5,583	3,292	8,875
1993	3,804	2,563	6,367
1994	4,606	5,360	9,966
1995	3,522	2,907	6,429
1996	3,801	3,152	6,953
1997	2,992	1,929	4,921
1998	3,352	2,506	5,858
1999	4,416	2,693	7,109
2000	4,960	3,318	8,278
2001	4,422	3,283	7,705
2002	4,767	3,349	8,116
2003	5,141	3,564	8,705
2004	4,822	2,539	7,361
2005	5,001	3,664	8,665
2006	4,296	2,855	7,151
2007	4,536	3,488	8,024
2008	4,092	2,720	6,812

*multiple weapon estimates not available at this writing

The general season elk hunter success rate for all weapon types in 2008 was 7.0 %. General season success rates by weapon type were 6.2 % for modern firearm, 9.1 % for archery, and 6.6 % for muzzleloader.

Surveys

WDFW conducts surveys on all 10 elk herds. On the westside the Department surveys 10-20 % of the elk units. For the Colockum and Yakima herds WDFW surveyed about 90 % and 70 % of the elk winter range, respectively. In the Blue Mountains we survey about 80 % of the elk winter range. In northeast Washington, elk surveys include composition counts made from the ground in the spring, and composition counts made while conducting aerial surveys for moose. WDFW uses the visibility bias model developed in Idaho for elk (Samuel et al. 1987) to estimate elk populations or sub-herds for the Blue Mountains, Yakima, and Colockum herds. These surveys are conducted in sampling units stratified as high-, medium-, and low-density zones.

Composition counts are conducted by WDFW and by Tribal biologists in the North Cascades and North Rainier. Some elk surveys conducted in western Washington are completed before the modern firearm hunting seasons. The rationale for mid-September surveys is there is a reduced level of segregation between age and sex classes during the rut. The assumption is that observations at this time tend to be less biased in terms of accurate bull:cow:calf ratios. Other Westside elk surveys are conducted in late winter. The rationale being that higher visibility due to the leaves being off the deciduous trees and groups of elk being somewhat larger in size at this time of the year offsets minor problems associated with segregation between the sexes.

Aerial and ground surveys, harvest data, and productivity data are used to model populations and provide estimates of herd components. Pre-hunt surveys typically range anywhere from 15 bulls:100 cows to 50+ bulls:100 cows in some southwest Washington GMUs. Calf:cow ratios also vary markedly in pre-hunt surveys from the mid 20s to the low 50s depending on the unit surveyed.

Population Status and Trend Analysis

Statewide elk populations are difficult to estimate but the statewide total is ranges from approximately 55,000 to 60,000 elk.

Overall calf ratios have improved slightly in the Blue Mountains during the report period, especially in GMUs 162, 169, 172, and 175. Late winter elk populations were estimated at approximately 5,100. Bull harvest declined markedly in the Blue Mountains in the 1980s. The spike bull general season was initiated in the Blue Mountains in 1989. The post-hunt Blue Mountain bull ratio combining all GMUs as a population management unit (PMU) surveyed was within management guidelines of 12 to 20 bulls per 100 cows.

Elk populations continue to grow slightly in numbers and expand their distribution in northeastern Washington. The Department's goal is to increase elk abundance in Pend Oreille County and eastern Stevens County. North of Kettle Falls there is some room for elk expansion east of the Columbia River. South of Kettle Falls there is room for elk expansion east of Highway 395. Range expansion of elk in northeast Washington will be allowed to continue in some locations within the limits of landowner tolerance.

The Yakima elk population is at population objective. The spike-only general season with branch-antlered bulls available by limited permit has been in place for the Yakima herd for almost 15 years. Post-hunt bull ratios have met objective since 2000. Site-specific damage problems exist for the Yakima herd

and require special permit hunts as well as damage hunts to address those cases.

The Colockum population still appears to be below objective. Post-hunt bull escapement objectives are not being met. The post-hunt bull ratio for the Colockum herd for all GMUs surveyed was below objective in 2009. The Colockum herd also creates localized damage problems. Most of these are being dealt with through extensive special permit hunts that apply hunting pressure through the fall and into the winter.

The North and South Rainier elk herds are both likely below objective. Limited data available indicate that population declines may have slowed. These two herds may have stabilized at some lower level. Both populations are very difficult to survey. Rigorous inferences about population size or rates of growth or decline cannot be made based on the limited information at our disposal.

Elk hunting regulations on the Olympic Peninsula were changed to a 3-point minimum antler restriction for legal bulls beginning in 1997. WDFW and Olympic Peninsula Tribes have been meeting regularly to evaluate elk population status and develop conservative hunting seasons. The Olympic elk herd is near management objective but the Olympic Peninsula can support more elk.

The North Cascades population continues to increase. The herd has increased to about 800 animals and is growing. The total population objective set in the herd plan is 1,200.

The Willapa Hills herd may be below population objective. In addition some refinement is necessary in terms of redistribution of elk to address damage complaints. This herd seems to have declined somewhat in recent years, probably as a result of increased hunting mortality, habitat loss, and declining habitat quality due to advancing successional age of timber stands and changes in forest management.

The Mount St. Helens herd is likely still above objective and plans to reduce elk densities will be continued through antlerless harvest in the fall of 2009. Both the Willapa Hills and Mount St. Helens populations are difficult to monitor due to the nature of the landscape. A new population estimation effort was started for the Mount St. Helens herd in the winter of 2009 and will continue for the next few years. These two herds contribute significantly to the Westside bull harvest each year.

Habitat Condition and Trend

In general elk do well on habitat in early to mid-successional stages. Elk herds in western Washington benefited from new growth after timber harvest in the 1960s, 70s, and early 80s. Much of the U. S. Forest Service land in western Washington is now shifting toward late successional reserves (LSR) and mature growth forest. This change is diminishing the carrying capacity of these habitats. The long-term trend in elk carrying capacity is down on public lands managed by other agencies.

Timber management on industry-owned forest is generally shifting toward smaller clear cuts or selective cuts. While this may be beneficial to elk, understory management and other silvicultural practices may be having a negative impact on elk forage quality and availability.

Excessive road density limits habitat suitability for elk on most managed forest. New road management programs are being implemented, resulting in more security for elk.

WDFW has cooperated with other researchers investigating the influence of habitat quality as it relates to elk body condition, calf production, and recruitment. Preliminary information suggests many western Washington habitats are less productive than first believed in terms of elk production.

Most of the habitat improvement projects statewide depend on partial funding from Rocky Mountain Elk Foundation (RMEF). Many habitat improvement projects sponsored by the Colville National Forest and the RMEF have improved habitat for elk. These projects have involved burning, fertilization and road management. Other cooperative projects involved RMEF and Olympic, Gifford Pinchot, Wenatchee, Umatilla, and Mount Baker-Snoqualmie National Forests. Elk forage enhancement projects are ongoing or planned for areas inhabited by the Willapa Hills, Olympic, Blue Mountains, Yakima, Colockum, North Cascades, North Rainier, Selkirk, and Mount St. Helens elk herds.

Wildlife Damage

WDFW is mandated by law to address agricultural damage caused by elk. In response to landowner complaints, WDFW tries to alleviate damage problems without reducing the elk population if possible.

The Blue Mountains and Colockum elk herds are below management objective but agricultural damage complaints occur in these areas each year. Elk damage complaints also come from areas inhabited by the Willapa Hills, Mount St. Helens, Yakima, North Rainier, and South Rainier herds.

Hunting seasons have been adopted to discourage elk from increasing in Benton and Ferry counties and from dispersing into northern Chelan and Okanogan counties.

WDFW is attempting to maintain elk at tolerable levels in Snohomish and southern Skagit counties and is preventing dispersal of elk on agricultural lands east of the Columbia River. In most of these areas, elk are in conflict with agricultural production. In many other areas, increasing urban sprawl and development are

restricting elk range. Maintaining elk populations that are viable, provide a sustained harvest, and are still tolerated by landowners is a constant, often contentious challenge.

Management Conclusions

After many years of any legal bull hunting seasons, antler restrictions and reduced season lengths have been adopted to achieve post-hunt bull ratio and overall survival objectives. In eastern Washington most units have spike-only bull general seasons with limited permit branch-antlered bull and antlerless seasons. In western Washington, most GMUs have a 3-point minimum antler restriction for the general season and offer antlerless elk hunting opportunities by limited permit. Both spike-only and 3-point minimum hunt structures are attempts at maintaining adequate bull sub-populations through the hunting season to breed the following fall. Bull escapement goals are set at a range of 12 to 20 bulls per 100 cows in post-hunt surveys, and an annual bull mortality rate from all sources of 50 % or less.

Elk in Washington are under intensive hunting pressure. Elk in Washington are hunted from early September until the middle of December. Washington is the smallest of the eleven western states and has the highest number of hunters per elk. It also has the highest human population density of all the “elk states”. Threats to elk population persistence include loss of habitat, declining quality of habitat, conflicts with agriculture, and high hunting demands by both state-licensed and tribal hunters.

Federal courts have ruled that members of federally recognized treaty tribes can hunt unrestricted by the state except for conservation closures. In 1998, the State Supreme Court ruled that members of federally recognized treaty tribes can legally hunt only within their ancestral hunting areas. State and tribal managers are working toward agreements that ensure conservation of wildlife resources including cooperative harvest management. Obtaining accurate, complete tribal harvest data is a constant point of negotiation with some tribes.

For this report time period, elk management plans for eight of the ten elk herds have been completed. Final elk herd management plans exist for Blue Mountains, North Rainier, South Rainier, North Cascades, Yakima, Colockum, Mount St. Helens, and Olympic. Draft plans are in development for the Selkirks and Willapa Hills herds.

Literature Cited

Samuel M. D., E. O. Garton, M. W. Schlegel, and R. G. Carson. 1987. Visibility bias during aerial surveys of elk in north-central Idaho. J. Wildl. Manage. 51:622-630.

Washington Department of Fish and Wildlife. 2003. Game Management Plan. Olympia.

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

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 sustained annual hunter harvest of a viable and productive elk population with desirable population characteristics. The harvest objective is to maintain the annual overall bull mortality rate at less than 50% and a post hunting season bull-to-cow ratio of 12 to 20 bulls per 100 cows (Washington Department of Fish and Wildlife 2003).

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 exceptionally difficult to harvest. Population data are extremely limited, but there is currently no indication that bull:cow ratios or opportunities for quality bull hunting are a problem. Therefore, there are no antler point restrictions and any antlered bull is legal.

A considerable change was made in the 3-year season package for 2003-2005 shifting the archery season later to a standard opening of September 8 and thus running to September 21. That season structure remained in place for the 2006-2008 package. New for muzzleloaders in 2003 was the opportunity to hunt GMU 113, Selkirk. Muzzleloader hunter opportunity in the "any elk" units (GMUs 101, 105, 108, 121) was also shifted from running concurrent with the modern firearm hunt to the muzzleloader only hunt in early October. In 2006 GMU 117 was added to the muzzleloader season, thus all GMUs were open to all 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 increased as harvest has increased, but it appears most of the increase in numbers has been in the primitive method hunts and especially archery (Figures 1 & 2).

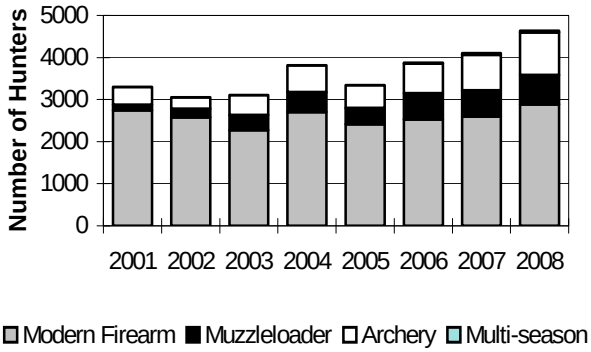


Figure 1.Trend in elk hunters by hunt method for GMUs 101-121.

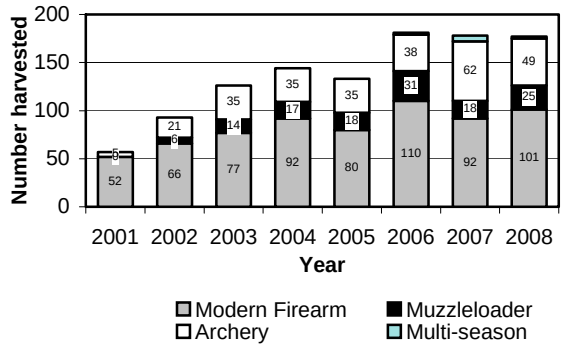


Figure 2. Trend in elk harvested by hunt method for GMUs 101-121.

Since mandatory hunter harvest reporting began in 2001 the number of elk hunters reporting hunting GMU's 101-121 increased 41% from 3,296 to 4,633 in 2008 (Washington Department of Fish and Wildlife 2009). During that time the total elk harvest increased more than three-fold from 57 elk in 2001 to a high of 181 elk in 2006 (Table 1). Through 2006 the overall elk harvest exhibited a mostly steady increase. Since 2006 the total elk harvest has leveled out. In 2007 the archery harvest took a large jump while the muzzleloader harvest declined by almost half from the year before (Figure 2). New in 2006 was the "multiple

season" elk tag. This tag resulted in a modest harvest of 2 elk in 2006, 6 in 2007, and 2 in 2008. Hunter success, however, has been substantially higher for multi-season tag holders at 19% in 2007 compared to general methods at 4%.

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 2008 was the highest observed since 2003 at 21 total and a success rate of 18% (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). In recent years the Colville District bull elk harvest has averaged less than 50 percent yearlings and just over 30 percent 6 point or better. Once again in 2008 the harvest percentage of yearling or 1-2 point bulls was lower than the percentage of 3-5 point "raghorn" bulls and the second season since 2003 that this has occurred.

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 for a bull/cow/calf ratio of 21:100:40.

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. The calf:cow ratio and the trend in total numbers is the only reliable information gathered on early spring surveys in this area. The spring 2009 survey efforts yielded a ratio of 28 calves per 100 cows, which is substantially lower than the previous seven-year average of 45 (Table 4).

Population status and trend analysis

General observations and anecdotal information indicate that elk populations are higher than they have ever been in northeastern Washington. Recent hunter harvest levels and the observed widespread distribution of elk along with reasonably healthy calf ratios support this contention.

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 two years Forest Practice Applications & Approvals were received for treating 10,494 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. Antlerless permit opportunity was increased substantially last year with a permit season that now includes December 16-31. In addition all user groups currently have general seasons within GMU 117, which should put 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 been implementing many projects that are designed to benefit elk. As of 2009 these projects including all partners amount to a total of 52,819 acres. Most of the projects involve burning to enhance winter forage production, but there are also projects to restore aspen stands and reclaim roadbeds for improved habitat. Most of these projects are in the prime elk areas of Pend Oreille County (J. McGowan, USFS, pers. comm. 2009).

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. The harvest objective of an overall bull mortality rate at less than 50% appears to be on track as the percentage of yearling bulls in the harvest as indicated by 1-2 point bulls, was 31% in 2008. While there are no post-season survey data on bull:cow ratios, the prime bull (6 point +) percentage in the 2008 bull harvest was 31% and consistent with the 5-year average of 31%, again 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 65% of the participation and 61% 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 steadily to 120 total 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 2008, 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 for 2008.

Literature Cited

Washington Department of Fish and Wildlife. 2003. Game Management Plan. Washington Dept. of Fish and Wildlife, Olympia, WA, USA

Washington Department of Fish and Wildlife. 2009. 2008 Game Harvest Report. Wildl. Prog., Washington Dept. of Fish & Wildlife, Olympia.

Table 1. Antlered bull and antlerless elk harvest within the Colville District, GMUs 101-121 from 2001 through 2008.

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	177

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%

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

Table 4. Early spring elk composition surveys within the Colville District.

	Ratios		Classified
Year	Bull:Cow	Calf:Cow	Sample
2002	14:100	48:100	220
2003	15:100	57:100	139
2004	29:100	36:100	46
2005	9:100	42:100	163
2006	6:100	46:100	288
2007	7:100	45:100	324
2008	1:100	39:100	291
2009	11:100	28:100	247

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 in place 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 2008 general elk hunting seasons for Game Management Unit (GMU) 124-142 did not change from the previous year and were all Any Elk with dates as follows:

- Modern Firearm – Oct. 25 - Nov. 2
- Archery – Sept. 8 - 21
- Late Archery (GMUs 124-127) – Nov. 20 - Dec. 8
- Muzzleloader – Oct. 4 - 10
- Late Muzzleloader (GMUs 130-142) – Nov. 20 - Dec. 8
- Master Hunters only (GMUs 127-142) – Dec. 9 – 31

Hunter numbers has varied, but has shown an upward trend since 2005 (Table 1). This past year, there was the largest increase in muzzleloader hunters, with an increase of nearly 23% (Fig. 1). Hunter success was effectively the same as last year, after decreasing from a high in 2005, when it nearly doubled, but has now leveled off to around 9%. Muzzleloader hunters were the most successful group in 2008 jumping ahead of modern firearm hunters once again (Table 2). Modern firearm success was above average, but much lower than in 2005 and 2007.

Total elk harvest increased from the previous year (Table 1). For both muzzleloaders and archers, total elk harvested increased in 2008 from 2007, but decreased for modern firearm hunters (Fig. 2). Total bulls taken this year were 138, the most bulls taken since mandatory reporting began in 2001. Harvest in bulls has shown an increasing trend ever since 2001 (Fig. 3). The majority of bulls are taken from 3 GMUs— 124, 127 and 130, with the majority being taken from GMU 130 (Fig. 4.)

Antler point classes reported in the harvest have varied from year to year (Table 3). The 6pt harvest has shown an increasing trend since 2006 and has had a 20% proportion of the overall harvest the last three years.

Antlerless harvest has decreased from a high of 157 antlerless elk in 2005 to 101 this past year. This change appears largely due to the harvest in GMUs 124 and 127 where antlerless harvest has decreased the last 3 years.

Surveys

Ground and aerial surveys have been limited due to budget restrictions. Composition counts have been conducted primarily in GMU 130 on and around the Turnbull National Wildlife Refuge due to limited 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. Some post-season composition counts are completed during our annual moose surveys conducted in December and January.

Table 4 shows the composition counts conducted in GMU 130 since 1999. Except for 2001, the bull:cow ratio in GMU 130 has been at or above the bull:cow ratio guidelines of 12 to 20 bulls:100 cows given in the WDFW Game Management Plan. Although based on a small sample size the bull:cow ratio for this report period was 42 bulls per 100 cows (WDFW 2009). This past year showed an increase in both calves and bulls. The calf ratio jumped from 55 to 83 calves per 100 cows, which is high and if correct would point to a highly productive year.

Population status and trend analysis

Since mandatory reporting began in 2001, harvest reports indicate a fairly consistent increasing trend of elk being harvested. The majority of the harvest for these PMUs occurs in GMU 130 with GMU 124 and 127 providing in combination ~36% (Table 5).

Both the proportion of mature bulls harvested and the bull:cow ratio has been increasing the last 3 years,

while the harvest of smaller bulls (1&2 and 3-5 points) has decreased (Table 3 & 4). This proportionately large harvest of older bulls is desirable but needs to be closely watched to ensure that it is sustainable. The decreasing antlerless harvest has been a concern, but appears to have leveled out in 2008.

Habitat condition and trend

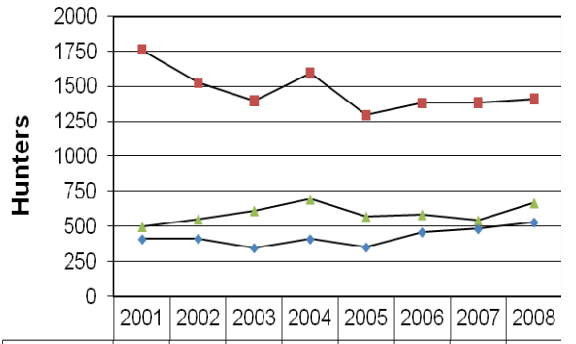
The greatest concern for our elk herds in the past has been related to agricultural conversion of native habitat in the area. Now, elk habitat degradation due to urban expansion, increased roads, and human disturbance is the highest concern. Some concern exists for habitat damage to aspen and other vegetation from high elk numbers on Turnbull National Wildlife Refuge.

Elk Damage

During the last few years, elk damage complaints have decreased. 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; as a result, 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".

Figure 1. Number of Elk Hunters by Weapon Type



	2001	2002	2003	2004	2005	2006	2007	2008
Modern	1764	1530	1,399	1,600	1,300	1,384	1,386	1,415
Muzzle	500	554	614	697	572	586	545	671
Archery	410	413	346	410	351	460	484	532

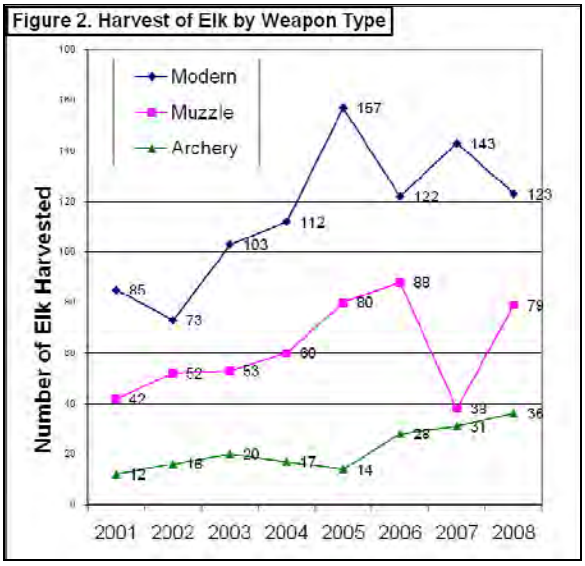
Management conclusions

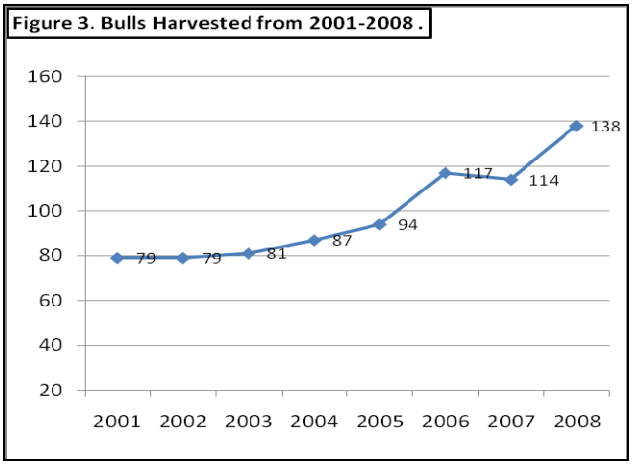
Data from the last five years indicates a small but constant increase in population levels in the District. Accordingly, the harvest has steadily increased especially in the last three years with a high harvest of bulls occurring this past year. The highest antlerless harve
st occurred in 2005, and since that time has decreased by 64%. This indicates a potential decrease in cows, so we will continue to monitor the overall population of this herd.

Literature Cited

Washington Department of Fish and Wildlife. 2009. Game Management Plan. Washington Dept. of Fish and Wildlife Olympia, WA, USA

Figure 2. Harvest of Elk by Weapon Type





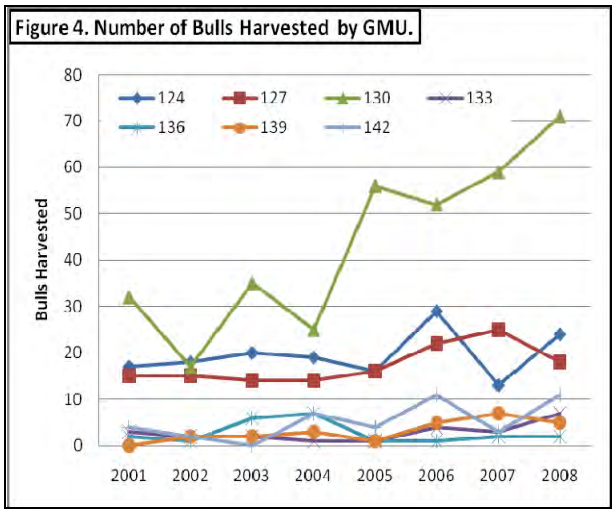


Table 1. GMU 124-142 Elk harvest, hunters and hunter days

Year	Bulls	Total	# Hunters	Hunter Days	Hunter Success
2001	79	139	2674	11380	5.20%
2002	79	141	2497	11210	5.65%
2003	81	176	2359	10221	7.46%
2004	87	189	2707	16456	6.98%
2005	94	251	2223	8992	11.29%
2006	117	242	2441	10323	9.91%
2007	114	216	2427	10663	8.90%
2008	138	239	2624	11134	9.11%

Table 2. Hunter Success By Weapon

Year	Archery	Modern	Muzzle	All
2001	2.93%	4.82%	8.40%	5.20%
2002	3.87%	4.77%	9.39%	5.65%
2003	5.78%	7.36%	8.63%	7.46%
2004	4.15%	7.00%	8.61%	6.98%
2005	3.99%	12.08%	13.99%	11.29%
2006	6.09%	8.82%	15.02%	9.91%
2007	6.40%	10.32%	6.97%	8.90%
2008	6.77%	8.69%	11.77%	9.11%
AVG	5.00%	7.98%	10.35%	8.06%

Table 3. Antler Point Proportion

Year	1-2 Pts	3-5 Pts	6+Pt
2001	60.27%	83.56%	16.44%
2002	47.37%	84.21%	15.79%
2003	45.57%	70.89%	29.11%
2004	43.42%	85.53%	14.47%
2005	49.47%	90.53%	9.47%
2006	38.71%	77.42%	22.58%
2007	44.64%	78.57%	21.43%
2008	31.72%	71.72%	28.28%

Table 4. Elk Composition Counts in GMU 130.

	Cumulative Numbers			per 100 Cows	
Year	Cow	Calves	Bulls	Calves	Bulls
1999	63	19	19	30	30
2000	80	33	24	41	30
2001	105	38	9	36	9
2004	211	106	36	50	17
2006	207	113	49	55	24
2007	140	78	50	55	36
2008	145	121	61	83	42

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

	Harvest	Proportion
GMU 124	44	18.40%
GMU 127	42	17.60%
GMU 130	116	48.50%
Total GMU 124-130	202	84.50%
Total GMU 124-142	239	

ELK STATUS AND TREND REPORT: REGION 1
PMU 13 – GMUs 145, 149, 154, 157, 162, 163, 166, 169, 172, 175, 178, 181, 186

PAT FOWLER, District Wildlife Biologist
PAUL WIK, Wildlife Biologist

Population objectives and guidelines

Elk (*Cervus elaphus*) populations in six of eight major elk units are at or near management objective. Calf recruitment is improving, and elk lost to damage control is being managed to reduce negative impacts on specific sub-herds. 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 with a wintering population of over 1,800, 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 set population objectives for each 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. Bull:cow ratios historically ranged from 2-5 bulls/100 cows, following this change, bull:cow ratios achieved management objectives within 3 years. Prior to the regulation, few bulls older than 2.5 years of age were observed during post-hunt surveys. Currently, an excellent and diverse age structure is observed in the post-hunt bull population.

The bull harvest in the Blue Mountains has declined due to low calf recruitment, a major decline in the Wenaha elk population, and restrictions needed to maintain bull survival. Between 1998 and 2007, the bull harvest averaged 231 bulls/year. Hunters harvested a total of 178 bulls in 2008 (Table 1), which is 23% below the previous10-year average.

Branched antlered bulls are harvested under permit control. In 2008, 134 permits were issued in seven units for rifle, muzzleloader, and archery hunters, plus 3 Landowner Hunting Permit (LHP) permits in GMU-172, and the auction and raffle tag permits. One hundred ten hunters harvested 73 bulls, for an overall success rate of 66% (Table 2). Six point or larger bulls comprised 85% of the harvest. Large, mature bulls continue to be harvested in the Blue Mountains, and generate much public interest.

Table 1. Blue Mountains Elk Harvest (PMU 13), 1992-2008 (includes GMU 157, Watershed)**.**

Year	Bulls Spikes	Bulls Adult	Bulls Total	Antlerless	Total	Antlerless Harvest Cows:100 Bulls
1992	278	78	356	281	637	79
1993	190	82	272	243	515	89
1994	241	64	305	167	472	55
1995	177	64	241	15	256	6
1996	138	69	207	109	316	53
1997	309	71	380	57	437	15
1998	107	41	148	61	209	41
1999	169	40	209	28	237	13
2000	231	41	272	25	297	9
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

Table 2. Permit Controlled Bull Elk Harvest-All Weapons, Blue Mtns. WA., 1992-2008 (excludes GMU-157 Watershed).

Year	Bull Permits	Bull Harvest	Hunter Success	Percent 6 Point+
1992	131	53	44%	64%
1993	132	53	41%	66%
1994	122	42	37%	66%
1995	122	45	41%	72%
1996	139	49	42%	68%
1997	110	54	51%	79%
1998	62	31	55%	73%
1999	67	29	51%	85%
2000	63	30	55%	83%
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%

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 2008. Weather conditions during the 2008 season allowed for good access throughout the hunt period. Normally, some Watershed permit holders do not hunt because they failed to research the area before applying, and were not aware of the rugged nature of the terrain. Only 30 permit holders reported hunting, harvesting 13 bulls and 1 cow for a success rate of 47%. Bulls harvested in the Watershed consisted of 78% six point or better.

Antlerless elk hunting is under permit control 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 declined slightly in 2008. A total of 586 antlerless elk permits were issued, which doesn't include hotspots or landowner damage control permits: modern firearm 440, muzzleloader 110, LHP 36. Hunters harvested a total of 124 antlerless elk from eight GMU's. Modern Firearm hunters harvested 89 antlerless elk, muzzleloaders harvested 8, and archers 27.

The antlerless harvest on private land was increased in GMU-162 between 2001-2005 to alleviate agricultural damage. In 2008, permit levels were reduced due to hunter complaints about finding few elk on private land. The strategy of targeting antlerless elk on private land was successful in reducing agricultural damage complaints, while allowing elk populations on public land to increase and maintain the overall elk population near management objective.

From 2003-2006, the Umatilla Tribe worked with the Department to control the tribal harvest of adult bulls in the Dayton unit and on the Rainwater Wildlife Area. Tribal hunters were required to call the Tribal Office to obtain a tag before hunting in GMU-162 Dayton, and report any harvest within 72 hours. Once the bull harvest quota was reached, hunting for branched bulls by tribal members was terminated. In 2007, the CTUIR rescinded the regulation for tribal members and returned to a season with no bag limit for branched-antlered bulls. No tribal harvest was reported or confirmed in this area for 2008.

Poaching of adult bulls appears to have returned to normal levels. Only a few were reported in 2008, compared to 50+ bulls between 2000-2002.

Surveys

Pre-season surveys are conducted to determine calf production when elk re-group after calving (July-Sept.). Surveys are conducted from the ground. A total of 844 elk were classified in 2008 with calf/cow ratios in the various sub-herds ranging from 52-77 calves/100 cows, and an overall average of 61 calves/100 cows.

Post-season surveys are conducted to determine population estimates and herd composition in late winter. The 2009 survey was conducted between March 3-7 in most units, and April 5 in GMU's 172 and 175. The Oregon Dept. of Fish & Wildlife conducted a fixed-wing survey of the Wenaha unit, north of the Wenaha River. The survey produced a count of 4,738 elk, compared to 4,237 elk in 2007 (Table 3).

Table 3. Annual Winter Elk Survey Summary, Blue Mtns. Wa.

	Bulls			Cow	Calves	Total	Per 100 Cows	
Year	Adult	Yearling	Total				Bu.	Ca
1992	276	155	431	2660	469	3560	16	18
1993	261	139	400	3103	589	4092	13	19
1994	240	91	331	2395	435	3167	14	18
1995	354	111	465	2690	534	3689	17	20
1996	307	82	362	2836	431	3656	13	15
1997	233	87	320	2487	598	3405	13	24
1998[a]	177	89	266	2325	527	3118	11	23
1999	232	122	354	2724	599	3677	13	23
2000	246	92	338	2806	484	3628	12	17
2001	208	92	300	2951	623	3874	10	21
2002	212	153	365	2835	595	3795	13	21
2003	193	98	291	2362	678	3332	12	29
2004	271	127	398	2561	620	3579	16	24
2005	336	113	449	2223	550	3483	20	27
2006	387	139	526	2669	780	3975	20	30
2007	413	168	581	2398	609	3588	24	25
2008	370	170	540	2882	815	4237	19	28
2009	531	166	697	3062	875	4738	23	29

Population status and trend analysis

Data from the 2009 survey was analyzed using the Hiller 12-E version of the sightability model (Unsworth et.al 1998). The analysis projected an estimated population of 4,925 elk (± 355) in the GMUs surveyed by helicopter (GMUs 154-162, 166-186). Two units not surveyed from the air (GMUs 145 & 149) have an estimated population of 150 elk, which puts the Blue Mountains elk population estimate for 2009 at ~5,100.

Elk population status varies between sub-herds. Sub-herds are managed according to the unique management issues associated with each sub-herd. Most antlerless elk hunts are permit controlled and targeted at elk on private land where damage issues exist, unless populations exceed management objective on public lands.

The number of elk counted in GMU-154/157 was 830, comparable to last year: 882. Winter weather conditions were similar to last year, with frequent

snowfall and colder temperatures, which tends to move elk that normally winter in Oregon north along the western front of the Blue Mountains and into Washington. The number of elk counted in the Dayton unit increased to 1,005, compared to 843 in 2008. The Wenaha herd is still below management objective (900) at approximately 700 elk. The elk count in the Tucannon sub-herd (GMU-166) declined slightly to 547 (631 in 2008), which includes elk counted in the western portion of GMU-178 (Peola). The count in Mountain View (GMU-172) increased in 2009 with 599 elk counted, compared to 376 in 2008.

Winter calf ratios in 2009 ranged from of 21 to 37 calves/100 cows, and averaged 29.

Post-hunt bull ratios in 2009 ranged from a low of 10 bulls/100 cows in GMU's-175, to a high of 41 bulls/100 cows in GMU-172 Mtn. View, and averaged 23 bulls/100 cows for the District. The artificially high bull ratio in GMU-172 (Mtn. View) can be attributed to an influx of bulls into GMU-172 from GMU-169 (Wenaha) due to winter snow pack and shed antler hunting activity. Cow elk will often move south of the Wenaha River or onto the Wenaha Wildlife Area (ODFW) to avoid shed antler hunting activity, which tends to inflate the bull:cow ratio obtained from surveys in the Wenaha and Mtn. View units.

Research

The Department concluded fieldwork on the Blue Mountains Elk Mortality and Vulnerability Study in the spring of 2007 The project had several objectives; evaluate harvest vulnerability of bull and cow elk based on habitat conditions and land ownership, determine what percentage of yearling bulls are being harvested under the "spike-only" strategy, evaluate the level of tribal harvest, determine the level of poaching occurring within the project area, and ascertain the level of bull movement between habitats and ownerships. Final reports from this research should be completed by 2009.

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 will be constructing 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 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 3-15 years due to extensive wildfires that occurred in 2005 and 2006. The School Fire burned 53,000 acres in GMUs 162, 166, 175, and 178 in 2005. This fire was an extremely hot and consumed most of the hiding and summer thermal cover in the Tucannon drainage. As a result, it will take a number of years for cover conditions to improve significantly. The Columbia Complex Fire burned 110,000 acres in GMU's 154, 162, 166, 169, and 175 in 2006. This fire burned at lower intensity, and in a mosaic pattern that greatly reduced decadent understory and fuels that had accumulated over many years. The Columbia Complex Fire produced excellent conditions for habitat regeneration over 80% of the acreage burned.

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

As a result of the School Fire, habitat improvement projects have already been initiated on the W.T. Wooten Wildlife Area. Forage enhancement projects are also being implemented on the Asotin Wildlife Area. Long-term habitat improvement projects will be developed in conjunction with the Blue Mountains Elk Initiative (BMEI) and Rocky Mountain Elk Foundation (RMEF) for both areas impacted by the wildfires.

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. Landowners in GMU-181 have again been issued landowner preference permits for antlerless elk in lieu of damage. The School Fire and loss of the elk drift fence has resulted in large numbers of elk moving into GMU-178 Peola. However, damage claims in 2008 appeared to be less than expected. The elk fence was completed in June 2009, and an effort will be made to move elk from Peola back inside the elk fence.

Management conclusions

The spike-only management program has been in place for 20 years. As a result, post-season bull:cow

ratios are at, or slightly above management objective. The increased number of adult bulls in the population has improved breeding ecology and efficiency. Most cows (93%, WDFW unpublished data) are now being bred by October 2, compared to only 55% of the cows bred by that date during the pre spike-only era (1987-1988).

The increase in adult bulls in the population 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 elk viewing recreation.

Summer calf ratios have improved and remain near historic levels; 50 calves:100 cows. Winter calf ratios have improved, but are still below optimum level (35 calves:100 cows). Calf recruitment has improved in many sub-herds, and is still far below optimum in GMU-169 (Wenaha). An increase in calf recruitment is necessary for this population to reach the current management objective.

Shed antler hunting activity continues to be a problem for elk on the winter range. Shed antler hunting activity in GMU-154, GMU-162, GMU-166, and GMU-169 is extremely intense during March and April. Elk use patterns in several units have changed over the last decade due to human 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 pushed onto agricultural lands. Shed antler hunting and other activities on winter range are putting elk under increased stress at a critical time of year.

Internal discussions are underway to consider recommendations to reduce harassment and control human activities on elk winter range, especially shed antler hunting.

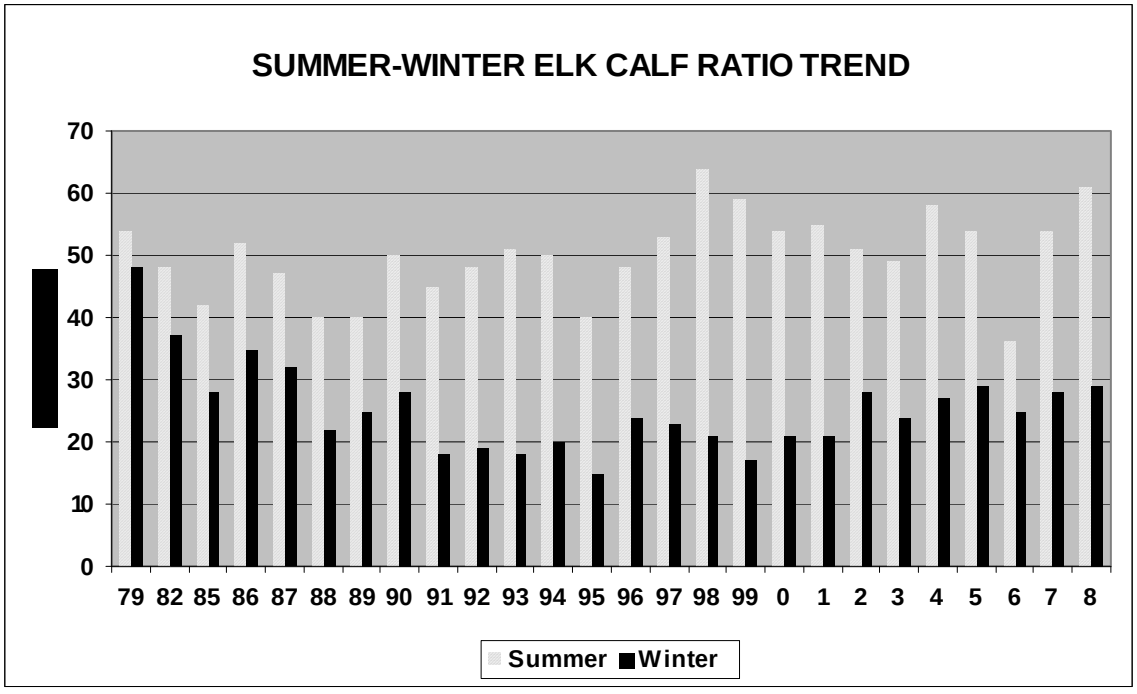
Agricultural damage continues to be a problem in some sub-herds (GMUs 154, 162, 178) resulting in damage control hunts. The current damage control strategy to target specific groups of elk on private land for damage control has worked well by allowing sub-herd populations to maintain numbers or actually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

Habitat values have declined due to roads, noxious weeds, and fire suppression. The School Fire will have a negative impact on the Tucannon elk herd for a few years, but in the long term, habitat conditions should improve dramatically. The Columbia Complex fire will improve habitat conditions in GMU 162.

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. Determining the affects of tribal hunting on the elk population, and achieving elk management objectives is extremely difficult when tribal hunters have no restrictions on bag limits and are not required to report harvest.

The Blue Mtns. elk population is approximately 220 elk under the management objective listed in the Blue Mtns. Elk Herd Plan (2009). Most sub-herds are at or near population management objective. The Wenaha

Figure 1. Calf Ratio Trend 1980-2008, Blue Mtns., Washington.



sub-herd is approximately 200 elk under management objective and appears to be increasing slowly. Calf recruitment has improved in recent years, but needs to improve more in order for the Wenaha sub-herd to reach population management objective.

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, 382
PMU 35 – GMUs 352, 356, 360
PMU 36 – GMUs 364, 368

JEFFREY A. BERNATOWICZ, District Wildlife Biologist, PMUs 32-36
MIKE LIVINGSTON, District Wildlife Biologist, PMUs 31, 34

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

Elk hunting seasons in Region 3 have changed frequently over the years. The major changes in recent years have been:

1994: All branched antler bull hunting became permit only in all PMU's except 34.

2000: Entire region came under one eastern elk tag by weapon. For example, instead of having to chose early or late and Colockum or Yakima, modern hunters could hunt anywhere in the Region for the entire season.

2003: Early archery general season changed from September 1-15 to September 8-21. The late Archery season was set at November 20-December 8. Damage hunts changed from muzzleloader to any Advanced Hunter.

2004: Antlerless elk were no longer legal for Archers in PMU 32.

In 2008, the general seasons outside of PMU 34 were:

Archery: Early season September 8-21, Spike only in PMU 32, spike or antlerless in PMU's 33,35and 36. Late season: November 20- December 8, spike or antlerless all units except GMU 328 (spike only).

Muzzleloader: October 4-10, spike-only.

Modern Firearm: October 25- November 2, spike-only.

PMUs 31 and 34 have been managed separately from the remainder of the region with an array of liberal seasons allowing the harvest of antlerless and any bull. In addition, a substantial number of damage permits have been issued to landowners to target problem elk and to reduce the sub-herd. In 2008, a modern firearm general season for antlerless elk occurred in the Blackrock Elk Area (private land west of Hanford) September 6-19. A general modern firearm season in all of GMU 372 and GMU 382 for any elk occurred October 25-November 2. In PMU 31 and GMU 373, general seasons for modern firearm, muzzleloader and archery seasons occurred simultaneously October 25-November 15. In 2008, the reported number of elk hunters in Region 3 decreased for the fourth year in a row (Table 1). The reported hunter numbers were 26% below the 10-year average.

Reported harvest and hunter success was below average for both the Colockum and Yakima herds. The Yakima herd is at objective so the antlerless hunting season structure is designed to maintain stability. The Colockum elk herd is below objective and the antlerless harvest has been reduced to allow the herd to increase. Lower herd size has decreased recruitment resulting in fewer bulls to harvest. Bull harvest in both herds was the lowest in recent history and 29% below the 10-year average. Below average harvest and success is expected to continue, but hopefully not as low as 2008.

Harvest data for the Rattlesnake Hills sub-herd derived from standard model calculations 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 2008, field personnel documented a harvest of 43 elk (24 bulls, 19 antlerless).

Harvest in GMU 373 was 1 bull and 1 cow. In GMU 381, 5 bulls and 4 antlerless elk were harvested. No elk were harvested in GMU 379. Elk numbers are low in these units and are managed liberally to prevent crop damage risk.

Surveys

Post-hunt aerial surveys were conducted in February and March 2009. Survey units were stratified and randomly selected. About 100% of the Colockum and 70% Yakima units were surveyed. Surveys were weighted toward high-density units so >95% of the herd was surveyed. Feedlots for the Yakima herd were ground surveyed. 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, southeast Yakima Training Center and surrounding private land to the south and west of ALE were surveyed.

Calf recruitment in both the Colockum and Yakima herds was down substantially from the previous year (Tables 2 and 3). Historical harvest data has not always followed trends seen on surveys. When dramatic shifts in calf ratio were observed in the 1990's, harvest often showed the opposite trend. There is some late spring mortality after surveys are completed but misclassification is also a potential problem, especially in large groups. In recent years, no attempt has been made to classify calves from large groups, during aerial surveys. Ratios from ground counts and smaller groups are applied. This change has increased confidence in the ratios and appears to be a better indicator of recruitment.

The observed bull ratio in the Yakima herd was within the objective of 12-20 bulls per 100 cows. There are a large number of raghorns from the large yearling bull recruitment in 2007 (Table 3).

The Colockum bull ratio continues to be below objective (Tables 2). The high 2007 yearling bull recruitment did not show up as raghorns on the winter range in 2008 or 2009. Some aerial and ground surveys have been conducted outside normal winter range, but significant numbers of young bulls have not been found. Bull recruitment has not been keeping up with mortality.

Population status and trend analysis

In February/March 2009, the Colockum and Yakima herds were estimated at 3,745 and 9,133, respectively (Tables 2 and 3). The Yakima herd is at objective, and the Colockum herd is below objective. Attempts have been made to reduce antlerless harvest in both herds over the last 3-5 years to stabilize the Yakima herd and to increase the Colockum herd. A reduction in antlerless harvest in the Colockum has slowly increased adult cow numbers. Low calf and bull recruitment are keeping the herd below objective.

If bull harvest is used as an index of population, both herds have decreased. Harvest comparisons must be viewed with caution as regulations have changed dramatically the last 15 years. Recruitment of calves will also have a major influence on bull harvest, which is weighted heavily toward yearlings. However, to maintain the high bull harvest seen in the Colockum from 1986-92, there were likely more adult cows than surveyed, or a higher number of calves per cows surveyed, or a combination of the two factors.

The survey data for the Yakima herd matches the harvest data fairly closely. A high antlerless harvest since 1999 has probably reduced the population. Historic harvest indicates the Yakima population has gone through cycles. Relatively low cow harvest in the mid-1980's

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
1987	564	579	824	482	21,505	2,163	4,173	27,841	8	22	6	9
1988	797	735	1,492	1,152	23,054	2,530	4,473	30,057	15	17	9	14
1989	977	537	1,294	901	25,785	3,323	3,992	33,100	11	14	9	11
1990	621	761	1,595	1,016	NO	DATA			NO	DATA		
1991	611	652	1,348	1,246	26,928	4,086	5,865	36,879	11	10	7	10
1992	801	613	1,513	1,020	26,513	4,618	5,989	37,120	11	12	6	11
1993	550	433	782	770	26,328	5,503	6,114	37,945	6	9	7	7
1994	542	731	970	2,418	21,341	5,517	5,622	32,480	17	11	9	15
1995	469	660	631	892	20,288	6,190	4,819	31,297	9	6	8	8
1996	449	593	911	1,069	21,237	5,490	5,558	32,285	10	7	8	9
1997	335	255	717	426	18,253	3,918	3,701	25,872	6	9	9	7
1998	492	239	975	889	20,128	4,705	4,362	29,195	8	11	9	9
1999	392	214	1,140	1,058	25,383	4,554	5,549	35,486	7	8	10	8
2000	385	245	1,450	1,549	23,278	4,305	5,363	32,959	9	18	12	11
2001	379	358	1,184	1,442	22,204	4,791	6,177	33,172	11	10	8	10
2002	513	591	1,017	1,157	21,926	6,119	5,914	33,959	8	13	10	10
2003	424	393	1,083	1,373	20,888	3,342	6,521	30,751	11	13	9	11
2004	449	218	1,013	772	23,291	3,789	6,760	33,840	8	7	5	6.5
2005	418	302	927	1,093	20,654	3,497	5,972	30,123	10	7	6	9
2006	381	241	802	695	19,045	2,743	5,618	27,406	8	9	7.5	8
2007	327	282	799	826	18,552	2,898	5,578	27,028	8	7	7	8
2008	303	121	701	607	16,084	2,261	4,613	22,958	8	8	7	8
Mean[a]	411	328	1,002	1,029	21,254	4,179	5,095	30,868	9	10	8	9

[a] 10 Year Mean Ending 2007

resulted in an increasing population that was reduced in the early 1990's. The population likely peaked 1999-2000 and decreased in recent years.

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 2009 yielded a herd size estimate of 639 ± 12 elk (390 cows, 58 calves, 191 bulls). Ratios per 100 cows were 49 bulls and 15 calves. No surveys were conducted in GMU 373, 382, 379 of 381.

Habitat condition and trend

The overall summer range forage for the Colockum herd is improving due to timber harvest. However, large areas may lack hiding cover. When human activity increases, a large portion of the herd concentrates in and around the Coffin Reserve.

Colockum winter range forage quality is likely decreasing. Nearly all 2000 acres of WDFW land, which was previously farmed in winter wheat, has been converted to CRP**.** The older CRP is in crested wheat grass, which is undesirable elk forage in this area. The remaining grasses are typically dry during the winter and have low digestibility.

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 timber harvest reduced forage production on a portion of summer range. Insect outbreaks have recently killed significant acreage. Controlled burns and wildfires are starting to create new forage.

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 influenced 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 rebuilt. Extended seasons below the fence were enacted in 2003 in an attempt to reduce damage.

Most of the Colockum herd is not fenced. Damage is being managed by hunting. The boundaries of the hunts are drawn 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 preference 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 reduced on the public lands where elk are wanted.

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.

Table 2. Colockum elk winter composition 1990-2009.

	Antlerless		Bulls		Total	Ratios (per 100 cows)	
Year	Cow	Calves	Spike	Branched	Elk	Calves	Bulls
1991	559	213		23	795	38	4
1992	1,314	309	16	9	2,099	23	2
1993	1,439	607	22	6	2,074	42	2
1994	NO	DATA					
1995	1,197	409	14	36	1,656	34	4
1996	1,597	486	88	66	2,237	30	10
1997	1,581	467	16	75	2,139	30	6
1998	2,807	854	88	60	3,809	30	5
1999[a]	3,871	1,061	84	242	5,258 ± 2,048[b]	27	8
2000[a]	2,697	570	60	130	3,457 ± 940[b]	21	7
2001[a]	3,464	719	100	170	4,453 ± 543[b]	21	8
2002[a]	2,800	829	119	391	4,172[c] ± 566[b]	30	18
2003[a]	3,060	526	96	238	3,920 ± 445[b]	17	11
2004[a]	2,388	782	63	209	3,442 ± 168[b]	33	11
2005[a]	3,084	770	46	86	3,986 ± 391[b]	25	4
2006[a]	2,244	873	73	116	3,306 ± 160[b]	39	8
2007[d]	2,829	843	130	116	3,918	30	9
2008[a]	2,859	917	43	72	3,890 ± 20[b]	32	4
2009[d]	3,000	590	70	85	3,745	20	5

[a] visibilty model
[b] ± 90% Confidence Interval
[c] Includes 33 unclassified elk
d Population estimate created without visibility modeling

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 until mid-June to target bulls damaging wheat. After mid-June only spikes are permitted until August when permits become antlerless only. The proximity of these elk to valuable perennial crops further increases the risk. Several orchard and vineyard managers west of ALE have fenced their crops or have selected to waive damage in return for damage permits. These farms are relatively small and surrounded by rangeland. In contrast, the area south of ALE near Prosser and Benton City contains vast 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), who owns the land, objected to public hunting. As of 2008, DOE has not changed their position.

Management conclusions

Based on the available information, the Yakima herd appears to be at population objective. The Colockum herd is below population and bull ratio objectives.

The Yakima herd is now nearing the lower end of population objective. A very cold, dry spring in 2008 reduced both yearling and calf recruitment. Hunter opportunity and harvest have been reduced to stabilize the herd. Achieving management goals in the Colockum is problematic. Most Colockum antlerless harvest is designed to address agricultural damage. 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.

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. Hazing and targeting problem elk has reduced, but not eliminated damage. Landowner tolerance and WDFW's ability to pay for damage are finite. Fortunately, the 2007 wildfire occurred after wheat harvest. 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 42% 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 high crop damage years.

Table 3. Yakima elk winter composition 1990-2006.

	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
1994	NO	DATA					
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 [a]	10,399	3,479	442	716	15,036 ± 4,334 [b]	33	11
2000 [a]	8,125	2,528	421	703	11,777 ± 1,242 [b]	31	14
2001 [a]	6,896	2,652	464	698	10,710 ± 830 [b]	38	17
2002 [a]	6,611	2,337	356	970	10,274 ± 609 [b]	35	20
2003 [a]	6,815	2,007	413	599	9,834 ± 983 [b]	29	15
2004 [a]	6,217	2,806	357	688	10,068 ± 457 [b]	45	17
2005 [a]	6,242	2,013	253	343	8,851 ± 843 [b]	32	10
2006 [a]	5,717	2,926	273	673	9,589 ± 270	51	17
2007 [c]	6,167	2,000	518	674	9,359	35	18
2008 [a]	6,001	2,368	290	820	9,478 ± 389	39	18
2009 [c]	6,076	1,816	267	737	9,133	30	17

[a] 1999-2005 data based on visibility model

[b] Population estimate + 90% C.I.

[c] Population Estimate was created with an incomplete survey and modeling

Table 4. Rattlesnake Hills Elk Harvest 1983-2008.
Data derived through landowner and hunter interviews.

Year	Bulls	Antlerless	Unk	Total	% Bull
1983	0	0	0	0	
1984	0	0	0	0	
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%
26-yr avg	21	21	2	40	52%
last 5 yrs avg	33	46	0	79	42%

ELK STATUS AND TREND REPORT: REGION 4
PMU 45 – GMUs 418, 437
PMU 46 – GMUs 448, 450

JENNIFER BOHANNON, Wildlife Biologist

Population objectives and guidelines

Management objectives are outlined in the North Cascade (Nooksack) Elk Herd Plan (Washington Department of Fish and Wildlife 2002) and include the following:

1) Manage the North Cascade elk herd using the best available science.
2) Increase elk population numbers in the North Cascade elk herd to or above the late 1980's estimated level of 1700 animals.
3) Promote expanding the North Cascade elk herd into potential ranges south of the Skagit River in the Sauk unit.
4) Re-establish tribal/state authorized hunting seasons.
5) Manage hunted elk units for spring bull ratios consistent with the statewide plan (currently 12 to 20 bulls per 100 cows) combined with overall bull mortality rates less than or equal to 50 percent.
6) Minimize elk damage to private lands.
7) Work cooperatively with Indian tribes to implement the North Cascade Elk Herd Plan.
8) Increase public awareness of elk and promote recreational uses of elk, including viewing and photographic opportunities.
9) Maintain elk habitat capability on U.S.D.A. Forest Service, WA. Department of Natural Resources, and private lands.

Hunting season and harvest trends

Conservation closures were established in both GMUs 418 and 437 in 1997. In 2008, a bull only special permit hunt, initiated in 2007, took place in GMU 418. As in 2007, a total of 30 permits were divided equally to state and tribal hunters. The 15 state permits were allocated as 3 archery, 3 muzzleloader, 7 modern firearm, 1 Westside raffle tag, and 1 auction tag. Neither the Westside raffle tag holder nor the auction tag holder hunted in GMU 418 in 2008. Out of the 15 state permits, 11 bulls were harvested. Tribal hunters harvested 14 bulls using their permits. Tribal hunting has continued in areas outside the primary range of the Nooksack elk herd (damage areas in both the Skagit and Nooksack river drainages, and other portions of GMUs 407 & 437). Tribal harvest outside of GMU 418 consisted of 1 bull and 2 cows harvested in GMU 407 and 2 bulls and one cow taken in GMU 437. General season state harvest during the 2008 season was 1 bull taken by a modern firearm hunter and 1 bull by archery in GMU 407 and 21 bulls and 17 cows/calves taken by either archery or muzzleloader hunters in Elk Area 4941 (GMU 437). This was a significant increase from the 9 bulls and 3 cows taken in the 2007 season. A deep and persistent snowfall during the muzzleloader season in elk area 4941 resulted in a higher than usual elk harvest. Tribal and state hunters harvested an additional 5 cows in the Acme area (GMU 418) using damage permits to address damage complaints. One cow was harvested in a hot spot hunt in GMU 448 as a result of landowner complaints of crop damage.

There were 10 documented poaching/closed season violations between July 2008 and June 2009 with 1 elk taken illegally in GMU 418, 2 in GMU 407, 3 in GMU 437, and 4 in GMU 448 (Sauk Prairie). Other reported sources of human-related mortality include 7 elk-vehicle collisions.

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. An additional 2 bulls were fitted with radio collars in 2008. In April 2009, WDFW and Tribal biologists deployed GPS (Global Positioning System) collars on 9 (2 bulls, 7 cows) elk as part of a Sauk-Suiattle project examining elk habitat use. Five of these collars were replacements for malfunctioning collars deployed in 2008.

Population status and trends

The North Cascade elk herd resulted from successful augmentations in 1946 and 1948 of eastern and western Washington elk stocks. The estimated peak population of 1700 elk occurred in 1984. It declined to a low of around 300 animals in 2002 (WDFW 2002). From 2003 to 2005, augmentations from the Mount St. Helens Wildlife Area added 98 cows and calves to the herd. The current population estimate for the Nooksack Herd based upon aerial surveys done in March and April 2009 is about 800 animals. Estimates of bull:cow and calf:cow ratios

based on data from the aerial surveys are shown in Table 1.

Table 1. Late winter/early spring elk herd ratios per 100 cows (with 95% confidence intervals).

Year	Bulls:100 Cows	Branch:100 Cows	Calves:100 Cows
2007	25.9 (24.5, 27.2)	15.6 (15.3, 16.0)	38.0 (27.8, 48.4)
2008	31.1 (16.1, 46.1)	15.9 (3.3, 28.5)	41.8 (34.7, 48.9)
2009	30.4 (24.9, 35.9)	17.4 (13.4, 21.4)	35.8 (20.3, 51.3)

These estimates have not been corrected for sighting bias and 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. To date, the Sauk-Suiattle Tribe has put GPS collars on 14 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 was estimated to be between 140 – 180 animals in 2008. 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, efforts to trap and move problem animals, along with the issuance of damage permits, appear to have reduced the number of animals in using this area considerably. Despite these efforts, elk damage complaints in the traditional problem areas persist, and a new problem area emerged in 2008 in the Sauk Prairie near Darrington. From July 2008-June 2009 there were 12 documented elk damage complaints in the Hwy 20 corridor from Sedro-Woolley to Concrete. One damage claim of $2,660 for clover/pasture grass in GMU 437 resulted in payment of $550. It is inevitable that there will be continuing conflict between increasing populations of humans and elk in low elevation agricultural areas.

Recreational Use

An elk public viewing area, developed in cooperation with The Skagit Land Trust and Skagit County, has been established along Highway 20 west of Concrete. There is recreational hunt in the agricultural damage hunt unit (Elk Area 4941) along the Skagit River for archery and muzzleloader hunters. The bull only special permit hunt will continue in GMU 418 in 2009 with 40 permits (20 spike, 20 any bull) divided equally between state and tribal hunters.

Augmentation

A total of 98 elk have been transplanted from the Mount St. Helens Wildlife Area (MSHWA) since 2003. Projected population responses to augmentation of the North Cascade Elk Herd based upon multiple variables indicated that the transplanting of up to 100 animals was the most practical management option for accelerated recovery of the herd (WDFW 2002). The augmentation goal has been met and there are no plans for additional augmentations.

Management conclusions

Management recommendations for the Nooksack elk herd and associated habitat include the following:

- Complete 5-year update of the North Cascade (Nooksack) Elk Herd Plan.
- Evaluate the potential of establishing an elk damage special management corridor along the north side of Highway 20.
- Continue efforts to establish a statistically valid population estimator.
- Continue road closure agreements with DNR and Sierra Pacific Corp. in primary winter and summer range areas.
- Establish additional public viewing areas, when possible.
- Evaluate potential habitat in the Skagit River drainage.
- Maintain and/or upgrade existing habitat enhancement projects.
- Establish new habitat (forage enhancement and road closure) projects in key summer range areas.
- Maintain elk population numbers in agricultural damage areas at or below current estimated levels (140 - 180 animals).
- Continue to collect genetic samples from the North Cascade elk herd.
- Complete a Habitat Landscape Evaluation for GMU 437 (Sauk).

Literature Cited

McCorquodale, S.M., M.A. Davison, and C. Madsen. 2005. Population Monitoring Tools for the North Cascades elk herd: A Proposal. Washington Department of Fish and Wildlife, Olympia. 23pp.

Washington Department of Fish and Wildlife. 2002. North Cascade (Nooksack) Elk Herd Plan. Wildlife Program, Washington Department of Fish and Wildlife, Olympia. 54pp.

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

RUSSELL LINK, 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. Past numbers have been reported as 200-250 elk in GMU 454 and 175-225 elk in GMU 460 (WDFW 2001). 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 >50 elk. The North Bend-Snoqualmie herd 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. Population objectives for GMU 460 are to increase the herd to 500 elk (North Rainier Elk Herd Plan, WDFW 2002). An additional objective in the forthcoming update to the 2002 plan will be the distribution of the 500 elk throughout GMU 460.

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.

The North Rainier Elk Herd Plan (WDFW 2002) presents information on distribution, herd and habitat management, associated social and economic values, and research on elk that range north of Mt. Rainier on the western slope of the Cascades. The elk in GMUs 485 and 466 are considered a sub-herd within the greater North Rainier Elk Herd. Objectives for this herd as written in the above plan include: increasing population numbers to 500 elk, maintaining minimum post-season bull to cow ratio of 12:100, and increasing and improving forage on winter/spring and summer range.

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 1994-2008 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 1994-2008 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

Table 1. GMU 485 Pre-hunt elk herd composition 1984-1997 (all ratios per 100 cows) no flights since 1998.

Year	Spikes	Br. Bulls	Total Bulls	Calf
1984	7	21	28	41
1985	8	12	20	36
1986	8	19	27	30
1987	13	14.5	27.5	22
1988	7.5	36	43.5	35
1989	5.3	28	33.3	28
1990	5.4	31	36.4	26
1991	7.5	26	34	15
1992	5	30	35	33
1993	3	26	29	20
1994	8	30	38	22
1995	11	29	40	26
1996	7	29.5	36.6	25
1997[a]	8.3	27.7	36	30

[a] Includes data from July 97 flight- elk not mixing at this time. No surveys were conducted in 1998, 1999, or 2000 because of low population levels.

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 from a high of 30 (8 bull, 22 cow) to 5 (3 pt. minimum bulls) in 2002 with an average of 6 elk killed (range 3-8/season) between 1999 and 2007 (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 (Fig. 4). 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.

In GMU 485 and beginning in 1984, 50 either-sex elk permits were allocated each year for the five-day all citizen season. Hunters focused on the branched bulls and subsequent composition surveys revealed a decline in this herd component. Subsequently, permit allocation was changed beginning in 1986 to reduce bull harvest and increase antlerless harvest. In 1996, 35 antlerless and 15 branch-antlered bull permits were issued.

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

Total elk harvest remained fairly consistent for the years 1984-1991, averaging 46 elk. Between 1992 and 1994 average harvest increased to 57 elk, dropping notably to 44 and 25 elk respectively in 1995 and 1996 despite the same permit level allocation.

Prior to 1992 these regulations met state management objectives. The increase in harvest from 1992-1996 may have adversely affected the population. (Again, no permits were issued from 1997-2003.)

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 Tribe, State, 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 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 2005-8 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.

Pre-hunt (September) bull:cow:calf ratios from 1984-1997 in GMU 485 are presented in Table 1. The pre-hunt composition shows a general decline in calf:cow ratios since 1984. The low calf survival rates are below the average for other western Washington herds.

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.

The pre-hunt, branch-antlered bull:cow ratios in GMU 485 have generally increased since 1984 and stabilized at about 29:100. Pre-hunt, branch-antlered bull survey data remained stable for the 1994-1997 period. Inadequate funding caused this survey to be scaled back in 1997. In 1998-2003 no pre-hunt flights were conducted because of population declines. Post-hunt (March) composition counts from 1985-2005 have shown a general increase in calf recruitment over the last four years (Table 2).

Table 2. GMU 485 Post-hunt elk herd composition, 1984-2009 (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

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

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.

In March and April 1997, a paintball mark-recapture estimate was conducted. This was the first opportunity to assess population changes since 1994. It was suspected the 1997 population estimate would show a decline from the 1994 estimate of 612 elk. The 1997 estimate was 227 elk (range 177-277). The paintball mark-recapture estimate was repeated in March and April of 2001 with an estimate of 170 elk (range 145-192) (Spencer unpubl. data 2001).

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. Efforts should be initiated to identify the scope of habitats used by these elk sub-herds and incorporate new data into city planning efforts to direct development, protect open space, establish parks, and other conservation efforts. 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.

Literature cited

Erland H., 2008. Upper Snoqualmie Valley Elk Group Study Census Results For Winter Of 2008 and Plans for 2009 Census Data Collection North Bend. WA http://www.snoqualmievalleyelk.org/tiki-index.php?page=upperValleyElk

Muckleshoot Indian Tribe. 2006. Vales, D. Unpublished data.

Raedeke, K. J. 1995. Big game management plan for the Green River Watershed, Tacoma, Washington. Raedeke Associates, Inc. Seattle. 86pp.

Raedeke, K. J. and J. F. Lehmkuhl. 1984. Elk populations Mount Rainier National Park: status of range outside the park. Final Report, Cooperative Park Unit, Univ. of Wash., Seattle. 69pp.

Washington Dept. of Fish and Wildlife. 1987-2000. Spencer, R.D. Unpublished data and information, GMU 485.

Washington Dept. of Fish and Wildlife 2002. North Rainier Elk Herd Plan. Wildlife Program, WDFW, Olympia. 63 pp.

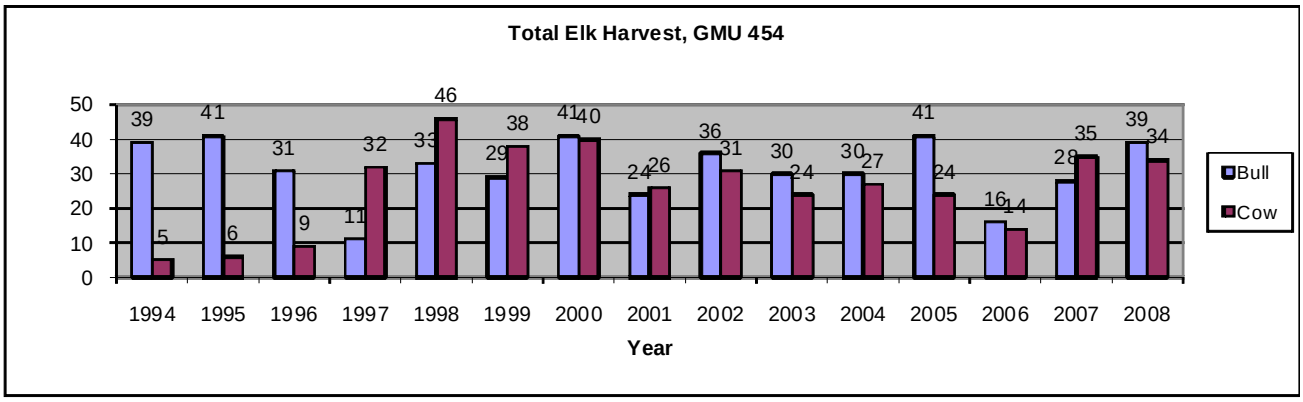


Figure 1. Annual elk harvest, GMU 454, 1994-2008 (all weapon types combined)

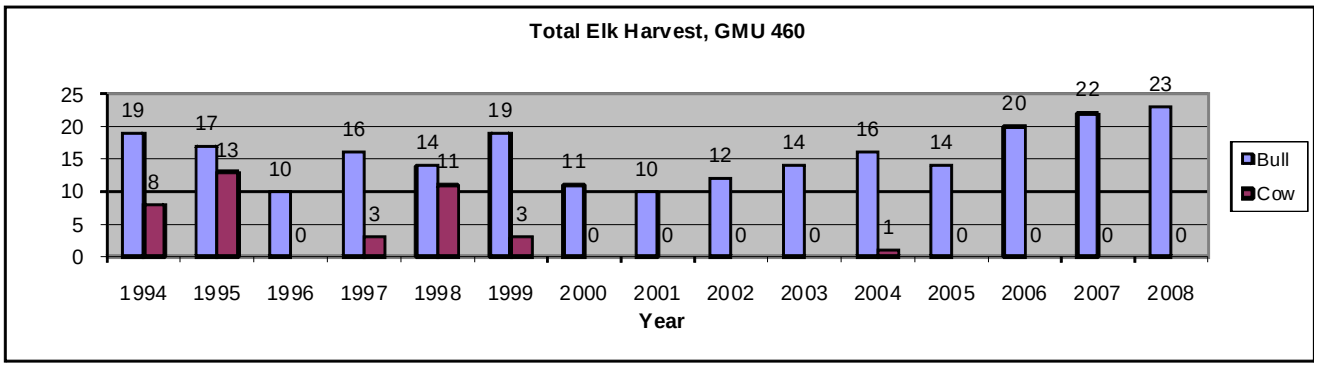


Figure 2. Annual elk harvest, GMU 460, 1994-2008 (all weapon types combined)

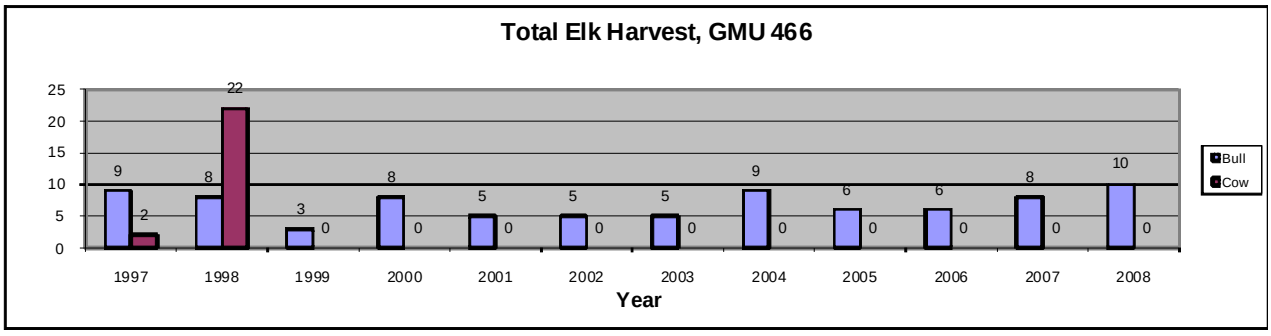


Figure 3. Annual elk harvest, GMU 466, 1997-2008 (all weapon types combined)
*2004 harvest reflects uncorrected raw data reported from hunter reports

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

ANNEMARIE PRINCE, Wildlife Biologist
ERIC HOLMAN, Wildlife Biologist
PATRICK MILLER, District Wildlife Biologist

Population Objectives/Guidelines

Region 5 contains all or part of three elk herds. The largest in the region and the state is the Mount Saint Helens (MSH) herd followed by the Willapa Hills herd and the South Rainier elk herd. Management plans for two of the herds, MSH and South Rainier have been written to date, and the Willapa Hills herd plan is 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 2006. Before adoption it was submitted for public review and three public meetings were held to gather input from the public. 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 herd's range in keeping with habitat limitations and landowner tolerances, to minimize elk damage to private property, to encourage/maintain the current habitat availability on USFS lands, and to maintain current elk winter range. Other goals include, managing the herd with the best available science and developing private/public partnerships to improve habitat and management of elk in the South Rainier herd.

The herd plan for the Willapa Hills has not been completed, but it will follow the same general goals as the other two plans and the state-wide elk management bull ratios and bull mortality rates. Specific population objectives will be set to keep within habitat limitations and public tolerance.

General Hunting Seasons and Harvest Trends

In 2008 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, restrict elk numbers where they are not tolerated by the public, and offer 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 muzzle loading 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, 504, 505, 506, 510, 513, 516, 520, 530, 550, 560, 572
3 pt. min. or antlerless	501
Any elk	564, 568, 574, 578, 388, 382
Permit only (limited entry, permit draw)	522, 524, 556

In Region 5, a total of 28,411 general season elk hunters spent 181,381 days afield in 2008 (Figure 1). Region 5 general season harvest was 2,214 elk and broken down by season and success as follows: 746/10% in archery, 252/6% in muzzleloader and 1,179/7% in the modern firearm season; the other 37 elk were killed by multi-season permit holders. Overall, hunter success during the general season was 11%. The 2008 general season elk harvest of 2,214 was down 16% from the most current 10 year average (1999-2008) and is down 20% from the 2007 harvest. Table 3 lists a summary of the 2008 general season elk harvest in all Region 5 GMUs.

Table 3. Summary of general season elk harvest, all weapons combined, for 2008 in Region 5.

GMU	Bull Harvest	Cow Harvest	Total Harvest
388	10	8	18
501	28	32	60
503	32	16	48
504	26	5	31
505	43	28	71
506	215	64	279
510	7	0	7
513	37	0	37
516	92	0	92
520	276	151	427
530	175	58	233
550	218	26	244
554	6	1	7
560	240	36	276
564	44	48	92
568	32	19	51
572	78	14	92
574	18	26	44
578	37	68	105
TOTAL	**1,614**	**600**	**2,214**

Most units in Region 5 had lower harvest rates in the general season compared to 2007 with 554, 560, 572 and 574 being the most notable. GMU's 388 and 506 had the only increases as compared to 2007.

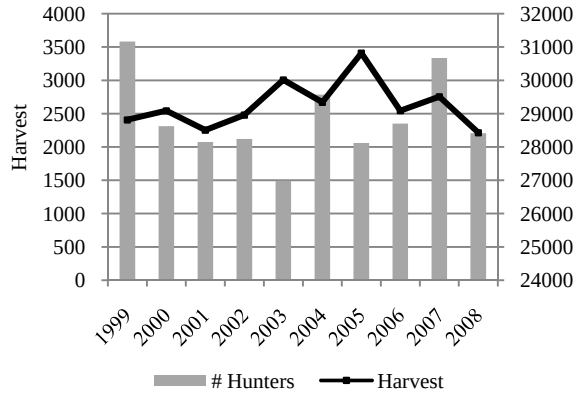


Figure 1: General season harvest and hunter numbers for all user groups from 1999-2008

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. Since 2006, permit levels have increased for modern firearm, muzzleloader, and archery (both bull and antlerless permits) throughout the region. A total of 2,714 special permits were distributed within 90 hunts in the Region for the 2008 season. Of this total number of permits, 2,145 were antlerless only permits. The total permit harvest for the region was 882. Some of these special permits were issued in designated elk areas and are primarily designed to help minimize agricultural damage caused by elk.

Antlerless permits within the MSH herd GMUs have been substantially increased since 2006 for all seasons to assist with the population reduction goal. Additionally, permit hunts on the Mount St. Helens Wildlife Area within GMU 522 continued in 2008; twelve antlerless and eight any elk permits were distributed among youth, senior, and hunters with disabilities. In 2008, elk permit hunts were conducted within the boundary of Mount St. Helens National Volcanic Monument. These hunts were aimed at reducing damage caused by elk to vegetation research plots within the monument as well as reducing the effect of elk using this area as refugia from the surrounding hunting pressure. These hunts were all in GMU 522 and account for the notable increase in harvest within this GMU. Table 4 lists the number of antlerless only elk permits and antlerless harvest for all user groups combined in Region 5 during 2008. Please note some of the antlerless harvest in the table below is made up of 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 2008 in Region 5

GMU	Antlerless Permits	Antlerless Harvest
503	30	12
504	200	50
505	170	25
506	70	22
520	195	67
524	140	66
522	46	12
530	130	74
550	265	141
554	70	27
556	260	115
560	410	58
572	150	27
578	9	5
TOTAL	**2,145**	**701**

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, which are highly sought after by hunters. These limited entry units had a combined success rate of 42% in 2008.

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	67 (46/21/0)	21 (12/9)	31%
524	197 (140/0/57)	102 (66/36)	52%
556	491 (260/0/231)	206 (115/91)	42%

Surveys

Historically, surveys in Region 5 were conducted pre-season or in the fall. These surveys were conducted across the landscape in representative GMUs and were limited mostly by annual budgets. These fall surveys provided the information needed to calculate population estimates using the Sex-Age-Kill or SAK model (Bender 1999). Due to some complications with the SAK model approach (discussed in population section), and the difficulty of surveying in late summer (warm temps, presence of recreational users, archery elk seasons, securing helicopters, etc.), these pre-season surveys have been abandoned in the region.

Beginning in the winter/spring of 2009, Region 5 began flying elk composition surveys in the spring or post-season. The limiting factor of how much area is covered by these surveys is still semi-budget related, but has more to do with this new approach being refined within specific/representative GMUs before it is deployed in the entire region. Through a new research project initiated this year in the region, it is anticipated that a more robust method of population estimation will be developed.

GMUs surveyed by WDFW in the spring of 2009 include 522, 524, 556, 550, 520, 554, 560, 568, and 572. Two separate flights were conducted within GMUs 520, 522, 524, 556, and 550 (flights 1 and 2) and a single flight was flown in GMUs 554, 560, 568, and 572 (flight 3); all of these GMUs are within the MSH elk herd area. The number and classification of elk seen on these flights are summarized below.

Table 6. Summary of winter/spring elk flights in Region 5 for 2008-2009

Flight	Calf	Cow	Spike	Rag	Mature Bull	Unk	Total
1	772	2307	198	149	161	167	3754
2	828	2694	266	156	153	90	4187
3	58	121	9	19	0	12	219

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 monthly counts and winter severity data in combination with other criteria are used to determine whether an emergency winter feeding effort for elk will be initiated on the Wildlife Area. Figure 2 shows the winter elk mortality for the past ten years and the peak winter elk counts for the past four years on the mudflow portion of the Wildlife Area.

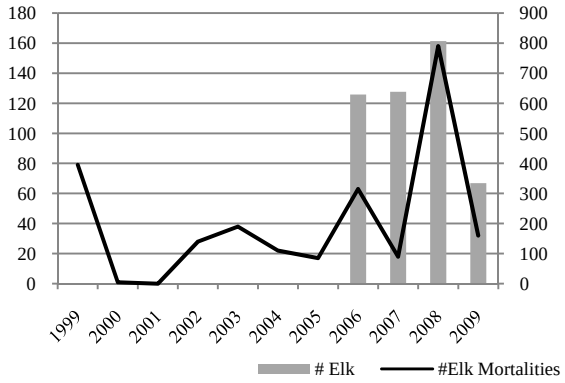


Figure 2: Elk mortality and elk counts on the mudflow portion of the Mt. St. Helens Wildlife Area 1999-2009

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 the last 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.

Mt. Saint Helens Herd

Due to 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 2008 in a cooperative venture by 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 radio collared 55 elk in February 2009 across a northwestern core area of the MSH elk herd (GMUs 520, 522, 524, 550, and 556). Subsequently, in March and April 2009 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 sophisticated 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 3 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 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 2008-2009 for Region 5

Flight	GMUs	Bull:Cow	Calf:Cow	% Mature Bulls
1	520, 522, 524, 556, 550	22:100	34:100	32%
2	520, 522, 524, 556, 550	21:100	31:100	27%
3	554, 560, 568, 572	23:100	48:100	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 Puyallup 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. The model was developed by the Tribe and survey funding was provided by the Tribe and Tribal wildlife grants (USFWS and BIA). WDFW staff participated and contributed to survey efforts in both 2005 and 2006. Current South Rainier herd population estimates derived by the Puyallup Tribe are in Table 8. It should be noted that WDFW did not participate in developing or reviewing this model or analyzing the data collected during survey efforts. This information has been provided by the Puyallup Tribe of Indians to supplement the South Rainier herd section of this report.

Table 8: Spring Population Estimates for the South Rainier Herd, Puyallup Tribe of Indians, 2006-2009

Year	Population Estimate
2006	938
2007	964
2008	815
2009	1084

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. Hopefully Region 5 can use this refined technique in other herd areas in the future.

Habitat Condition and Trend

Region 5 continues to face the 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) that inundated historical winter range, and (3) general increases in development and human encroachment throughout the lowlands of Region 5, which can lead to 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 1 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 nearly 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 clearcuts, relatively open young regeneration stands, and low forage-potential closed canopy forests. Post-logging treatments on industrial

timberland (i.e., herbicide application) often reduce 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 reside and winter in the valley with increased human-elk interactions; however this area is the prime winter range for the herd.

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

Habitat Enhancement

Mt. St. Helens Herd

The WDFW continues to take steps to enhance forage quality on the North Toutle mudflow through plantings and fertilization. Maintenance activities included liming and/or fertilizing approximately 121 acres of existing forage stands. Harrowing and over seeding were applied as management treatments in selected portions of one of the forage sites that was rehabilitated in 2008 with apparent positive results. Increases in forage production are evident at the Upper Bear Creek (Mikey's Meadow), Boulder Flat, and Golf Green forage areas that were rehabilitated last year. Two tree/shrub planting projects occurred in the late winter of 2008. A river stabilization planting included a total of 14,000 rooted plants over a three mile area and a riparian planting of 1,150 rooted plants.

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 10,000 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 866 acres of wide-spaced thinning projects have been completed on both summer and winter range areas. Funding for 2009-2010 has been secured and will result in an additional 400 acres of summer range habitat improvements. Funding has, and will be provided via U.S. Fish and Wildlife Service Tribal Wildlife Grants, the Puyallup Tribe of Indians, RMEF, and the USFS. These projects continue to provide valuable winter and summer forage for elk. This information has been provided by the Puyallup Tribe of Indians to supplement the South Rainier herd section of this report.

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 focus on 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 these 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 radio collared 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 radio collaring, 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 habitat quality these elk are using. During the first year (2009) of the new study, data were collected from 44 cow elk (the other 11 elk were bulls). These data suggested the elk that successfully reared a calf in 2008 were very lean in midwinter (Feb. 2009), but this is not uncommon for Westside elk. Cow elk that had not lactated in fall 2008 were generally in much better condition, which would also be typical. Cow elk from the mudflow consisted of lean, recently lactating elk; and non-lactaters with good mid-winter fat levels, but sample sizes are small after only 1 year of capture work. Overall, the pregnancy rate for the cow elk captured in this first year was slightly lower than typical of Rocky Mountain elk and similar to rates seen elsewhere in Roosevelt elk. WDFW genetic data have indicated elk of both ancestries are present in the MSH population. Strong conclusions regarding body condition and productivity of MSH elk are not currently warranted with only a single year's data.

Another research effort initiated in the spring of 2009 is designed to address the increasing number of elk within the region showing signs of "hoof rot". Although reports of overgrown and deformed hooves in Roosevelt elk have occurred sporadically in SW Washington for over a decade, the number and geographical distribution of such reports increased dramatically in 2008. Elk showing symptoms have elongated/deformed claws and often become emaciated and die.

During the winter of 2009 we undertook an investigation to better characterize the problem and examine possible etiologies. Lower limbs were collected from 3 affected elk that were killed by hunters. In addition, six affected elk from three locations, and three apparently unaffected elk from one location were harvested and complete necropsies, radiology, routine histology, hepatic trace mineral measurements, bacteriology, virus isolation and parasitology were performed. Unfortunately, no samples had any major abnormalities. The "hoof rot" problem seems to be increasing in the region and more collections and samples are needed before a formal opinion can be made about the cause of the problem.

A research project that focuses on habitat use of the South Rainier elk herd is currently being completed by the Puyallup Tribal Wildlife Program. The research data will be available to supplement the South Rainier elk herd plan updates slated for 2009-2010. This habitat research will contribute to a greater 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 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 permit levels within the MSH herd, we believe we are approaching our management goals in this herd. Permit levels remain high, but are being monitored every year to ensure we do not over achieve our reduction goal. New research efforts within this herd should give us a better estimate of the 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.

Literature cited

Bender, L. C., and R. D. Spencer. 1999. Estimating elk population size by reconstruction from harvest data and herd ratios. Wildl. Soc. Bull. 27:636-645.

Gilbert, Brian A. and Barbara J. Moeller. 2008. Modeling elk sightability bias of aerial surveys during winter in the central Cascades. Northwest Science, 82:3, 222-228.

Pacificorps Energy, 2008. Lewis River Wildlife Habitat Management Plan. Lewis River Hydroelectric Projects Federal Energy Regulatory Commission Project NOS. 935, 2071 and 2011.

WDFW. 2006. Mount Saint Helens Elk Herd Plan. Wildlife Management Program, WDFW, Olympia. 38pp.

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

ELK STATUS AND TREND REPORT: REGION 6
PMUs 61-67, GMUs 601-699

H. M. ZAHN, District Wildlife Biologist

Population objectives and guidelines

The 2008 hunting season was the third of the 2006-2008 three-year season package. Overall management goals remain to increase or maintain elk (*Cervus elaphus*) populations in suitable habitat while addressing localized elk damage complaints. On the Olympic Peninsula, because of treaty rights, long-term management strategies are being cooperatively developed and implemented with Olympic Peninsula Treaty Tribes.

Hunting seasons and harvest trends

For the year 2008 hunting season the three-point minimum requirement for antlered elk was retained region-wide. This requirement not only enjoys general support with the public but also allows us to meet bull escapement goals. In addition to general elk seasons, a total of 511 special elk permits were authorized by the commission. These permits were issued to all user groups including Master Hunters, hunters with disabilities, and youth hunters. Only 126 of these permits were issued on the Olympic Peninsula mostly to address elk damage issues in the Dungeness Area and in portions of the Satsop and Wynoochee units. Harvest estimates, based on mandatory reporting adjusted for non-response bias, project a total region-wide elk harvest of 922 during general elk seasons, a 9 percent decline over the previous year. The percentage breakdown of the total elk harvest by user group was 44, 41, and 15 percent for modern firearm, archery, and muzzleloader users respectively. Permit holders took an additional 161 elk during permit seasons (28 antlered and 133 antlerless). General seasons harvest estimates of antlered elk by Population Management Units (PMU) are listed in Table 1. Hunting conditions were typical for the area and season with no unusual dry or inclement weather recorded. All harvest estimates are for state hunting seasons only and do not include harvest by treaty tribes.

Region-wide the general season harvest of antlered elk was estimated as 727 in 2008. This is a 6 percent decline over the previous year. An additional 28 antlered elk were taken during special permit seasons. Consistent with recent years the PMU with the largest harvest was PMU 61 with an estimated antlered harvest of 339. Within this PMU the game management unit (GMU) with the highest antlered harvest has been GMU 673 (Williams Creek). Over the recent 5-year period (2003-2007) GMU 673 (Williams Creek) has supported an average annual general elk season antlered harvest of 125 bulls. The 2008 harvest for this unit was 128 antlered elk, which was a 13 percent increase over the 2007 antlered harvest of this unit. The GMUs comprising PMU 65 include some of the historically best elk areas in Region 6. Antlered elk harvest in this PMU was estimated at 110 bulls, nearly on a par with the 2007 estimate of 114 bulls.

During this reporting period, meetings between regional personnel and representatives of Olympic Peninsula Tribes continued for the purpose of managing the elk resource of the Olympic Peninsula cooperatively. Periodic technical and policy meetings take place with representatives of the Point No Point Treaty Council (Skokomish, Port Gamble S'Klallam, Jamestown S'Klallam, Lower Elwha Klallam), Quinault, Hoh, Quileute and Makah Tribes.

Surveys

The Williams Creek (GMU 673) bull elk mortality study, which was initiated in October 2005, was continued during this reporting period. The study seeks to obtain estimates of bull elk mortality rates by following radioed elk from initial tagging to eventual death. During July 2008 a total of 14 additional bull elk were radioed. Since that time tagging has ceased and we are currently in the process of analyzing the study results. Resources and weather permitting we try to conduct aerial (helicopter) elk group composition surveys in select units. These are conducted during the late September through early October period (pre-season surveys) and during the late March through early April period (post-season surveys). During this reporting period we conducted 4 such aerial surveys.

The results of the 2 pre-season surveys are summarized in Table 2. Two units (GMUs 673 and 658) were sampled, unfortunately under less than optimal weather conditions. Pre-season surveys can be good indicators of calf production as well as bull ratios in the population.

The results of the 3 post-season surveys (conducted April 6,9 and 10,2009) are summarized in Table 3. These surveys were undertaken on overcast days when elk generally are more visible.

Post-season surveys have value in estimating over-winter calf survival and hence recruitment into the yearling class. Post-season surveys are not, however, good indicators of adult bull (older than yearling) escapement since adult males do not mix freely with other elk at this time of year. This pertains particularly

to the forested areas of coastal Washington. One method of estimating annual bull mortality from all sources is to look at the proportion of yearling males among antlered elk seen during pre-season (fall) surveys. Because of bull elk behavior during the rut it is felt that this results in a conservative estimator of overall annual bull elk mortality rates from all sources. In Region 6 this estimator varies yearly but tends to fall between 40-50 percent total annual mortality rate for antlered elk.

Population status and trend analysis

Harvest figures of legal bulls taken during the 2008 state elk seasons confirm trends observed in recent years. Thus the bull harvest on the Olympic Peninsula is now above the very low levels observed during the early to mid – 1990's although still below the 1980's levels. At the same time the bull elk harvest in PMU 61,which is mostly in Pacific County, leads the Region. All indications are that this trend is likely to continue into at least the near future. Factors contributing to this positive trend likely include the increased availability of cover as well as road closure programs practiced by the private and public landowners in the area.

Habitat condition and trend

Habitat conditions on managed forestlands continue to be generally favorable for elk, although high road densities are detrimental if roads are open to vehicular traffic. Units that sustained large-scale timber harvest during the 1970s (portions of Pacific County) now have large stands of second growth that serve as cover. Timber harvests continue in the area, creating new forage areas. We have not documented nutritional stress (due to lack of forage) at the population level. Indeed, there are no indications of unusual winter mortality. Current forest management practices, which favor smaller clear-cuts, will benefit elk.

Management conclusions

The guiding principles of the current 3-year season package were carried over into the year 2008 elk season. These include a 3-point minimum antler restriction for legal bulls, conservative cow harvest, where possible, and very low cow harvest on the Olympic Peninsula during state seasons. We continue to try to address elk damage problems through special permit seasons. Elk calf survival and hence recruitment rates are in line with long-term averages. Unusual winter mortality has not been documented.

Table 2. Results of pre-season elk surveys (October 02, 2008)

		Antlerless		Antlered		Ratios per 100 cows		
GMU	*n*	Cows	Calves	Spikes	Branch	Calves	Spikes	Branch
673	94	53	27	7	7	51	13	13
658	69	47	14	3	5	30	6	11

Table 3. Results of post-season elk surveys (April 6,9,10, 2009).

		Antlerless		Antlered		Ratios per 100 cows		
GMU	*n*	Cows	Calves	Spikes	Branch	Calves	Spikes	Branch
673	305	218	56	27	4	26	12	2
658	261	191	43	23	4	23	12	2
648	190	126	44	14	6	35	11	5

Mountain Goat

MOUNTAIN GOAT STATUS AND TREND REPORT
Statewide

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

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). Twenty-one permits (18 general permits, 2 raffle permits, 1 auction permit) were available in 10 goat management units in 2008. The 2008 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.

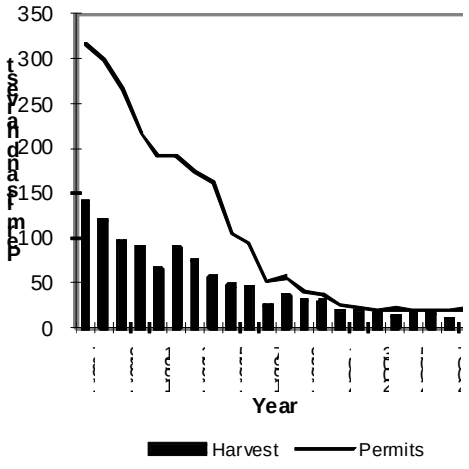


Figure 1. Mountain goat recreational hunting opportunity in Washington

Of the 21 permits available in 2008, 18 individuals actually reported that they hunted goats. A total of 15 goats were killed for a hunter success rate of 75%.

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 to slightly increasing.

Habitat condition and trend

Fire suppression policies and natural forest succession continues to degrade critical mountain goat foraging habitat. Fire suppression allows conifers to invade these natural openings and decreases their foraging value for goats. The degradation and loss of alpine meadows, coupled with increasing recreational human use and disturbance of alpine habitat are likely the two greatest negative impacts to mountain goats.

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. Future management activities should consider a goat translocation project to begin rebuilding goat populations in areas of vacant suitable habitat.

Table 1. Goat harvest statistics, 2008, WDFW.

Hunt Name	Total Applicants	Permits Issued	Total Harvest	Males Killed	Females Killed	Goats Seen	Days/Kill	Hunter Success
CHELAN NORTH	1,408	1	1	0	1	25	8	100%
METHOW	2,007	2	2	1	1	77	6	100%
NACHES/CORRAL PASSES	4,317	2	2	2	0	82	2	100%
BUMPING RIVER	4,057	2	2	2	0	82	4	100%
BLAZED RIDGE	3,626	2	1	0	1	54	8	50%
TATOOSH	1,236	1	1	1	0	12	18	100%
SMITH CREEK	1,261	1	0	0	0	13	0	0%
GOAT ROCKS/TIETON	5,825	5	5	5	0	229	4	100%
CHOWDER RIDGE	867	1	1	0	1	1	1	100%
AVALANCHE GORGE	775	1	0	0	0	40	0	0%
		18	15	11	4	615		75%

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 conservative, sustainable yield, with the goal of increasing herd size and distribution where possible. In addition to hunting recreation, 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

Hunters enjoyed good conditions in 2008 with the high country remaining accessible throughout the season. The two issued permits yielded two harvested goats in 2008 (Table 1), and hunters saw an average of 38 goats.

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

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, surveys must indicate a population size of at least 100 goats in a population management unit, such as Goat Unit 2-2. Since the Methow unit is below the 100 goat population size, no permits were issued in the Methow unit for the 2009 season.

Surveys

Annual surveys are conducted 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 2007, yielding a count of 61 animals; with only 8 animals observed in the Mt Gardner portion of the unit despite excellent survey conditions (Table 2). In most years, observers tally around 50 animals in this area. The scarcity of goats in the Gardner Mountain vicinity is unexplained, but is likely a survey artifact rather than a real reduction in animals. As a result, the high productivity observed in 2007 is almost entirely attributable to the Handcock Ridge area of the unit. No survey occurred in 2008, but one is planned for early fall 2009.

Table 2. Population composition counts from the Methow Unit, 1995-2009

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	--	--	--	--	--

*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.

In 2002, WDFW extended an ongoing goat research project to the Methow Unit with the radio marking of two mountain goats. These animals were part of a larger effort to assess population parameters and habitat relationships. The research findings suggest historical hunting levels may have been too high and unsustainable for goats. This lead to the hunting closure in units with less than 100 goats to allow these populations to recover. Because funding has not been sufficient to survey all goat units in the state, hunted units have been the priority for annual surveys. It is

hoped to survey the Methow at least every other year to document population status and trends. Also, a sightability model has been developed to improve survey data accuracy and consistency.

Population status and trend analysis

The survey effort in the Methow Unit has been consistent from 2000-2007 with the population remaining stable. Even so, it appears that productivity may vary significantly between different portions of the unit. These differences are likely explained at least in part by differing fire histories and corresponding differences in vegetation successional stages.

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 mild winter with a lower snow pack this past year. Excessive winter mortality was unlikely.

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

The mountain goat population in the Methow unit has been stable from 2000-2007 with no indication of change in 2008. With the recently completed mountain goat research finding the Methow unit population too low to provide recreational hunting opportunities, management continues to focus on population growth and distribution. As a result, emphasis should remain on providing the resources necessary for a consistent survey effort to monitor population status. Utilizing the newly developed sightability model will also provide improved survey accuracy and consistency leading to improved population estimates.

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 minimal interchange between the two herd segments. In addition, the Handcock Ridge band spends significant time west of the Cascade Crest. As a result, the feasibility of managing the areas as sub-herds should be examined. Also the Unit boundary for the northwest portion of the area should be redrawn to better incorporate occupied goat range.

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 objective for Chelan County mountain goats is to maintain self-sustaining goat populations in historic ranges and recreational hunting opportunities. Statewide mountain goat strategies recommend that before a population is 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 and nannies consisting <30% of the harvest (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 has been authorized each year since 2002. Few of these permits were successful, as animals were harvested in 2004 (billy) and 2008 (nanny) only. Characteristically rugged wilderness terrain with restricted access limits hunting success. The overall harvest success rate is 44%. Only two goats have been harvested the past 7 years, for a 29% success rate. Of the four goats harvested, only one was a nanny.

The North Shore Lake Chelan, has been hunted under a single permit, however, in 2009 it will be increased to 2 permits based on the increasing population and a quota of 2 still being <4% of the adult population. Based on the above criteria, the South Shore population is not large enough to sustain harvest at this time. Because the south shore population is small, it remains vulnerable and hunting is not yet justified. This population will continue to be surveyed annually to determine when population objectives are met. Other populations within the east Central Cascades (Chiwawa, Nason Ridge, and Wenatchee Mtn) have not been surveyed, therefore, no data is available to evaluate population size or trend, thus will not be hunted. Non-formal observations indicate current goat numbers are too low for harvest.

Surveys

Two survey methods have been used to monitor mountain goat populations in Chelan County. As part of a hydropower license agreement, the Chelan Public Utility District (PUD) annually conducts 12 winter wildlife surveys by boat on Lake Chelan along both the north and south. An estimate of the Lake Chelan population is based on the greatest total number of goats observed from all surveys completed during each winter. These data represent the only long-term data set for Chelan County goats (Pope and Cordell-Stine, 2009). However, sightability from the boat-based survey platform and the resulting ability to classify age is dependent on weather, which may account for the variability in observation data. Kid numbers and nanny:kid ratios may also be biased high with the inclusion of large number of unclassified goats (37 unclassified in 2008-09).

In other areas of Chelan County, helicopter surveys have been used in selected mountain goat ranges. Due to the high cost of surveys in difficult terrain where populations are at low densities, mountain goats are difficult to monitor. There have been no helicopter surveys from 2007-2009 as survey priority is focused on hunted herds, and boat surveys monitor both populations adjacent to the lake. As additional funds come available, priority should be given to collecting data on the other goat populations within the East Central Cascades zone. Currently, only coarse estimates exist from incidental observations on these populations.

Population status and trend analysis

Mountain goat populations in Chelan County are well below historic levels of the 1960s to 1980s (estimated at 500 goats). Except for the Lake Chelan population, mountain goats are not monitored closely enough in Chelan County to document population trends. Based on limited surveys since 1996, the Chelan County goat population appears stable to increasing (Table 2). The Lake Chelan populations have been closely monitored by the Chelan PUD for the past 20 years. Overall, their numbers appear to be increasing (Table 3). Kid:adult ratios are within productivity goals of 25 kids:100 adults, over a three year period, averaging 29 kids:100 adults for 2006-2008.

The North Shore population was estimated at 91 goats (range: 75-104), with 26 kids:100 adults (range: 24-29) over the last three years. Moderate kid production and low harvest success has yielded high goat numbers. Future harvest (assuming a harvest selection toward billies) is unlikely to inhibit this

slowly growing population. The south shore population was estimated over the last three years to average 81 goats (range: 76-102), with 30 kids:100 adults (range: 26-35). This population has consistently had higher production than the north shore over the last ten years.

Research

A statewide mountain goat research project was initiated to determine habitat use and seasonal range, population status, assess survey methods, and identify limiting factors in 2002. There were 3 adult nannies collared (two during July and one during January 2004) in Chelan County. One nanny was collared on Nason Ridge, one in the headwaters of Graham Harbor Creek on the south shore of Lake Chelan, and one along Point-No-Point Creek on the north shore. In 2005-2006 all goats were found to concentrate their activity in 4-5 mi^2 areas near their capture locations. The Nason Ridge nanny spent all of her time on the Ridge during 2005-2006. The Graham Harbor nanny has ranged between Graham Harbor, Graham Mountain, and Pyramid Mountain. The Point-No-Point nanny has been in the vicinity of Point-No-Point Creek, Little Goat Mountain, and Safety Harbor Creek. Two other nannies that were collared on Gamma Ridge on Glacier Peak have since traveled 10-12 miles east to the south shore of Lake Chelan. During winter 2005/2006, one was near Pinnacle Peak and the other near Bonanza Peak. This is the first documentation of goats sharing habitats across the Region 2 (D7) - Region 4 boundary. During fall 2006, 3 goats collared on Gamma Ridge were found in east Chelan County.

Habitat condition and trend

Fire suppression during the last 50 years has probably 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 management. A let-burn policy is currently in place for wilderness areas on the Wenatchee National Forest, except where it threatens homes, so habitat changes will probably occur slowly. Goat habitat conditions are expected to gradually improve as a result of this policy. Fires are anticipated to reduce habitat over the initial 1-2 years but should increase forage after that time. However forest cover will be reduced for decades.

During summer 2001, the Rex Creek fire on the north shore of Lake Chelan burned over 40,000 acres, including approximately 50% of the goat range. The Domke Lake fire occurred in the summer of 2007 on the south shore of Lake Chelan. A total of 11,900 acres were burned and much of it was in occupied goat habitat. Domke Lake has had several more small fires in 2008 and 2009.

Management conclusions

Mountain goat populations in Chelan County are below historic levels, thus, most of the populations are not hunted. Population trends of goats outside the Lake Chelan herds cannot be effectively monitored without additional survey resources. Based on year survey data, average kid production is gradually increasing in both the north and south shore populations. Emphasis should be placed on expanded surveys in the East Central Cascades to better understand current mountain goat populations and their distribution.

Literature cited

Pope, V. R. and Cordell-Stine, K. A. 2009. Lake Chelan Winter Wildlife Status Report: Winter of 2008-2009. Chelan Public Utility District, Wenatchee WA.

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

Table 1: Mountain Goat Harvest for North Shore Lake Chelan, 2001-2008.

Year	Permits Issued	Hunters	Goats Harvested	Percent Success	Goats Observed by Hunters	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

Table 2. Mountain goat counts in Chelan County, 1996-2008.

Year	Area**						
	North Lake Chelan	South Lake Chelan	Stehekin	Chiwawa	North Wenatchee Mtns.	Nason Ridge	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	94	66		15	23		198
Population Estimate	100	66	20	75	60	24	345
Range	90-115	60-100	15-30	50-100	50-75	13-35	

** Chiwawa: Chelan County north of Little Wenatchee River, east of Cascade Crest
Nason Ridge: North of highway 2, south of Little Wenatchee River
North Wenatchee Mtns: West of highway 97, north Chelan/Kittitas county line, east of Cascade Crest, south of highway 2.

Table 3. Mountain goat population composition for Lake Chelan, 1994 - 2008. Chelan County PUD survey data.

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
Average	97	23	119	23

MOUNTAIN GOAT STATUS AND TREND REPORT: REGION 3
Goat Units: 3-6/4-38, 3-7, 3-10, 3-11

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 2008, there were 6 general permits spread over 3 units open to hunting (Tables 1-4). Nine goats were taken as both raffle and the auction tag holder hunted the Region.

Surveys

Tables 1-4 show annual survey results for 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 2008, surveys were conducted during August and September.

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 on goats.

All goat populations in the Region appear to have declined from historic levels, probably due to over harvest. Research suggests harvesting no more than 4% of the adult population. Harvest in the Bumping from 1980-1996 average over 6 goats annually. The high count for adults was 66, for an estimated harvest of 10%. Since 1997, harvest has been more conservative and the population may be recovering. The unit is large, with extensive habitat and cover. It is easy to miss entire groups of animals on a survey, as happened in 2004 and 2006. The total population in the survey area is estimated at approximately 100 goats.

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. A sustainable harvest in Naches/Corral Pass during the 1990's would have required an adult population of at least 200; the population estimate at the time was about 70. Recent reductions in harvest and high recruitment in 2004 and 2008 has helped the population rebound. Combined data for our surveys and those conducted by the Muckleshoot Indian Tribe in the western portion of the unit indicate the population maybe much higher than the 116 seen in 2008.

Blazed Ridge was historically included as part of the Naches Pass unit. In 1996, permits were issued for the new Blazed Ridge unit. Historically, the unit may have been over-harvested. Historic records indicate it was not unusual to issue 40 permits for the area. The high count in 1997 was due to a large group of goats that were probably passing through the unit as they were not in typical goat habitat and have not been seen since. In recent years, 70-80 animals are typically seen on 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. Surveys in 2004 and 2005 excluded Davis and Goat Peaks, which have few animals. The current population for the entire area is probably less than 50 animals. This unit is the smallest unit in the region.

Habitat condition and trend

The majority of goats in the Bumping, Tieton and Naches Pass spent 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 of wilderness areas. Timber harvest has/is occurring in both units. The north portion of the Blazed ridge unit has been particularly heavily harvested. The timber cutting has probably improved summer habitat, but

may have removed winter cover. Roads 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 development 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 probably declined over historical levels. Over-harvest appears to have been a factor. Harvest has been reduced and populations appear to be 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 "populations". Current resources for surveys are limited. Options for collecting better quality data need to be explored.

Table 1. Harvest and surveys for 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

*Includes raffle/auction *Includes 21 unclassifed

Table 2. Harvest and surveysfor goat Unit 3-6,4-38 Naches/Corral Pass

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

* Includes auction/raffle permit hunter

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

Harvest Information				Survey Data			
Year	Permits	Hunters	Harvest	Kids	Adults	Total	K:100
1991				9	22	31	41
1992-5		NO DATA					
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		NO DATA		
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

* Includes auction/raffle

[a] Probable double count of ~15 animals

Table 4. Harvest and surveys for goat Unit 3-11 Kachess Ridge

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

JENNIFER BOHANNON, 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% 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. One female goat was harvested by a state permit holder in these units in 2008 (Table 1). Additionally, the Tribes reported harvesting one female goat in 2008.

Surveys

In September 2008, 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 WDFW, Sauk-Suiattle Indian Tribe, and the Northwest Indian Tribal Commission. A Hughes 500-D 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 338 goats were observed on Mt. Baker, Mt. Shuksan (Lake Ann), and Loomis Mountain (Table 2). For the Mt. Baker survey blocks, the total count and age composition were lower than the July 2005 and 2006 and August 2007 surveys (Table 3). Cool, rainy weather delayed the 2008 survey until September and this later date could have affected sightability if goats were in smaller groups and/or at lower elevations than in July or August. When adjusted for sightability bias due to group size, terrain obstruction, and vegetation obstruction, the number of goats on Mt. Baker in 2008 is estimated at approximately 360 animals (Table 4).

The Department of Fish and Wildlife initiated a mountain goat research project in 2002 that included

Table 2. 2008 mountain goat survey results for the Mt. Baker/Loomis Mountain area.

Block	Total	Adults	Yearlings	Kids	Unknown
Black Buttes	53	29	6	18	0
Heliotrope	10	8	1	1	0
Chowder Ridge	84	53	10	14	7
Sholes Glacier	13	9	1	3	0
Coleman Pinnacle	106	68	12	25	1
Lava Divide	42	29	2	11	0
Lake Ann	26	20	2	4	0
Loomis Mountain	4	4	0	0	0
Total	338	220	34	76	8

Table 3. Mt. Baker* mountain goat surveys 2003-2008.

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

*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. Therefore, the ratio K:100 has changed to exclude yearlings starting in 2004.

Table 1. Summary of harvest information for mountain goats in north Puget Sound, 2007-2008.

Unit	Year	Permits	Harvest	Success (%)	Goats seen	Kids seen	Days hunted
Chowder Ridge	2008	1	1	100	1	0	1
	2007	1	1	100	150	12	7
Avalanche Gorge	2008	1	0	0	40	2	0
	2007	1	1	100	57	17	5

Table 4. Mt. Baker sightability estimates 2008

	Observed	Estimates	90%CI
Groups	80		
Total	308	360.1	329.7-390.6
Adults	196	232.8	215.9-249.7
Yearlings	32	36.2	31.2-41.1
Kids	72	82.0	73.8-90.2
Unknown	8	9.2	5.5-12.9
Adults & Yearlings	228	269.0	244.9-293.0
Juveniles	104	118.2	107.1-129.2
Kids/Ad+Yl	0.32	0.30	0.28-0.33
Juv/Adult	0.53	0.51	0.49-0.53

Dates: 09/09/2008, 09/10/2008
Blocks: Black Buttes, Chowder Ridge, Coleman Pinnacle, Heliotrope, Lava Divide, Sholes Glacier

cooperators such as the U.S. Forest Service, the National Parks Service, the Sauk-Suiattle Tribe, the 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

Hebert, D.M. and Turnbull, W.G. 1977. A description of southern interior and coastal mountain ecotypes in British Columbia, 1st Annual Symposium Mt. Goats. 21pp.

2009 MOUNTAIN GOAT STATUS AND TREND REPORT: REGION 5
Goat Rocks, Smith Creek, Tatoosh

PATRICK J. MILLER, District Wildlife Biologist

Population objectives/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. The Goat Rocks-Tieton River unit probably has one of the highest goat population in the state of Washington. Hunting in all three units is allowed by permit only. In 2008, a new Game Management Plan (GMP) for the State of Washington (WDFW 2008) adopted a new minimum population size for goat units to be open for hunting. An estimated 100 goats in a Goat Management Unit need to be present for hunting to take place beginning in 2009.

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 2008: Smith Creek = 1; Tatoosh = 1; 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 stable to 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 (see Surveys below). 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 comprised of narrow strips of alpine vegetation with heavy forest nearby.

Prior concern over low recruitment or increasing adult mortality in the Goat Rocks Unit led to a reduction in permits from 10 to 7 in 1998. The permit levels for Goat Rocks were combined with Tieton River for 2003. Permit levels were reduced by 1 in 2003 to allow for potential raffle or auction hunter harvest outside the permit process. Concerns over lower hunter success combined with habitat loss in the Smith Creek Unit supported the decision to reduce the permits in this unit from 3 to 1 in 2001.

Weather conditions in 2008 were moderate for goat hunting. Periods of warm dry weather during the early weeks of September made hunting difficult, particularly for those hunters in the Tatoosh Unit. The majority of animals in Tatoosh available for harvest migrate out of Rainier National Park with the onset of snow at the higher elevations. Warm weather tends to delay this movement. Weather conditions moderated as September progressed, and cooler weather prevailed during most of October. Harvest in Goat Rocks was distributed throughout the first month of the 'any weapon' season.

Hunter success from 1993 to 2008 is depicted in Table 1. Historically, success rates in the Goat Rocks Unit approach 100% and this was the case in 2008. This unit contains extensive, high quality habitat; has the highest goat numbers; and is comprised of resident animals. Success rates in Goat Rocks since 1993 appear stable. The number of goats seen by hunters is also stable.

Since 1993 success rates in Tatoosh have also been stable. The single hunter in the unit in 2008 did harvest a goat. Goat sightings per hunter are mixed, though many sightings are from areas north of the hunt unit boundary, in Mt. Rainier National Park.

Goat hunting (archery only) was initiated in the Smith Creek Unit in 1993, following augmentation and recovery of the population. The endemic goat population was nearly extirpated due to over exploitation facilitated by easy hunter access and the patchy distribution and lower quality of goat habitat in the unit. Permit allocation was conservative (n=3) for the first few years of hunting in Smith Creek and overall harvest was acceptably low with favorable population response. Subsequently, permits were increased to 5 in 1995 and the change in 1997 to any weapon resulted in a return to 3 permits. However, the number of goats seen has been declining and as a result, in 2001, the permit number was decreased to one. The single permit holder in 2008 reported not killing a goat.

Surveys

Recently, survey coverage has expanded to include all three Mt. Goat Units in Region 5. Part of this expanded coverage was part of a Mt. Goat study that was conducted by WDFW. One of the study objectives was to estimate sightability of goats during aerial surveys. Concern has long been expressed over the portion of the goat population that is observed during a flight and hopefully this study will begin to answer that question.

In 2008, all areas of goat habitat in all three goat units were surveyed. No goats were observed in the Tatoosh unit. Seventeen goats were observed in the Smith Creek unit, a 50% reduction in comparison with the previous year. The Goat Rocks/Tieton survey yielded 268 animals, which indicates that the conservative nature of the permit harvest may be helping to increase this population.

Population status and trend analysis

Goat populations in Tatoosh seem to be low. In the surveys during 2002-2008, all of the goats observed were in the National Park. Permit levels for 2008 remained at 1 and the unit will be closed in 2009. Populations in Smith Creek are also low and becoming a concern to managers. This unit will also close to hunting in 2009 due to low numbers of goats. Population status in the Goat Rocks is hopefully on the increase. Survey data from 2004 through 2008 indicate an increased number of goats. Even when the Tieton River unit influence is incorporated, this unit will remain open for permit harvest per the GMP. Results of the cooperative Cispus AMA study with the USFS indicate that goat populations are expanding in several areas of the Region. Population estimates for the three Mt. Goat Management Units are presented 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 (USFS) 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 unlikely of a prescribed burn program in the foreseeable future. Presently, it does not appear that habitat is limiting goats; however, enhancement will have to be pursued in the future, as more and more habitat in the Smith Creek Unit is lost to conifer encroachment.

Management conclusions

All three mountain goat units in Region 5 are valued for both viewing and hunting. New Mt Goat management direction dictates that the Smith Creek and Tatoosh units be 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.

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) coverage could be used to identify suitable goat habitat within unsuitable matrices of 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.

Literature cited

Adams, L. G., and J. A. Bailey. 1982. Population dynamics of mountain goats in the Sawatch Range, Colorado. Journal of Wildlife Management 46:1003-1009.

Brent, H. 1960. Helicopter goat counts. Unpublished report, Washington Department of Game.

Caughley, G. 1977. Analysis of vertebrate populations. John Wiley & Sons, New York, N.Y. 234pp.

Czaplewski, R. L., D. M. Crowe, and L. L. McDonald. 1983. Sample sizes and confidence intervals for wildlife population ratios. Wildlife Society Bulletin 11:121_128.

Rice, Clifford, D. 2008. Washington Mt Goat Population Estimate,

Festa-Bianchet, M, and M. Urquhart. 1994. Mountain goat recruitment: kid production and survival to breeding age. Can. J. Zool. 72:22-27.Hemstrom, M. A. 1979. A recent disturbance history of the forest ecosystems of Mount Rainier National Park. Ph. D. Thesis, Oregon State University, Corvallis, OR. 67 pp.

Houston, D. B., B. B. Moorhead, and R. W. Olson. 1986. An aerial census of mountain goats in the Olympic Mountain Range, Washington. Northwest Sci. 60:131-136.

Kogut, T. 1996. Trends in Natural Meadows within Mountain Goat Habitat, Cispus Adaptive Management Area. USFS Gifford Pinchot Nat. For. Unpublished Report. 9pp.

Olmsted, J. 1979. Mountain goat winter habitat study. Job completion report, W_88 R_3. Wash. Dept. Of Game, Olympia WA. 50 pp.

McCullough, D. R., and D. H. Hirth. 1988. Evaluation of the Petersen-Lincoln estimator for a white-tailed deer population. Journal of Wildlife Management 52:534-544.

WDFW, 2008. Game Management Plan 2009-2015, 136

Table 1. Hunter survey summary statistics for Region 5 mountain goat harvests, 1993-2008.

Unit	Year	Permits Issued	Harvest*	Success (%)	Avg. goats seen	Kid:Adult seen	Avg days to harvest
Smith Creek	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	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	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, 1998 - 2008.

Goat Unit	Year	Adult	Yearling	Kid	Unknown	Total	Kid:Adult
5-2 Tatoosh	2008	0	0	0	0	0	N/A
	2007	1		1	0	2	N/a
	2006***	16		4	0	20	25:100
	2005	12	4	6	0	22	37:100
	2004	5	0	2	0	7	40:100
	2003	2	3	1	0	8	14:100
	2002	5	3	1	1	10	11:100
	2001	6	1	2		9	33:100
	2000	9	0	2		14	22:100
5-3 Smith Creek	2008	9	2	4	2	17	44:100
	2007	28	0	6		34	46:100
	2006	16	6	5		27	31:100
	2005	15	6	11		34	52:100
	2004	16	3	11		30	42:100
	2003	9		6		15	67:100
	2002	8	3	6		17	54:100
	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	2008	178	23	60	7	268	34:100
	2007	****					
	2006	203	14	71		290	35:100
	2005**	188	47	66		303	28:100
	2004**	183	31	43		261	20:100
	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 (2008).

Area	Unit	Mt. Goat Unit	Estimate
Goat Rocks	Goat Rocks/Tieton R.	5-4	282
Smith Creek	Smith Creek	5-3	32
Tatoosh	Tatoosh	5-2	10

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 been high over the last 3 years as bighorn numbers increase (Figure 1). Thirty-six general season permits, one auction permit, and two raffle permit were available in twelve different sheep management units for and a total of 38,905 applicants entered the drawing. The 2008 bighorn sheep season was September 15 to October 10, (except 4 areas; either October 1-10 or November 3-30). Hunters had the choice of any legal weapon to harvest any bighorn ram (no curl restrictions). Of the 36 permits available in 2008, all individuals reported that they hunted bighorn sheep. A total of 32 sheep were killed for a hunter success rate of 98%.

Surveys

All bighorn sheep units open to hunting in 2008 were surveyed. Surveys also were conducted in all non-hunted populations, including the 4 herds of the Blue Mountains. Survey efforts in this area continue to be a priority as we attempt to document population recovery from the 1995 *pasteurella* outbreak. 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 stable, with a sizable mature ram component. California bighorn populations remained stable in most herds (see individual herd reports).

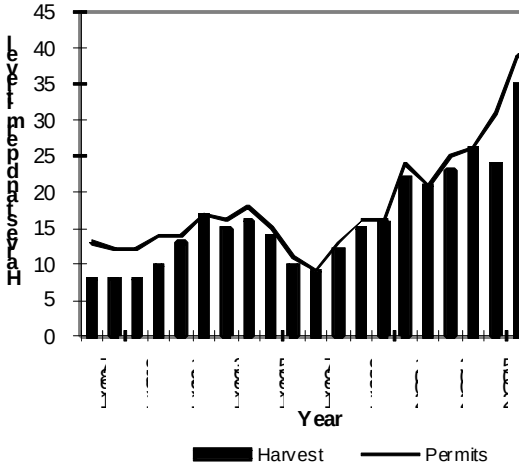


Figure 1. Trend in bighorn sheep recreational hun

Table 1. Bighorn sheep harvest statistics, 2008, WDFW.

Hunt Number	Hunt Name	Total Applicants	Permits Issued	Total Harvest	Sheep Seen	Lambs Seen	Days/Kill	Hunter Success
5001	VULCAN MOUNTAIN A	1,357	1	1	35	9	12	100%
5002	VULCAN MOUNTAIN B	39	2	2	120	0	3	100%
5003	SELAH BUTTE	5,371	5	5	325	72	2	100%
5004	UMTANUM	6,142	5	5	177	36	3	100%
5005	CLEMAN MOUNTAIN A	5,129	4	2	99	40	1	67%
5006	CLEMAN MOUNTAIN B	4,251	4	4	525	60	6	100%
5007	MT. HULL	1,502	2	1	100	5	4	100%
5008	WENAHA	1,372	1	1	4	2	2	100%
5009	LINCOLN CLIFFS	1,290	1	1	42	8	3	100%
5010	QUILOMENE A	3,502	4	4	197	32	4	100%
5011	SWAKANE	2,583	1	1	32	4	6	100%
5012	TIETON	2,469	3	2	69	4	1	100%
5013	MANSON	2,144	2	2	140	30	8	100%
5014	ASOTIN	1,754	1	1	9	4	3	100%
		38,905	36	32	1,874	306		98%

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.

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).

Restoration of bighorn sheep should remain a top priority. A new herd was established at Chelan butte in 2004 and a new translocation project is scheduled in the Tucannon herd for 2009-10 winter.

BIGHORN SHEEP STATUS AND TREND REPORT: REGION 1
Hall Mountain

DANA L. BASE, DISTRICT WILDLIFE BIOLOGIST

Population objectives and guidelines

Rocky Mountain Bighorn Sheep were introduced to Hall Mountain from Alberta, Canada in 1972 (Johnson 1983). The traditional objective has been to maintain a population of 40–70 Rocky Mountain Bighorn Sheep within the Hall Mountain Herd. The Hall Mountain Herd has not been hunted; however, beginning in 2009 this population of bighorn sheep will be available for harvest to the one Rocky Mountain Bighorn Sheep Raffle Permit winner. In the past this population was used as a primary source for transplants of Rocky Mountain Bighorn Sheep to other parts of the state.

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 no feeding occurred from then on. Reconnaissance of the feeding site vicinity was made the first winter, 2003-2004, to assess reaction of the sheep to the loss of the feed source. Few sheep were observed. A survey accomplished the following year on January 6, 2005 documented 27 bighorn sheep at the old feeder site. As these sheep are replaced by their progeny, they appear to have lost much of their former fidelity to the winter-feeding site. Indeed sheep have not been routinely observed at the old feeder site since 2004.

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

The U.S. Forest Service (USFS: Sullivan Lake Ranger District, Colville National Forest) regularly monitored survival and movements of a number of bighorn sheep from the Hall Mountain Herd by radio telemetry from 1995 - 1999 (Baldwin 1999, Aluzas 1997, and Bertram 1996). Since the year 2000 radio-tracking was carried out only intermittently by USFS and Washington Department of Fish and Wildlife (WDFW) personnel. The latest radio-tracking was accomplished from the Sullivan Lake Road at the south end of Sullivan Lake on March 20, 2006. A radio signal was received from only 1 ewe on that date (Table 2). All of the radio collars have been deployed for well over 5 years. Consequently the batteries on the other radio-collared sheep have gradually become too old and depleted to allow signal transmission.

Of the 21 total bighorn sheep that were fitted with radio transmitters beginning in December of 1995, 13 had confirmed mortalities. These mortalities included 7 rams and 6 ewes. Three other radio-collared sheep are of unknown status as radio contact was after the year 2000 and 2 of the 3 had no ear tags. Of the remaining 5 radio-collared sheep, 2 were observed at the Canada Highway 3 Feeder as recently as March 2006. The remaining 3 were been monitored by radio telemetry as recently as January and April 2005 for 2, and March 2006 for the third (Table 2).

There were two ground-based surveys of these bighorn sheep accomplished in the winter of 2008-2009 along with some incidental observations The composite total count was 23 sheep including 4 rams, 14 ewes, and 5 lambs (Table 1).

Habitat condition and trend

Northeastern Washington is densely forested and bighorn sheep depend upon the steep terrain and open grasslands on Hall Mountain and other scattered sub-alpine openings for forage and predator avoidance. Between Hall Mountain, Sullivan Mountain, Crowell Ridge, and Gypsy Ridge non-forested escape terrain is limited and fragmented. Sheep migrating between these and other peaks and ridges have to go through dense forest where vulnerability to predators including cougars and bears increases.

The U.S. Forest Service owns virtually all the bighorn sheep habitat. Consequently, there are no immediate threats to habitat quality and quantity. The U.S. Forest Service plans to continue to actively manage winter range habitat with controlled burns, but this is subject to project funding. There are no domestic livestock grazing on the portion of the national forest frequented by the bighorn sheep.

Augmentation and translocation

The last year that bighorn sheep were trans-located from Hall Mountain was in 1993 (Table 1). The feeder site at Noisy Creek presented the ability to easily capture sheep for studies or trans-location. With the closure of the feeder site in 2003 the annual trapping activities ended. The WDFW has no further plans to trap sheep at Hall Mountain at this time.

Management conclusions

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

With the loss of the ability to reliably survey sheep at the feeder site each winter, new survey techniques and protocol have been developed. Ground-based surveys are time intensive and generally require more than one visit to obtain a reasonable composite count. As the sheep disperse over a wider range for forage, they are less likely to be observed with a high rate of precision. Expensive helicopter surveys may occasionally be necessary in the future. If the population increases to a level near the parameters required for general permit hunting, the herd will need to be monitored even more closely.

References Cited

Aluzas, K. 1997. Bighorn Sheep radio-telemetry monitoring progress report # 2. Sullivan Lake Ranger District, Colville National Forest. Unpublished report. 10 p.

Baldwin, T. 1999. Bighorn Sheep radio-telemetry monitoring progress report # 4. Sullivan Lake Ranger District, Colville National Forest. Unpublished report. 5 p.

Bertram, T.M. 1996. Bighorn Sheep radio-telemetry Monitoring progress report # 1. Sullivan Lake Ranger District, Colville National Forest. Unpublished report. 4 p.

Johnson, R.L. 1983. Mountain Goats and Mountain Sheep of Washington. Biol. Bull. No. 18. Wash. State Game Dept., Olympia. 196 p.

Mowat, G. 2007. BC Environment, Fish and Wildlife Section. British Columbia, Canada. Personal communication.

Suarez, R.V. 2001. Lake Basin Prescribed Burn. Sullivan Lake Ranger District, Colville National Forest. Rocky Mountain Elk Foundation Project Completion Report - Unpublished. 2 p.

Washington Department of Fish and Wildlife. 2003. Game Management Plan. Wash. Dept. Fish and Wildlife, Olympia, Wash. 136 p.

Table 1. Population composition counts of Hall Mountain Bighorn Sheep since herd establishment in 1972 to 2009. (Note that the last year of winter feeding was in 2003. Also, subsequent to the original release of 18 sheep in 1972, there has been only one additional introduction, which was of two adult ewes in 1981. There have been 85 sheep translocated out of this population over 9 separate years. In addition, some sheep from this population broke off from the Hall Mountain Herd and established a new population in the Kootenay Pass area of British Columbia, Canada in about 1982).

				Count	*Number Trans-located*			Ratio
YEAR	Lambs	Ewes	Rams	Total	Lambs	Ewes	Rams	*Lambs:100 Ewes:Rams*
1972	0	13	5	18				0 : 100 : 38
1973	No Data	No Data	No Data	No Data				No Data
1974	7	No Data	No Data	19				No Data
1975	5	No Data	No Data	22				No Data
1976	2	7	5	14	2	5	2	29 : 100 : 71
1977	No Data	No Data	No Data	No Data				No Data
1978	5	10	6	21				50 : 100 : 60
1979	8	No Data	No Data	27				No Data
1980	9	15	4	28				60 : 100 : 27
1981	14	24	10	48				58 : 100 : 42
1982	15	34	21	70	4	8	3	44: 100 : 62
1983	13	22	13	48	7	3	1	59 : 100 : 59
1984	17	27	17	61				63 : 100 : 63
1985	12	29	21	62	8	15	3	41 : 100 : 72
1986	9	11	13	33			1	82 : 100 : 118
1987	6	10	12	28	2		1	60 : 100 : 120
1988	5	12	10	27				42 : 100 : 83
1989	9	15	13	37				60 : 100 : 87
1990	11	20	19	50	3			55 : 100 : 95
1991	6	12	12	30	1	3	2	50 : 100 : 100
1992	5	14	12	31				36 : 100 : 86
1993	9	18	13	40	3	4	4	50 : 100 : 72
1994	6	14	13	33				43 : 100 : 93
1995	5	15	10	30				33 : 100 : 67
1996	5	17	10	32				29 : 100 : 59
1997	3	14	10	27				21 : 100 : 71
1998	6	11	8	25				55 : 100 : 73
1999	6	14	9	29				43 : 100 : 64
2000	4	13	9	26				31 : 100 : 69
2001	4	11	8	23				36 : 100 : 73
2002	7	13	4	24				54 : 100 : 31
2003	No Data	No Data	No Data	No Data				No Data
2004	No Data	No Data	No Data	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

Table 2. Radio-telemetry tracking of 21 bighorn sheep from Hall Mountain and their most recent status.

Ear Tag #	Mo/Yr Radio-Tagged	Sex	Capture Age	Latest Status
Orange 12	12/1995	M	10+	Mortality in July 1997.
Yellow 28	12/1995	F	2.5	*Last observed at Canada Hwy. 3 Feeder on 3/6/2006.*
Yellow 30	12/1995	F	2.5	Mortality in July 1998.
Scarlet 12 (formerly Red 11)	02/1996	M	4+	Mortality in fall of 2000.
Red 14	02/1996	F	4+	Mortality by Cougar in January 2001 at Noisy Creek Feeder.
Red 39	12/1996	F	4+	Mortality in August 1997.
Scarlet 13	12/1996 & 01/2000	M	6+	Mortality discovered in August 2003.
Yellow 29	12/1996	M	8.5	Mortality in August 1997.
Scarlet 4	12/1996	F	2.5	*Last radio signal received near Sullivan Lake on 3/20/2006. Last observed from Sullivan Lake Road on 12/1/2006.*
None	12/1996	F	4+	Mortality in September 1997.
None	12/1996	M	4+	Unknown - latest signal at Hall Mountain in early 2000.
Red 16	12/1996	M	2.5	Unknown - last detected at Hall Mtn. on 10/10/1997.
None	12/1996	M	4+	Unknown - last detected at Hall Mountain in early 2000.
Green 8	12/1996	F	2.5	*Last observed at Canada Hwy. 3 Feeder on 3/6/2006.*
Lavender 51	01/1999	F	4+	Mortality in March 2000.
Lavender 52	01/1999	F	4+	*Radio signal received near Sullivan Lake on 4/27/2005.*
Lavender 54	01/1999	F	6.5	*Radio signal received near Sullivan Lake on 1/5/2005 and last observed on the northwest side of Sullivan Lake in July 2005.*
Lavender 58	01/1999	M	4+	Mortality in June 2000.
Green 18	01/1999	M	4.5	Mortality in September 2000 on Sullivan Mountain.
Scarlet 10	01/2000	F	Adult	Mortality on lower Hall Mountain in September 2002.
Scarlet 11	01/2000	M	Subadult	Mortality at the Canada Hwy. 3 Feeder on 12/7/2001.

BIGHORN SHEEP STATUS AND TREND REPORT: REGION 1
Vulcan Mountain

DANA L. BASE, District Wildlife Biologist

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 total of 82 bighorn sheep were observed on October 29, 2008 including 18 rams, 19 lambs, 42 ewes, and 3 unclassified sheep. This is the highest count since 1990 (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 (Figure 1).

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) have hunted bighorn sheep within the Vulcan Mountain Unit. Biologists annually confer prior to developing their respective permit recommendations. Recreational permit-only hunting began in 1981. From 1981 through 1999 there were 49 bighorn sheep legally harvested from the Vulcan Unit including 48 rams and 1 ewe (Table 2). 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 (Table 2).

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

Table 1. Annual population composite counts of the Vulcan Mountain Bighorn Sheep Herd from 1980 through 2008.

			Rams					Ratio
Year	Lambs	Ewes	Yearling	<3/4 curl	>3/4 curl	Total Rams	Total Sheep	Lambs : 100 Ewes : Rams
1980	14	27	-	-	-	18	59	52 : 100 : 67
1981	14	22	-	-	-	6	42	64 : 100 : 27
1982	15	18	-	-	-	13	46	83 : 100 : 72
1983	9	25	-	-	-	17	51	36 : 100 : 68
1984	22	33	-	-	-	18	73	67 : 100 : 55
1985	-	-	-	-	-	-	-	No survey in 1985
1986	15	40	-	-	-	21	76	38 : 100 : 53
1987	17	35	-	-	-	12	64	49 : 100 : 34
1988	22	47	-	-	-	14	83	47 : 100 : 30
1989	21	35	-	-	-	18	74	60 : 100 : 51
1990*	28	53	-	-	-	26	107	53 : 100 : 49
1991	11	36	-	-	-	24	71	30 : 100 : 67
1992	11	32	-	-	-	13	56	34 : 100 : 41
1993	8	37	-	-	3	9	54	22 : 100 : 24
1994	10	41	-	-	9	18	69	44 : 100 : 24
1995	10	26	3	13	9	25	61	38 : 100 : 104
1996	2	22	1	11	7	19	43	9 : 100 : 86
1997	3	19	2	21	7	30	52	16 : 100 : 158
1998	0	8	0	9	7	16	24	0 : 100 : 200
1999	0	16	0	6	2	8	24	0 : 100 : 50
2000	2	9	0	4	4	8	19	22 : 100 : 89
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

* Annual “censuses” have been conducted regularly in the fall from 1990 to the present.

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.

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 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. Monitoring since that time has

shown little movement from 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 private property forage range seeding projects accomplished 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).

Table 2. Summary of State and Colville Confederated Tribes (CCT) hunter harvest of bighorn sheep from the Vulcan Mountain Unit from 1981 through 2008.

Year	Org.	# Tags	Harvest	Avg. Age
1981	State	3	3 rams	6.3 years
1982	State	3	3 rams	7.7
1983	State	3	3 rams	6.3
1984	State	2	2 rams	5.5
1985	State	2	1 ram	4.5
1986	State	3	3 rams	7.7
1987	State	3	3 rams	7.3
1988	State	3	3 rams	No data
1989	State	2	2 rams	6.5
1990	State	3	3 rams	6.7
1991	State	2	2 rams	6.5
1992	State	3	3 rams	6.3
1993	State	4	4 rams	5.8
1994	State	4	4 rams	6.3
1995	State	2	2 rams	5.5
1995	CCT	2	1 ram	1.5
1996	State	2	2 rams	6.6
1996	CCT	2	1 ram, 1 ewe	Ram = 1.5
1997	State	1	1 ram	6.5
1997	CCT	1	None	---
1998	State	1	1 ram	5
1998	CCT	1	None	---
1999	State	1	1 ram	10.5
1999	CCT	1	None	---
2000	No	tags	allocated	---
2001	No	tags	allocated	---
2002	No	tags	allocated	---
2003	No	tags	allocated	---
2004	No	tags	allocated	---
2005	State	1	1 ram	4.5
2005	CCT	1	None	---
2006	State	1	1 ram	2.5
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	4.5

Management conclusions

The Vulcan Mountain Herd of bighorn sheep has recovered in health and in population. Lamb ratios since 2001 average over 50 lambs per 100 ewes. With healthy lamb recruitment, the Vulcan Mountain Herd has 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 (WDFW 2003), 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). One permit for any ram was authorized and filled in each of the 2005 and 2006 fall seasons. The CCT permit for "any bighorn sheep" was not filled and reportedly not hunted in 2005 (Demers 2006). 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 has been added for the 2009 hunt for youth hunters only (under age 16) making a total of 4 permits, 1 ram and 3 ewes.

Literature Cited

Demers, D. Colville Confederated Tribes. Personal communication in 2006.

Doloughan, K., U.S. Dept. of Interior: Bureau of Land Management. Personal communication in 2004.

Foreyt, W. J., Ph.D. Washington State University. Personal communications from 1999 through 2005.

Gajadhar, A. A., Ph.D. Canadian Food Inspection Agency – Saskatoon, Saskatchewan Laboratory. Personal communication in 2002.

Hall, P. B., DVM. Washington Department of Fish and Wildlife. Personal communications from 1999 through 2002.

Judd, S. Colville Confederated Tribes. Personal communications from 1994 through 2001.

Krausz, E. Colville Confederated Tribes. Personal communications, 2006-2009.

Mansfield, K. DVM. Washington Department of Fish and Wildlife. Personal communication in 2007.

Murphy, B., PhD. 2000. Washington Animal Disease Diagnostic Laboratory, Report No. 2000-12482.

Washington Department of Fish and Wildlife. 2003. Game Management Plan. Wash. Dept. Fish and Wildlife, Olympia, Wash. 136 p.

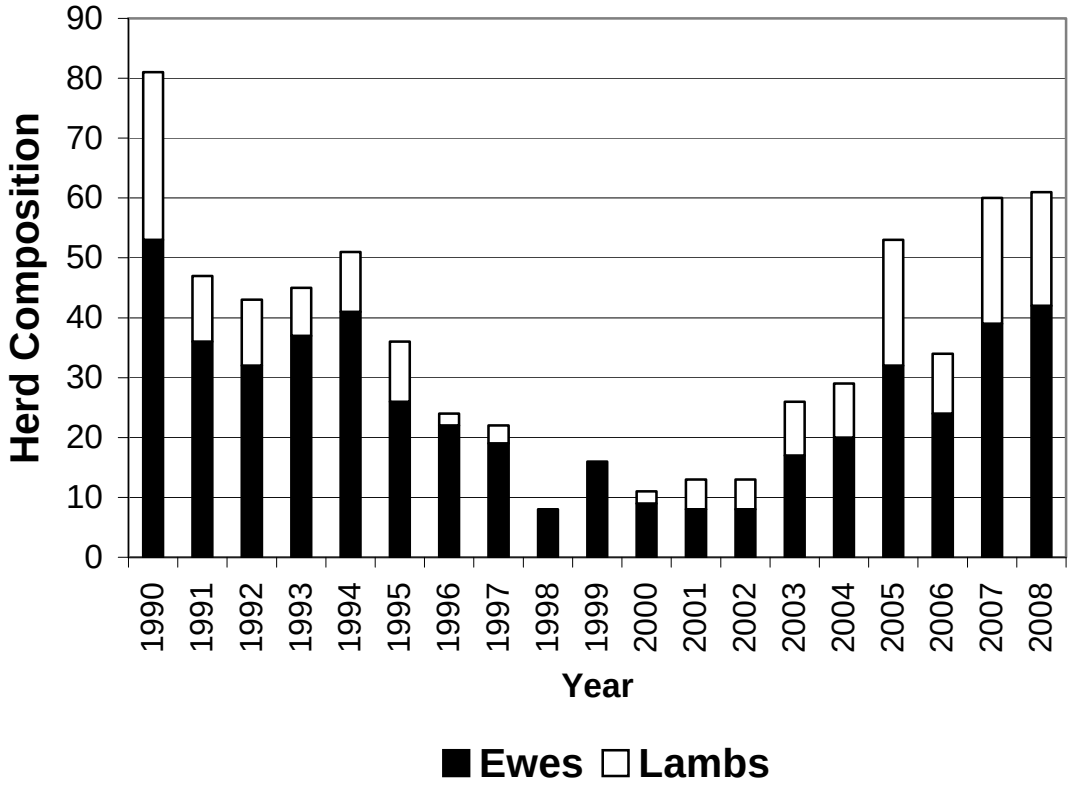


Figure 1. Vulcan Mtn. Bighorn sheep ewe and lamb composition, 1990-2008.

BIGHORN SHEEP STATUS AND TREND REPORT 2009: REGION 1
Lincoln Cliffs

HOWARD L. FERGUSON, District Wildlife Biologist
MICHAEL T. ATAMIAN, Wildlife Biologist

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 into the Hellgate area of the Colville Indian Reservation, north side of Lake Roosevelt.

Hunting seasons and harvest trends

The first hunting permit for this herd was issued for the 1997-hunting season. Since then, one permit has been issued each year and harvest success has remained at 100%.

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	1375	40	12	4
2006	1218	8	3	0
2007	1326	7	1	2
2008	1290	42	8	0

The number of applicants for the Lincoln Cliffs hunt has been fairly stable for the past five years, averaging around 1300 a year (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.

From 1997 to 2007, hunters have spent on average five days hunting per kill (Table 2). However, in 2006 and 2007 the permitee spent only one day hunting per kill decreasing the running 3-year average to two 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, 15 mature rams have been removed by hunting by either the regular permittees or the auction and raffle winners. The number of mature rams seen by hunters has been variable over the years, 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 (Table 2).

Table 2. Days per kill.

Year	Days/Kill	Last 3 yrs Running Avg.
1997	6	
1998	14	
1999	4	8
2000	1	6
2001	3	3
2002	3	2
2003	1	2
2004	7	4
2005	11	6
2006	1	6
2007	1	4
2008	3	2
Avg.	**5.0**	

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 will be conducted, whenever possible, to supplement the aerial surveys.

Over the years aerial surveys have been inconsistent due to funding and personnel. However, since 2002 a concerted effort has been made to conduct two aerial surveys per year – one in the spring and one in late fall. These surveys were facilitated by radio collaring thirteen of the 15 sheep translocated in 2003; however as of 2007 no collars remain active. The data in table 3 is not a reflection of the population number, since each year is a combination of multiple surveys and individual sheep may be recounted, but is used for determining composition. These composition surveys count as many sheep as possible in order to get the best age and sex ratios.

Table 3. Lincoln Cliffs Bighorn Sheep Surveys

	Cumulative Count Totals				Ratio
Year	Sheep	Rams	Ewes	Lambs	R:100E:L
1992	20	-	-	-	-
1993	26	6	13	7	46:100:54
1994	35	8	17	10	47:100:59
1995	45	11	21	11	52:100:52
1996	65	15	33	16	45:100:48
1997	90	23	42	25	55:100:60
1998	102	16	49	37	33:100:76
1999	88	25	44	18	57:100:41
2000	95	21	46	29	46:100:63
2001	No Survey Conducted				
2002	153	61	67	25	91:100:37
2003	178	50	81	47	62:100:58
2004	133	27	79	27	34:100:34
2005	93	44	61	23	72:100:38
2006	96	26	56	14	46:100:25
2007	112	30	59	23	51:100:39
2008	111	28	63	20	44:100:32

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. G.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 this year (Table 1). Lower hunter observation numbers may also 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 30 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 have been approximately 10% each year, with a total of 7 mortalities since 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, 29 known sheep mortalities have occurred -- 15 from hunting, 2 from vehicle collisions, 5 from cougar, and 7 unknowns -- a total of 23 rams and 6 ewes.

Lamb production shows an overall declining trend since 1999 (Figure 1), the first year sheep were captured and translocated to Lake Chelan. Since 2002 the lamb to 100 ewe ratio has been in the mid to high 30s, except for a spike in 2003 and a drop in 2006. The spike in 2003 coincides with the translocation of sheep from Nevada. The reason for the drop in productivity in 2006 is unknown.

Minimum population estimates, based on maximum count of rams, ewes, and lambs from all surveys in a given year, show the Lincoln Cliff population to be relatively stable (Fig. 2). There was a decline in ewes and lambs in 2005 followed by a

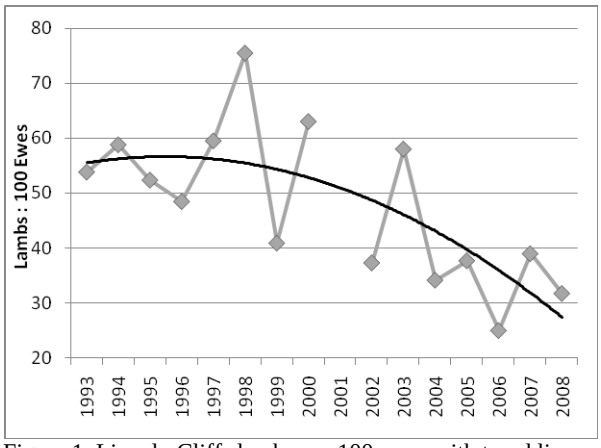


Figure 1. Lincoln Cliffs lambs per 100 ewes with trend line.

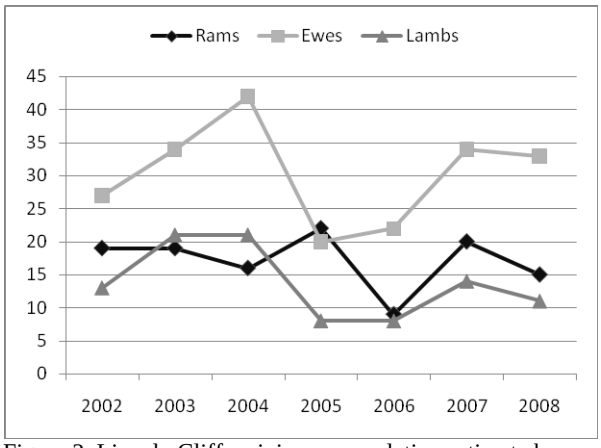


Figure 2. Lincoln Cliffs minimum population estimate by sex and age for 2002 – 2008. Estimated as the maximum count from all surveys conducted each year.

decline of rams in 2006. All three appear to be recovering from this in 2007 and 2008. Estimates are only shown from 2002 on because this is the year regular helicopter surveys were initiated.

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 competition 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 will 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 60-90 animals. This sets the Lincoln Cliff herd just at or 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 will be reviewed and possibly raised.

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 2009-2010 season. However, because of the low number of mature rams being observed and the number of mature rams being removed during the past years, no raffle or auction hunts will occur at Lincoln Cliffs.

Literature Cited

Washington Department of Fish and Wildlife. 2009. Game Management Plan. Wildlife Program, Washington Department of Fish and Wildlife, Olympia, Washington, USA.

BIGHORN SHEEP STATUS AND TREND REPORT: REGION 1
Blue Mountains

Pat E. Fowler, District Wildlife Biologist
Paul A. Wik, 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; Mountain View, Wenaha, Black Butte, and Asotin Creek. 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 Washington, herds in Montana, Wyoming, and from the Wallowa Mountains in Oregon. Minimal California bighorn subspecies genetics likely remain 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 Rocky Mountain subspecies.

Population management objectives for each herd are based on habitat conditions 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.

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, Nez Perce Tribe (NPT), 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, Mtn. 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 2008, the Black Butte, Mountain View, and Wenaha herds were available. In 2009, the Tucannon herd was added to the available units.

Raffle permit holders have been successful in harvesting rams in all years; 2005 – Tucannon herd, 2006 – Wenaha herd, and 2007 – Mountain View herd, 2008 – Wenaha herd. In 2006, WDFW issued the first permit to a licensed hunter for the Wenaha herd since 1996. This permit was good for 1 ram in the Crooked Creek drainage of the Wenaha GMU (169). In 2007, a draw permit was issued for the Wenaha unit as well as the raffle permit, which resulted 2 rams being harvested. In 2008, draw permits were issued for the Wenaha and Asotin herds, with 3 rams being harvested (including the raffle). The Asotin permit resulted in the first legal harvest of a Washington licensed hunter in that herd, an unknown number of tribal harvests have occurred during the past decade within this herd.

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 annual but information on harvest is limited. WDFW has documented some tribal hunting, with 8 rams over the last 7 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 closing.

In March 2008, WDFW captured and radio-collared 10 young rams (age 1 – 5) in an attempt to document why rams are experiencing low survival in the Asotin herd. This should determine whether disease, predation, or harvest is resulting in a skewed age distribution towards younger rams. Two of those rams were fitted with an additional GPS collar, which should lead to a better understanding of movements and dispersal.

Twelve bighorn sheep, 10 ewes and 2 young rams, were captured and removed from the Asotin herd in February 2009. The sheep were donated to Washington State University Veterinary Center for disease related research. The population reduction was implemented to reduce habitat use expansion by the Asotin herd.

Surveys

Aerial surveys are conducted in March or April 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 March helicopter surveys.

Surveys conducted for the five herds in early 2009 resulted in a count of 229 bighorn sheep, 131ewes, 29 lambs, 67 rams for a ratio of 51 rams and 22 lambs per 100 ewes (Table 1.). A population estimate from modeling has not been developed for 2009 at this time, but biologists estimate that there are approximately 230 - 250 bighorns in the 5 herds. The population appears to be relatively stable over the past 5 years, despite low lamb recruitment 3 of the past 5 years.

Population status and trend analysis

Lamb survival has been limiting population size since the *Pasturella* die-off in 1996, with lamb survival varying greatly between years. No lamb recruitment occurred in 2008 within the Black Butte and Mountain View herds, and the Wenaha and Asotin herds had lamb ratios of 25 and 38 lambs/100 ewes, respectively. The Tucannon herd was not observed during March 2009 surveys, but the prior month, ground surveys detected 7ewes and 2 rams (class II and IV). No lambs were observed during the winter of 2009. Four lambs were documented in June 2009 in the Tucannon herd. Lamb mortality has been high in the Black Butte and Mountain View herds by July 2009, 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.

Individual herds should be able to increase in numbers 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 2009, with the Black Butte, Mtn 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 Asotin and Tucannon herds have remained *Pasturella* free to this point.

The ram population suffered high mortality during the *Pasturella* die-off in 1995-96, which resulted in few adult rams in the population for several years. Low lamb survival following the all age class die-off resulted in poor recruitment of rams into the population. The number of Class-III and IV rams in the population is currently declining in most herds, and still remains substantially below the number that existed prior to the die-off (Table 1). Poor lamb recruitment, predation, pneumonia, and harvest are all contributing to the low performance of bighorn herds in the Blue Mountains.

The Tucannon herd is at an all time low since 1975 (beginning of data). This population will not rebound in the near future without a supplemental transplant. In August 2005, the School Fire consumed 49,515 acres in the Tucannon drainage, including the entire range of this herd. With the loss of at least 7 adult sheep, a supplemental transplant will be scheduled to occur as soon as feasible. The rebuilding of the elk fence along the northern boundary of the W.T. Wooten Wildlife Area was completed in May 2009. The elk fence prevents sheep from moving north onto private land where they may come in contact with domestic sheep or goats. The completion of the fence has allowed WDFW to go forward with plans to transplant additional sheep into the Tucannon during the winter of 2009-2010 if available.

Habitat condition and trend

Habitat conditions are moderate to good in most areas. However, the spread of noxious weeds, mostly yellow starthistle (*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

Pasturella continues to plague three bighorn populations; Black Butte, Wenaha, Mtn. View. The Asotin and Tucannon herds have not experienced *Pasturella* pneumonia, but do suffer from 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 the Black Butte herd. 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. Fortunately, in July 2006, FNAWS reached an agreement with one landowner and 200+ domestic sheep were removed from lower Joseph Creek and in March 2009, another landowner with 5 domestic sheep within the Black Butte range removed his stock.

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, which originated in the die-off of 1995-96. The Black Butte, Wenaha, and Mtn. View herds are still plagued by 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. The Asotin Creek herd was not infected by the *Pasturella* outbreak, but has suffered adult mortality due to unregulated tribal hunting and natural predation. 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 objective.

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. 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. The response guidelines have not been implemented since their adoption in February 2008.

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.

Planning is currently occurring to transplant additional Rocky Mtn bighorn sheep into the Tucannon herd during January 2010. Currently, the suppressed population will take many generations to recover, if it could at all. This transplant will be implemented to return the Tucannon population to its management objective.

Three of the five bighorn sheep herds do not meet the criteria listed in the Bighorn Sheep Management Plan for establishing permit hunting opportunity on a herd by herd basis. The Wenaha and Asotin herds meet the criteria for a hunting season, and one public permit was issued for each in 2009. One raffle permit is also issued in the Blue Mtns. and the funds are used for bighorn sheep management.

Table 1. Bighorn Sheep Population Trend and Herd Composition, Blue Mountains 1994-2009

			Rams					Count	Population		
Year	Lambs	Ewes	C I	C II	C III	CIIIB	C IV	Total	Total	Estimate	R:100:L
1994	89	202	3	35	57(14))			95	386	450	47:100:44
1995	20	138	10	11	20		8	49	208	242	36:100:14
1996	16	115	8	6	10		3	27	158	176	23:100:14
1997	26	135	11	16	12		7	46	207	220	34:100:19
1998	31	105	17	15	16		7	55	191	214	52:100:30
1999	42	104	13	15	10		5	43	189	216	41:100:40
2000	32	100	15	22	13		5	55	187	212	55:100:32
2001	33	99	5	17	25		5	52	184	206	53:100:33
2002	29	83	7	15	28		7	57	169	192	69:100:35
2003	38	96	9	14	24		7	54	189	205	56:100:39
2004	50	103	17	10	30		6	63	216	227	61:100:48
2005	28	121	10	26	28		17	81	230		67:100:23
2006	41	104	7	13	6		3	53*	198	246	51:100:39
2007	50	106	13	16	31		7	66	223		62:100:47
2008	28	125	21	26	22	1	4	74	227		59:100:22
2009	29	131	2	34	23	2	6	67	229		51:100:22

*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		
Year	Lambs	Ewes	CI	CII	CIII	CIIIB*	CIV	Total	Total	Estimate	R:100:L
1994	3	6	3	2	1			6	15	15	100:100:50
1995	1	4	1	3	1			5	10	12	125:100:25
1996	1	5	0	1	3		1	5	11	13	100:100:11
1997	2	14	1	1	3		0	5	21	13	36:100:33
1998	7	13	3	2	1		1	7	27	30	54:100:54
1999	8	16	2	2	3		2	9	26	34	56:100:50
2000	7	18	4	2	2		1	9	34	38	50:100:39
2001	3	23	1	2	3		2	8	34	40	24:100:13
2002	7	17	0	4	4		1	9	33	36	53:100:41
2003	11	23	1	5	1		1	8	42	45	35:100:48
2004	12	22	6	1	5		0	12	46	51	54:100:54
2005	8	26	3	1	6		0	10	44		38:100:31
2006	13	34	6	6	3		1	16	63	63	47:100:38
2007	10	30	2	8	6		3	19	59		63:100:33
2008	13	40	11	9	6	0	1	27	80	80	67:100:32
2009	18	48	1	9	6	0	1	17	84		32:100:38

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

Table 3. Black Butte Herd Composition Data 1977-08, Blue Mtns. Washington. Pre-1989 rams were broken into legal and sublegal categories.

			Rams					Count	Population		
Year	Lambs	Ewes	CI	CII	CIII	CIIIB	CIV	Total	Total	Estimate	R:100:L
1977	3	7		2				2	12	N/A	29:100:43
1978	3	9		3				3	15	N/A	33:100:33
1979	6	12		6	2			8	26	N/A	67:100:50
1980	4	13		5	1			6	23	N/A	46:100:31
1981	9	17		10	3			13	39	N/A	76:100:53
1982	7	10		7	2			9	26	N/A	90:100:70
1983	11	17		9	4			13	41	N/A	77:100:65
1984	7	31		6	10			16	54	N/A	52:100:23
1985	18	34		8	10			18	80	N/A	53:100:53
1986	25	33		14	10			24	82	N/A	76:100:76
1987	28	46		13	13			26	100	N/A	56:100:60
1988	19	56		23	13			36	111	N/A	64:100:34
1989	33	64	—	28	8		8	44	141	150	69:100:52
1990	16	46	—	14	12		9	35	97	120	76:100:35
1991	23	45	—	13	3		2	18	86	110	40:100:51
1992	31	55	—	10	5		7	22	108	130	40:100:56
1993	39	75	—	7	8		7	22	136	150	29:100:52
1994	51	93	—	13	18		8	39	183	215	42:100:55
1995	2	34	3	1	1		1	6	42	50	18:100:6
1996	2	29	2	1	2			5	36	45	17:100:7
1997	7	30	4	4	2		2	12	49	54	40:100:23
1998	11	31	4	5	3		2	14	56	64	36:100:35
1999	10	30	4	6	5		1	16	56	60	59:100:33
2000	7	25	3	7	4		2	16	48	60	60:100:28
2001	7	25	3	9	8		2	22	54	60	88:100:28
2002	2	18	3	6	14		1	25	51	55	138:100:11
2003	13	24	2	3	10		1	16	53	60	67:100:54
2004	9	26	6	4	6		1	17	52	57	27:100:35
2005	5	45	3	12	7		2	24	74	74	53:100:11
2006	3	19	1	2	5		1	9	31	60	47:100:16
2007	4	24	5	2	9		1	17	45		71:100:17
2008	1	27	2	3	2	0	0	7	35		26:100:4
2009	0	25	1	10	7	2	1	21	47		95:100:0

Black Butte Herd Composition Data 1977-07, Blue Mtns. Washington. Pre-1989 rams were broken into legal and sublegal categories.

Table 4. Mountain View herd population trend and composition counts, 1974-2009, Blue Mtns., Washington.

			Rams						Population		
Year	Lambs	Ewes	CI	CII	CIII	CIIIB	CIV	Total	Total	Estimate	R:100:L
1974	5	6		3	0			3	14	N/A	50:100:75
1975	3	6		2	1			3	12	N/A	50:100:50
1976	5	7		3	2			5	17	N/A	71:100:71
1977	6	7		4	2			6	19	N/A	86:100:86
1978	6	12		6	2			8	26	N/A	67:100:50
1979	9	16		4	6			10	35	N/A	63:100:56
1980	12	17		7	8			15	44	N/A	88:100:71
1981	11	21		7	7			14	46	N/A	67:100:52
1982	7	17		8	2			10	34	N/A	59:100:41
1983	10	29		11	8			19	58	N/A	66:100:41
1984	13	28		10	5			15	56	N/A	54:100:46
1985	15	35		13	7			20	70	N/A	57:100:43
1986	20	38		10	4			14	72	N/A	37:100:52
1987	6	15		5	2			7	28	N/A	47:100:40
1988	6	16		5	4			9	31	N/A	56:100:38
1989	6	16		5	2		2	9	31	31	56:100:38
1990	7	18		5	1		1	7	32	32	39:100:39
1991	8	15		8	2		4	14	37	37	93:100:53
1992	5	16		6	4		4	14	35	35	88:100:31
1993	18	23		10	4		4	18	59	65	78:100:78
1994	10	24		10	3		4	17	51	60	71:100:42
1995	6	28	1	1	3		2	7	41	45	25:100:21
1996	1	14	2	0	1		0	3	16	18	0.3611921
1997	3	14	1	1	1		1	4	21	23	29:100:21
1998	5	12	3	2	1		1	7	21	23	58:100:42
1999	10	14	3	1	1		0	5	29	32	36:100:71
2000	4	14	4	1	1		0	6	24	27	43:100:29
2001	3	11	1	2	1		0	4	21	28	35:100:27
2002	8	10	0	1	0		0	1	19	25	10:100:80
2003	0	11	1	1	4		1	7	18	.	64:100:0
2004	10	14	2	2	2		1	7	31	32	50:100:71
2005	4	13	2	5	1		1	9	26		69:100:31
2006	10	16	0	5	1		1	7	33	33	44:100:63
2007	12	19	4	0	3		0	7	38		37:100:63
2008	0	22	2	0	0		0	2	24	34	9:100:0
2009	0	7	0	4	2	0	0	6	13		86:100:0

Table 5. Tucannon herd population trend and composition counts, 1975-2009, Blue Mtns., Washington.

			Rams						Population		
Year	Lambs	Ewes	CI	CII	CIII	CIIIB	CIV	Total	Total	Estimate	R:100:L
1975	4	7		1	3			4	15	N/A	57:100:57
1976	4	9		2	2			4	17	N/A	44:100:44
1977	2	10		3	2			5	17	N/A	50:100:20
1978	.	.		.	.			.	0	N/A	.
1979	4	10		6	3			9	23	N/A	90:100:40
1980	3	13		7	4			11	27	N/A	85:100:23
1981	9	14		4	7			11	34	N/A	79:100:64
1982	5	17		6	6			12	34	N/A	71:100:29
1983	4	20		6	5			11	35	N/A	55:100:20
1984	4	23		5	7			12	39	N/A	52:100:17
1985	4	20		6	7			13	37	N/A	65:100:20
1986	7	18		6	10			16	41	N/A	89:100:39
1987	8	20		7	11			18	46	N/A	90:100:40
1988	8	21		10	10			20	49	N/A	95:100:38
1989	9	23		10	8			18	50	55	78:100:39
1990	11	22		11	8		5	24	57	65	104:100:50
1991	12	23		10	8		5	23	58	65	100:100:52
1992	15	28		12	8		4	24	67	70	86:100:54
1993	12	24		13	6		2	21	57	60	89:100:50
1994	4	24		4	12		2	18	46	50	75:100:17
1995	2	24	1	4	6		1	12	39	45	50:100:08
1996	10	24	1	4	5		2	12	46	50	50:100:42
1997	10	27	1	3	3		3	10	47	50	37:100:37
1998	4	22	4	2	4		2	12	38	42	50:100:18
1999	2	17	2	2	1		2	7	26	30	41:100:12
2000	7	13	1	4	1		1	7	27	27	54:100:54
2001	2	12	0	0	3		1	4	18	18	33:100:25
2002	0	7	0	0	4		2	6	11	11	86:100:0
2003	2	9	1	1	3		1	6	17	17	67:100:22
2004	2	9	1	1	2		2	6	17	17	66:100:22
2005*	2	5	2	1	2		2	7	14		140:100:40
2006									7 - 9		
2007	2	2	1						5		
2008	3	3	1		1		1	3	9	9	100:100:100
2009	0	7	0	1	0	0	1	2	9		29:100:0

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

Table 6. Wenaha Herd Population Trend and Composition Counts, Blue Mtns. Washington. Pre 1989 rams were broken into legal and sublegal.

			Rams						Population		
Year	Lambs	Ewes	CI	CII	CIII	CIIIB	CIV	Total	Total	Estimate	R:100:L
1983	5	10		5	.			5	20	N/A	50:100:50
1984	3	12		.	.			.	15	N/A	.:100:25
1985	10	13		3	.			3	26	N/A	23:100:78
1986	10	14		4	1			5	29	N/A	36:100:71
1987	13	23		15	6			21	57	N/A	91:100:57
1988	17	28		8	7			15	60	N/A	54:100:61
1989	12	36		15	12			27	75	100	75:100:31
1990	33	59		14	9		7	30	122	135	51:100:56
1991	19	45		11	13			24	88	100	53:100:42
1992	19	51		4	20			24	94	115	47:100:37
1993	25	48		14	15			29	102	120	60:100:52
1994	21	55		6	9			15	91	110	27:100:38
1995	9	48	4	2	9		4	19	76	90	40:100:19
1996	2	43	4	0	0			4	49	50	0.4445023
1997	4	50	1	7	4			12	62	69	24:100:8
1998	4	27	3	4	7		1	15	46	55	56:100:15
1999	12	27	2	4	0			6	45	60	0.9866204
2000	7	30	3	8	5		1	17	54	60	57:100:23
2001	8	28	0	4	10			14	50	60	50:100:29
2002	6	35	4	4	8		3	19	60	65	54:100:17
2003	12	29	4	4	7		3	18	59	65	62:100:41
2004	17	32	2	2	15		2	21	70	N/A	66:100:53
2005	9	32	0	7	12		12	31	72		97:10028
2006	15	35						21	71	90	60:100:43
2007	22	31	1	6	13		3	23	76		74:100:71
2008	11	33	5	14	13	1	2	35	79		106:100:33
2009	11	44	0	10	8	0	3	21	76		48:100:25

BIGHORN SHEEP STATUS AND TREND REPORT: REGION 2
MT. Hull Unit 10

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 exceeds this level with an estimated 100-110 animals. As a result, a herd reduction of 25% is the current management focus. This population supports a conservative, any ram permit harvest to the extent it is compatible with herd demographics.

Sinlahekin herd. The population objective for the Sinlahekin herd is 50 animals, and during a 2007 survey, biologist tallied 51 animals. Over the last decade seasonal ranges for this herd have changed significantly, thus a reevaluation of the population objective may be warranted. Consequently, the Sinlahekin herd is still being managed for steady population growth.

Hunting seasons and harvest trends

Mt Hull Herd. Two any ram permits were issued for the Mt Hull Unit in 2008. WDFW permit holders harvested two mature rams in 2008, and the harvest of one mature ram occurred under the Colville Confederated Tribe any sheep permit (Table 1). One any ram permit and two adult ewe only permits were issued for 2009.

Sinlahekin herd. No permits were issued for the Sinlahekin Unit in 2008.

Table 1. Summary of harvest information for bighorn sheep in the Mt. Hull Unit.

Year	Permits	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

[a] CCT=Colville Confederated Tribes

Surveys

Mt Hull Herd. Washington Department of Fish and Wildlife and Colville Confederated Tribes Biologists conducted a ground survey of the Mt. Hull Unit in late October 2008 and classified 103 sheep, including 33 rams, 13 of which were $\geq$ ¾ curl (Table 2). Observed lamb production increased from that in 2007. Good survey conditions resulted in visual classification of greater than 90% of the estimated herd total.

Sinlahekin herd. Washington Department of Fish and Wildlife Biologists also conducted a helicopter survey of the Sinlahekin Unit in early December 2008 and classified 33 sheep, including 5 rams, 3 of which were $\geq$ ¾ curl (Table 3).

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 and are now at an all time estimated high of 100+ animals. The ram cohort fluxuated significantly in the early 2000s in response to fire activity in the US and Canada, but is now quite robust.

In 2001 WDFW augmented the herd with 8 ewes and 3 rams from the Cleman Mountain area. 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 exceeding carrying capacity.

In recent years the number of bighorn sheep crossing west of Highway 97 has been increasing. 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 and to date, two have been killed by vehicle collisions in 2009. Similarly, large numbers of sheep are increasingly foraging in irrigated agricultural fields adjacent to Mt Hull, prompting complaints from frustrated landowners. These two behaviors may be indicative of forage competition and declining range quality.

An attempt to reduce the Mt Hull population occurred in early January 2009. A corral trap was set up with the goal of removing 20-24 Bighorn sheep from the population. However, only six Bighorn sheep (4 males and 2 females) were successfully captured. These sheep were transported to the Hellsgate Reserve on the Colville Confederated Tribes reservation to start a new herd of California Bighorn sheep. If surveys indicate the Mt Hull population remains high another trapping attempt may occur in winter 2009/2010.

Sinlahekin herd. The long-term outlook for the Sinlahekin herd may be 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 2007 survey documenting the most bighorn sheep since 1994. 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. However, lamb production remains low. Improvements in lamb production may allow for future harvest.

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, recent droughts, 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.

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 Aeneas Mountain and 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 fuels treatment and prescribed fire program within the Sinlahekin Wildlife Area has all ready reduced tree encroachment and increased forage on 400 acres. An additional 4,000 acres is scheduled for fuels treatment within the Sinlahekin Wildlife Area starting in 2009. This effort, combined with an aggressive weed control program should also improve habitat conditions within the Sinlahekin Wildlife Area.

An additional threat to the Sinlahekin herd 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. Past research indicates a high endemic level of parasitism and disease in the Sinlahekin herd.

Road mortality has been a minor issue in the Sinlahekin herd with four mature Bighorn sheep rams killed in the last few years.

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. Recently, changes in sheep behavior suggest that the habitat is being strained by the swelling herd size. This herd is currently exceeding the population management objectives of 55-80 animals. As a result, WDFW is working to reduce the Mt Hull population to help increase range quality, reduce road mortalities, and reduce landowner conflicts. Capture efforts to relocate additional sheep may occur in winter 2009/2010. WDFW is also continuing to work on improving habitat and on improved bighorn sheep warning signage along Highway 97.

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.

Table 2. Population composition counts from the Mt Hull area. <3/4 = less than 3/4 curl rams, ≥3/4 = greater than or equal to 3/4 curl rams, and L:100:R is lambs (L) and rams (R) per 100 ewes (100).

			Rams			Count	Population	
Year	Lambs	Ewes	<3/4	≥3/4	Total	Total	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

Table 3. Population composition counts from the Sinlahekin area. <3/4 = less than 3/4 curl rams, >3/4 = greater than 3/4 curl rams, and L:100:R is lambs (L) and rams (R) per 100 ewes (100).

			Rams				Count	Population	
Year	Lambs	Ewes	<3/4	>3/4	Total	Unknown	Total	Estimate	L:100:R
1990	--	--	--	--	--	--	--	--	--
1991	--	--	--	--	--	--	--	--	--
1992	6	30	--	--	15	0	41	--	20:100:50
1993	2	17	--	--	4	0	23	--	12:100:24
1994	1	21	--	--	1	0	23	--	5:100:5
1995	9	24	5	6	11	0	44	--	38:100:46
1996	2	20	7	0	7	0	29	30-45	10:100:35
1997	--	--	--	--	--	--	--	25-40	--
1998	--	--	--	--	--	--	--	25-40	--
1999	0	0	0	0	0	0	0	25-40	--
2000	--	--	--	--	--	--	14	20-30	--
2001	6	16	4	0	4	3	29	30-35	38:100:25
2002	8	20	6	0	6	0	34	35-40	40:100:30
2003	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

BIGHORN SHEEP STATUS AND TREND REPORT: REGION 2
Swakane Canyon, Chelan Butte and Lake Chelan

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

Population objectives and guidelines

Within District Seven, California bighorn sheep are found in Chelan County, having been reintroduced 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 81-90 bighorns in the Swakane herd as of June 2009. The population objective for Swakane is 50-60 adult sheep (WDFW 2008). The north shore of Lake Chelan 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 84-98 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). Permit allocation has been conservative in the Swakane due to highway mortalities and to ensure a sufficient number of older rams for public viewing. No bighorn permit will be offered in the Swakane in 2009 due to the high rate of vehicle collision mortalities along SR 97A in 2008. If highway mortalities are reduced, the permit status will be reevaluated for 2010.

On the north shore of Lake Chelan, 2 permits have been offered since the permit began in 2005, all being successful. The 2007 auction permit holder also harvested a ram from the Lake Chelan herd. There will be two permits on the north shore of Lake Chelan for 2009.

The Chelan Butte herd has not been hunted yet, however, the herd is being evaluated based on 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). Our current emphasis is on completing helicopter surveys to confirmation of herd size and composition.

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 foothill cliffs just above the Columbia River and SR 97A, allowing for better monitoring, which likely represents increased sightability as well as population growth. Proliferation of residential developments and associated ornamental plantings along the west shore of the Rocky Reach pool may be enticing bighorns to

cross Highway 97A with increasing frequency and annual duration. For over 30 years, no bighorn mortalities were attributabed to vehicle collisions. Twenty-four Swakane bighorns were killed by vehicles on SR 97A (11 rams, 8 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. When completed, the fence will be 8 miles long and extend from Rocky Reach Dam north to Spencer Canyon, the section where most collisions occur. Construction of the first section will begin July 2009 and should be complete in October 2009.

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 38%. This rate of increase seems to have plateaued as lamb production has decreased. Evident from recent telemetry data, several bands have moved farther uplake into steeper, rockier, unoccupied habitat. 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 108-129 is retained for 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 (Table 3). The Chelan Butte heard is easily viewed from the road system and counts occur regularly. As many as 98 sheep by been reported seen together on Chelan Butte, however, we have not been able to confirm those numbers.

We estimate that less than 20 bighorns use the Colockum and Jump Off 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 cliff. Residents report a small group of 5-9 ewes and lambs on Jumpoff Ridge and that these animals occur 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 shrubsteppe 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/improved for bighorn sheep within the range of the Swakane herd along the breaks of the Columbia River. Ewe bands continue to come down near the river, using the native riparian and ornamental forage, during all seasons. The SR 97A fence will eliminate very little habitat, as they spend most of their time in habitats west of the highway.

Telemetry data will be used to determine how the Swakane herd reacts to the newly constructed wildlife fence. Due to the observed preference of California bighorns for low elevation habitats, those susceptible to human encroachment, there is long-term impact occurring due to 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 2004-2009;

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.

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 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, suggest there may be habitat to support more than 800 bighorns.

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. 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.

Literature Cited

Musser, J., and P. Dauer. 2003. Bighorn reintroduction site evaluation. USDI-BLM Wenatchee Resource Area. 14p.

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

Table 1. Observed population composition of the Swakane bighorn sheep herd, 1996-2009

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

*12 rams classified from the observed 20.

Table 2. Observed population composition of the Lake Chelan bighorn sheep herd, 1999-2009.

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

*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.

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

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: Tieton, Cleman Mountain, Umtanum/Selah Butte, and Quilomene. Hunting is by permit, for rams only and occurs in all units. The number of permits and harvest are given in Table 1. The Yakama Nation also issues permits, including ewe permits in the Yakima Canyon (Umtanum and Selah Butte).

Surveys

Quilomene, and Umtanum/ Selah Butte are typically surveyed via helicopter in June. Clemans Mountain is ground surveyed in June and/or at the feeding station in January. June aerial surveys in the Tieton have not been productive, historically. The Tieton herd is mostly monitored via tracking radioed sheep and interviews with permit holders. In November 2008, Tieton was aerial surveyed. Additional observations of sheep in all units are obtained during surveys for other species. All available information is used to estimate the total population. Survey results are given in Tables 2, 3, 4 and 5.

Population status and trend analysis

Bighorn sheep were native to areas within Region 3, but had been eliminated by over hunting and disease transmitted from domestic animals by the early 1900s. Bighorn sheep re- introductions began in Region 3 during the 1960s on the Colockum Wildlife Area and Cleman Mountain.

The Colockum reintroduction was the first in the region and the population was estimated at over 100 animals by the late 1960's. The population crashed in the early 1970's. The cause of the decline was not documented, but was probably either a result of *Pasteurella H.* pneumonia or winter mortality. Colockum bighorns were at very low numbers in the 1980s and reportedly died out by 1990. Reintroduction was initiated in 1993. By 1996, 41 bighorns had been released in the area. The Quilomene population quickly grew to over 160 sheep (Table 2). In 2006, reports and observations of coughing sheep and low lamb production raised concerns that disease was affecting the herd. Fecal analysis did not indicate a high parasite numbers, leaving viral infection as the likely cause of the problems. In 2007 and 2008, lamb production rebounded. The herd now appears to be recovering, but is below objective.

The Cleman Mountain population was established in 1967 with eight animals. The herd grew rapidly to over 100 animals (Ellis Bowhay, Pers. Comm. 1998) and then crashed and stagnated in the late 1980s. The decline and stagnation was probably a result of disease. A portion of the population was captured, tested, and treated with antibiotics in 1990. Augmentation included 27 animals from 1989-96. Production has been good and the herd has exceeded the goal of 150 animals since 2000 (Table 2). Over 100 animals have been captured and trans-located or used for research. Another 63 have been harvested. The population is still above objective and captures are scheduled for winter 2009/2010.

The Umtanum herd was established in 1970 with the release of eight animals. 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 annually and it is now considered one herd.

Population estimates for Umtanum/Selah Butte have 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. In 2005, 289 sheep were seen on the survey, for an increase of over 100 from any previous survey. A large portion of the increase was due to the establishment of a new group of sheep at the south end of the unit, which has grown to over 70 animals. High lamb production and mild winters have resulted in an increasing population, which is generating complaints from the one private ranch in the area. Twenty-six sheep have been removed for augmentation/research since 2005 to keep the herd within the objective. The Yakama Nation started harvesting ewes in 2008. WDFW issued ewe permits in 2009.

The Tieton River 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. However, very reliable

hunters drew tags in 2006 and 2007 and provided excellent data that supported population models. Lamb production was very high in 2008. An aerial survey in 2008 confirmed the population was over objective and 30 animals were removed for augmentation in early 2009. The population is still over the initial objective. 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 in 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.

Habitat condition and trend

Forage resources vary annually with moisture. Summers drought conditions temporarily ended in 2006. Small fires in the Clemans and Tieton areas have regenerated new growth that benefit sheep in the last 5 years.

Augmentation/habitat enhancement

Augmentation efforts ended in 2002. All herds, with the possible exception of the Quilomene, now have healthy populations with a surplus of sheep that could be used for augmenting other populations or research efforts. Three guzzlers were installed in the Tieton in fall 2002 in cooperation with the USFS. Sheep at Clemans Mt. are fed during the winter and salt blocks are occasionally placed in the Tieton and Clemans. In 2006, a large private ranch in Quilomene was purchased by WDFW and the possibility of domestic sheep grazing was eliminated.

Management conclusions

The overall bighorn sheep population in Region 3 is healthy and growing. The history of bighorn sheep in Region 3 has been one of boom and bust. Historical declines have likely been associated with disease, particularly *Pasteurella H.*, which is transmitted by domestic sheep. The probability of another disease outbreak is high. Domestic sheep and/or goats have been documented either with or in close proximity of wild sheep in every herd in the Region. In 2009, a small group of bighorns were seen within a USFS domestic sheep allotment a few miles west of the Clemans core herd. Domestic goat ranching has increased dramatically within the region in the last 10 years and contact with bighorns documented or suspected. It is unknown if the goats harbor diseases or parasites harmful to bighorn sheep, but herd declines have coincidentally occurred after contact with domestic goats in other parts of Washington and the country.

As bighorns sheep populations expand, the risk of another catastrophic disease outbreak increases. Damage complaints to range and irrigated pasture on a private ranch in the Umtanum/Selah butte have increased. History has shown that bighorns can't be stockpiled. Removal for transplant and research has been used frequently in the past 10 years and should be continued if a need exists. Permit harvest of ewes should also be considered.

A concern the last 3-4 years has been Clemans 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 a catastrophic event likely. Minerals have been placed off the highway in attempts to attract bighorns away from danger. The highways may also need to be washed in the spring to remove minerals.

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
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)
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
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

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

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

*Estimate based winter counts and modeling

Table 4. Umtanum/Selah Butte June Population Compostion

Year	Lambs	Ewes	Total Rams	Adult Rams	Total Count	Estimated Population	Desired Population
1989						170	
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	275	250-300
2006	27	106	24	21	157	275	250-300
2007	54	120	68	55	242	275	250-300
2008	63	156	60	51	*279	275	250-300
2009	47	149	62	52	257	275	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

Moose

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

DANA L. BASE, District Wildlife Biologist

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 sustained yield by hunting.

Hunting seasons and harvest trends

Moose hunting opportunity in Washington is limited by permit. There is a mandatory hunter report to be returned to the Washington Department of Fish and Wildlife (WDFW).

Permit availability and therefore moose hunter opportunity in Washington has increased over the last 15+ years (Figure 1.) For 2008, there were 78 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, 108 / 111, 113, 117, and 121 / 124 West respectively). Two additional moose permits were available by raffle and 1 by auction, each offering hunters the choice of any open moose unit. Also in 2008, drawings were offered in GMU 117 for 9 "antlerless only" permits specifically for youth and senior hunters as well as hunters with disabilities. One antlerless moose permit was also offered by drawing exclusively to state hunter education instructors. 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 provide eligibility to all hunters for all units and to maintain hunter choice. Except for the 9 antlerless moose tags under the 49 Degrees North B, C, and D Permit Hunts, along with the hunter education instructor permit, moose hunters in the Colville District units were allowed to take 1 moose of either sex.

A total of 74 moose were killed including 63 bulls and 11 cows within the Colville District units in the 2008 season (Table 1). The hunter success rate was 95% and hunters averaged 6.2 days hunting per moose harvested. The 49 Degrees North B, C, and D Permits for Youth, Senior, and Hunters with Disabilities, had 7 antlerless moose harvested out of the 9 permits issued for a 78% success rate. Hunters there averaged 4.4 days hunted per harvest.

Surveys

The 2008-2009 winter helicopter survey focused on the Selkirk Mountains (GMU 113) , 49 Degrees North (GMU 117), and Three Forks areas (GMUs 108 and 111). The overall sighting rate was 17.1 moose per flight hour. The overall bull and calf to cow ratio was 72 bulls and 38 calves per 100 cows respectively (Table 2).

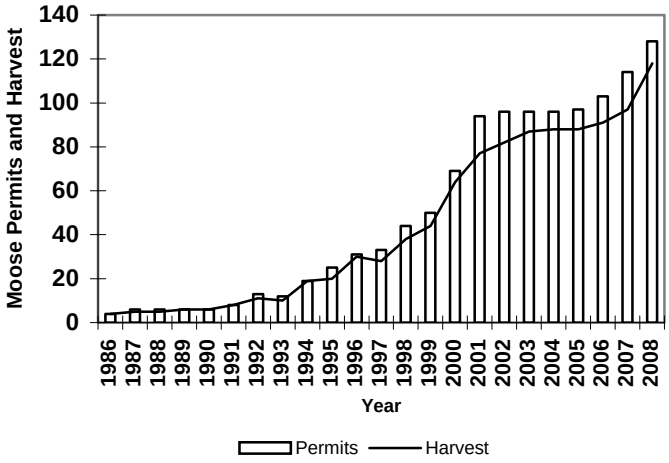


Figure 1. Statewide moose permit levels and harvest, 1986-2008.

Moose hunters provide their observations with the mandatory report. Hunters reported observing 809 moose within the Colville District during the 2008 season for a mean sighting rate of 10.8 moose per hunter (Table 3).

Population status and trend analysis

Early winter composition survey flights have been accomplished each year for the last 15 years (Table 4 and Figure 2). The December 2008 survey yielded an overall ratio of 72 bulls observed per 100 cows, which is a decrease in the ratio of 90 bulls per 100 cows obtained in 2007. The calf to cow ratio stayed about the same in 2008 as in 2007 at 38 calves per 100 cows. For both bulls and calves the fifteen-year trend shows a slight increase relative to cows (Figure 2).

We monitor age and antler spread of harvested bull moose to detect trends in the age structure of the bull population, which in turn indicate the mortality rate on the bull population (Figure 3 and Table 5). For the Colville District in 2008, the mean antler spread of harvested bull moose was 39 inches. Ages of harvested moose from teeth collected in the 2008 hunting season

were not available at the time of this report. The average age of bull moose taken in 2007 was 5.0 years. Also in 2007 slightly more adult bulls (age 5+ years) than sub-adults (age 2-4) were harvested, which was the case in 7 of the 16 years from 1992 through 2007 (Table 5).

Table 1. Colville District (GMUs # 101/105, 108/111, 113, 117, and 121/124 West) moose harvest and hunter effort, 1992 – 2008.

Year	Permits	Success	Bull	Cow	Total	Total Days	Days / kill
1992	9	78%	7	0	7	65	9.3
1993	9	78%	6	1	7	113	16.1
1994	15	100%	14	1	15	98	6.5
1995	20	85%	10	5	17	152	8.9
1996	23	96%	19	3	22	115	5.2
1997	21	86%	17	1	18	248	13.8
1998	28	89%	24	1	25	211	8.4
1999	32	84%	25	2	27	231	8.6
2000	41	93%	37	1	38	285	7.0
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

The limited hunter harvest has likely had inconsequential impact on the overall population of moose within the Colville District. The hunter success rate in 2008 returned to the desired high level of 95% from 82% in 2007.

Habitat condition and trend

Moose prefer 15-25 year old clear-cuts or thinnings on moist sites. Forest regeneration in these areas tends to produce dense thickets of willows and other hardwood shrubs that moose browse. Logging in northeast Washington has been intense since the 1980s, especially on private industrial timberlands. In the past forest successional conditions appeared to be excellent for moose production. 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 two years Forest Practice Applications & Approvals were received for treating 10,494 acres mostly within south Stevens County, which includes GMUs 117 and 121. The consequence to moose from this broad a scale of herbicide application will inevitably be a reduction in population carrying capacity.

Human safety and nuisance problems

Moose occasionally create a nuisance and potential safety problem within small towns or other human settlements within the Colville District. These conflicts are usually handled by either gently herding the moose out of the city limits or stopping traffic long enough for the animals to find their own way out. Possibly more serious in the rural areas of this 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 protecting their calves.

Management conclusions

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. At the same time habitat conditions are becoming less favorable to moose with widespread herbicide treatment within hardwood shrub fields. In some hunt areas we have 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.

Table 2. Composition counts of moose for helicopter-surveyed areas in the 2008-2009 winter.

Area	GMU	Date	Bull	Cow	Calf	Unclas.	Total	Bulls :100 Cows : Calves	Hours	Moose/hour
Selkirk Mountains	113		8	14	7	0	29	57 : 100 : 50	2.3	12.6
49 degrees North	117		28	40	14	0	82	70 : 100 : 35	2.2	37.3
Three Forks	108/111		6	4	1	3	14	150 : 100 : 25	2.8	5.0
Overall :			*42*	*58*	*22*	*3*	*125*	*72 bulls : 100 cows : 38 calves*	*7.3*	*17.1*

Table 3. Moose hunter observations and days per kill in the Colville District for the 2008 season.

Area	Permit quota	Number of hunters	Total moose harvested	Total moose observed	Average number of moose seen per hunter	Average number of days per kill
Kettle Range	2	2	2	14	7	12.5
Three forks	8	7	7	34	5	11.1
Selkirk Mtns.	25	25	25	162	6	5.6
49 Degrees N	35	33	32	438	13	5.5
Huckleberry Mtns.	8	8	8	161	20	4.6
Overall :	*78*	*75*	*74*	*809*	*Mean = 10.8*	*mean = 6.2*

Table 4. Summary of early winter survey effort by helicopter on moose within the Colville District from 1994 through 2008.

Year	GMUs Surveyed	Hours Flown	Total Moose Classified	Moose Observed per Hour	Bulls/Cow/Calf Ratio Bulls : 100 Cows : Calves
1994	113	n/a	36	4.2	82 : 100 : 29
1995	113	11.0	43	3.9	85 : 100 : 33
1996	117	5.0	49	9.8	71 : 100 : 33
1997	109, 117	8.2	146	17.8	89 : 100 : 32
1998	113, 117, 121, 124-W	10.5	92	8.8	70 : 100 : 26
1999	113, 117	7.0	92	13.1	78 : 100 : 64
2000	117, 109, 101, 105	9.2	143	15.5	93 : 100 : 49
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

Table 5. Tooth age and antler spread in inches for harvested bull moose in the Colville District from 1992 through 2008.

Year	Sample Size for Aging	Mean Age (years)	Sample Size for Antler Spread	Mean Spread (inches)	Yearling	2-4 years old	> 5 years old
1992	5	4.5	7	39	0%	80%	20%
1993	6	5.0	6	35	0%	67%	33%
1994	8	3.9	12	36	0%	75%	25%
1995	8	5.9	8	37	0%	50%	50%
1996	17	5.7	17	37	6%	29%	65%
1997	16	4.1	17	34	13%	56%	31%
1998	22	4.8	24	41	0%	55%	45%
1999	22	5.4	26	36	10%	45%	45%
2000	34	6.7	34	41	0%	37%	63%
2001	32	6.9	36	39	0%	31%	69%
2002	37	5.1	37	36	3%	61%	36%
2003	46	5.3	45	39	0%	46%	54%
2004	39	5.4	44	38	5%	41%	54%
2005	43	4.5	46	39	5%	56%	39%
2006	40	4.8	48	38	2%	65%	33%
2007	26	5.0	50	38	0 %	46 %	54 %
2008			58	39			

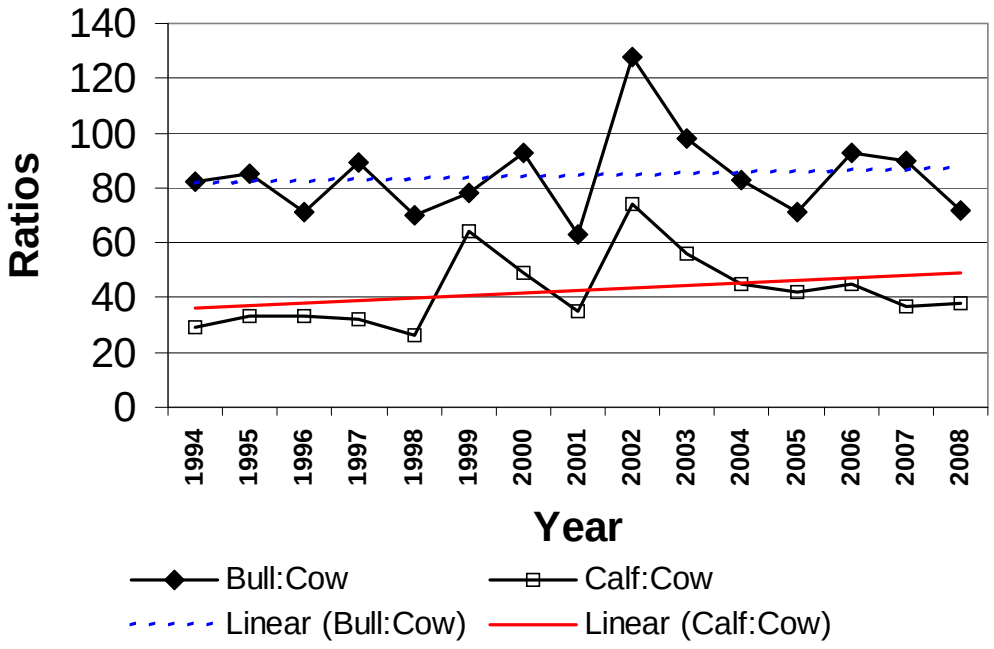


Figure 2. Composition and trends of moose herds as determined by early winter helicopter surveys 1994-2008. Areas surveyed vary annually.

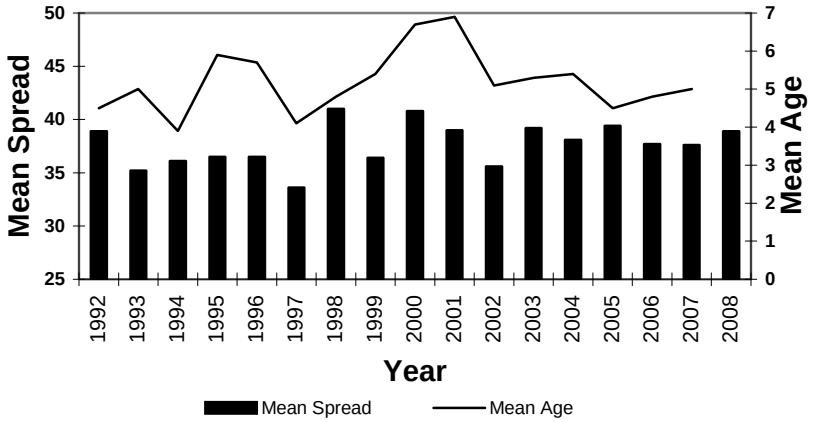


Figure 3. Average age (years) and antler spread (inches) of bull moose harvested within the Colville District, 1992 - 2008.

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 limited by permit, and are a once in a lifetime opportunity if drawn except for the antlerless-only, 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 increased to 50 this year from the 40 offered in 2007 -- 36 in Mt. Spokane (30 in 2007) and 14 in Hangman (10 in 2007). Applications were again up in 2008 at 16,777 up from 15,763 in 2007, 14,811 in 2006, and 14,638 in 2005. Both the Hangman and Mt. Spokane units had an either-sex moose hunt and an antlerless-only hunt. In addition, the Mt. Spokane unit also had a youth-only antlerless hunt with 8 permits.

Forty-nine permittees reported having hunted moose in 2008, with participation rates of 100 percent except for the Mt. Spokane A hunt. A total of 44 moose were killed (17 bulls, 27 cows) this year compared to 35 in 2007 and 33 in 2006. The mean number of days hunted per hunter increased to 4.2 days compared to 3.2 in 2007 (Table 1). The overall success rate this year was ~90%; however, for both "any moose" – "once in a lifetime hunt", the success rate was 100%. The cumulative success rate since 2001 is 97% for actual hunters in both units.

The mean antler spread for bulls harvested in the Mt. Spokane unit in 2008 was 32.4 inches down from a high of 39.2 inches in 2007. The mean antler spread for the Hangman unit in 2008 was 33.5 up from 32.3 in 2007 (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 Table 3 for a comparison of moose observed and Table 4 for a comparison of moose density by unit as derived 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 an increasing population in the Mt. Spokane Unit and a sustaining population for the Hangman Unit (Table 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.

Results from aerial surveys indicate that the Hangman unit generally supports higher densities of moose than the Mt. Spokane unit (Table 4). In 2007, observed moose density within Mt. Spokane was the highest density ever recorded for this unit and only decreased slightly this year to 0.43 moose/km^2 (Table 4). For 2008, in the Mica Peak area of the Hangman unit, the observed density was 0.77 moose/km^2 up from .060.

As seen in Table 5, survey results may vary considerably depending on winter conditions. Snow depths appear to influence the distribution of moose across survey quadrats each year, and therefore, also influence survey results. With the heavy snowfall this year, the lack of moose at higher elevations was noted, with the majority of moose being observed at or below the foothills.

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 lower elevations where hunter access is limited. Management in this district is compounded 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 Mt. Spokane unit is largely composed of large landowner 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 north end 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 46 in 2006. In 2008, there were 87 reported moose incidents. More revealing is the number of winter incident reports – ranging from November of one year through April of the following year. For the winter of 2004-2005 12 complaints were filed, for 2005-2006 23, for 2006-2007 27, for 2007-2008 68 complaints, and for 2008-09 42 were filed. As indicated by the numbers, these past two winters have been exceptional for moose complaints because of the heavy record snowfall which pushed moose to lower elevations and into the city. Dealing with urban/suburban moose will continue to be a priority for WDFW in the Spokane area. A moose damage/nuisance hunt will be initiated in 2009.

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 Unit appear to be increasing, while numbers in the Hangman unit have fluctuated – ranging from a low of 17 to a high of 57 (Table 3). The Hangman unit is more prone to fluctuation because of its proximity to the Idaho border – allowing more movement in and out of our aerial survey boundaries.

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, the population, although increasing, does 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 since 2005.

Literature cited

Costain, B. 1989. Habitat Use Patterns and Population Trends Among Shiras Moose, MS degree, U. of Montana. 1989

Myers, W. 2000. Personal communication.

Table 1. Moose harvest and hunter success for GMUs 124, 127 and 130.

Year	Permits	Success	Bulls	Cows	Total	Days/ Kill
1993	3	100%	3	0	3	5.3
1994	4	100%	3	1	4	11.0
1995	5	100%	5	0	5	3.8
1996	8	100%	6	2	8	5.3
1997	11	91%	10	0	10	4.4
1998	15	87%	8	5	13	3.4
1999	17	100%	9	8	17	2.6
2000	27	96%	6	18	24	3.8
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

Table 2. Antler spread for District 2 moose units.

Year	Mt. Spokane	Hangman
2000	34.4	36.5
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
Average	**33.3**	**35.8**

Table 3. Observed moose for each unit for years 1999-2007.

Unit	Number of Moose Observed							
	1999	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Mt. Spokane	88	45	43	150	22	66	77	78
Hangman	--	46	17	57	53	28	35	41

Table 4. Observed moose densities (moose/km^2)for each unit for years 1999-2007.

Unit	Density of Moose Observed (moose/km^2)							
	1999	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Mt. Spokane	0.15	0.15	0.13	0.47	0.30	0.39	0.50	0.43
Hangman	--	0.66	0.24	1.18	1.09	0.58	0.49	0.77

Table 5. Moose observations and herd composition during aerial surveys from 1990 to 2007

Survey Area	Year	Bull	Cow	Calf	Total	Bull:Cows:Calf
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
* Survey unit primarily in Idaho						

Cougar

COUGAR STATUS AND TREND REPORT

Statewide

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

Distribution and abundance

Cougar *(Puma concolor)* occur throughout most of the forested regions of Washington State, encompassing approximately 88,497 km^2 or 51% of the State (Figure 1). No reliable estimate of statewide cougar abundance is available for Washington. However, cougar population size has been estimated in three project areas in Washington. Currently, the best available estimate of statewide abundance is from an extrapolation from those projects, corresponding to about 1,900 to 2,100 animals (excluding kittens).

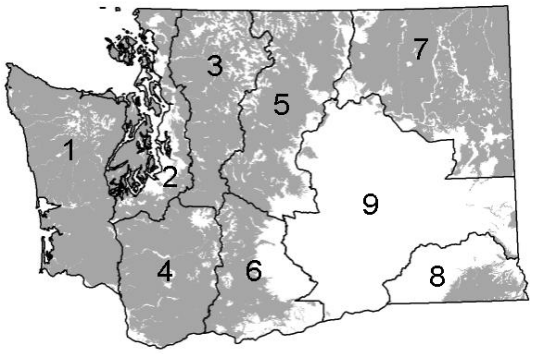


Figure 1. Distribution of cougars (gray) and cougar management units in Washington.

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), while minimizing the number of negative human-cougar interactions. Within the context, the population objective CMU 2 is to manage cougar populations at a level that increases public and protection of private property (Table 1; see Game Management Plan 2009-2015).

The methods for assessing cougar populations are in transition in Washington, largely due to better scientific data becoming available and relatively recent changes in hunting methodologies in portions of the State. The status of regional cougar populations in western and southeastern Washington are assessed using hunter effort and success data, median age data from harvested cougar, and percentage of females in the harvest. These are not ideal methods for assessing cougar populations because harvest information can be misleading and generally are not sensitive to small-to-moderate changes in population levels, particularly over a short period of time (<3 years). Nevertheless, these parameters suggest cougar populations are relatively stable in western and southeastern Washington. In 2008, a cougar research project was initiated in the southeastern Washington to provide better scientific information on population size and status.

In comparison, the status of cougar populations in northeastern and central Washington are assessed using cougar demographic data from living cougar populations, as well as the parameters from harvest data. 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 also has provided valuable data on population growth rates from cougar research projects in northeastern and central Washington. These data suggest that cougar populations in northeastern

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.

Washington have declined whereas populations in central Washington appear to be stable. The decline in northeastern Washington has largely been due to hunter harvest (following population objectives in the 2003 Game Management Plan). Preliminary data suggests that the lower population levels achieved via hunting are increasing to original levels due to an immigration of subadult cougars (Wielgus, pers. comm.).

Hunting seasons and harvest trends

Since the mid-1980s, the most significant change to cougar seasons has been the passage of three legislative bills. During the November 1996 general election, Washington voters passed Initiative 655 (I-655) that banned the use of hounds for hunting cougar and bobcat, and the use of bait and hounds for hunting black bear. In an effort to mitigate the anticipated decrease in cougar harvest (i.e., post I-655), permit-only seasons were replaced with general seasons, cougar seasons were lengthened from approximately 6 weeks to 7 and one-half months, and bag limit was increased from 1 to 2 cougar/year. Legislation was also passed that provided the authority to the Fish and Wildlife Commission to establish reduced costs for cougar and black bear transport tags, which they did from $24 to $5 in 1996 (cougar tags can also be purchased as part of a big game package). The outcome of these strategies was the number of hunters purchasing a cougar tag in Washington increased from 1,000 to ~59,000. As a result, annual cougar harvest during post I-655 years increased slightly; however, the composition of the harvest has changed dramatically (Table 2). The majority of cougar harvested pre-I 655 was done so with the aid of dogs, thus mostly males and older animals were taken. From 1996 to 2000, the majority of cougars were harvested either as opportunistic encounters by deer/elk and cougar hunters, or by using tracking and calling techniques. These harvest methods are not as selective as using dogs. Therefore, hunters harvested more females and younger cougars (Martorello and Beausoleil 2003).

During the 2000 legislative session, the Legislature and Governor passed Engrossed Substitute Senate Bill 5001, which allowed the use of dogs to hunt cougar, but only to address a demonstrated public safety threat and only in portions of GMUs. Following the bill, the Fish and Wildlife Commission adopted what's called public safety cougar removals. By Commission rule, permits to use dogs to hunt cougar are allocated to GMUs with 11 of more confirmed human-cougar incidents (including sightings), of which at least 4 must be threats to public safety or pets/livestock. Kills levels associated with public safety cougar removal permits have ranged from 64 cougar in 2001 to 4 cougar in 2005.

During the 2004 legislative session, the Legislature and Governor passed Substitute Senate Bill 6118, creating a pilot cougar hound-hunting program. Under the program, Commission rule establishes seasons to allow licensed hunters to hunt cougar with the aid of dogs, but only for three years and only in Chelan, Okanogan, Ferry, Stevens, and Pend O'reille counties. Under this legislation, the Fish and Wildlife Commission established four hunt zones across the five county area, each with a total kill quota and a female subquota; the kill season remains open for a zone until either the total kill quota or female subquota is reached, at which point the season becomes a pursuit-only season (unlawful to kill cougar).

During the 2008 legislative session, the Legislature and Governor passed ESHB 2438, which extended the pilot cougar hunt 3 additional years. The bill also provided a mechanism for other counties to request inclusion into the pilot program. In 2008, only Klickitat County opted into the pilot hound hunt program.

Also in 2008 and the Department adopted the 2009-2015 Game Management Plan, which includes cougar as a species chapter. The cougar plan identifies the female harvest guidelines to achieve the population objective in each CMU (Table 3).

Human conflict

The trend in confirmed human safety incidents, and pet and livestock depredations has decreased since the recorded high of 936 in 2000 (Figure 2). However, the levels of interactions continue to be problematic in some counties (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.

Literature cited

Martorello, D. A., and R. A. Beausoleil. 2003. Characteristics of cougar harvest with and without the use of dogs. Pages 129-135 *in* S.A. Becker, D.D. Bjornlie, F.G. Lindzey, and D.S. Moody, eds. Proceedings of the Seventh Mountain Lion Workshop. Lander, Wyoming, USA

Table 2. Cougar harvest statistics by CMU, WDFW.

CMU	2000	2001	2002	2003	2004	2005	2006	2007	2008
1	18	34	15	24	14	18	26	7	18
2	10	17	8	2	13	11	11	12	12
3	19	11	15	3	4	3	7	9	7
4	15	20	12	19	28	25	23	11	16
5	42	64	42	46	52	45	42	64	49
6	14	16	14	20	13	10	13	14	21
7	111	115	90	86	65	75	54	65	41
8	18	19	13	18	14	11	14	9	14
9	5	4	1	4	5	4	10	10	10
	252	300	210	222	208	202	200	201	188

Table 3. Cougar harvest statistics, 2008, WDFW.

	General Season			Special Permit Hunts			Depredation/Kill Permit			Other		
CMU	M	F	Unk	M	F	Unk	M	F	Unk	M	F	Unk
1	7	7	1	0	0	0	0	1	0	1	1	0
2	2	6	0	0	1	0	0	2	0	0	1	0
3	1	4	0	0	0	0	0	0	0	1	1	0
4	10	6	0	0	0	0	0	0	0	0	0	0
5	8	20	0	4	2	0	2	4	0	6	2	1
6	7	12	1	0	0	0	0	0	0	0	1	0
7	10	12	2	4	6	0	4	1	0	2	0	0
8	7	6	0	0	0	0	0	0	0	1	0	0
9	0	10	0	0	0	0	0	0	0	0	0	0
	52	83	4	8	9	0	6	8	0	11	6	1

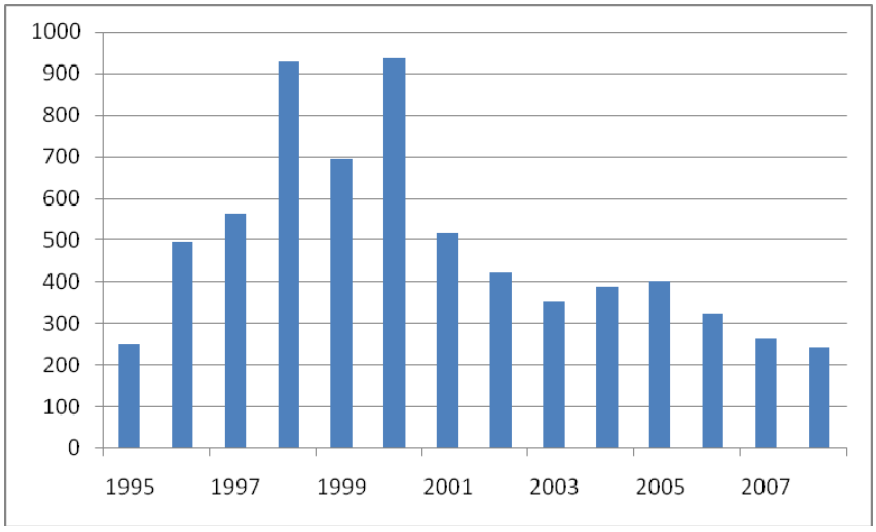


Figure 2. Number of confirmed human-cougar complaints, 1995-2008, WDFW.

Table 4. Confirmed human-cougar complaints by county, 2003-2008, WDFW.

County	2003	2004	2005	2006	2007	2008
Adams	0	0	0	0	0	1
Asotin	0	0	2	4	0	0
Benton	0	0	3	0	0	0
Chelan	8	11	7	9	13	5
Clallam	9	23	19	9	7	6
Clark	5	10	25	18	21	12
Columbia	1	2	2	2	0	8
Cowlitz	2	3	10	7	3	3
Douglas	3	6	6	5	2	2
Ferry	23	21	23	3	6	13
Franklin	0	0	2	0	0	1
Garfield	0	0	7	5	0	0
Grant	0	0	4	6	2	5
Grays	0	13	7	9	3	9
Jefferson	8	9	1	1	2	13
King	29	37	31	23	25	6
Kitsap	7	11	7	1	2	5
Kittitas	4	2	6	5	2	1
Klickitat	8	6	20	19	38	18
Lewis	5	12	9	20	5	9
Lincoln	4	6	7	7	1	2
Mason	0	1	1	1	4	7
Okanogan	92	50	64	46	19	15
Pacific	0	2	1	1	1	1
Pend Oreille	2	4	0	6	7	10
Pierce	39	27	13	13	25	12
Skagit	16	11	18	16	10	9
Skamania	0	7	2	1	4	3
Snohomish	9	26	17	9	8	5
Spokane	29	28	24	29	10	14
Stevens	20	34	20	25	20	17
Thurston	5	2	2	0	3	6
Wahkiakum	3	1	1	1	0	1
Walla Walla	3	0	6	10	9	5
Whatcom	10	16	26	6	3	13
Whitman	3	2	1	2	1	0
Yakima	3	0	6	3	6	2
Unknown cty	0	3	0	0	1	3
TOTAL	350	386	400	322	263	242

Black Bear

BLACK BEAR STATUS AND TREND REPORT
Statewide

RICH A. BEAUSOLEIL, Bear-Cougar Specialist
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.

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 has begun to develop survey efforts that aim to improve the estimates of these parameters, while at the same time evaluating harvest data to assess long-term trends.

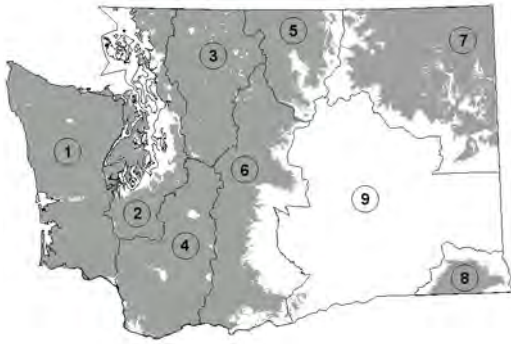


Figure 1. Black bear distribution and black bear management units.

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

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 18 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 2008, the number of bear harvested increased to about 2,200, up from an average of about 1,440 bears per year (Table 2).

Depending on location, black bear hunting season begin either August 1st or September 2nd and continue through November 15th. In GMUs where a spring hunt occurs, the dates are April 15 through May 31, except 3 areas extended to June 15. While there is no physical mandatory sealing requirements 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 2003, 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. In 2005, in response to spring bear seasons being implemented to reduce bark-peeling damage on public lands, the Department launched a population estimation / survival-monitoring project in Capitol Forest in western Washington.

Human-black bear conflict

The total number of black bear-human interactions over the past decade decreased from a high in 1998 of 786 complaints to a low in 2002 with 382 complaints (Figure 2). Since then, complaints have averaged 474 per year. In Washington, negative black bear/ human conflict overwhelmingly involves garbage issues (i.e. poor storage), but tree peeling, livestock, orchard and apiary depredations are also experienced. Human population growth and development has only compounded these issues. The Department recently 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

Table 2. Statewide black bear harvest, hunter effort, and median age information, 1996 - 2006, Washington Department of Fish and Wildlife.

								Median Age		
Year	Male	Female	Total Harvest	# of Hunters	% Success	# Hunter Days	# Days per kill	Males	Females	% Females
1996	951	359	1,310	12,868	10%	104,431	80	4.5	5.5	27%
1997	546	298	844	11,060	8%	97,426	115	4.5	5.5	35%
1998	1,157	645	1,802	20,891	9%	216,456	120	4.5	5.5	36%
1999	757	349	1,106	37,033	3%	481,319	435	4.5	5.5	32%
2000	777	371	1,148	37,401	3%	296,849	259	3.5	5.5	32%
2001	919	512	1,431	25,141	6%	230,431	161	3.5	4.5	36%
2002	800	427	1,227	24,844	7%	219,428	127	3.5	5.5	35%
2003	989	583	1,556	22,510	7%	192,544	123	3.5	4.5	37%
2004	1,093	561	1,654	21,573	8%	186,626	113	3.5	5.5	34%
2005	940	333	1,333	20,724	6%	172,527	129	3.0	5.0	25%
2006	1,061	581	1,642	21,801	8%	168,237	103	3.0	4.0	35%
2007	1,096	489	1,585	23,667	7%	168,237	106	--	--	31%
2008	1,450	758	2,208	26,347	8%	215,032	102	--	--	34%

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.

Black bear license plate

Wildlife-themed license plates are available to Washington residents and feature some of the state's premier wildlife species (Figure 3). Adopted by the 2005 Washington State Legislature and signed into law by Governor Christine Gregoire, these special license plates boast a black bear, bald eagle, orca, elk, or mule deer image. Plates are available for passenger vehicles, light duty pickups, trailers, motorcycles, motor homes, RVs, 5th wheels and campers.

Wildlife-themed backgrounds are available for an additional cost ($40 new, $30 subsequent renewal) plus fees. Revenue generated from the sale of "Washington's Wildlife" license plates will be spent to improve management of Washington's game animals. Activities include, but are not limited to: habitat improvements, improved population monitoring, population restoration and expansion, improved public access opportunities, and improved educational materials. This additional revenue source will be invaluable source of funding to many game and non-game management programs.

Literature Cited

Bunnell, F. L., and D. E. N. Tait. 1980. Bears in models and in reality–implications to management. International Conference Bear Research and Management 4:15-23

Caughley, G. 1974. Interpretation of age ratios. Journal of Wildlife Management 38:557-562

Clark, J. D. 1999. Black bear population dynamics in the Southeast: some new perspectives on some old problems. Eastern Black Bear Workshop Proceedings 15:97-115.

Garshelis, D. L. 1991. Monitoring effects of harvest on black bear populations in North America: A review and evaluation of techniques. Eastern Workshop of Black Bear Research and Management 10:120-144.

Koehler, G. M. and D. John Pierce. 2003. Black bear home-range sizes in Washington: Climatic, vegetative, and social influences. Journal of Mammalogy 84 (1):81-91

Pelton, M. R. 2000. Black Bear. Pages 389-408 *in* Demarais, S. and P. R. Krausman, Eds. Ecology and management of large mammals in North America. Prentice Hall, Upper Saddle River, New Jersey, USA.

Poelker, R. J. and H. D. Hartwell. 1973. Black bear of Washington. Biological Bulletin Number 14. Washington Department of Game.

Washington Department of Fish and Wildlife. 2002. Final environmental impact statement for the game management plan: July 2003-June 2009. Washington Department of Fish and Wildlife, Olympia, Washington 98501.

Figure 3. One of 5 wildlife-themed license plates.

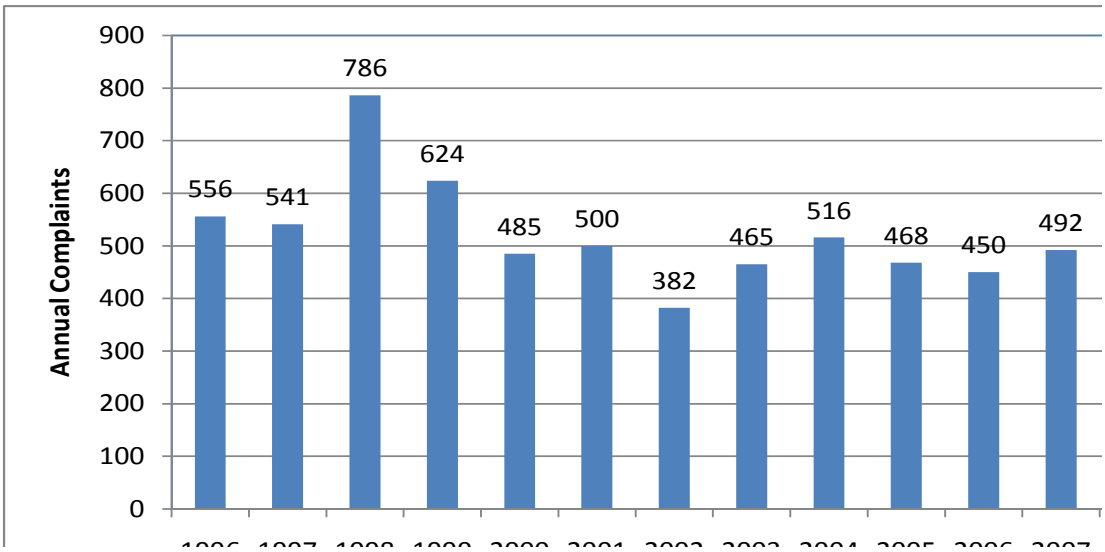


Figure 2. Trend in confirmed human-black bear interactions in Washington.

BLACK BEAR STATUS AND TREND REPORT: REGION 1
Northeastern Black Bear Management Unit (BBMU 7)

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

The general fall black bear season in the primary bear harvest units (GMUs 101-117) of the Northeastern BBMU opened September 2, 2008, the day after Labor Day. The rest of the GMUs opened August 1, with the season in all units extending through November 15. A total of 4,430 hunters hunted these units in 2008, which was about a 16% decrease from 2007. The 2008 spring permit and fall general combined harvest of 297 black bears was well below the 2007 harvest of 468 and 25% below the seven-year (2001-2007) annual average harvest of 398 black bears. Hunter success in 2008 (7%) dropped below the 7-year mode (9%; Table 1, Figure 1).

Population status and trend analysis

Ages of hunter-harvested black bears as determined by tooth samples collected in the 2008 season were not available at the time this report was written. In the Northeastern BBMU, the median age of harvested female black bears in 2007 returned to the acceptable median age range of 5 years from 3 years in 2006 (Table 1, Figure 2). The median male age declined, however, from 3 to 2 years from 2006 to 2007. The percentage of female black bears in the harvest also declined in 2007, dropping to 36% from 38% in 2006. In 2008 the percentage of females harvested dropped once again to 32%. These parameters are within the acceptable harvest limits for black bears.

Nuisance and damage activity

Black bear incidents (includes sightings, nuisance complaints, depredations) are common in the Northeastern BBMU. WDFW Officers continue to stress management of food, garbage, and other attractants that cause 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 excellent in 2008; 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 two years Forest Practice Applications & Approvals were received for treating 10,494 acres mostly within south Stevens County, which includes 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

The percentage of female black bears in the harvest declined to a more desirable level for management guidelines in 2008. In addition at least as recently as 2007 the median age of harvested females was within the minimum management guideline.

Spring 2008 was the second year for a spring permit season on black bears. Once again the WDFW issued 70 permits within 6 GMUs for spring black bear hunts to run from April 15 through May 31, 2008. Only 37 of the 70 permittees reported hunting. The spring harvest level was modest with 18 bears taken for a success rate of 49%.

Hunters have unlawfully killed 3 grizzly bears by mistaken bear identity within the last 10 years. A bear identification and certification program is under discussion to reduce the possibility of incidental take while black bear hunting. In the meantime the WDFW and U.S. Forest Service will continue 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.

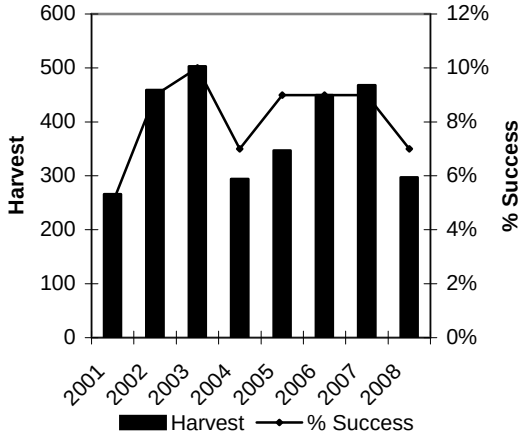


Figure 1. Total harvest and % hunter success, BBMU 7, 1997-2008.

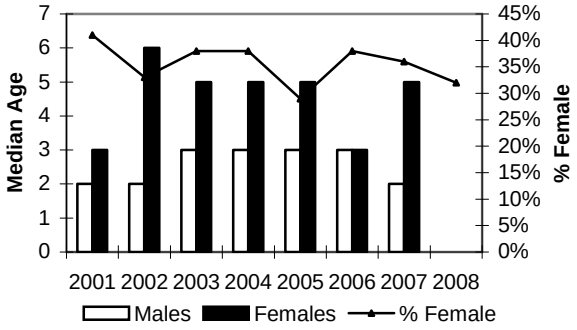


Figure 2. Median ages of harvested bears and % females in the harvest, BBMU 7, 1997-2008.

Table 1. Black bear harvest, hunter effort, and median age, Northeastern Black Bear Management Unit, 2001-2008.

						General Season		Median Age		Hunter Rept
Year	Male	Female	Total	# of Hunters	Success	Hunter Days	Days per Kill	Males	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	5268	9%	30,569	67	2.0	5.0	36%
2008	202	95	297	4467	7%	27,520	99	na	na	32%

BLACK BEAR STATUS AND TREND REPORT: REGION 1

Blue Mountains Black Bear Management Unit (BBMU 8)

PAT FOWLER, District Wildlife Biologist
PAUL WIK, Wildlife Biologist

Population objectives and guidelines

The black bear population in the Blue Mtns. BBMU is managed to provide recreational harvest opportunity, while maintaining a healthy bear population and minimizing conflicts with the public and other resource management objectives.

Hunting seasons and harvest trends

Two bear hunting opportunities are offered in the Black Bear Management Unit 8 (BBMU-8). The general season ran for 74 days in 2008 (Sept. 2 - Nov. 15). A permit controlled spring bear season ran from April 15 to May 31, with 155 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 1999-2008, 1,114 permits have been issued with 621 hunters participating in the hunt. Hunters averaged 29% success, harvesting 178 bears; 120 males, and 58 females. Hunters during the spring of 2008 had a success rate of 35%, and a harvest of 29 bears; 16 males, 12 females (Table 1).

Hunter success during the fall general season was 5%, with a harvest of 76 bears (52 males, 24 females). The 2008 general season bear harvest increased slightly over the 2007 harvest, but is still very close to the 1992-08 average harvest of 77 bears/year (Table 2). The combined harvest for the 2008 spring/fall seasons was 104 bears; 68 males, 36 females.

The percentage of male bears in the general season harvest averaged 64% from 1992-2008. Over the last 3 years, the percentage of males in the harvest has increased, averaging 71%, which is slightly higher than the long-term average. No data on the age of bears harvested in 2008 is available.

Nuisance and damage

The number of bear complaints received has remained fairly stable over the last few years (see statewide black bear report).

Habitat condition and trend

The U.S. Forest Service has implemented a prescribed fire program on the Pomeroy Ranger District. Several prescribed burns have been completed. 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).

Two extensive wildfires burned 163,000 acres of habitat in GMU's 154, 162, 166, 175, and 178 in August of 2005 and 2006; School Fire-2005, Columbia Complex Fire-2006). The fires have created excellent conditions for bears, as shrubs and new vegetation in the burned areas regenerates.

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 likely contain healthy bear populations and receive little hunting pressure. These areas may supplement bear populations in adjacent units through emigration.

Combining the general bear season with a permit controlled spring bear season enhances our ability to provide optimum recreational opportunity and a well-balanced harvest by game management unit.

Table 1. Spring Bear Hunt Statistics. 1999-2008

Year	Permits	Hunters	Bear Harvest Males	Females	Total Hunter Success		Spring Season % Male in Hv.	General Season % Males in Hv.
1999	70	51	5	2	7	14%	71%	86%
2000	100	82	14	3	17	21%	82%	48%
2001	108	47	5	3	8	17%	63%	55%
2002	106	72	18	12	30	42%	60%	64%
2003	105	57	13	2	15	26%	87%	58%
2004	105	72	9	5	14	19%	64%	63%
2005	105	57	10	3	13	23%	77%	70%
2006	105	33	13	4	17	52%	76%	71%
2007	155	69	17	12	29	42%	59%	73%
2008	155	81	16	12	28	35%	57%	68%
Total	1114	621	120	58	177	29%	68%	67%

Table 2. Black Bear General Season Harvest Summary 1992-2008, Blue Mtns., Washington.

Year	Bear Harvest Male	Female	Total	# of hunters	% Success	Hunter Days	Days per kill	Median Age Male	Female
1992	30	16	46	494	9%	2740	69	1.5	2.5
1993	25	32	57	491	12%	1988	35	6.5	2.5
1994	71	38	109	903	6%	5450	50	2.5	5.5
1995	88	46	134	1024	13%	7363	55	3.5	5.5
1996	43	18	61	1325	5%	8543	140	3.0	4.5
1997	14	14	28	1486	2%	11567	413	10.5	5.5
1998	40	42	82	1566	5%	1567	130	3.0	5.5
1999	83	13	96	3057	3%	25212	263	NA	NA
2000	16	17	33	2782	1%	16224	492	5.0	3.5
2001	31	25	56	1323	4%	7855	140	3.0	2.5
2002	86	49	135	1478	9%	9026	67	5.0	5.5
2003	57	41	98	1312	7.5%	8582	88	5.5	4.5
2004	49	29	78	1292	6%	7989	102	5.5	8.5
2005	43	18	61	1186	5%	7157	117	3.5	4.5
2006	65	26	91	1175	8%	6793	58	4.0	3.5
2007	53	20	73	1386	5%	8066	80	4.0	6.0
2008	52	24	76	1502	5%	9017	119	na	na
Average	49	28	77	1398	6%	8538	111	nag	na

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

The management objective for black bears in the East Cascades Black Bear Management Unit (BBMU 6) is to provide maximum hunting opportunity without negatively affecting the black bear population. Harvest objectives are based on criteria associated with percent females in the harvest and median ages of harvested bears (Table 1).

Table 1. Management guidelines for black bear harvest in Washington State.

Criteria	Over-harvest	Acceptable harvest	Desirable harvest
% females in harvest	≥40%	≤36%-40%	≤35%
Median harvest age	≤3 years	≥4 years	≥5 years
Median male harvest age	≤2 years	>2 years	≥4 years
Median female harvest age	≤4 years	≥5 years	≥6 years

Hunting seasons and harvest trends

Beginning in 1999, three big game packages that included a black bear tag were offered. These packages allowed hunters to purchase a bear tag for a nominal fee, which more than tripled the number of bear hunters in 1999 (11,050) compared to the average between 1989-1998 (3,394) (Table 2). Because there were more hunters relative to the number of bears, success decreased from 6.0 percent in 1998 to 1.0 percent in 1999 and 2000. Since the increase in 1999, bear hunter numbers declined to around 5,300 in 2001 and 2002, with further declines to 4,300 in 2005. Hunter numbers increased to 4,828 in 2006 and to 5,204 in 2007. Hunter success also increased from 3.8% in 2005 to 5.2% in 2006 and to 5.3% in 2007.

The harvest of black bears in BBMU 6 ranged between 120 and 339 from 1989 to 2007. In 2007, 276 black bears were harvested, 33% above the average from 1989-2006 (185). In 2007, the median age of males dropped to 2.5 years. Sample size was too small to estimate median female age in 2007. Percent females in the harvest were 41% in 2006, and then decreased to 27% in 2007. The average female harvest from 1989 to 2007 remains within the desirable harvest guidelines at 32%. Sex and age composition of the harvest was within the acceptable and desirable categories (Table 1).

Population status and trend analysis

Harvest statistics indicate the bear population in BBMU 6 is not over-harvested. The percentage of females in the harvest has averaged 32% over the last 19 years, while the median age of male and female bears harvested have remained stable. These data suggest a stable population.

Nuisance and damage activity

In general, bear nuisance and damage complaints increased from 1994 to 1998, following fires that burned large areas in 1994. However, fewer damage complaints were received 1999 to 2007, despite dry summer conditions. There is an increasing trend of specific bear nuisance complaints involving garbage at residences in the Leavenworth and Lake Wenatchee areas. Much of the new development is of summer or weekend residences where garbage from a weekend is left out for pickup mid-week. Complaints have resulted in some bears being removed, however, the cause lies with inadequate garbage disposal methods, not problem black bears.

Habitat condition and trend

In 1994, fires in Chelan County reduced the amount of forage and cover for black bear. Since the fires the amount of forbs and soft mast appears to have increased, which should benefit bears. Mast is not surveyed in BBMU 6, but casual observations and reports indicate 2007 was an average year for huckleberries and other mast.

Large sections of BBMU 6 are in remote or wilderness areas where no habitat alterations occur. Forest management has not changed significantly in recent years. Localized fringe areas have seen an increase in recreational development and orchards. The orchards provide abundant soft mast but create damage situations.

Management conclusions

The black bear population in BBMU 6 appears to be healthy. High amounts of secure, relatively inaccessible habitat suggest the robust nature of this 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, 1989-2008.

Year	No. males	No. females	Total	No. hunters	% success	Hunter days	Median Age		% females in harvest
							Males	Females	
1989	112	65	175	2,392	7.4	9,550	4.0	4.5	37
1990[a]									
1991	126	101	227	2,886	7.8	13,615	3.5	4.0	44
1992	129	84	213	2,847	7.4	13,125	4.5	4.5	39
1993	117	42	159	3,758	4.3	20,780	3.5	5.5	26
1994	93	48	141	2,620	6.0	15,709	4.5	6.5	34
1995	86	35	121	2,724	4.3	12,291	3.5	4.5	29
1996	130	16	146	3,429	4.3	15,317	4.5	7.5	11
1997	102	44	146	4,229	3.5	20,271	4.5	4.5	30
1998	230	109	339	5,661	6.0	38,557	4.5	5.0	32
1999	108	34	142	11,050	1.0	106,157	5.5	4.5	24
2000	87	33	120	9,379	1.0	54,846	4.0	8.5	28
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	202	74	276	5,204	5.3	32,487	2.5	NA	27
2008[a]									
Avg.	129	62	190	4,745	5	31,889	4	6	32

[a] No harvest data available.

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 2008 black bear season in the Okanogan BBMU occurred between August 1-November 15. Hunters had generally favorable conditions during the season. Hunter numbers continued to increase in 2008 to 1,644, which is below the 12-year average. Hunters also spent more days in the field in 2008, which led to an increase in hunter success of 8%, which is above the 12-year average of 6% (Table 1).

Population status and trend analysis

Bears have always been a difficult animal to survey and census. Results from recent WDFW black bear research have helped refine statewide population estimates; however, no estimate for the Okanogan BBMU exists.

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 continued to fall in 2008 to 24%, well within acceptable harvest guidelines. The 2008 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. According to WDFW Law Enforcement no depredation permits were issued in 2008 in the Okanogan BBMU. This is likely a result of good natural food availability throughout 2008 in combination with better sanitation actions rectifying nuisance and damage complaints.

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

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%

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 increased slightly but is below the 12-year average and the percent female harvest is within acceptable harvest guidelines. Declining population parameters of harvested animals warrant close scrutiny of median ages in future harvests; however, for this data to be meaningful, hunter compliance with tooth submittal for aging must be improved to generate larger sample sizes.

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.

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 (BBMU) 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 2008 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. Typical spring weather likely favorably influenced the availability of plant foods for bears.

The number of general season bear hunters hunting in BBMU 3 increased in 2008. Hunter success and harvest also increased in 2008. The total 2008 harvest was 416 bears, the highest harvest seen in over a decade (Table 1). 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 harvest was 39%.

Nuisance and damage activity

Eighty-seven depredation permits were issued to industrial timberland owners concerned about tree damage in spring 2008, which is a considerable increase from the 39 permits issued in 2007. However, of the permits issued in 2008, 43 total bears were reported as taken: 28 males, 12 females, and 3 unknown sex, which is basically identical to the damage harvest reported in 2007 with 44 animals killed (24 males, 16 females, 4 gender not reported).

To help alleviate bear damage in some locations, a spring permit hunt was approved for the 2008 season for 2 areas in BBMU3. In spring 2008, 25 permits were issued in a portion of GMU 448, and 20 permits will be issued in portions of GMU 418. Seven males and 3 females were harvested from GMU 418 and 4 males and 0 females were harvested from GMU 448 during the spring permit hunt.

The number of problem bears seen along the urban-rural interface continued in all three counties contained within BBMU 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.

Habitat condition and trend

Human populations in BBMU 3 are expected to increase in the coming years and continued habitat loss is the expected result. Where human encroachment is not an issue, habitat is sufficient to support healthy black bear populations.

Management conclusions

Black Bear harvest in BBMU 3 increased in 2008. The combined total of bears killed in damage hunts, permit hunts and the general season was 473 animals. Median age data are not yet available for 2008; 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, 1995-2008

						% hunter	median age	median age	
Year	male	female	total harvest	days/kill	# hunters	success	male age	female age	% female
1995	107	46	153	60	1658	8	4.5	5.5	30
1996	130	55	185	63	1733	11	5.5	4.5	30
1997	78	38	116	54	1117	11	6.5	4.5	33
1998	192	91	283	69	2948	10	6.5	3	32
1999	95	62	157	210	3273	5	6.5	8.5	39
2000	118	51	169	108	3065	6	5	7	43
2001	102	47	149	125	2147	6.9	5.5	5	46
2002	119	68	187	95	2083	9	7.5	7.5	57
2003	105	64	169	81	1660	10.2	3.5	3.5	38
2004	176	70	246	52.6	1626	15.1	3.5	4.5	28
2005	87	34	121	103	1465	8.3	4	6	28
2006	110	63	173	71	1662	10.1	4	4.5	36
2007	153	44	197	57.5	1922	10.2	4	6	29
2008	254	162	416	45.3	2443	17			39

2009 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 and to reduce timber damage, property damage, and black bear/human 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 2008, hunter success for the general black bear season in the BBMU 4 was about 6%. This was an increase from the 2007 success rate, and is an increase from the previous 10 seasons in the South Cascades. The reported 2008 general season black bear harvest (317) in the BBMU 4 was the highest harvest level in the past 10 years and was higher than the 10-year average (179) for this bear management unit (Table 1). Bear hunter numbers have increased gradually over the past 5 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 2009 to mitigate timber damage. A total of 100 permits were issued to landowners this year, an increase from previous years. A total of 42 bears (26 males, 12 females, 4 unknown) were taken during the spring 2009 depredation permit season. This represents a similar harvest to the previous year (43). Reports for 13 permits have not been received at this time and it is assumed that additional bear harvest has taken place. The overall effect of the spring depredation permit harvest on black bear populations and the benefit these hunts actually 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

For the 2008-2009 hunting season there was an increase in the overall number of bears harvested in the South Cascades Bear Management Unit. Age data from tooth analysis is currently unavailable for evaluation of male/female harvest for the 2008 hunting season. Modifications to the 2010 bear hunting season will be reviewed as this data becomes available. The percentage of females in the 2008 harvest was 33% and meets the target level of less than 40% female harvest in the population.

Surveys

No formal bear surveys were conducted in BBMU 4 in 2008. Population status was estimated from trends in harvest statistics.

Nuisance and Damage

WDFW responds to bear nuisance and damage complaints made by the general public. During the time period 1 January to 31 December 2008, one landowner was issued a depredation permit and the bear was subsequently harvested in the spring of 2009. All other bear issues, outside the commercial forest program, were resolved by WDFW enforcement agents by working with landowners to reduce bear attractants (i.e., garbage).

As urbanization continues to encroach on bear habitat in BBMU 4, bear/human interactions have continued, especially in Clark and Lewis counties. Many reports from the public are of bear sightings and do not warrant action beyond education.

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 trees. Little information exists on the impact of bear feeding and the impacts to local bear populations. Consideration is currently underway to shift from issuing depredation permits to a recreational spring bear permit season.

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 continue to be high. 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 significantly in the past

10 years and further bear/human interactions are expected.

Management Conclusions

Black bear harvest numbers increased in 2008 (317), and were well above peak harvest numbers in 2004 (242) (Table 1). The 2008 black bear harvest (317) represents an above average harvest year compared to the 10-year average (179). Male and female harvest objectives, as determined by age class data, were not available at the time of this report. This information will be evaluated later in the year prior to evaluating the next hunting cycle to determine the need for future management changes. Percentage of females in the harvest currently meets bear 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 hunt. 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, 1997-2008

Year	Male	Female	Total	Success	Hunters	Days Hunted	Days/Kill
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
2000	127	44	171	0.02	7206	57733	338
1999	71	15	86	0.01	7669	74857	870
1998	95	67	162	0.03	5112	45061	278

Table 2. Median age of black bear harvested in the South Cascades Black Bear Management Unit, 1997-2008.

Year	Male	Sample	Female	Sample	Sexes Combined	Sample
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
2000	4.5	27	5.5	17	4.5	44
1999	4.5	32	5.0	8	4.5	40
1998	4.5	28	3.0	16	4.0	44

BLACK BEAR STATUS AND TREND REPORT: REGION 6
Coastal Black Bear Management Unit (BBMU1)

WARREN MICHAELIS, Wildlife Biologist

Population objectives/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 and to reduce timber damage, property damage, and black bear/human 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 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.

Hunting seasons and harvest trends

The estimated total black bear harvest for the coastal region in 2008 was 385, and was higher than the previous year (Table 1). About 68% of the total harvest was males and 32% females. Percent female harvest was similar in proportion with the reported 2007 percent female total harvest. Hunter success decreased during the 2008 season. The 2008 general black bear season extended from August 1 through November 10.

Nuisance and damage activity

Spring timber damage seasons in Region 6 are on an "as needed" basis. Harvest information from 2008 depredation permits was not available at the time this report was completed.

During the 2008 spring bear damage hunt season, 50 permits were issued in the Capitol Forest GMU 663. A total of 4 male bears and 1 female were taken. An additional spring bear hunt was held in the Copalis GMU 642. A total of 99 permits were issued and 17 bears (10 male and 7 female) were taken. Seasons for permit holders were from April 15 to June 15, 2008.

Population status and trend analysis

No formal statewide bear surveys are conducted in Washington. Black bear population levels are monitored through harvest statistics (median harvest age for each sex and percentage of females in the harvest; Figures 1 and 2, Table 1). Based on these parameters, harvest levels appear to within acceptable limits.

Management conclusions

The coastal BBMU has ample secure habitat for bears and a defacto bear reserve (Olympia 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 strategy that takes into account harvest from all sources (i.e., general seasons, permit seasons, and spring tree damage depredation take).

Table 1. Coastal BBMU1 bear harvest summary 1996-2008

Year	Male	Female	Total	Days/Kill	Hunter Success
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%
1999	126	98	224	401	3%
1998	131	90	221	178	5%
1997	102	56	158	92	9%
1996	222	44	266	103	10%

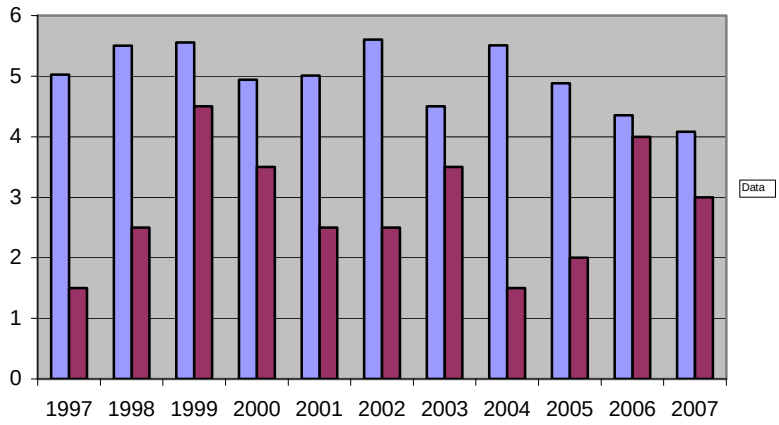


Figure 1. Estimates of the mean-age distribution of male bears harvested in the Coastal BBMU, 1997-2007 (Blue is weighted mean and red is weighted mode).

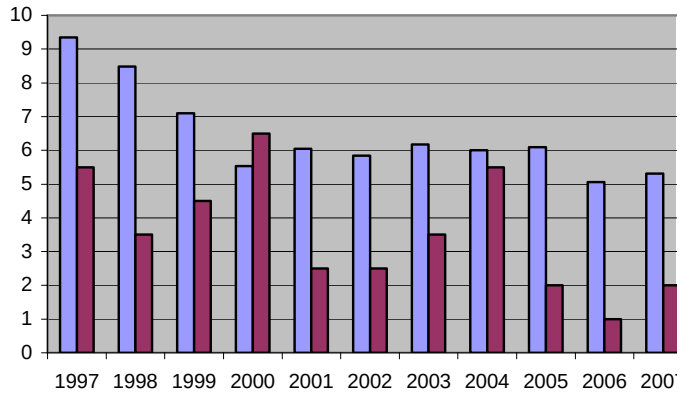


Figure 2. Estimates of the mean-age distribution of female bears harvested in the Coastal BBMU, 1997-2007 (Blue is weighted mean and red is weighted mode).

.

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 established a population objective for band-tailed pigeons in Washington based on the WDFW call-count survey (Pacific Flyway Council 1984). PFC is currently working to develop a revised population objective based on the new mineral site survey. Population objectives for mourning doves are being developed as part of the national mourning dove harvest strategy.

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. 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. Based on these actions, the WDFW call-count survey was discontinued after the 2003 survey, but is presented in this report for comparison to the mineral site survey.

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 in 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).

Band-tailed pigeon mineral site survey

USGS conducted mineral site surveys at 8 locations in 2001 and 2002 (Overton and Casazza 2004). These included two in Region 4 (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). In 2003, WDFW surveyed these same sites. 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). Cooperators from WDFW and USFWS completed surveys during the July 10-20, 2009 survey period.

Mourning dove call-count survey

The mourning dove survey was completed between May 20-31, 2009 following USFWS (2009) 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 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, and reminder postcards are sent out to those not returning reports by the deadline. Responses from the postcard reminder 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, 2008. Hunters failing to

comply with reporting requirements were ineligible to participate in the 2009 season.

Mourning dove harvest estimation

Mourning dove harvest was estimated as part of the statewide hunter survey conducted by WDFW (WDFW 2009).

Results

Band-tailed pigeon call-count survey

Past call-count survey results are presented in Table 1 and Figure 1.

Band-tailed pigeon mineral site survey

Mineral site survey raw data summaries are presented in Table 2 and Figure 1. Complete 2008 survey results are available through USFWS (2009), but the 2009 analysis will not be available until 2010.

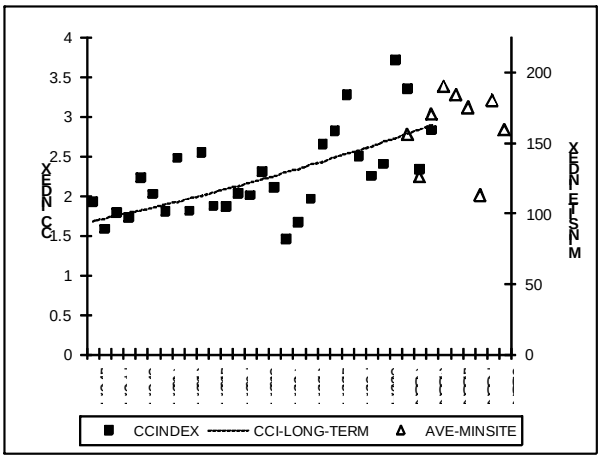


Figure 1. Band-tailed pigeon call-count results and mineral site raw data summaries.

Mourning dove call-count survey

Mourning dove survey results are presented in USFWS (2009).

Band-tailed pigeon harvest

Harvest and hunter activity for the 2002-2008 seasons are summarized in Figures 2-3 and Table 3.

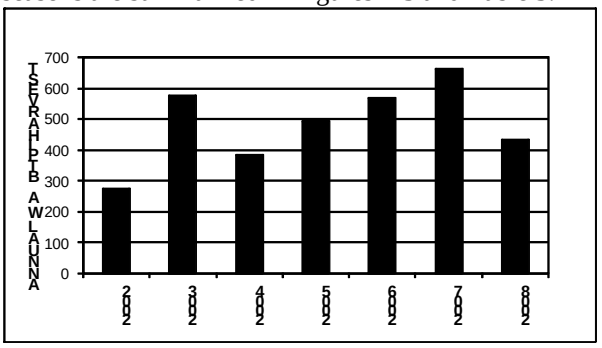


Figure 2. Band-tailed pigeon harvest.

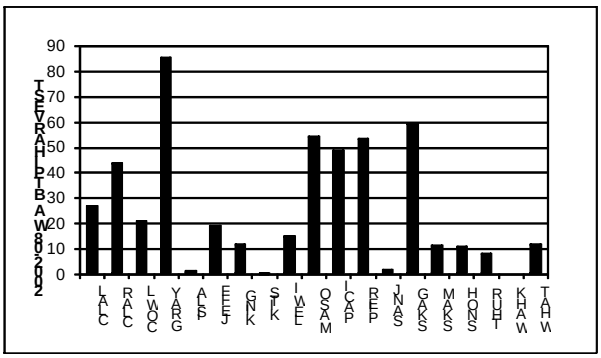


Figure 3. Band-tailed pigeon 2002-2008 average annual harvest by county.

Mourning dove harvest

As measured by WDFW surveys, harvest in 2008 was estimated at 68,725 doves, down 21% from 2007 (Figure 4). Hunter numbers were estimated at 4,315, down 24% from 2007. Number of days hunted was 13,895, down 8% from 2007.

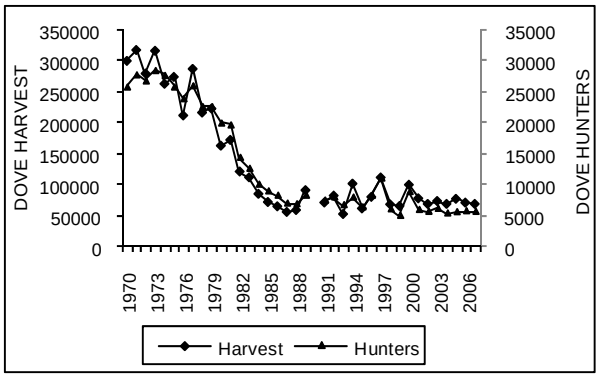


Figure 4. Mourning dove harvest and hunter numbers.

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 consistent with the past Pacific Flyway management plan. The 2009 mineral site survey raw data summaries point to maintenance of

increased numbers of band-tails present during the breeding season, compared to historic surveys.

Literature Cited

Dillman, D. A.., 1978. Mail and Telephone Surveys: The Total Design Method. John Wiley & Sons, New York, New York, USA.

Jeffery, R. 1989. The band-tailed pigeon in Washington. Unpublished report. WDFW, Olympia WA.

Overton, C. and M. Casazza. 2003. Pacific Coast mineral site survey for breeding band-tailed pigeons – Washington. Unpublished report. USGS, Dixon CA.

Pacific Flyway Council. 1993. Pacific Flyway management plan for the Pacific Coast Population of Band-tailed Pigeons. Pacific Coast Band-tailed Pigeon Subcomm., Pacific Flyway Study Comm. [c/o USFWS], Portland, OR. Unpubl. rept.

Sauer, J. R., J. E. Hines, and J. Fallon. 2003. The North American Breeding Bird Survey, Results and Analysis 1966 - 2002. Version 2003.1, USGS Patuxent Wildlife Research Center, Laurel, MD.

USFWS. 2009. Mourning dove, white-winged dove, and band-tailed pigeon population status. Unpublished report. USFWS, Laurel MD.

WDFW 2009. 2008 game harvest report. Unpublished report. WDFW, Olympia WA.

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 results.

SITE	2001	2002	2003	2004	2005	2006	2007	2008	2009
Altoona				64	0	5	0		
Cedar Cr.	328	215	157	215	185	231	191	312	163
L. Cavenaugh				108	172	76	71	117	70
Lilliwaup	60	77	108	199	143	273	141	89	110
McAllister	82	118	174	124	174	87	25	136	46
Mud Bay	164	154	222	134	371	294	95	203	130
Oyster Cr.	362		455	474	542	293	157	331	314
Newaukum				634	167	335	309	219	
Potlatch	135	147	90	297	285	306	168	295	480
Red Salmon	52	103	121	179	103	64	33	107	41
St. Martins				220	128	191	189	141	210
Sumas	67	71	31	46		68			
U. Kalama				110	225	327	120	350	317
Warm Beach				48	58	62	83	36	29
Willapa				3	24	10	3	0	5
Mean	156	126	170	190	184	175	113	180	159

Table 3: WDFW band-tailed pigeon harvest report summary.

	2002	2003	2004	2005	2006	2007	2008	7-YR AVE
NUMBER OF PERMITS ISSUED	522	657	766	809	909	894	917	782
TOTAL DAYS (SUCCESSFUL)	357	337	209	382	315	364	247	316
TOTAL HARVEST	273	574	383	492	569	661	434	484
HARVEST BY COUNTY								
CLAL	37	35	14	25	35	37	5	27
CLAR	29	45	29	35	60	51	56	44
COWL	28	54	4	2	3	32	24	21
GRAY	47	53	104	76	71	145	103	86
ISLA	0	0	0	0	9	0	0	1
JEFF	10	16	31	26	14	29	6	19
KING	4	23	13	6	11	14	9	12
KITS	0	1	0	0	0	0	0	0
LEWI	7	13	11	34	5	22	13	15
MASO	26	38	48	62	63	84	59	54
PACI	13	21	37	35	73	80	82	49
PIER	20	82	30	62	85	63	32	53
SANJ	0	0	12	0	0	0	0	2
SKAG	33	99	15	97	74	65	31	59
SKAM	5	16	0	10	16	21	11	11
SNOH	15	29	3	12	11	3	4	11
THUR	0	13	8	2	24	10	0	8
WHAT	0	34	24	6	14	4	0	0

Waterfowl

WATERFOWL STATUS AND TREND REPORT: STATEWIDE
Breeding Populations and Production

MIKAL MOORE, Waterfowl Specialist

Introduction

This report summarizes waterfowl productivity data collected during 2009, 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 will consist 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.

In 2009, east-west transects (*n = 47)* were established in 3 stratum from a random starting point, and flown with a helicopter. Transect spacing was based on expected breeding duck densities. Stratum transect spacing and coverage were as follows: Irrigated, 8 miles apart, 3.1% coverage; Potholes, 15 miles apart, 1.7% coverage, Highlands, 20 miles apart, 1.2% coverage. The fourth stratum, Palouse Rivers, was sampled by surveying 30% of the total length of four southeast rivers. Observers surveyed 309 mi^2, covering approximately 1.9% of the overall survey area.

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 are surveyed by helicopter.

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 2009 index of breeding duck populations in eastern Washington was 117,650 (Table 2; Fig. 2), down 2% from 2008 and 23% below the long-term average. This count represents the fourth year of decline in breeding duck counts in eastern Washington, and the fifth lowest count since 1980.

Breeding pair counts declined in 2 out of 4 eastern Washington strata (Fig. 4, Table 3). The Irrigated stratum declined 14% from 2008, 21% below the 1979-2008 average (Figs. 4 and 5, Table 3). With the exception of green-winged teal (+375%), northern shoveler (+8%), redhead (+63%), and scaup (+121%), all major breeding duck species in the Irrigated strata declined from the previous year. Green-winged teal (+2%), northern shoveler (+19%), scaup (+17%), and ring-necked ducks (+132%) all exceeded the long-term average in 2009. These gains were evident in both the Yakima and Columbia basins. The long-term decline in duck production on wetlands associated with Desert Wildlife Area wasteways continues (Fig. 5). 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 X).

Breeding duck indices in the Potholes stratum were up 14% from 2008, 28% below the long-term average.

All major breeding species, with the exception of gadwall (-12%), cinnamon teal (-9%), and redheads (-15%), increased from 2008 levels in the Potholes strata. Nearly all major breeding species, with the exception of gadwall (0%), and green-winged teal (+18%) remain below the long-term average in the Potholes stratum. Most of the long-term variability in Washington's breeding duck index has come from surveys in the Potholes area (Fig. 4, Table 3). This area has inconsistent precipitation patterns and many semi-permanent and ephemeral wetlands. In 2009, the Potholes strata supported 38% of breeding ducks in all strata. In 2001, the Potholes strata supported 45% of the duck production of all strata combined. Breeding mallard populations in the Potholes strata declined sharply beginning in 2002, but have increased for the past 3 years from the low in 2006. Currently Potholes mallards are 27% below the long-term average (n = 10,965) for the strata.

The Northeast stratum was 7% above the 2008 count and 10% below the long-term average. This stratum represents 17% of breeding ducks in all eastern Washington strata in 2009. Mallard (+37%), gadwall (+100%), American wigeon (+64%), blue-winged teal (+38%), wood duck (+20%), bufflehead (+10%), and ruddy duck (+38%), all exceeded 2008 counts. All other major breeding duck species declined in the Northeast strata. In 2008, mallard (+11%), gadwall (+1%), wigeon (+40%), wood duck (+74%), and goldeneye (+48%) all exceeded the long-term average.

Breeding pair counts in the Palouse strata were 22% below the previous year and 70% below the long-term average. The Palouse strata 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 numbered 47,533 down 6% from 2008, and 10% below the long-term average (Fig. 3, Table 2). The Irrigated stratum hosts 65% of eastern Washington breeding mallards. Breeding mallard counts declined in the Potholes over a seven year dry period but have recovered after the past four years due to normal precipitation recharging the aquifer and filling wetland basins.

Gadwall breeding indices have declined for the third straight year, after peaking in 2007 (Fig. 3, Table 2). Gadwall breeding population counts fell below the long-term average by 4% in 2009. 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 appear 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.

Cinnamon and blue-winged teal (BCTE) have not been separated in the long-term database because of differences among observers in recording data and difficulty in distinguishing females. BCTE were the second most common breeding duck in eastern Washington until 2002 when gadwall surpassed them in total numbers. The combined total of BCTE is down 23% from 2008 and 65% below the long-term average (Fig. 3, Table 2). A general downward trend has occurred since 1985. In the mid-1980's, approximately 4.5 times as many breeding BCTE were detected in eastern Washington compared to recent surveys (Figs. 3, 6).

Redhead numbers in 2009 were down 6% from the previous year and 51% below the long-term average. 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: Experimental Eastern Washington Helicopter Transects

Total breeding duck counts numbered 146,391 (+/- 13,429) within 4 strata in eastern Washington. This count exceeds the traditional survey total by 31,314. Total mallards numbered 77,291 (+/- 47,544), exceeding the traditional survey total by 29,748. Gadwall were the second most numerous species on the survey (n = 18,159), followed by blue-winged/ cinnamon teal (n = 11,487), and redhead (n = 10,361).

Representation by strata was similar between the experimental helicopter transects and the traditional survey. The Irrigated stratum accounted for 48% of the total duck count in the helicopter survey, and 44% in the traditional survey. The Potholes stratum comprised 33% of the total duck count in the helicopter survey, versus 38% is the traditional survey. The Northeast stratum represented 18% of the total duck count in the helicopter survey, and 17% in the traditional survey. The Palouse accounted for 1% of total ducks in both surveys.

Results: Western Washington Survey Area

The western Washington duck surveys estimated the breeding population index for mallards at 8,378, 6% below the 2008 index and 8% below the 1997-2008 average. The wood duck breeding index was 1,228, 52% below the 2008 index, and 47% below the long-term average (Table 5, Fig. 7). Breeding mallard populations in western Washington appear to be fairly stable despite the large-scale loss of wetlands and wetland function to urban development. Wood ducks are notoriously difficult to survey from the air, which

contributes to the dynamic fluctuations in breeding pair counts. Therefore, long-term average comparisons are more meaningful when discussing wood duck populations.

Pond Survey

Ponds are counted on 8 transects within the Potholes Strata (Fig. 1) during the breeding-duck survey to index water conditions and to monitor the availability of breeding habitat (Fig. 8, Table 6). The 1997 index of 15,665 ponds was the highest ever recorded. The 2009 pond index was 5,992, 9% above 2008 levels, and 10% below the long-term average. Pond counts were up on the Douglas, Lincoln, and Far East transects over the previous year. Only the Far East was above the long-term average (+28%) in 2009 (Table 6). An abundant snowpack in portions of far eastern Washington, coupled with several spring snowstorms resulted in good runoff, filling numerous seasonal wetlands.

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. These surveys were not performed in 2006 due to personnel limitations.

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 2009 duck brood production survey index for the Potholes, Palouse, and Northeast strata was down 16% from 2008 and 39% below the long-term for all combined duck species (Table 7, Fig. 9). In general, all species are rebounding from record low counts in 2005. Green-winged teal (+31%) were the only dabbling duck broods above the long-term average (Table 7). Among diving ducks, scaup (+97%), goldeneye (+101%), bufflehead (+153%), and merganser (+56%) broods all exceeded the long-term average (Table 7).

Brood production declined over the previous year in all strata (Table 8). Long-term gains in brood production were seen in the Okanogan (+33%) transect only (Table 8).

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 9). 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 1). 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 2009 index of goose nests increased across the survey area. However, only 13 out of 21 surveys were conducted according to the variable survey schedule. Overall the nest index was 7% above the 2008 count and 10% below the 20-year average (Table 10, Fig. 10). The 20-year average provides a fair comparison for current goose nest counts.

The nest surveys in the Upper Columbia were up 4% from the 2008 nesting effort and 40% below the 20-year average (Table 10, Fig. 11). Goose nest counts on the Upper Columbia began a steep decline starting in 2003 (Fig. 11). Individual transects were fairly static in 2009 with a slight increase in the Hanford nesting effort.

The total number of nests found on the Lower Columbia decreased by 1% from 2008, 6% below the 20-year average (Table 10, Fig. 11). The transect with the most consistent survey is below the I-5 Bridge to Puget Island. For this area, 367 nests were recorded in 2009, an 8% increase from 2008, and 19% below the long-term average.

Goose nesting effort on the Snake River in 2009 was up 23% from the previous year and 10% above the 20-year average. 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 22% from 2008, 16% above the 20-year average (Table 10, Fig. 11). The Potholes Reservoir survey, conducted every other year, yielded 36% more nests (n = 369) 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 (Table 10, Fig. 12). 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 2009 index decreased 9% from 2008, 4% above the 20-year average.

In western Washington, the population index for Canada geese was 4,631, an increase of 14% from 2008, and 69% above the 10-year average of the survey (Table 5, Fig. 13).

Potential Improvements to Waterfowl Breeding and Production Surveys

- Expand new duck breeding population survey to western Washington
- Expand databases to include older data.
- Clearly delineate strata, evaluate new strata boundaries, 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.

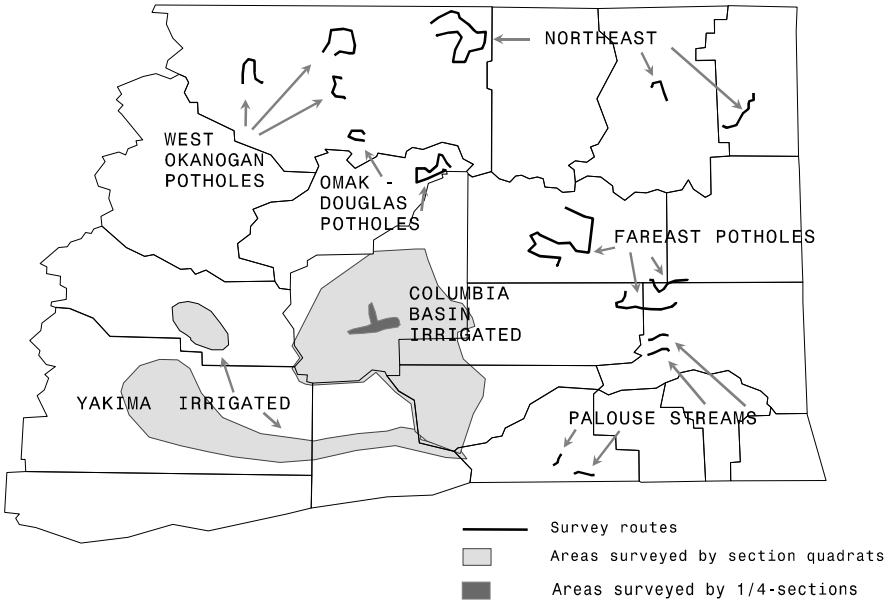


Figure 1.1. Aerial breeding waterfowl survey transects flown in 2009.

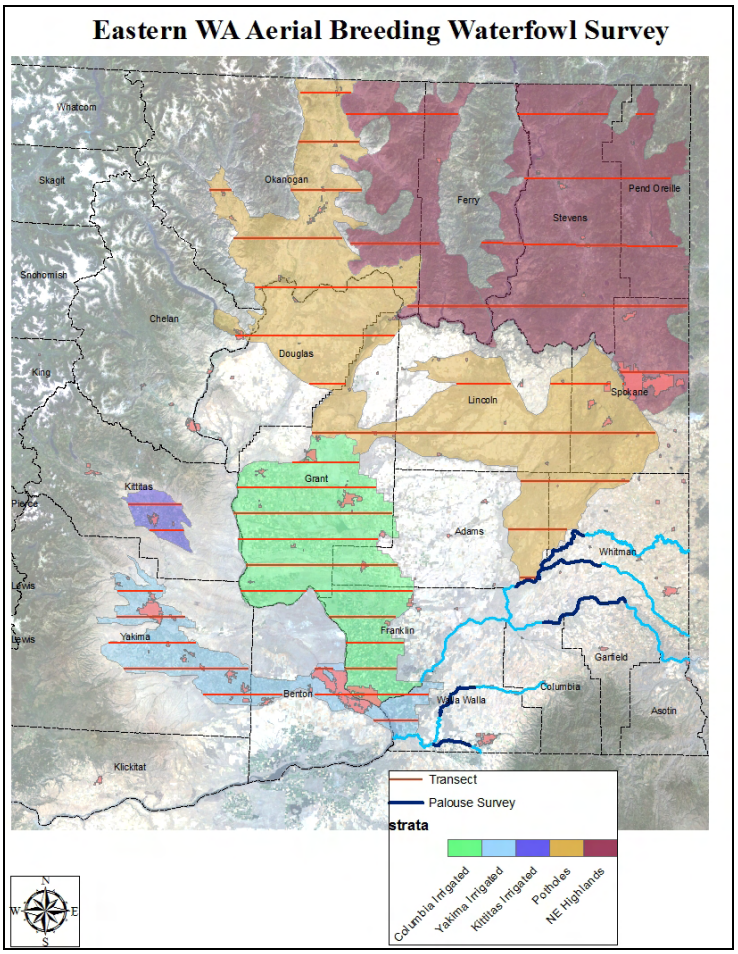


Figure 2. Total breeding duck population index for eastern Washington, 1961-2009

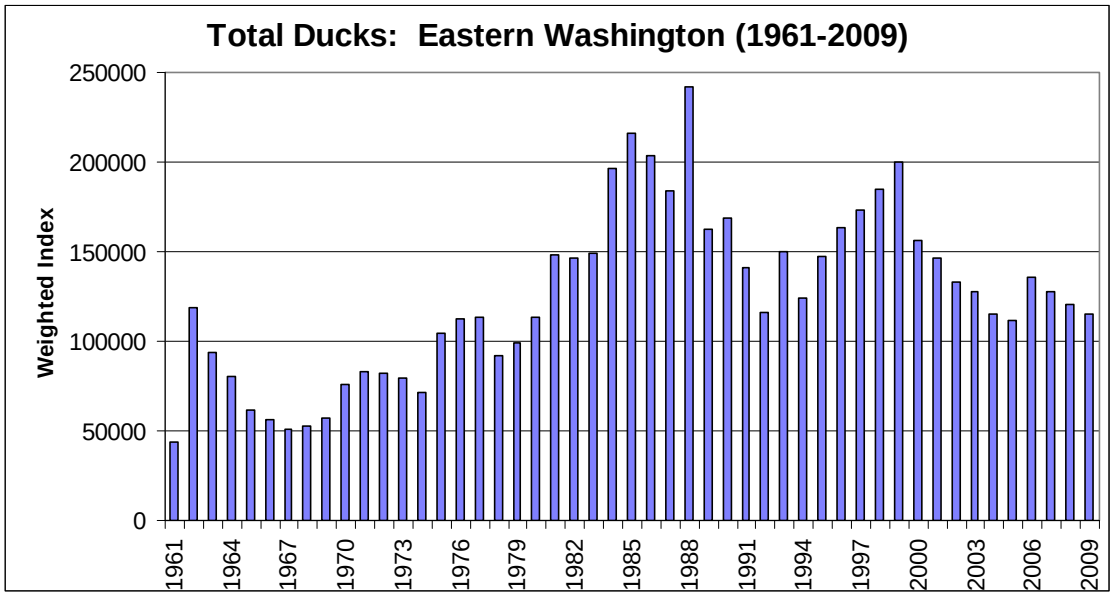
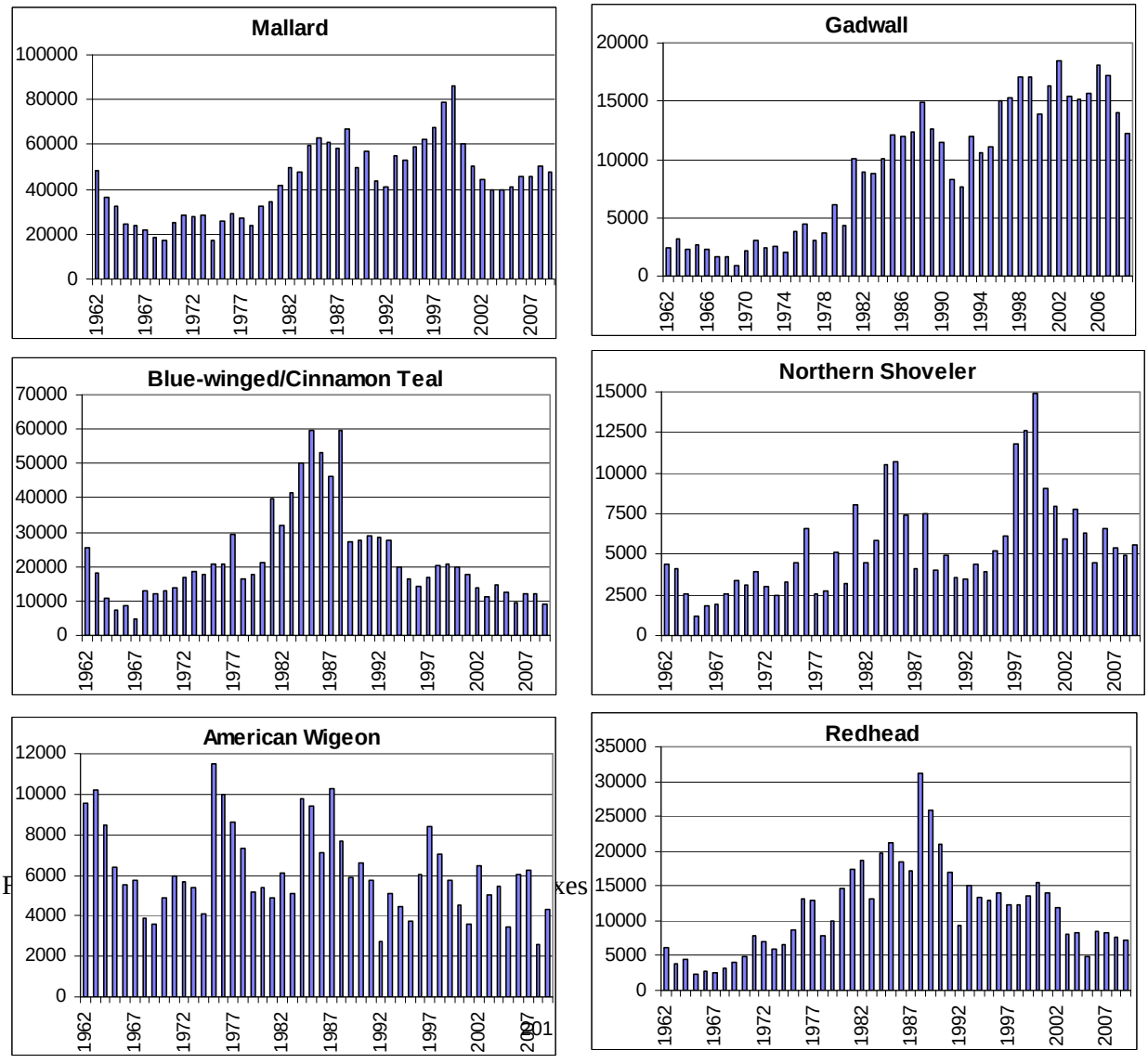
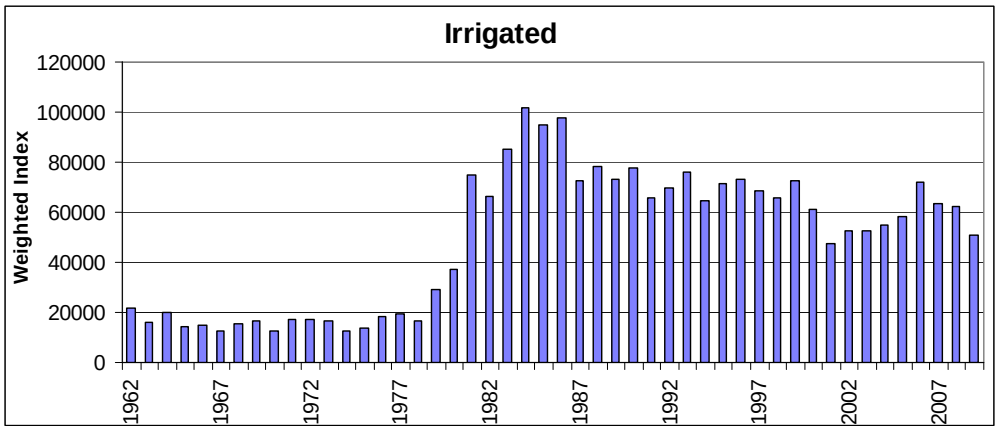
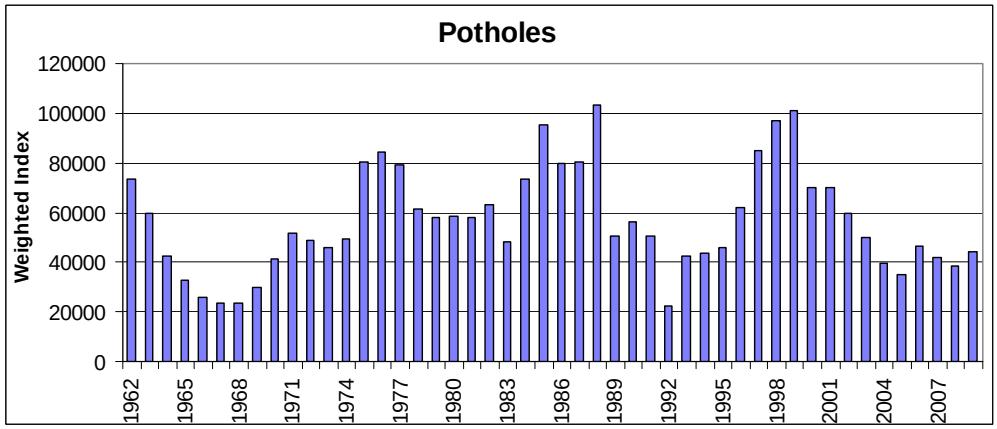
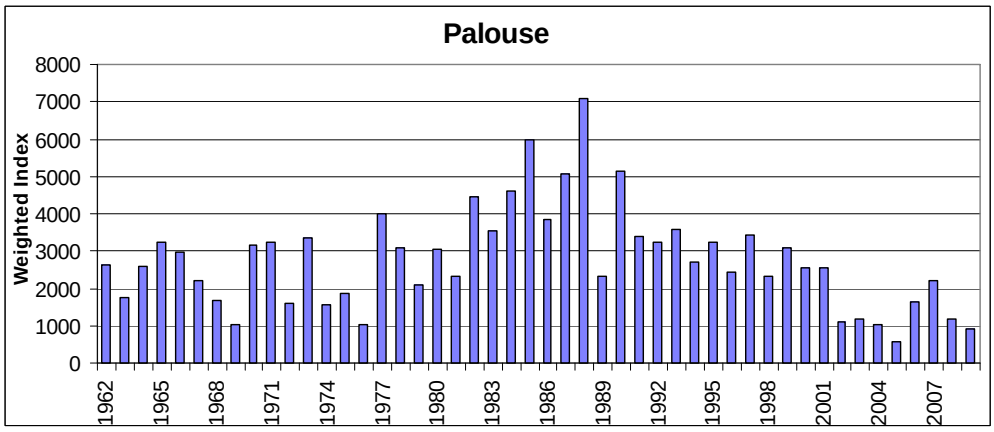


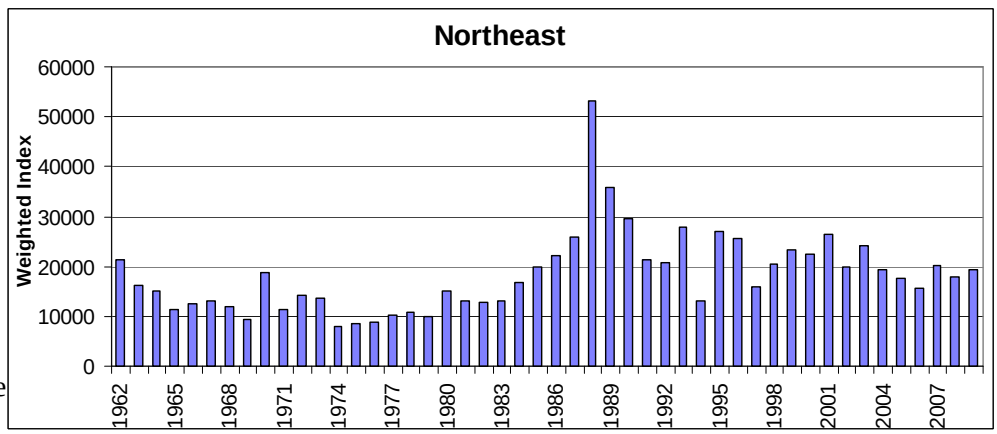
Figure 3. Indices of common breeding ducks in eastern Washington, 1962-2009.




Irrigated
Weighted Index
120000
100000
80000
60000
40000
20000
0
1962
1967
1972
1977
1982
1987
1992
1997
2002
2007


Potholes
Weighted Index
120000
100000
80000
60000
40000
20000
0
1962
1965
1968
1971
1974
1977
1980
1983
1986
1989
1992
1995
1998
2001
2004
2007


Palouse
Weighted Index
8000
7000
6000
5000
4000
3000
2000
1000
0
1962
1965
1968
1971
1974
1977
1980
1983
1986
1989
1992
1995
1998
2001
2004
2007


Northeast
Weighted Index
60000
50000
40000
30000
20000
10000
0
1962
1965
1968
1971
1974
1977
1980
1983
1986
1989
1992
1995
1998
2001
2004
2007

Figure

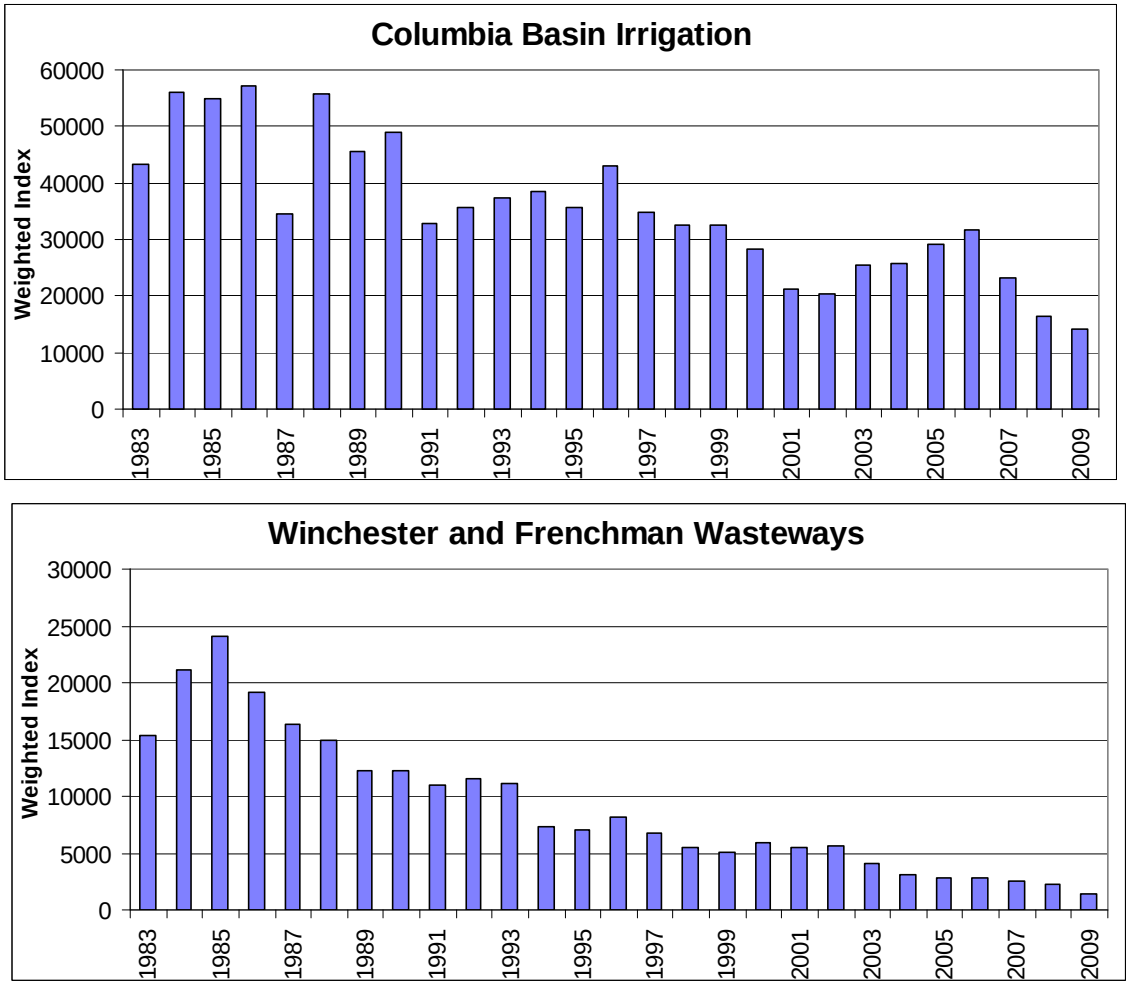


Figure 6. Proportion of blue-winged and cinnamon teal in eastern Washington breeding population surveys (1983-2009).

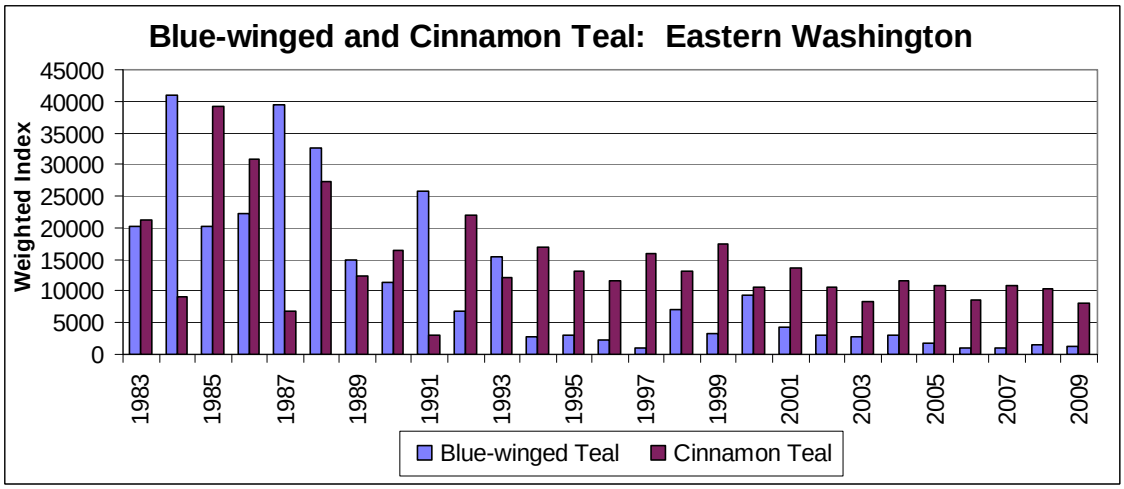


Figure 7. Western Washington total population indices for breeding ducks, 1997-2009.

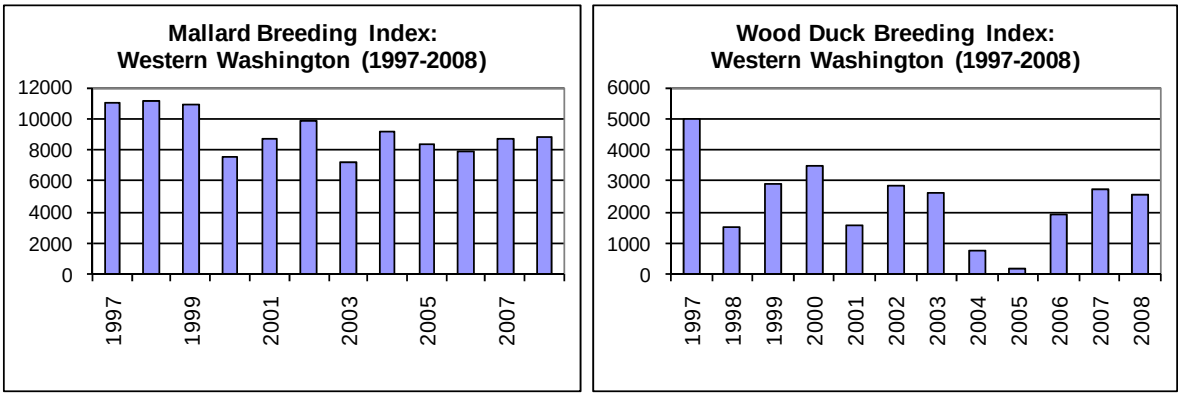


Figure 8. Index to pond numbers in the Potholes Strata, 1979-2009.

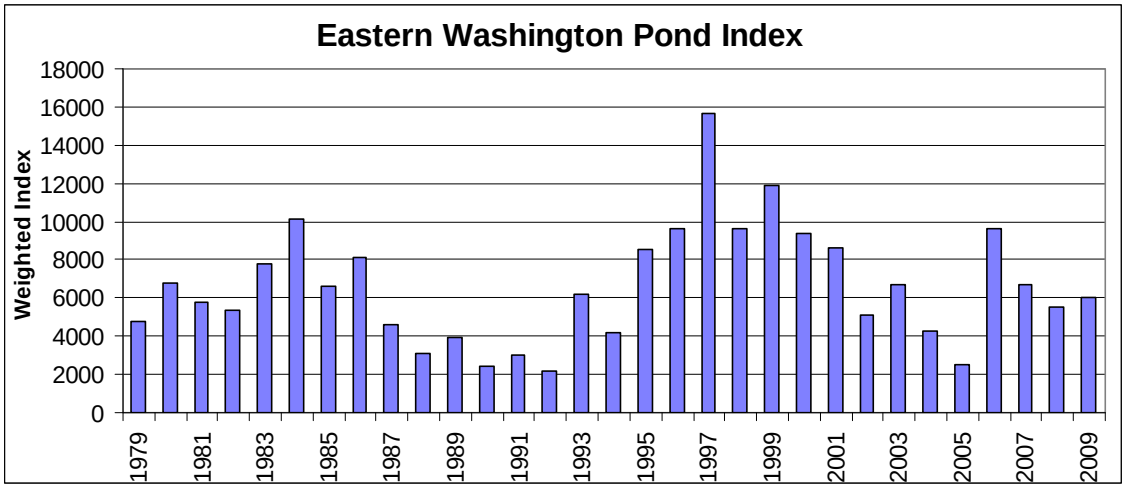


Figure 9. Weighted duck brood index (all species) for 3 eastern Washington strata, 1979-2009.

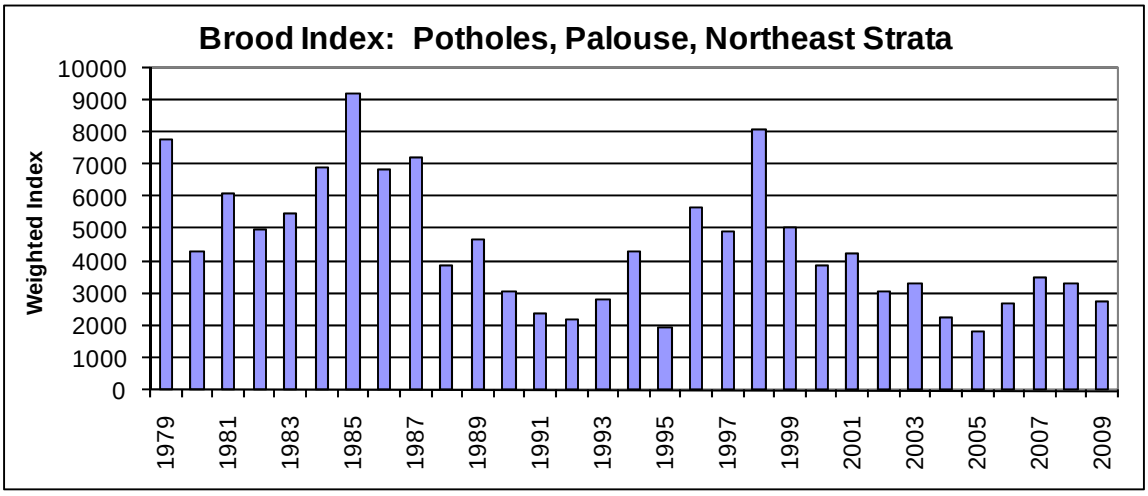


Figure 10. Total Canada goose nest attempts found on Columbia and Snake Rivers and in Columbia Basin, 1982-2009.

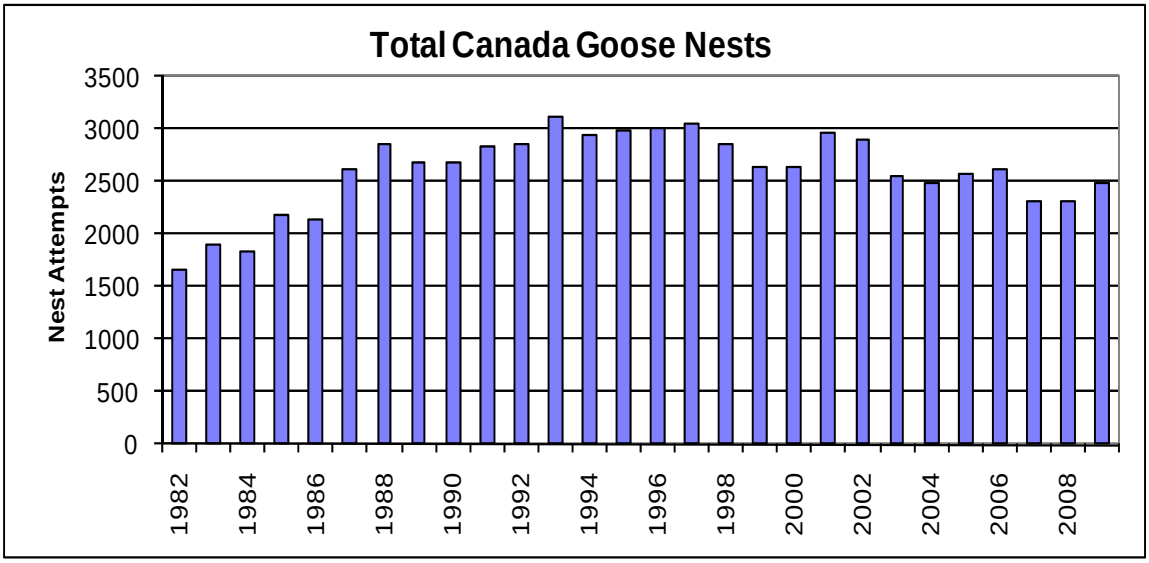


Figure 11. Canada goose nest surveys (number of nest attempts) by strata, eastern Washington, 1982-2009.

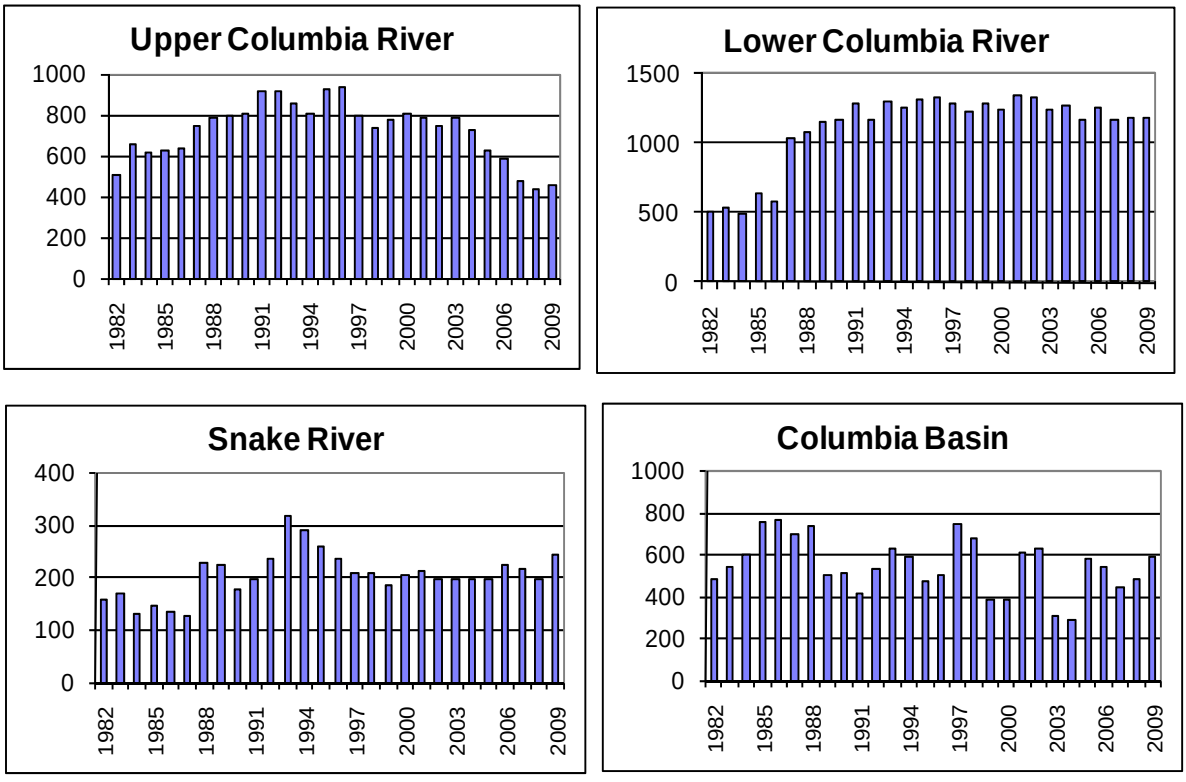


Figure 12. Breeding Canada goose index from eastern Washington breeding duck surveys, 1979-2009.

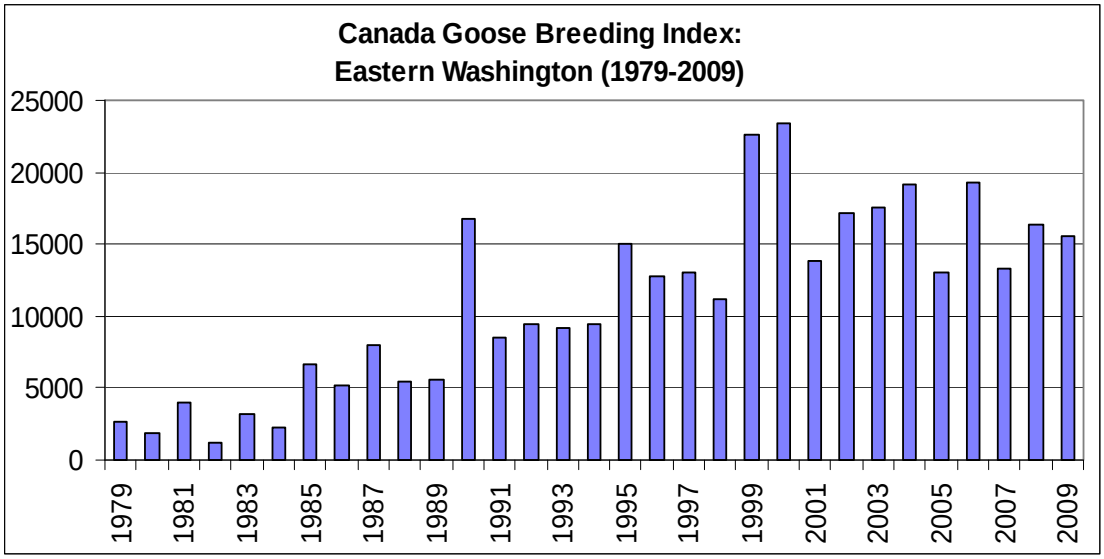


Figure 13. Breeding Canada goose index from western Washington duck surveys, 1997-2008.

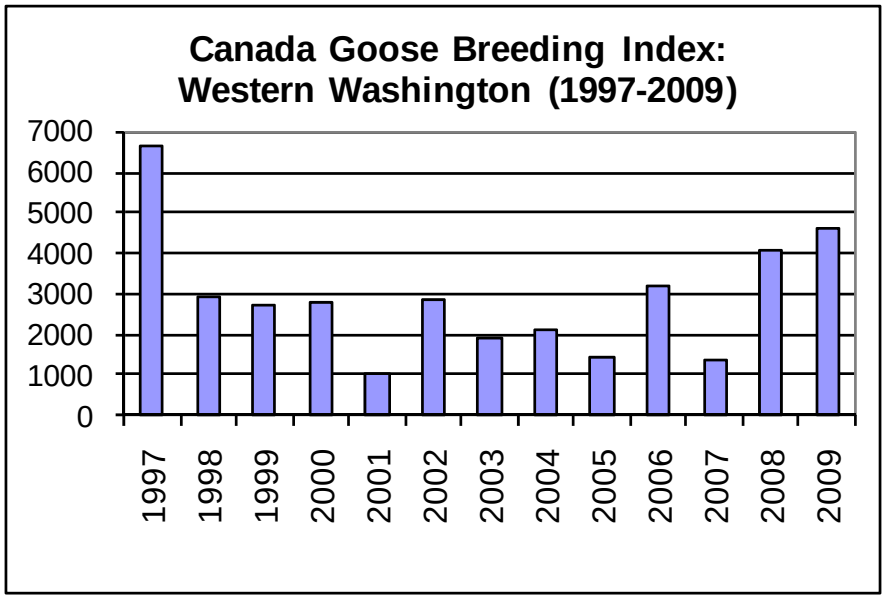


Table 1. Breeding duck routes, weighting factors and percent of area surveyed for areas and subareas surveyed for weighting breeding duck, goose, and ponds indices in Washington.

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 (1998-2009).

Species	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	1979-2008 average	2009 vs. 2008	2009 vs. LTA
Mallard	60434	50464	44676	39843	39958	40794	45485	46053	50647	47544	52853	-0.06	-0.10
Gadwall	13908	16261	18527	15353	15185	15665	17995	17165	14065	12212	12732	-0.13	-0.04
Am. Wigeon	4523	3593	6501	5028	5442	3439	6012	6240	2618	4283	5860	0.64	-0.27
Am .green-winged teal	3320	3037	2673	1749	1477	2406	4095	4060	1590	3169	3067	0.99	0.03
Blue-winged teal	9308	4351	3064	2864	2998	1659	1110	1085	1507	1171	13391	-0.22	-0.91
Cinnamon teal	10540	13580	10653	8410	11620	10744	8434	10914	10414	8046	13042	-0.23	-0.38
Blue +cinn teal	19848	17931	13717	11274	14619	12404	9544	11999	11921	9217	26433	-0.23	-0.65
Northern shoveler	9100	8000	5968	7794	6293	4477	6581	5409	4898	5555	6679	0.13	-0.17
Northern pintail	970	1018	395	608	1096	644	1089	723	450	1198	1730	1.66	-0.31
Wood duck	1841	2223	1863	616	1553	1375	1549	1870	1781	1327	1682	-0.25	-0.21
Redhead	15584	13915	11831	8117	8365	4978	8492	8265	7757	7156	14519	-0.06	-0.51
Canvasback	603	1073	1507	919	618	610	1460	756	1132	873	811	-0.23	0.08
Scaup spp.	6982	10976	9289	12722	4807	5741	9709	6530	4244	5982	8798	0.43	-0.32
Ring-necked duck	5100	3931	1405	3063	850	2525	3640	2732	2995	2521	2813	-0.14	-0.10
Goldeneye spp.	2126	3643	4036	4713	3255	3567	2847	2837	3841	3686	2703	-0.04	0.36
Bufflehead	410	826	1606	3034	1280	2425	6361	2809	3728	949	1623	-0.75	-0.42
Scoter spp.	0	0	0	0	0	0	0	0	0	0	9		-1.00
Ruddy duck	11419	9156	9023	12175	9624	10150	10464	9538	8262	8378	10746	0.09	-0.22
Merganser spp.	161	356	327	757	463	304	121	1279	969	1030	438	0.06	1.35
Total ducks	156328	146402	133343	127764	114883	111503	135442	128265	120897	115078	153496	-0.04	-0.25
American coot	25945	40172	18171	19328	19085	12346	22151	33763	22069	25521	30969	0.16	-0.18
Canada goose	23449	13890	17179	17596	19137	13022	19253	13244	16342	15589	10909	-0.05	0.43

Table 3. Weighted breeding duck population indices by area for eastern Washington (1979-2009).

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	71494	46672	1626	15650	135442
2007	63664	42119	2211	20271	128265
2008	62230	38710	1171	17999	120109
2009	**50846**	**44020**	**911**	**19300**	**115078**
1979-08 Avg	68182	61678	3096	21679	154636
2009 vs. 2008	-2%	-7%	-47%	-11	-6
2009 vs. LTA	-9%	-36%	-62%	-17	-22

Table 4. Comparison of breeding waterfowl helicopter survey results (new method) and traditional survey (old method), Eastern Washington, 2009.

	Irrigated			Potholes			Northeast			Palouse			TOTAL		
Species	New method	*(SE)*	Old method	New method	*(SE)*	Old method	New method	*(SE)*	Old method	New method	*(SE)*	Old method	New method	*(SE)*	Old method
Mallard	45491	*8489*	30970	16756	*4295*	10965	13892	*6044*	4698	1152	*299*	911	77291	*11276*	47544
Gadwall	7478	*2402*	5207	9309	*2413*	5984	1292	*1244*	1021	80	*22*	0	18159	*3625*	12212
American Wigeon	1731	*801*	325	1513	*522*	3039	162	*155*	919	0	*0*	0	3405	*969*	4283
Cinnamon Teal	3723	*979*	5199	4654	*1349*	1877	1292	*633*	970	0	*0*	0	9670	*1783*	8046
Blue-winged Teal	261	*145*	0	931	*752*	609	162	*147*	562	7	*4*	0	1360	*780*	1171
Green-winged teal	523	*215*	838	465	*339*	1922	808	*556*	408	7	*4*	0	1802	*686*	3169
Northern shoveler	2286	*723*	2308	1978	*901*	2992	162	*155*	255	0	*0*	0	4426	*1165*	5555
Northern Pintail	0	*0*	121	233	*158*	1077	0	*0*	0	0	*0*	0	233	*158*	1198
Redhead	2384	*912*	1222	7331	*4452*	4351	646	*453*	1583	0	*0*	0	10361	*4567*	7156
Canvasback	65	*66*	20	233	*231*	649	162	*155*	204	0	*0*	0	460	*286*	873
Scaup	2678	*1372*	2301	0	*0*	2098	0	*0*	1583	0	*0*	0	2678	*1372*	5982
Ring-necked Duck	196	*102*	645	349	*208*	1416	1777	*916*	460	0	*0*	0	2322	*945*	2521
Goldeneye	0	*0*	0	0	*0*	903	323	*326*	2783	0	*0*	0	323	*326*	3686
Bufflehead	653	*283*	0	815	*477*	668	808	*647*	281	0	*0*	0	2275	*852*	949
Ruddy duck	163	*106*	1050	1804	*1725*	5286	1050	*1011*	2042	0	*0*	0	3017	*2002*	8378
Mergansers	327	*147*	80	349	*191*	31	1615	*899*	919	34	*18*	0	2324	*731*	1030
Wood duck	2351	*865*	561	1047	*600*	153	2423	*1792*	613	7	*4*	0	5828	*2079*	1327
TOTAL DUCKS	**70768**	***9146***	**50846**	**47766**	***7169***	**44020**	**26572**	***6723***	**19301**	**1285**	***300***	**911**	**146391**	***13429***	**115078**
American Coot	12932	*5815*	2511	14080	*9485*	15694	10823	*5066*	7251	0	*0*	65	37834	*12225*	25521
Canada goose	8817	*2025*	2208	10182	*3557*	7184	8965	*8452*	5157	528	*54*	1041	28492	*9391*	15589

Table 5. Breeding waterfowl population indices for western Washington, 1997-2009

Species	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	97-08 avg	2009 vs. 2008	2009 vs. LTA
Mallard	11012	11127	10979	7608	8766	9874	7232	9163	8378	7913	8781	8898	8378	9144	-6	-8
Wood Duck	5036	1535	2922	3490	1571	2828	2631	779	199	1924	2739	2556	1228	2351	-52	-48
Canada Goose	6637	2889	2741	2762	1042	2844	1903	2104	1394	3169	1361	4050	4631	2741	+14	+69

Table 6. Weighted pond index from transects within the Pothole strata, eastern Washington, 1979-2008.

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**
1979-2008 avg	984	630	334	3608	1066	6622
2009 vs. 2008	+19%	-25%	-25%	+12%	+28%	+9%
2009 vs. LTA	-23%	-20%	-21%	-14%	+28%	-10%

[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, 2000-2009.

Species	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	79-08 Average	% change from 2008	% change from Average
Mallard	1864	1762	1123	1328	1634	1557	1608	1786	1419	1416	1710	0%	-17%
Gadwall	281	740	383	230	230	26	179	132	292	87	382	-70%	-77%
Wigeon	102	153	102	179	204	255	102	54	48	43	266	-9%	-84%
Green-winged teal	255	204	77	102	26	26	230	94	151	140	140	21%	31%
Blue-winged teal	281	281	230	179	153	26	26	0	42	48	567	13%	-92%
Cinnamon teal	51	281	51	26	51	51	26	103	91	14	95	-85%	-85%
Northern shoveler	230	357	179	204	51	0	77	15	59	44	169	-25%	-74%
Northern pintail	230	128	153	102	51	0	0	0	0	0	126	NA	-100%
Wood duck	51	51	0	26	77	26	128	107	28	28	41	0%	-32%
Redhead	230	128	179	255	51	0	179	211	252	154	433	-39%	-64%
Canvasback	26	51	77	128	26	26	128	26	90	0	34	-100%	-100%
Scaup	26	0	0	102	0	0	51	14	21	94	48	358%	97%
Ring-necked duck	0	0	0	26	128	0	281	26	50	14	50	-72%	-72%
Goldeneye	77	230	26	26	357	179	485	444	412	331	165	-20%	101%
Bufflehead	0	0	179	26	0	26	0	40	14	24	9	70%	153%
Ruddy duck	102	51	0	179	102	204	460	222	219	183	0	NA	NA
Merganser	26	0	0	26	26	0	128	204	77	77	228	-16%	-20%
TOTAL BROODS	**3830**	**4417**	**2757**	**3089**	**3166**	**2400**	**4085**	**3477**	**3265**	**2741**	**4556**	**-16%**	**-40%**

Table 8. 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	919	163	8112	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	919	65	1794	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
LTA	**2577**	**856**	**927**	**203**	**4563**	**179**
2009 vs. 2008	**-9%**	**-18%**	**-18%**	**-50%**	**-16%**	**5%**
2009 vs. LTA	**-67%**	**36%**	**-26%**	**-84%**	**-40%**	**-64%**

Note: Discrepancies in calculations from previous reports have been corrected on this table.

Table 9. 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	04-09
UPPER COLUMBIA				+4.1%	+1.8%	-2.3%	+1.4%	-8.3%
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%
Snake River	1975	Army Corps	Annual					
Snake River Cliff	1979	Army Corps	Discontinued					
LOWER COLUMBIA				+18.9%	+4.0%	-1.2%	0	-0.7%
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%
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%
Geese counted on duck surveys		WDFW	Annual	+31.9%	+32.1%	+7.0%	+18.8%	-7.3%

Table 10. Canada goose nest surveys in important areas of Washington, (1974-2009) and weighted number of geese observed during duck population surveys (1979-2009).

	Number of Nests					Geese observed during 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
1989-08 avg	766	221	1242	514	2742	14299
09 vs. 08	+4%	+23%	-1%	+22%	+7%	-9%
09 vs. 20-yr avg	-40%	+10%	-6%	+16%	-10%	+4%

WATERFOWL STATUS AND TREND REPORT: STATEWIDE
Winter Waterfowl Populations and Harvest

MIKAL MOORE, Waterfowl Specialist

Introduction

This report summarizes the 2008-09 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 1940s.

Population surveys

Methods

The primary survey to determine status of wintering waterfowl throughout the Pacific Flyway is the January Midwinter Waterfowl Survey (MWS). This is a coordinated, comprehensive survey of the most important waterfowl wintering areas, using a combination of standardized surveys from fixed-winged aircraft and ground observation locations. The MWS is a combined effort among several agencies, including WDFW, ODFW, Yakama Nation, USFWS, and Canadian Wildlife Service.

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 2008-09 MWS in January 2009. Washington's midwinter index for total waterfowl and coots was estimated at 973,160, an increase of 16% from the previous year and 8% below the 10-year average (1999-2008; Table 1).

The 2009 Pacific Flyway midwinter index for total waterfowl was 7.1 million waterfowl. This represents an 2% decrease from 2008 (7.2 million), 6% above the 10-year average (6.7 million), and 7% above the long-term average (6.7 million; 1955-2008).

The 2009 midwinter indices for total ducks in the 11 Pacific Flyway states was 5.2 million (Fig. 1), down 2% from the 2008 count (5.4 million), -1% below the 10-year average (5.3 million), and 8% below the long-term average (5.7 million; 1955-2008).

In Washington, the 2009 total duck population was 973,160, up 16% from 2008 levels of 597,608, and 8% below the 10-year average (Fig. 2). The Washington total duck count represents 14.2% of the Pacific Flyway wintering population, 1.5% below the state's 10-year average of 15.7% (Fig. 3). This is the first year of increase in the ratio since 2003. The highest ratio of Washington ducks to total Pacific Flyway ducks in the MWS was in 1991 (28.6%).

The 2009 mallard total for the Pacific Flyway was 855,147, down 12% from 2008, 29% below the 10-year average (1999-2008), and 47% below the long-term average (1955-2008). The total number of mallards counted in Washington in 2009 was 254,655, a 19% decrease from the previous year, and 44% 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 37.3% (Fig. 4). This proportion (29.8%) dipped below 30% in 2009 for the first time since 1998.

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 2009 MWS for Canada geese in the Pacific Flyway was the highest count on record at 502,211, the first count to surpass half a million birds. The count exceeded the 2008 survey by 5%, the 10-year average by 19%, and the LTA by 44%.

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 2009 total of 28,629 Canada geese was the lowest on record, down 52% from 2008, and 52% below the 10-year average (Table 1, Fig. 5). No explanation can be provided for the survey variability, but may be related to survey conditions or indicative of shifting wintering sites of geese within the flyway.

The northern population of snow geese from Wrangel Island, Russia that over-winter in Skagit, Snohomish, and Island counties of NW Washington and the Fraser River Delta, B.C. had a very poor production year in 2008. A very cold, late spring on Wrangel Island covered eggs with snow, resulting in only 17% egg success. By January, the age ratio of young to adults was estimated at 1%. Juveniles typically comprise 12-22% of the population. Midwinter snow goose aerial photo counts by Canadian Wildlife Service in January 2009 numbered 57,511. This represents a 39% decrease over the 2008 count of 94,859 snow geese, 12% below the 10-year average. (Table 1, Fig. 6).

The number of brant counted in Washington during the 2009 midwinter survey was 29,243, a 48% increase from 2008, and 106% above the 10-year average (Table 1, Fig. 7). The number of brant counted during the northern Puget Sound midwinter aerial survey on January 8, 2009, was 23,384, up 99% from the previous year. The largest concentrations of brant were in Samish Bay (55%), Lummi Bay (26%), and Padilla Bay (12%). 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 2008-09, 50% of harvested birds (n=190) were gray-bellied (WHA) brant (Munsell 4-8). In 2007-08, 21% of harvested birds (n=133) were gray-bellied brant, versus 52% in 2006. These results call into question the assumption that all brant counted in Skagit County during the MWS are WHA brant.

The 2009 northern Puget Sound (Skagit, Whatcom, and Snohomish counties) trumpeter swan MWS totaled 9,061 (Table 2), 23% above the 2008 count of 7,373. The 2008 count is the highest total trumpeter swan count recorded in Washington. Juveniles accounted for 15.3% of the 2009 survey (Table 2), slightly below the 1999-2008 average of 16.1%.

The 2009 northern Puget Sound tundra swan midwinter index was 2,115, 3% above the 2008 index and 8% above the 10-year average. Juveniles represented 15.2% of the population (Table 2), the second highest ratio on record for this survey. The 1999-08 average juvenile percentage of tundra swans in this survey is 13.5%.

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 1,719 carcasses collected from 2000-2006, the majority of deaths were lead-related (77%). 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 2006-07, 2007-08, and 2008-2009, 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 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). Despite this overall reduction in lead-related mortalities, a higher number of mortalities occurred in Skagit and Snohomish counties in 2006-09 compared to previous years. However, this increase is proportional to the local population growth in these counties and the percentage of the local population in Skagit and Snohomish counties that is lead poisoned has remained unchanged pre- and post-hazing. The results of this multi-year effort to find the source of lead poisoning in wintering swans suggest that Judson Lake is the major source of lead for swans wintering in Sumas Prairie and northwestern Washington, but that it is not the only source responsible for the lead-caused swan mortalities. Depending on funding availability, hazing activities will continue in 2009-2010, concurrent with the development and testing of alternate strategies to prevent swans from accessing lead shot at Judson Lake.

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).

The highest count during the North Puget Sound monthly surveys took place during January 2009, totaling 377,964 waterfowl. The record high count took place in December 2006 (n = 974,180). Waterfowl frequently move between the Fraser River and Skagit River Deltas. depending on weather conditions. A major winter weather event in northwestern Washington caused widespread flooding during January, attracting numerous ducks inland to dabble in flooded cropland. These areas are not on the traditional survey route and the count is

probably conservative.

The highest count in the North Columbia Basin during 2008-09 occurred during December with 357,494 total waterfowl (including coots). For the South Columbia Basin the highest count was in December, with 218,018 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 22,295 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. These October surveys were originally aerial counts but switched to ground counts in 2006. Observers counted a combined total of 31,235 undifferentiated Canada geese on the two lakes in October 2008. This count was 30% above the long-term average (1976-2007) of 24,103 (Fig. 8). The highest historical count was 80,050 in 1984. This population is of concern due to high harvest return rates of banded geese in the Columbia Basin. 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 2011.

Hunting Season Regulations

The 2008-09 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. 20-21. Canvasback season was closed statewide, and the reduced scaup season ran from Nov. 1-Jan. 25. The daily bag-limit was 7 ducks, to include not more than with 2 hen mallard, 1 pintail, 2 scaup, 2 redhead, 1 harlequin, 4 scoter, and 4 long-tailed duck (Table 3).

Substantial waterfowl populations in the Pacific Flyway over the last 12 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. The federal migratory bird stamp remained at $15.00 (Table 4).

Goose hunting regulations have been dynamic in recent years. Changes have resulted from efforts 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 2008-09 (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 initiated in 1995-96 was continued in Area 2A during 2008-09, with season days of Saturdays and Wednesdays during February 7 – March 7, 2009 and a season quota of 5 duskys for the area.

For the 2008-09 season, the Aleutian goose bag limit was 1 in Area 2B, but 4 in all other areas. Previously listed as both a federal and state endangered species, Aleutian Canada goose populations have experienced exponential population growth in recent years and have caused crop and pasture depredation complaints in coastal areas south of Washington.

The January-only brant season took place in 2009, with 7 hunt days allowed in Skagit County and 10 days in Pacific County (Table 3).

Harvest surveys

Methods

Harvest estimates were based on the Small Game Harvest Questionnaire sent to 10% of the hunting license buyers. Hunters were asked to report the numbers of ducks and geese they harvested by county. The species composition of the waterfowl harvest was derived from a Daily Waterfowl Harvest Report Card Survey. In this survey, cards were sent to 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, and reminder postcards are sent out to those not returning reports by the deadline. Responses from the postcard reminder 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, 2009. Hunters failing to comply with reporting requirements were ineligible to participate in the 2009-10 season.

The harvest of dusky Canada geese is determined at mandatory hunter check stations in southwest Washington. In 2008-09, geese were examined at six WDFW stations and one USFWS-operated mandatory check stations. 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 of the need to purchase a training videotape. The study materials, including the video, are now available from the WDFW website. 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 the same test online, and offered several testing dates 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, with a maximum of three tests per season.

Waterfowl Harvest Survey Results

The 2008-09 Washington duck harvest of 410,257 decreased 4% from the 2007-08 harvest of 429,287. 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). Since that time there was a slow and gradual increase, stabilizing over the past 10 years.

Mallards made up 58% of Washington's 2008-09 harvest, followed by American wigeon (13%), American green-winged teal (10%), and northern pintail (4%) (Table 6).

The total Canada goose harvest for 2008-09 was 55,692, down 7% from the 2007-08 harvest of 59,595. A record low harvest of 26,479 occurred in 2004-05; the record high harvest (n = 72,721) was recorded 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 2008-09 large Canada goose harvest (n = 32,020) was down 16% from the previous year and 1% below the long-term average.

The harvest of small Canada geese in 2008-09 (n = 23,672) increased 10% from the previous year, 22% above the long-term average (Fig. 11). The highest recorded harvest of small Canada geese in Washington was 47,270 in 1979-80. The lowest harvest (n = 8,880) took place in 2003-04. The reasons for the dynamic small goose harvest are uncertain. Unfortunately, population trends in Washington's small Canada geese have not been well documented. Banding information is minimal and aerial surveys are logistically difficult.

Waterfowl harvest is summarized by WDFW administrative regions in Table 7 and Fig. 12. Except for the 2003-04 season, when Regions Two, Three and Four shared equal percentages (23.0%) of the harvest, Region Two has traditional represented the highest percentage of the state's harvest. This was again the case for the 2008-09 season when Region Two had 25.4% of the harvest followed by Region Four (24.5%), Region Three (20.5%), Region Six (13.0%), Region One (9.2%), and Region Five (7.4%).

Mandatory Harvest Reporting Results

The 2008-09 sea duck harvest survey, based on the fifth year of mandatory harvest report cards, indicated a total harvest of 2,447 (Fig. 13, Table 8). The harvest was dominated by surf scoters (64%), followed by white-winged scoters (18%), long-tailed

ducks (8%), harlequin ducks (5%) and black scoters (4%). From a total of 2,340 authorizations, an estimated 401 hunters were successful and hunted a total of 859 days. The harvest was reported from 15 counties with Island County reporting 29% of the harvest followed by Mason County (18%), Whatcom County (13%), Thurston County (12%), and Skagit County (11%). In general, interest in sea duck hunting is increasing. The number of authorizations has doubled since the inception of the program though the number of active sea duck hunters is unknown. Recent evaluation of Puget Sound winter aerial survey expansion factors indicate that the scoter population may be as much as 84,000 in the Sound. Given a 2004-08-harvest estimate of 2,376, the average Puget Sound scoter harvest rate is less than 3% and within sustainable levels for the population.

The 2008-09 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 409, 9% below the 2007-08 estimate of 453 (Fig. 14, Table 9). Between 1994 and 2006, brant harvest ranged from a high of 1,534 in 1996 to a low of 60 brant in 2002, for a 10-year average harvest of 404 (1999-08). The season was closed from 1983 to 1986.

The 2008-09 snow goose harvest was estimated at 10,155, down 35% from the record harvest of 2007-08. This is attributable to very low juvenile composition in the flock, resulting in many birds that had been exposed to hunting previously. Snow goose harvest in Washington is historically variable (Table 10, Fig. 15). It was on a negative trend during the mid-1980's and early 1990's. Harvest of snow geese increased since 1993 with an average harvest of 2,284 (Fig. 14). These geese are part of the Wrangell Island population of lesser snow geese that have reached nearly historic levels on the breeding grounds (n = 140,000). Snow 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 1996-2007 and didn't take a dusky in 2007-08 were automatically sent a new permit for 2008-09. New hunters and those harvesting duskys in 2007-08 were required to take a new test. A total of 3,443 permits were issued in 2008-09 (up 10% from 2007-08. The 2008-09 regular season ran to completion in all quota zones. The percentage of duskys in the harvest was 1%, unchanged from 2007-08. A total of 3,366 geese were checked during the regular season, an increase of 38% from 2007-08 and 47% above the 5-year average of 2,286 (Table 11. Fig. 16). A total of 568 individuals (up 23% from the 2007-08 season) checked birds at check stations. The 2008-09 late season had 67 Master Hunter program participants and 6 youth hunters, of which 48 checked geese at check stations. Total late season harvest was 207 geese, which was 5% below the 2007-08 late season and 12% above the 5-year average. Landowners indicated they were pleased with the effectiveness of the late season hunt and believe the added hazing reduced damage to agricultural crops. 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 2007-08 season, an estimated 23,482 hunters participated in the Washington waterfowl season, down 12% from 2007-08 (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 2009 estimate of Washington waterfowl hunters is the second lowest on record.

The estimated average number of ducks harvested per hunter in 2007-08 was 17.5, the highest average on record in Washington (Fig. 18). 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 the agency has implemented 5 regulated access areas (RAA) including Winchester Ponds and Frenchman Ponds in Region 2, Bailie Youth Ranch and Windmill Ranch in Region 3, and the Fir Island Quality Snow Goose Hunt. Starting in 2008-09, a new RAA will be implemented on the Gloyd Seeps Wildlife Area. All programs feature 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.

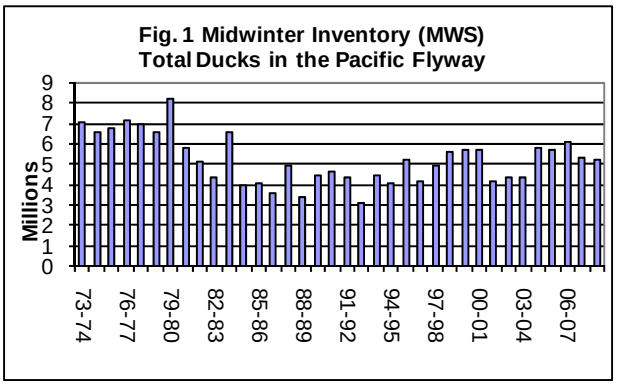


Fig. 1 Midwinter Inventory (MWS)
Total Ducks in the Pacific Flyway
Millions
0
1
2
3
4
5
6
7
8
9
73-74
76-77
79-80
82-83
85-86
88-89
91-92
94-95
97-98
00-01
03-04
06-07

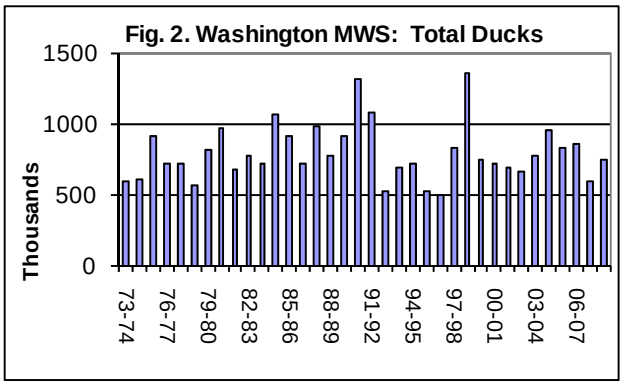


Fig. 2. Washington MWS: Total Ducks
Thousands
0
500
1000
1500
73-74
76-77
79-80
82-83
85-86
88-89
91-92
94-95
97-98
00-01
03-04
06-07

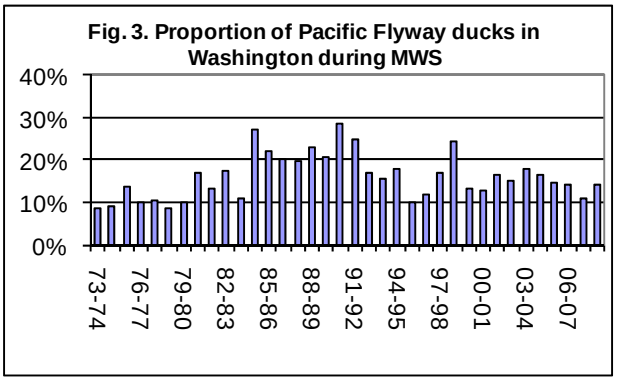


Fig. 3. Proportion of Pacific Flyway ducks in
Washington during MWS
0%
10%
20%
30%
40%
73-74
76-77
79-80
82-83
85-86
88-89
91-92
94-95
97-98
00-01
03-04
06-07

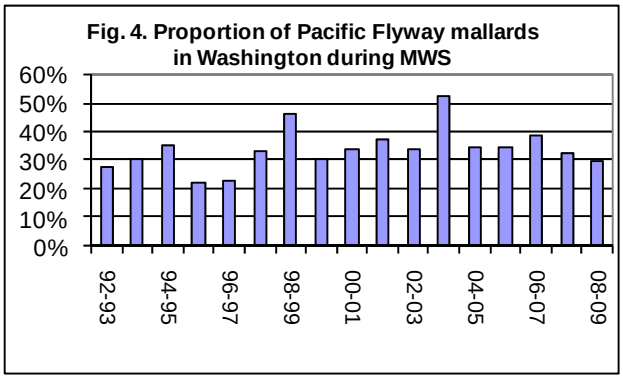


Fig. 4. Proportion of Pacific Flyway mallards
in Washington during MWS
0%
10%
20%
30%
40%
50%
60%
92-93
94-95
96-97
98-99
00-01
02-03
04-05
06-07
08-09

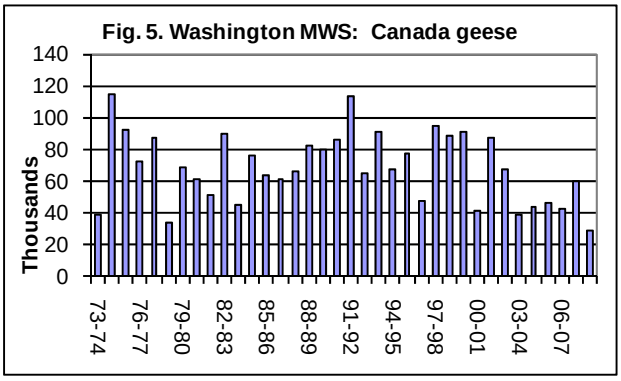


Fig. 5. Washington MWS: Canada geese
Thousands
0
20
40
60
80
100
120
140
73-74
76-77
79-80
82-83
85-86
88-89
91-92
94-95
97-98
00-01
03-04
06-07

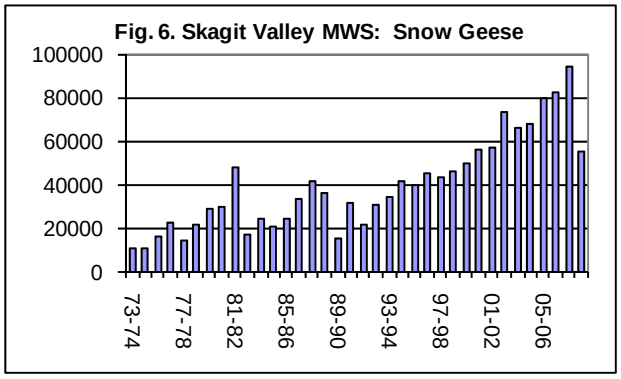


Fig. 6. Skagit Valley MWS: Snow Geese
0
20000
40000
60000
80000
100000
73-74
77-78
81-82
85-86
89-90
93-94
97-98
01-02
05-06

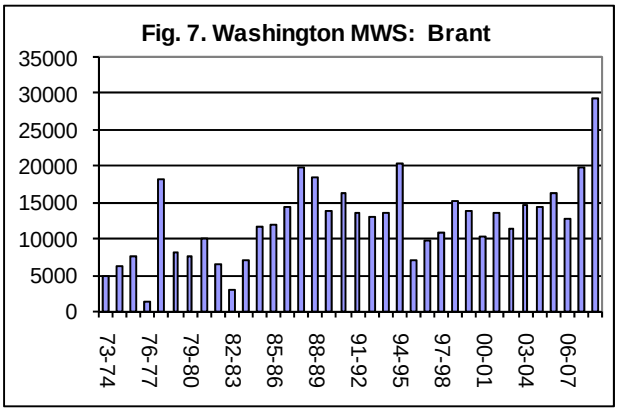


Fig. 7. Washington MWS: Brant
0
5000
10000
15000
20000
25000
30000
35000
73-74
76-77
79-80
82-83
85-86
88-89
91-92
94-95
97-98
00-01
03-04
06-07

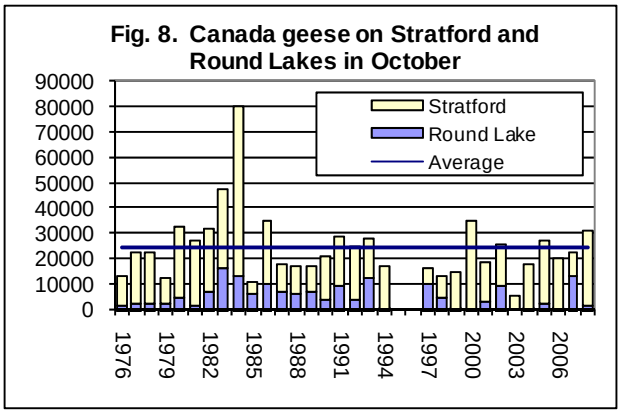
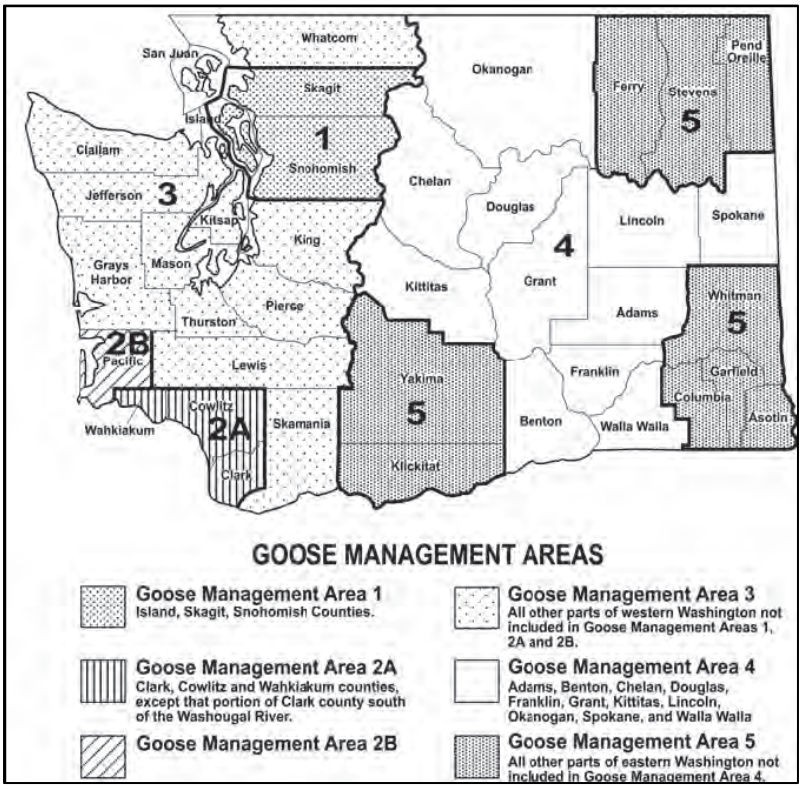


Fig. 8. Canada geese on Stratford and
Round Lakes in October
Stratford
Round Lake
Average
0
10000
20000
30000
40000
50000
60000
70000
80000
90000
1976
1979
1982
1985
1988
1991
1994
1997
2000
2003
2006

Figure 9. Washington Goose Management Areas



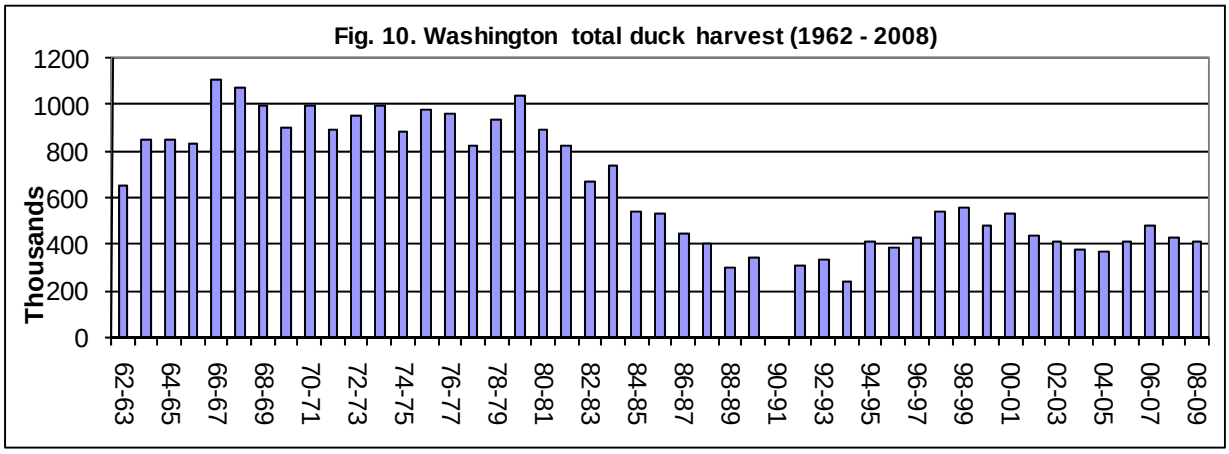
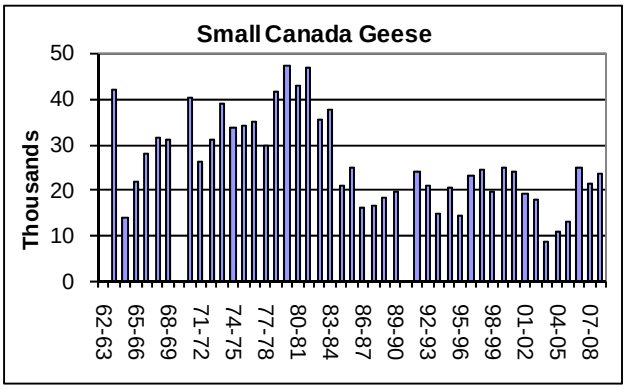


Fig. 11. Washington Canada Goose Harvest



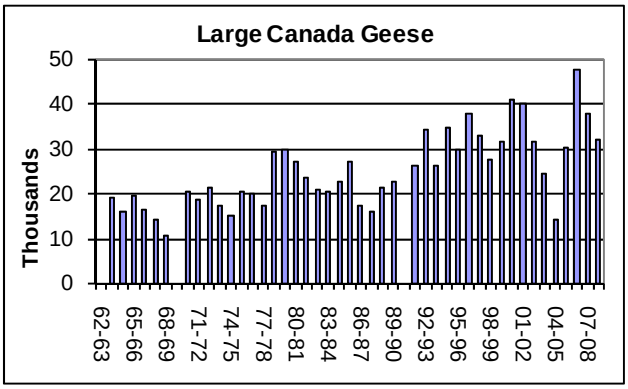


Fig. 12. Waterfowl Harvest by Region

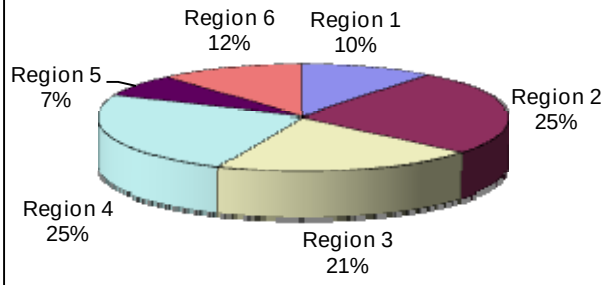


Fig. 13 Sea Duck Harvest (2008-09)

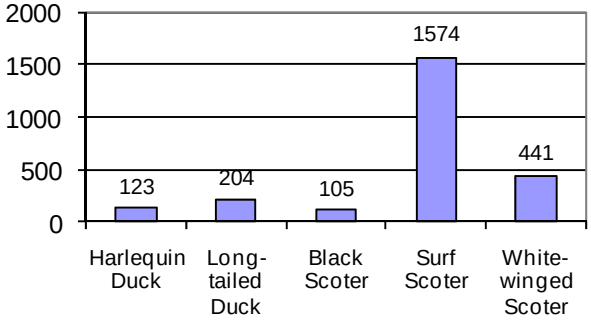


Fig. 14. Washington brant harvest

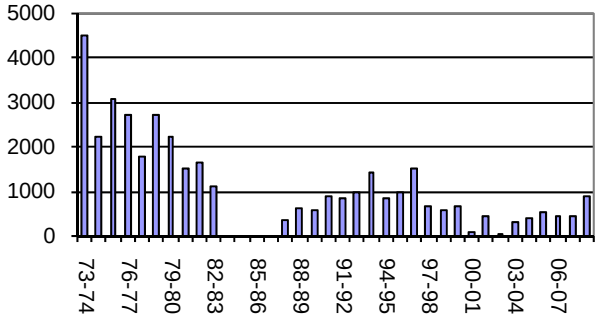


Fig. 15. Skagit snow goose harvest

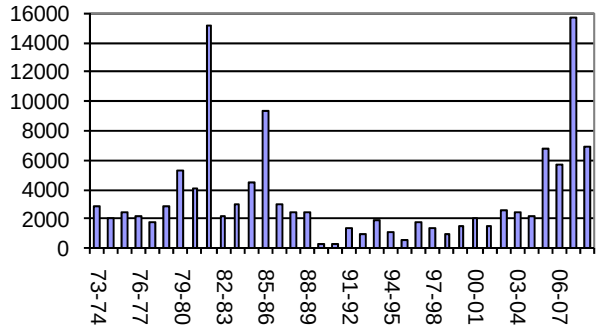
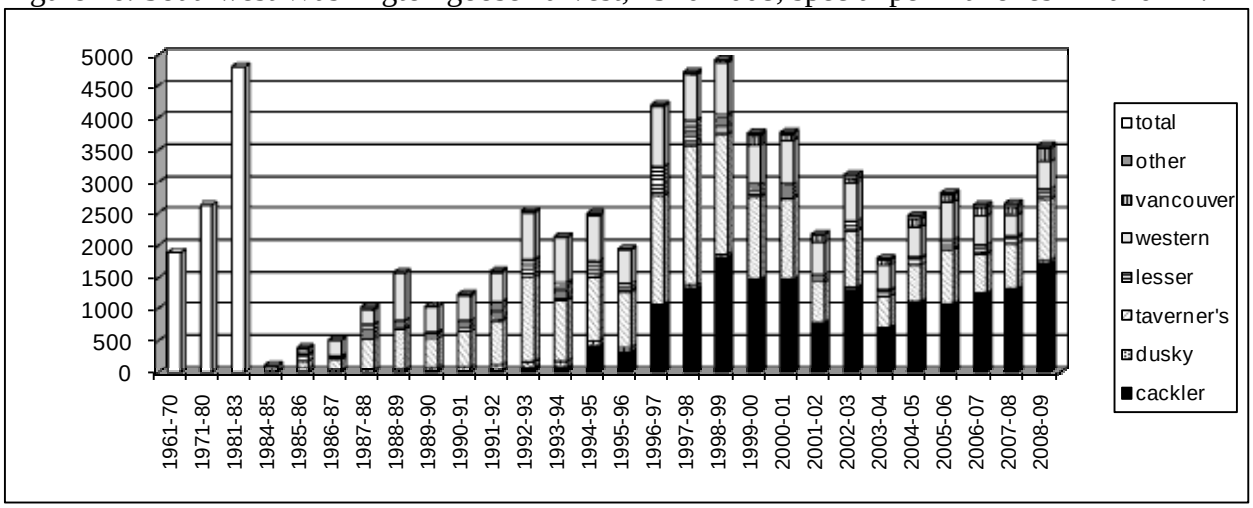
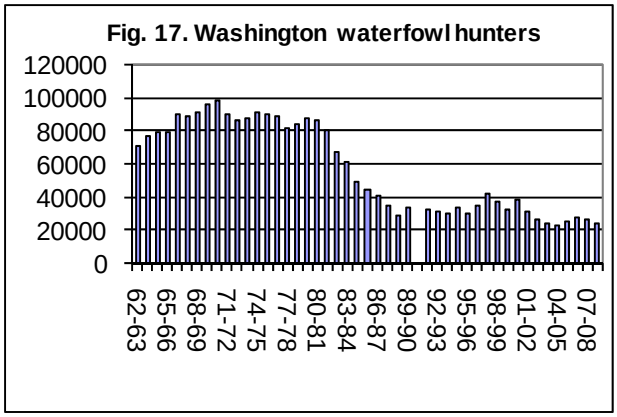


Figure 16. Southwest Washington goose harvest, 1970-2008, special permit zones 2A and 2B.





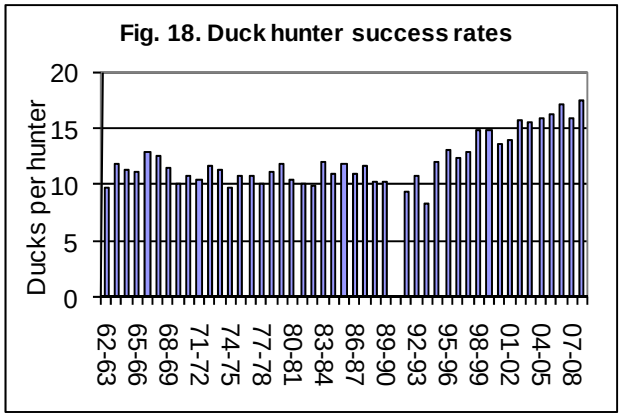


Figure 19. The waterfowl regulated access program promotes quality hunting opportunities by reducing hunting pressure.

TABLE 1. WASHINGTON DEPARTMENT OF FISH AND WILDLIFE ANNUAL WATERFOWL SURVEY - JANUARY 2009

SPECIES	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	09 vs. 08	99-08 avg	09 vs. avg
Mallard	979679	442811	356830	348841	325459	432570	470186	374881	494597	313871	254655	-19%	453973	-44%
Gadwall	5243	8043	10571	10595	11391	9252	10904	5780	5314	5854	5324	-9%	8295	-36%
Wigeon	172049	112926	133465	124301	113838	151981	195798	170491	90734	89614	207236	131%	135520	53%
Green-winged Teal	12486	11089	6098	13695	8083	14565	33358	29492	30947	15506	15175	-2%	17532	-13%
B.W. & Cinn. Teal	2	0	0	484	57	11	4	5	272	2	12	500%	84	-86%
Shoveler	2890	3036	1358	1852	5801	3445	2553	4130	8763	2210	2671	21%	3604	-26%
Pintail	81653	70040	75597	72106	57465	49567	117296	94327	113949	45848	117235	156%	77785	51%
Wood Duck	329	84	206	356	59	132	472	173	99	378	309	-18%	229	35%
Redhead	2335	1505	27918	11353	6867	2621	4795	13026	3645	2443	4668	91%	7651	-39%
Canvasback	4841	2898	6020	3272	2131	3350	2929	2504	1501	3790	3239	-15%	3324	-3%
Scaup	28274	26933	28833	31970	41832	40744	34884	52519	29711	35052	40306	15%	35075	15%
Ringneck	3240	7488	6386	7306	6457	4583	8358	8507	12642	16568	19740	19%	8154	142%
Goldeneye	10851	13157	17177	15711	20098	14035	15941	19184	13973	15106	15976	6%	15523	3%
Bufflehead	17185	18017	20647	20266	26426	20009	23293	21857	17511	21230	25510	20%	20644	24%
Ruddy Duck	2476	3819	3075	3457	4966	2936	1937	1718	2179	3096	1508	-51%	2966	-49%
Scoter	21507	20326	15932	16597	14125	15876	16753	18265	15307	16742	12585	-25%	17143	-27%
Oldsquaw	645	450	559	423	573	478	654	927	804	504	547	9%	602	-9%
Harlequin	696	843	603	653	797	963	793	1015	733	902	670	-26%	800	-16%
Merganser	6653	7762	9535	10564	12325	10495	10202	8355	7443	6377	6523	2%	8971	-27%
Unidentified Ducks	3527	2577	1539	1606	3552	2660	5869	7458	4731	2515	9981	297%	3603	177%
Snow Goose*	38185	48843	47743	55480	73363	66801	47111	80060	75141	82583	55016	-33%	61531	-11%
White-fronted Goose	0	3	34	21	2	5	27	17	82	42	119	183%	23	411%
Canada Goose	88698	91229	41351	88092	67941	39301	43908	45857	42759	60173	28629	-52%	60931	-53%
Brant	15252	13859	10197	13478	11455	14544	14286	16305	12712	19775	29243	48%	14186	106%
Tundra Swan**	2802	4342	4597	2521	6393	1447	2778	3422	3548	3570	3380	-5%	3542	-5%
Trumpeter Swan**	3215	3896	4047	4562	4263	3996	5508	7904	9104	7747	9852	27%	5424	82%
Unknown Swan**	11	402	49	254	168	2432	2381	232	842	292	1100	277%	706	56%
Coot	104706	62387	74250	80631	91284	91387	105522	119856	72265	69305	101951	47%	87159	17%
TOTAL	1609430	978769	904617	940447	917171	1000186	1178500	1108267	1071308	841095	973160	16%	1054979	-8%
*B.C. Snow Geese Skagit/B.C.	7759	879	8675	1770	0	0	1588	2939	0	12276	2495	-80%	3589	-30%
Total	45944	49722	56418	57250	73363	66801	48699	82999	75141	94859	57511	-39%	65120	-12%

**Comprehensive western Washington swan surveys in 1989, 1991, 1996, 2001, 2006

Table 2. 2008-09 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. 5-7**	**Dec. 8-9**	**Jan. 5**
Mallards		63,102	232,705	16,579
Total Ducks		128,653	288,205	59,405
Total Geese		22,485	19,886	4,995
Total Swans		306	197	163
Total Coots		42,636	49,206	60,665
SURVEY TOTAL		192,313	357,494	125,228
	No survey			
South Columbia Basin	**Oct.**	**Nov. 6**	**Dec. 9-10**	**Jan. 6-9**
Mallards		37,214	68,123	96,667
Total Ducks		51,777	86,399	139,563
Total Geese		5,251	17,328	24,696
Total Swans		198	69	111
Total Coots		30,955	22,653	11,498
SURVEY TOTAL		137,307	218,018	200,761
	No survey			
Yakima Basin	**Oct.**	**Nov. 8**	**Dec. 4**	**Jan. 16**
Mallards			7,498	17,777
Total Ducks			11,851	20,125
Total Geese			264	2,117
Total Swans			18	53
Total Coots				
SURVEY TOTAL			12,133	22,295
	No survey	No survey		
Northern Puget Sound		**Nov. 5**		**Jan. 6-19**
Mallards		54,788		132,580
Northern pintail		36,079		94,205
American wigeon		35,258		143,463
Green-winged teal		16,195		6,982
Brant				
TOTAL DABBLERS		142,320		377,964
	No survey		No survey	

Snow Goose Aerial Photo Counts	**Date**	**Skagit/ Snohomish**	**Fraser**	**Total**	**% Young**
	1/26/09	54,818	2,495	57,313	1.0%
	2/10/09	54,536	2,441	56,977	
Brant Aerial Surveys	**Date**	**Skagit Co.**	**Whatcom Co.**	**Total**	
	12/9/08	3,532	3,553	6,618	
	1/8/09	16,227	7,157	23,384	

Age-ratios obtained from field observations – Northern Puget Sound				
Species	**Date**	**Sample size**	**Juveniles**	**% Young**
Trumpeter Swan	1/28-2/2/2009	9,061	1,386	15.3%
Tundra Swan	1/28-2/2/2009	2,115	321	15.2%

Table 3. Waterfowl hunting season regulation summary 2008-09.

	Area	SEASON DATES (inclusive)	Daily Bag Limit	Possession Limit
DUCKS (except Canvasback and Scaup) (d)	Statewide	Sept. 20-21, 2008(Youth hunting only) (a)	7 (b)	14 (b)
		Oct. 11-15 and Oct. 18, 2008 – Jan. 25, 2009.	7 (b)	14 (b)
Canvasback	Season closed			
Scaup	Statewide	Sept. 20-21, 2008 (Youth hunting only) (a) and Nov. 1 - Jan 25	2	4
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. 6-11, 2008	5 Canada geese	10 Canada geese
	Goose Mgmt. Area 2A	Sept. 6-11, 2008	3 Canada geese	6 Canada geese
	Goose Mgmt. Area 2B	Sept. 1-15, 2008	5 Canada geese	10 Canada geese
	Goose Mgmt. Areas 4 & 5	Sept. 6-7, 2008	3 Canada geese	6 Canada geese
	Statewide, except Goose Mgmt. Areas 2A & 2B	Sept. 20-21 (Youth hunting only) (a)	4 Canada geese	8 Canada geese
	Goose Mgmt. Area 1 (d)	Oct. 11-23 & Nov. 1, 2008-Jan. 25, 2009, except snow, Ross', or blue geese may only be taken Oct. 11, 2008-Jan. 25, 2009.	4	8
	Goose Mgmt. Area 2A (d)	Except Ridgefield NWR, Sat., Sun., & Wed., only, Nov. 8-23 & Dec. 3, 2008-Jan. 25, 2009, Ridgefield NWR: 8am-4pm Sat., Tues., and Thurs. only, Nov. 13-22 and Dec. 4, 2008-Jan. 24, 2009, closed Dec. 25, 2008 and Jan. 1, 2009.	4 (c)	8 (c)
	Goose Mgmt. Area 2B (d)	8 a.m. – 4 p.m. Sat. and Wed. only, Oct. 11, 2008-Jan. 10, 2009	4 (c)	8 (c)
	Goose Mgmt. Area 3	Oct. 13-23 and Nov. 1, 2008-Jan. 25, 2009	4	8
	Goose Mgmt. Area 4	Oct. 11-13 and Sat., Sun., Wed. only, Oct. 18, 2008-Jan. 18, 2009; Nov. 11, 27, 28, Dec. 25, 26, 29, 30, 2008; Jan. 1, 2009, and every day Jan. 19-25, 2009.	4	8
	Goose Mgmt. Area 5	Oct.11-13, & Oct. 18, 2008-Jan. 25, 2009	4	8
Brant (d,e)	Skagit Co.	Jan. 15, 17, 18, 20, 22, 24, & 25, 2009	2	4
	Pacific Co.	Jan. 10, 11, 13, 15, 17, 18, 20, 22, 24, & 25, 2009	2	4
Swans	Statewide	Closed		

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, 1 pintail, 2 scaup, 2 redhead, 1 harlequin, 4 scoter, and 4 long-tailed duck. Canvasback season closed.
Possession limit: 14 ducks – to include not more than 4 hen mallard, 2 pintail, 4 scaup, 4 redhead, 1 harlequin, 8 scoter, and 8 long-tailed duck. Canvasback season closed.
Season limit: 1 harlequin (see sea duck authorization requirement)

c) **Daily bag limit:** 4 geese – to include not more than 1 dusky Canada goose, 2 cackling geese, except not more than 1 Aleutian goose in Pacific County.
Possession limit: 8 geese – to include not more than 1 dusky Canada goose, 4 cackling geese, except not more than 2 Aleutian geese in Pacific County.
Season limit: 1 dusky Canada goose. A dusky Canada goose is definied 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 defineid as goose with a culment (bill) length of 32 mm or less)

d) **Written authorization**: required to hunt sea ducks (harlequin, scoter, long-tailed duck) 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	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	-
77-78	100	93	7	7	-	-	-	5.00	7.50	3 zones[1]
78-79	100	93	7	7	-	-	-	5.00	7.50	" "
79-80	100	93	7	7	-	-	-	7.50	7.50	" "
80-81	100	93	7	7	-	-	-	7.50	7.50	1 zone[2]
81-82	100	93	7	7	-	-	-	7.50	7.50	" "
82-83	100	93	7	7	-	-	-	7.50	10.50	" "
83-84	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	" "
88-89	66	59	4	4	3 (1 ♀)	1	5.00	12.00	12.00	" "
89-80	66	59	4	4	3 (1 ♀)	1	5.00	12.00	12.00	" "
90-91	66	59	4	4	3 (1 ♀)	1	5.00	12.00	12.00	" "
91-92	66	59	4	4	3 (1 ♀)	1	6.00	15.00	15.00	Steel statewide
92-93	66	59	4	4	3 (1 ♀)	1	6.00	15.00	15.00	" "
93-94	66	59	4	4	3 (1 ♀)	1	6.00	15.00	15.00	" "
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	

[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)

* 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 (2008-09)[1]

Species	No. Harvested	% of total
Mallard	239,053	58.3%
Northern pintail	17,555	4.3%
American wigeon	54,597	13.3%
Green-winged teal	41,136	10.0%
Other ducks	57,916	14.1%
Total ducks	410,257	
Large Canada	32,020	46.0%
Small Canada	23,672	34.0%
White-fronted	647	0.9%
Snow	6,944	10.0%
Brant	881	1.3%
Total geese	69,538	
Total waterfowl	479,795	

[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 (2008-09)

Regions	Ducks Harvested	% of State Total Ducks Harvested	Geese Harvested	% of State Total Geese Harvested
Region 1	33,951	8.3%	10,244	14.7%
Region 2	98,366	24.0%	23,406	33.7%
Region 3	80,432	19.6%	18,055	26.0%
Region 4	109,347	26.7%	8,148	11.7%
Region 5	31,069	7.6%	4,595	6.6%
Region 6	57,092	13.9%	5,090	7.3%
Total	410,257		69,538	

Table 8. Sea duck harvest, 2008-09[1].

Species	No. Harvested
Harlequin duck	123
Long-tailed duck	204
Black scoter	105
Surf scoter	1,574
White-winged scoter	441
ALL SCOTERS	2,120
TOTAL	2,447

[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.	WHATCOM CO.	PACIFIC CO.	TOTAL
YEAR	MONTH	PERMITS ISSUED	SUCCESSFUL HUNTERS	HUNTER DAYS	SEASON DAYS	HARVEST	HARVEST	HARVEST	HARVEST
1990	DEC	490	338	763	11	808	0	73	881
1991	DEC	654	330	647	11	790	3	52	845
1992	DEC	747	319	709	11	950	9	18	977
1993	DEC	1194	496	765	11	1347	7	53	1407
1994	DEC	1069	287	484	9	825	0	23	848
1995	DEC	1207	343	552	11	918	0	44	962
1996	DEC	1445	254	549	11	1493	0	41	1534
1997	JAN	1331	197	326	5	597	0	59	656
1998	JAN	1348	243	350	5	570	0	18	588
1999	JAN	1336	218	386	9	581	0	86	667
2000	JAN	1295	39	59	5*	0	0	108	108
2001	NOV				5	56	0	20	76
2001	JAN				5	347	0	17	364
2001	ALL	1436	187	277	10	403	0	37	440
2002	NOV				5	18	0	9	27
2002	JAN				5*	0	0	33	33
2002	ALL	1387	27	277	10	18	0	42	60
2003	NOV				5	22	0	13	35
2003	JAN				5	235	0	64	299
2003	ALL	1187	152	200	10	257	0	77	334
2004	NOV				5	36	0	11	47
2004	JAN				5	308	0	34	342
2004	ALL	1612	126	209	10	344	0	45	389
2005	JAN	1707	220	336	5	504	0	53	557
2006	JAN	1793	199	272	7	367	0	74	441
2007	JAN	1795	166	243	7	341	0	112	453
2008	JAN	2116	191	262	7	328	0	81	409

[1] These figures are based on analysis of mandatory report returns, corrected for non-response bias.

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 (SUCCESSFUL)	HARVEST*	HARVEST*	HARVEST*	HARVEST*
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

[1]These figures are based on analysis of mandatory report returns, corrected for non-response bias, unadjusted for 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

Wild Turkey

WILD TURKEY STATUS AND TREND REPORT: STATEWIDE

MICK COPE, Upland Game Section Manager

Population objectives and guidelines

Turkeys have been released in Washington over a period of 70 years. The primary objective of these releases was to provide additional hunting recreation. From 1985 to 2002, the Department of Fish and Wildlife (WDFW) conducted several release projects. Since wild turkeys are not native to Washington, three subspecies of turkeys were chosen based on the habitats they would be occupying.

Merriam's turkeys were released in Ferry, Klickitat, Lincoln, Okanogan, Pend Oreille, Chelan, Yakima, Kittitas, and Stevens counties; Rio Grande turkeys were released in Walla Walla, Garfield, Columbia, Asotin, Lincoln, Whitman, Chelan, Kittitas, Yakima, and Okanogan counties; and the eastern subspecies was introduced in Pacific, Cowlitz, Thurston, Lewis, and Grays Harbor counties.

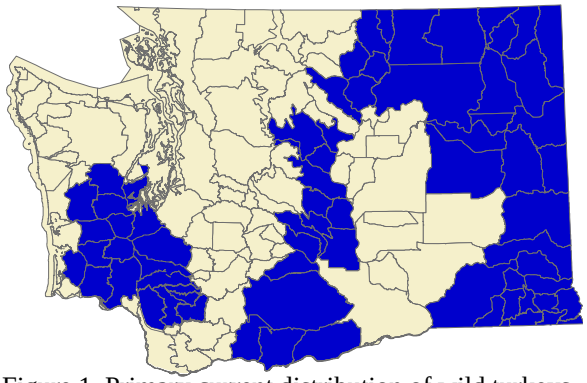


Figure 1. Primary current distribution of wild turkeys in Washington based on Game Management Units.

Current population management activities are focused on providing hunting opportunities in much of Washington State (Figure 1). Very few translocation activities have occurred in recent years, none during the 2008 reporting period, and are used as a last resort response to damage and nuisance complaints.

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 card with date, location, sex, and age of harvested birds within 10 days of harvest.

Hunting seasons for wild turkeys have varied from a 2-day, fall season in 1965 to the current 31-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. Permit-only early fall hunting continued, however, within the Mica Peak (GMU 127), Roosevelt (GMU 133), Blue Mountains East (GMUs 145, 172-186), Blue Mountains West (GMUs 149-163), and Klickitat (GMUs 382, 388, 568-578) areas. In 2006 a late fall permit hunt called NE Washington was also added for GMUs 101-124. While all fall seasons are either sex, the percentage of hens in the harvest has varied widely.

Since one of the objectives of the fall season in northeastern Washington is to limit population growth, having too many toms in the fall harvest (averaging 51% and as high as 56% in 2005) was a management concern. In April 2008, the Fish and Wildlife Commission changed the early fall season in GMUs 105-124 from either sex to beardless turkey only in an attempt to create additional impact on spring production and to retain male turkeys for the spring hunt. This action successfully targeted hens, resulting in a fall hen harvest of 81% (29% toms).

Additional early fall, permit-only seasons continued in southeast WA, Klickitat County, and GMU 133. The early fall hunt dates were moved from late November to late September/early October to avoid overlapping other hunting seasons.

The Late Fall Permit Hunt for northeast Washington, GMU's 101-124, which began in 2006, continued in 2008. The season was held November 20-December 15, 2008, and for the first time the 800 permits were fully subscribed.

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. The use of dogs is not allowed, decoys are legal, and hunting hours are one-half hour before sunrise to sunset. In 2006, regulation changes made using electronic decoys and calls illegal. In 2006, the Fish and Wildlife Commission adopted a regulation permitting falconers to hunt turkeys during the fall and winter.

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.

Since 2001, turkey hunters have been required to report their hunting activity. Hunter reports are collected by Game Management Unit (GMU), a geographic area also used for reporting deer and elk harvest. This mandatory reporting system has produced more accurate estimates of harvest and hunter participation than those estimates made in the past.

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 2007, a total of 16,612 people hunted turkeys, taking a total of 6,531 turkeys. While harvest in 2008 was lower than 2007, it is substantially higher than before 2000. (Figure 2).

To make management of turkey populations more effective, GMUs are grouped 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 shows which GMUs are part of each PMU.

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 2008, 4,192 wild turkeys were harvested in Region 1 (PMUs P10 and P15) during the spring general, fall general, and fall permit seasons combined (Table 2 and Table 3). The 2008 spring harvest in Region One decreased approximately 24% from 2007 but still accounted for approximately 80% of the overall statewide spring turkey harvest (Table 2).

Harvest of wild turkeys in Region 2 (PMU P20) varied little from 1990 to 1999 (range: 10-21). However, from 2000 to 2007 harvest increased 8-fold (32-258) (Table 2). This increase can be attributed to the release of nearly 800 Merriam's turkeys during 2000-2002 in Chelan and Okanogan counties. Mild winters and favorable spring weather from 2000 to 2004, translated into good over-winter survival and production of turkeys and to the natural expansion of birds. However, the 2008 harvest decreased slightly less than 10%.

Turkey harvest in Region 3 (PMU P30) jumped from 10 birds in 2000, to 178 birds in 2004, then leveled between 2004 and 2006 (Table 2). Turkey harvest in 2008 decreased from 2007, but remained similar to the 5-year average for the PMU. Harvest is distributed throughout the forested areas of the region, but the Teanaway River drainage is usually the most productive area.

Turkey harvest started slowly in Klickitat County in the 1960s but increased into the 1980s with harvest in 1986 dropping to <50 turkeys. Harvest reported for PMU P35 has increased substantially since supplemental releases in 1988-89. Spring turkey harvest has gradually increased, reaching an all-time high in 2007 at 487. The 2008 harvest in Klickitat County equaled the 5-year average for the PMU. The improvement in turkey hunting in Klickitat County has been aided by mild winters and increased distribution throughout the county.

Spring turkey harvest in the Westside habitats of Regions 5 and 6 (PMU P50) continues to be low, still not reaching above 100 birds harvested (Table 2).

Surveys

Between 2004 and 2008 the Colville District carried out a pilot project cooperating with volunteers to carry out an annual winter survey of wild turkeys in northeastern Washington. 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. This system that relied less on volunteer coordination

worked well but expansion of the number of routes will require volunteers to adopt additional routes. Results of the surveys show that turkey numbers in PMU 10 may be down from previous years.

Population Status and Trend

Turkey releases were documented historically in Asotin and Walla Walla counties in 1929 and 1919. These were likely the eastern subspecies raised on game farms. Turkeys were released again during the 1960s by the Department of Game in Walla Walla and Columbia counties. A total of 18 Merriam's turkeys were released in Walla Walla County on Coppei Creek and 16 were released on W.T. Wooten Wildlife Area. These releases did not result in long-term population establishment.

From 1988 to 1990 Rio Grande turkeys were brought in from Texas and released at several locations in Asotin, Columbia, and Garfield counties. In all, 87 turkeys were released in Asotin County, 40 were released in Columbia County, and 49 in Garfield County. Additional Rio Grande turkeys were trapped in these counties and trans-located to other parts of the Blue Mountain foothills including Walla Walla County (34 birds) and along the Palouse River in Whitman County (56 birds). Harvest of Rio Grande turkeys in southeast Washington was 471 in 2004.

Based on harvest trends (Table 2), the Blue Mountains population has expanded substantially. The Blue Mountain foothills seem to provide excellent habitat conditions for Rio Grande turkeys as does the northern half of Lincoln County.

In 1961, 15 Merriam's turkeys were released in the Rice area of Stevens County and a population became established. Birds were subsequently trapped from this population and released throughout the state. Initially, turkeys did very well in Stevens County with a fall harvest of 120 birds in 1965. Harvest declined and stabilized near 20/year. By the mid-1980s harvest had declined to about 10 birds/year.

In 1988 and 1989, 170 Merriam's turkeys from South Dakota were released throughout Stevens County. Merriam's turkeys were also released in Ferry and Pend Oreille counties from Stevens County nuisance trap and removal projects. Stevens, Pend Oreille and Ferry counties contain good habitat for the Merriam's subspecies.

Turkey populations in Region 1 reached some level of population stability between 2000 and 2007, and have potentially decreased in numbers in 2008. Generally, available habitats are occupied, but the spring harvest in PMU 10 experienced a substantial decrease in 2008 (Figure 2, Table 2).

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 report concern over decreasing populations.

The turkey population in Okanogan County has been increasing in recent years, especially evident in areas where housing is increasing. Additional hunting opportunity will be available to permit holders in the 2009 fall season.

In P30, attempts to establish wild populations of turkeys began in 1913. In all, 94 game farm-reared birds of the eastern subspecies were released by 1931. A second attempt using wild Merriam's turkeys was tried in the 1960's, but neither of these early releases resulted in a population. Rio Grande turkeys (38) were released in P30 in 1984 and 1985. A population started, but only persisted at a low level. Although pockets of Rio Grande habitat occur throughout P30, the overall habitat is probably better suited for the Merriam's subspecies. From 1999-2001, 574 wild-trapped Merriam's turkeys from Stevens County were released in PMU P30 to enhance localized populations. Harvest indicates the transplant was successful. Spring harvest estimates between 2004 and 2008 point to a stable population.

In south-central Washington (PMU P35), Klickitat County was one of the first areas in Washington where several early attempts were made to establish wild turkeys. Between 1930 and 1946, 93 turkeys were released in 4 different attempts to establish a population. These releases did not result in population establishment. Then in 1960, 12 wild-trapped Merriam's turkeys were released. This release resulted in establishment of Washington's largest, most stable turkey population from 1960 through 1990. After suspected population declines by the mid 1980s, approximately 125 Merriam's turkeys were released in 1988 and 1989 in hopes of rejuvenating the population. An additional 92 Merriam's turkeys were released in PMU P35 in 1997 and 1999. No releases have occurred in PMU P35 or the other counties of Region 5 since 1999.

Turkey harvest for 2006 in PMU P35, which includes GMU 578 (West Klickitat) and GMU 388 (Grayback), and GMU 382 (East Klickitat), was up in 2007 with an all-time high spring harvest of 487 turkeys. Turkey harvest in 2008 returned to an average level at 370 (Table 2). 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.

From 1925 and 1931 several documented turkey releases were made throughout western Washington. Most releases were limited in number and widely scattered. Releases were more numerous in San Juan County with over 35 birds in 3 different releases

(over 6 years) and Clark County with 50 birds released in 2 years. In the early 1960s, turkeys were also released on Protection Island in Jefferson County.

The Department of Game trapped Merriam's turkeys in Klickitat and Stevens Counties and released 4 on San Juan Island, 6 in Lewis County, and 12 on Scatter Creek Wildlife Area. In addition, several turkeys were taken from Northwest Trek Wildlife Park and released on Bangor Naval Base property. Most of these releases did not result in population establishment.

In 1987 the Department of Wildlife began releasing wild-trapped eastern wild turkeys in Lewis and Pacific counties. Thirty-one eastern turkeys were released in Lewis County from 1989 to 1992, and 39 in Cowlitz County. In 1993 and 1994 a few additional (<10) turkeys were trapped in Pacific County and some were moved to Cowlitz County. From 1997 to 2000, Wahkiakum County received 88 eastern turkeys from Iowa and 8 from Pacific and Cowlitz counties. Twelve eastern turkeys from Iowa were released in Cowlitz County in 2000.

Determining population trends for the wild turkey population in PMU P50 is difficult. Sightings of wild turkey continue to increase over the years and sightings in locations away from release sites are also occurring. In addition, turkeys continue to be harvested throughout the season. The 2008 harvest was similar to the 10-year average for the PMU. 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 affected turkey survival.

Augmentation and habitat enhancement

There were no new releases of turkeys in PMU P20 (Chelan or Okanogan counties) during 2003-2008. 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.

Over 25 upland bird feeders in Chelan and eastern Kittitas counties were maintained and filled for upland birds, including turkeys, from 2000 to 2006 on a limited basis to assist establishment of the introduced population. These feeders were filled and maintained primarily by the Wenatchee Sportsman's Association. Only a few small flocks of 3-6 birds appeared not to use feed sites.

No releases were made 2001-08 in PMU P30. Some winter-feeding occurred either through WDFW, NWTF, local sportsmen, or interested landowners.

The 2005-2009 Wild Turkey Management Plan identified a potential introduction area in Skagit and Whatcom counties. Potential release sites were identified 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.

During late winter and early spring 2000, 268 eastern wild turkeys from Iowa were released at sites in Thurston, Pacific, Grays Harbor, and Mason counties. There have been no releases since 2000.

Habitat enhancement priorities have been identified in the Wild Turkey 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.

Management conclusions

The 2008 spring turkey harvest in Region One decreased dramatically from the level of harvest between 2002 and 2007 (Figure 2; Table 2). The cause of this decrease is not known definitively, however, hunter participation was lower (9,556 in 2008 Vs 10,734 in 2007), those who did participate were slightly less successful (33.6% in 2008 Vs 42.7% in 2007), and hunters had to spend more time hunting per bird harvested (8.4 days/kill in 2007 and 11.3 days per kill in 2008). Once again, PMU-10 and PMU-15 hunters experienced the highest success rates in the state with 33.6% and 32.8% 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 should focus on winter food enhancements, likely increasing available grain, clovers, fruiting shrubs, and mast producing trees. Klickitat County will be the focus of an oak habitat enhancement project in the coming years, which will improve winter habitat for turkeys and other oak dependent species.

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 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. Introduced populations in other states, such as Missouri and New Hampshire, took around 20 years to reach the long-term carrying capacity of the habitat. The population of turkeys in south-central Okanogan County appears to be stable or 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.

Releases of Merriam's turkeys in Yakima and Kittitas counties have increased harvest and hunter participation. Recruitment has been best in Kittitas County.

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. Observations and analysis of data (e.g., percent young males in spring harvest) collected over the next several years should determine whether eastern wild turkeys will achieve viable population status.

The wild turkey population management plan was adopted in January 2006. This plan guides future population expansion of wild turkeys as well as population monitoring, harvest management, recreational opportunity, and public education. Copies of the plan can be downloaded from the wild turkey management plan Internet page (http://wdfw.wa.gov/wlm/game/water/turkey/management/index.htm) or through a request from the Wildlife Program office in Olympia (360-902-2515).

Figure 2. Estimated spring turkey harvest in each turkey Population Management Unit (PMU), 1996-2006.

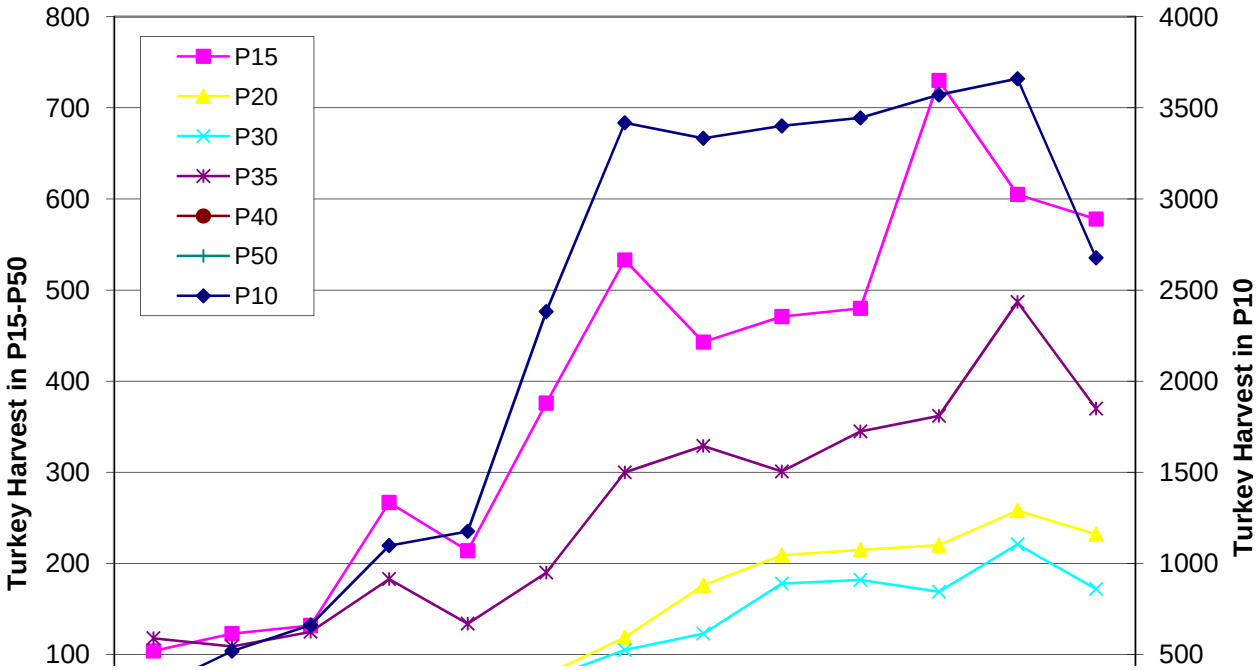


Table 2. Estimated spring turkey harvest in each turkey Population Management Unit (PMU) 1996-2007.

PMU	1998	1999	2000	2001*	2002	2003	2004	2005	2006	2007	2008
P10	662	1098	1176	2382	3418	3333	3401	3445	3571	3660	2677
P15	132	267	214	376	533	443	471	480	730	605	578
P20	20	21	32	78	119	176	209	215	220	258	232
P30	0	1	10	73	105	123	178	182	169	221	172
P35	125	183	134	190	300	329	301	345	362	487	370
P40	1	0	1	2	7	9	15	10	8	9	3
P50	40	46	48	47	54	52	54	53	77	62	50
Total:	***980***	***1616***	***1615***	***3148***	***4536***	***4465***	***4629***	***4730***	**5137**	**5302**	***4082***

* = first year of mandatory reporting system

Table 3. Estimated fall turkey harvest (permit and general season) in each turkey population management unit (PMU) 2000-07.

PMU	2002		2003		2004*		2005		2006**		2007		2008	
	No. of Permits	Fall Harvest	No. of Permits	Fall Harvest	No. of Permits	Fall Harvest	No. of Permits	Fall Harvest	No. of Permits	Fall Harvest	No. of Permits	Fall Harvest	No. of Permits	Fall Harvest
P 10	1992	433	1300	599	400	71	400	79	865	204	883	207	800	847
P 15	50	20	50	17	50	27	50	15	300	59	300	54	500	90
P 20	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P 30	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P 35	75	20	75	14	75	23	75	27	75	16	75	17	75	16
P 40	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P 50	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total:	***2117***	***473***	***1425***	***630***	***525***	***1276***	***525***	***1535***	***1240***	***1213***	***1258***	***1205***	***1375***	***953***

*= A general fall season was implemented in much of PMU P10 **=Late fall permit season began in much of PMU 10

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 2003). 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 (Figure 1). Surveys (crowing count and brood index) conducted between 1982 and 1998 also indicate a decrease in pheasant numbers in eastern Washington (Rice 2003). 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 2004).

Harvest estimation techniques between 1984 and 2000 indicate a decline in pheasant numbers (Figure 2). However in 2001 the Department changed the small game survey protocols by sampling 50% of small game hunters to increase harvest and participation estimate precision. Stabilization in sampling has occurred in harvest and hunter numbers due to protocol changes (Figure 1).

Rooster pheasants have been released in the fall as part of the Eastern Washington Pheasant Enhancement Program 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 2.

While data shows statewide declines (Figures 1 and 2), harvest estimates for the Yakima, Columbia, and Snake River Basins reflect variable decreasing trends in populations from 1994 to 2008 (Figure 3). 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.

Hunters

Hunter numbers have also dropped dramatically since the late 1960's (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 (Figures 1 and 2).

Cause of Decline

The cause of the decline in pheasant populations

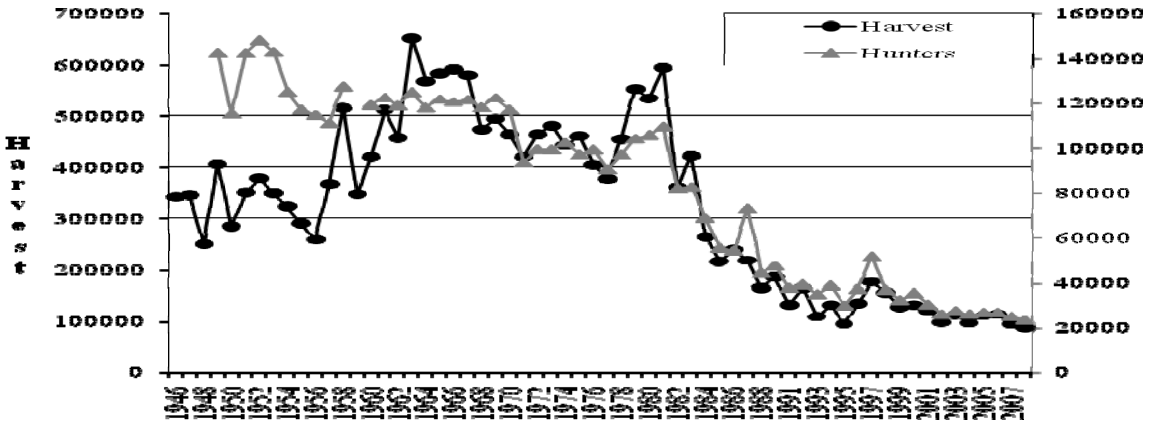


Figure 1. Estimated annual pheasant harvest and annual hunter participation in Washington 1946-2008

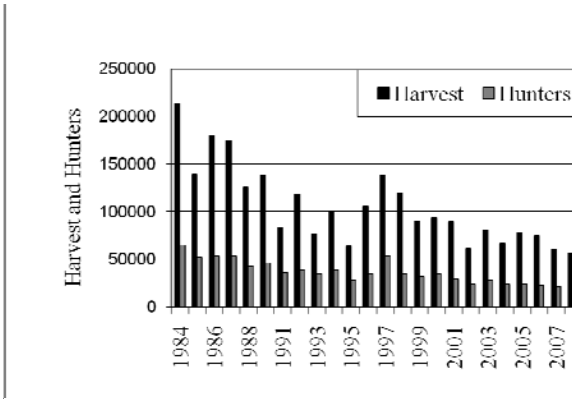


Figure 2. Estimated annual pheasant harvest and hunter participation in Washington 1984-2008.

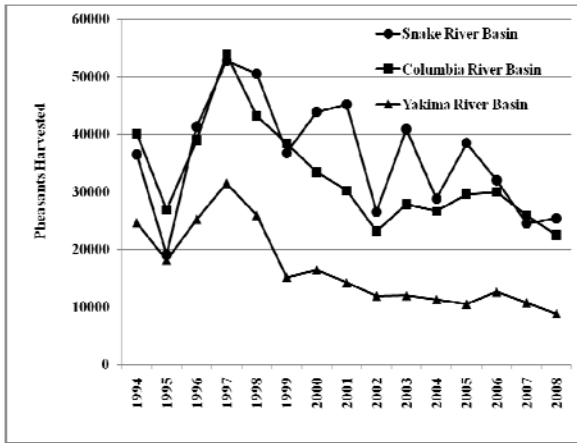


Figure 3. Estimated harvest for the Snake, Columbia, and Yakima River basins from 1994-2008.

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 decline. Of particular importance is breeding habitat (including nesting and brood rearing habitat), habitat for wintering and habitat that provides escape cover from predators. Conceptually, loss of native grasslands to tillage has increased the importance of the Conservation Reserve Program (CRP) grasslands for maintaining ring-necked pheasant populations (Eggebo et al. 2003).

Disturbingly, according to Farm Service Agency (FSA), approximately 35% of Eastern Washington Conservation Reserve Program will expire in the next three years. With both wheat and alfalfa trading at record highs, landowners have terminated CRP contracts and destroyed key habitats to plant these crops. Orchards and vineyards have also replaced habitats in some areas. 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.

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). 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.

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, decrease insect availability. Early spring droughts with cold, wet conditions during the peak of hatch, may cause a dramatic decline in productivity.

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 results in the removal of 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. 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.

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/wlm/game/water/pheasant_workshop.pdf.

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" below:

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 1980's 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) Re-establish pheasant crowing counts and brood index counts 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 Technical Service Provider monies to place habitat technicians in 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. 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.

Literature Cited

Blus, L. J. and C. J. Henny (1997). Field studies on pesticides and birds: Unexpected and unique relations. Ecological Applications 7(4): 1125-1132.

De Snoo, G. R. and J. De Leeuw 1996. Non-target insects in unsprayed cereal edges and aphid dispersal to the adjacent crop. Journal of Applied Entomology 120(8): 501-504.

Eggebo, S. L., K. F. Higgins, et al. 2003. Effects of CRP field age and cover type on ring-necked pheasants in eastern South Dakota. Wildlife Society Bulletin 31(3):779-785.

Rice, C.G. 2003. Utility of Pheasant Call and Brood

Counts for Monitoring Population Density and PredictingHarvest. Western North American Naturalist.63 (2): 178-188.

Rodgers, R. D. 2002. Effects of wheat-stubble height and weed control on winter pheasant abundance. Wildlife Society Bulletin 30(4):1099-1112.

Savory, C. J. 1989. The Importance of invertebrate food to chicks of gallinaceous species. Proceedings of the Nutrition Society 48(1): 113-133.

Washington Department of Fish and Wildlife. 2003. Game Mangament Plan. Washington Department of Fish and Wildlife, Olympia, Washington, USA.

Chukar

CHUKAR STATUS AND TREND REPORT: REGION 1
Snake River Basin

Paul A. Wik, Wildlife Biologist

Population objectives and guidelines

The chukar (*Alectoris chukar*) management objective is to maintain healthy populations throughout the available habitat. Chukar populations in Region 1 reached an all time high between 1979 and 1981, but started declining significantly in 1982. Determining the ultimate cause of the decline may be necessary prior to returning chukar populations to higher levels.

Harvest management is designed to provide maximum recreational opportunity without negatively impacting populations. However, it is recognized that the current population is not providing the recreational opportunities desired.

Hunting seasons and harvest trends

The hunting season for chukar has varied in length over the years, from a split early and late season in the 1960s and 1970s, to the implementation of one, standardized season in 1997. The current season runs from early October through mid-January, with a limit of six birds per day.

Chukar hunting was a major recreational pursuit in southeast Washington during the 1970s, when populations peaked. During this period, the annual chukar harvest averaged more than 66,000 birds in Region 1. Most of the harvest occurred within the Snake River basin portion of Whitman, Garfield, and Asotin counties. The average harvest in Region 1 declined to 28,872 birds per year during the 1980s, and further declined to only 12,020 birds per year in the 1990s. The first 8 years of the 21st century has shown a continued decline in chukar harvest, with an average of 5,064 from 2000 through 2008, 92% below the harvest level experienced in the 1970's.

The Region 1 harvest remained low in 2006, 2007, and 2008 at 3,912, 1,788, 1,477, respectively (Table 1). The continued decline in harvest numbers and hunter numbers is expected to continue into 2009 (Table 1 and Figure 1).

Hunter participation peaked in the late 1970s and early 1980's, but has declined dramatically since then. Today, only 1,000 - 2,000 hunters pursue chukar in Region One (Figure 1).

Surveys

Chukar populations were surveyed by helicopter from 1987 to 1997, when aerial surveys were terminated due to budget constraints. At present, no surveys are conducted to monitor chukar populations. Field personnel note the abundance of broods during regular field operations.

Population status and trend analysis

The chukar population crashed in the early 1980's, and has continued a long-term decline since then. The reason for the sudden population decline is unknown. 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 starthistle. This loss of habitat likely hinders population recovery, but is not the likely ultimate cause of the regional population decline. Areas with minimal star-thistle have also experienced population declines during the same time period. The effects of weather conditions on chukar nesting success and recruitment have not been clarified at this point, but can contribute to poor recruitment.

The annual chukar population is primarily dependent upon recruitment and over-winter survival. Production in 2008 appeared to be up slightly from the previous 4 – 5 year period, based upon field observations during aerial deer and bighorn sheep surveys. This could lead to an increase in 2009-2010 harvest.

Habitat condition and trend

Noxious weeds, especially yellow star-thistle, are continuing to expand over thousands of acres of prime chukar habitat in southeast Washington. The problem is so wide spread, that several counties have halted control programs, leaving it to private landowners. Chukar partridge appear to thrive on lands that contain ample cheatgrass (*Bromus tectorum*), they do not appear to favor areas inundated with yellow starthistle.

Cheatgrass is a staple of the chukar diet in spring and fall, and the availability of cheatgrass can have a significant impact on the chukar population, and is widespread throughout the range in Region 1. Habitat conditions have not likely changed on a regional scale since the early 1980's in a manner that explains the dramatic decline observed.

Augmentation and habitat enhancement

Weed control programs have declined on private and public lands because of the costs involved in the aerial application of herbicides. Aerial spraying is the most effective method, if followed by good land management practices. Unfortunately, landowners tend to put livestock back out on acreage that has recently been sprayed, which only exacerbates the weed problem. Biological control agents are also used, but appear to be most effective in newer, smaller stands.

Biological control agents tend to control the growth of small patches of weeds, failing to eliminate most patches.

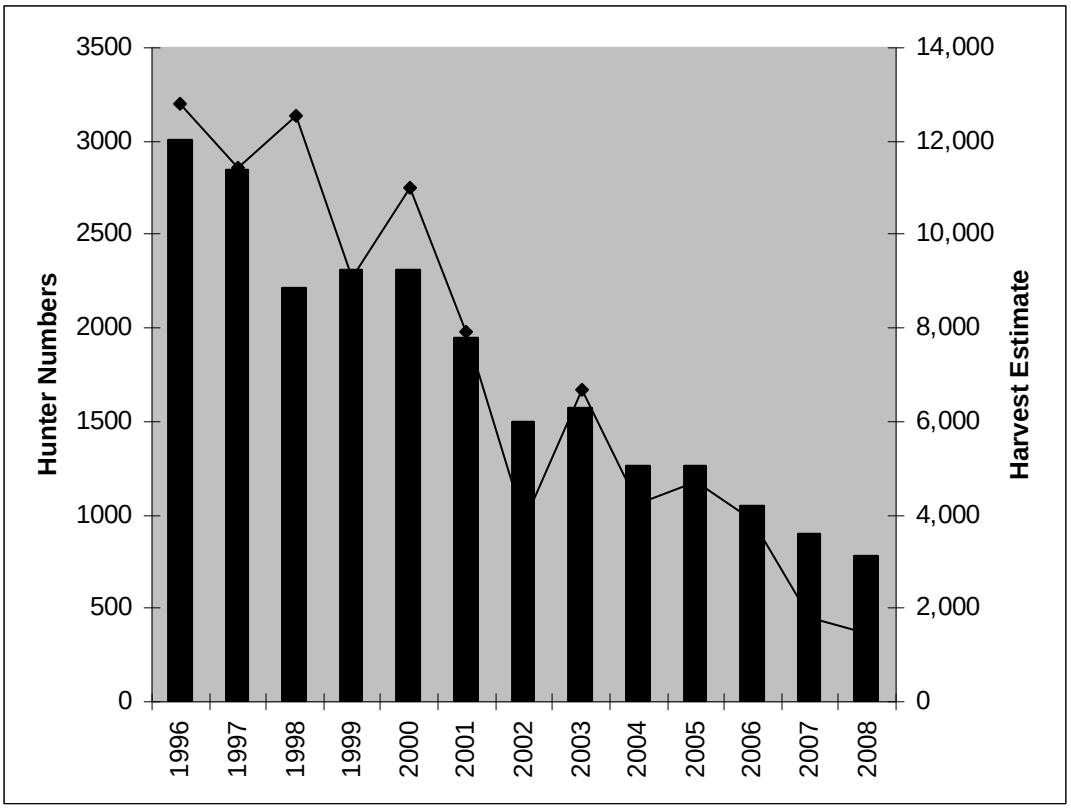
Management conclusions

Chukar populations in Region 1 are far below the peak levels of the 1970s and early 1980s. Habitat deterioration and poor land management practices results in the loss of additional habitat. 2008 harvest estimates were well below the 10-year and long-term averages. Chukar populations will not return to historical levels until the ultimate cause of the decline is determined. The spread of noxious weeds and poor nesting conditions for productivity and survival continue to exacerbate the problem. It is unknown whether other factors than habitat conditions (i.e. disease or genetics) are contributing to the continuing decline in chukar numbers. Improving chukar populations will likely require extensive research into the currently suppressed population.

Table 1. Region One Chukar Harvest Summary 1997 - 2008.

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Asotin	5,111	5,006	3,547	4,788	3,687	1,440	3,246	3,315	2,111	1,876	1,297	745
Columbia	561	273	111	155	179	147	163	42	112	533	62	115
Ferry	0	0	0	0	0	0	0	0	0	0	0	0
Garfield	2,057	2,648	1,337	724	769	673	676	155	626	308	89	80
Walla Walla	155	0	0	55	429	384	410	61	133	5	18	98
Whitman	1,075	2,319	1,875	2,953	2,644	1,058	2,024	650	987	1075	264	369
Lincoln	77	135	148	174	76	137	108	0	223	68	58	45
Spokane	405	154	55	146	111	32	46	100	524	47	0	25
Stevens	0	0	0	0	10	0	0	0	0	0	0	0
Pend Ore	0	0	0	0	0	0	na	0	0	0	0	0
Total	11,438	12,533	9,072	10,995	7,905	3,871	6,673	4,243	4,716	3912	1,788	1,477

Figure 1. Region 1 Chukar harvest and hunter numbers for the 1995/1996 season through 2008/2009 season.



CHUKAR STATUS AND TREND REPORT: REGION 2
Upper Columbia River Basin

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

Population objectives and guidelines

Management objectives for chukar partridge (*Alectoris chukar)* are to maintain healthy chukar populations in all suitable habitats within Region 2 and provide maximum recreational opportunities consistent with population management objectives.

Hunting seasons and harvest trends

In 2008, an estimated 6,074 chukar were harvested in Region 2, which is the lowest harvest in the last 16 years. This represents a 25% decrease from the 2007 harvest and a 40% decrease from the 10-year average harvest of 10,186. Chukar harvest in this region reached a low of 4,755 in 1993, increased to 13,042 in 1997, and fluctuated between 8,104 and 15,506 from 1998 to 2008 with no apparent trend (Figure 1). There were 1,842 chukar hunters in 2008, which was a 21% decrease from 2007 and a 30% decrease from the 10-year average of 2630 hunters. Despite the decrease in harvest, harvest/day hunted was similar to last year at 0.69, but below the 10-year average of 1.0.

Surveys

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 second consecutive year, no chukars were observed during the driving routes (only two times in eleven years). The lack of chukars observed might be attributed to the reduced mileage of the driven routes from road closure occurring in 2007. An average 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.

Population status and trend analysis

In 2009, spring weather was much cooler than normal, delaying vegetation growth, insect hatches and nesting activities. Precipitation has also been lower than normal this spring, which should allow for good brood production.

Habitat condition and trend

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. Recent fire activity has altered large tracts of habitat in Douglas Co, which may temporarily reduce numbers or redistribute chukars.

Management conclusions

With the amount of chukar habitat relatively stable in the Region, chukar populations and chukar harvest will likely be driven annual weather conditions and its resulting influence on production.

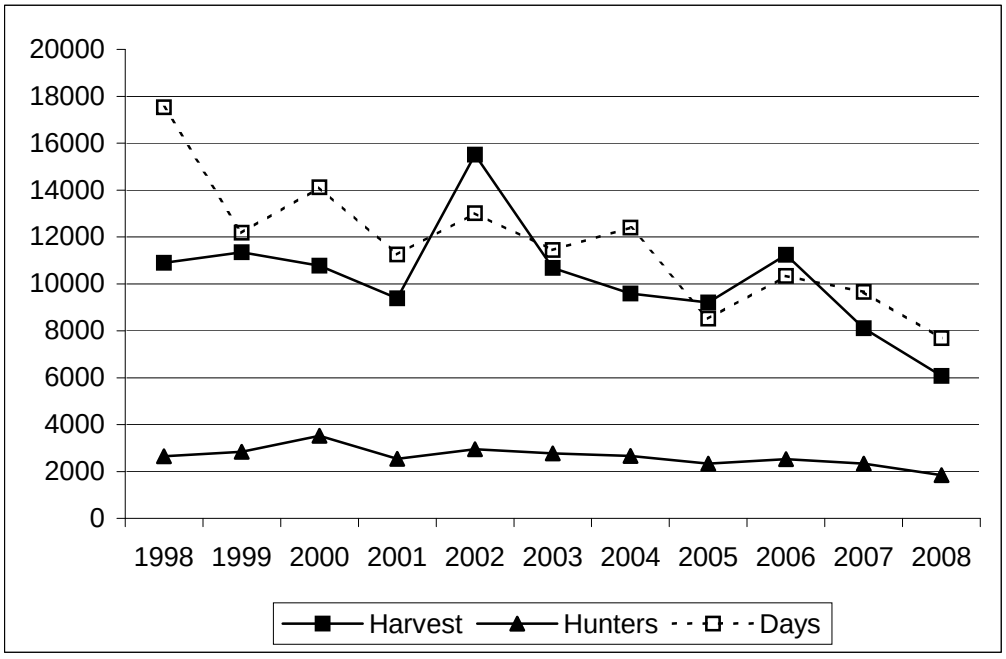


Fig 1. Chukar harvest, hunter numbers and hunter effort for Region 2 for the period 1998-2008.

CHUKAR STATUS AND TREND REPORT: REGION 3
Yakima and Lower Mid-Columbia River Basins

MIKE LIVINGSTON, District Wildlife Biologist

Population objectives and guidelines

The objective of chukar (*Alectoris chukar*) management is to increase the population to, or beyond, historic levels. Harvest management is designed to provide maximum recreational opportunity without negatively impacting populations.

Hunting seasons and harvest trends

The chukar-hunting season during 1990-1997 in Region 3 began the third Saturday in October and ended the second Sunday in January. In 1997 the opener was moved to October 1, and in 2003 the opener was shifted to the first Saturday in October. The season was extended to mid- January in 2000. The bag limit has remained at 6 birds per day.

A mailed hunter questionnaire indicated the 2008 harvest increased by 12% from 2007, but declined 35% from the 10-year mean of 5,329. The number of hunters was down 18% from 2007 and 29% below the 10-year mean (Fig. 1). Hunter success (birds/day/hunter) declined 8% from 2007 and 14% from the 10-year mean (Fig. 2).

Population status and trend analysis

Population surveys have not been conducted for 11 years. 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 23-year averages. While 2008 chukar harvest was slightly up from 2007, hunter numbers declined and were the lowest recorded during the 23-year monitoring period.

Field observations indicate that chukar numbers are influenced by weather and insect productivity. Persistent snow cover during the winters of 1992-93 and 1996-97 may have influenced the dramatic declines. Populations rebounded rapidly following these rough years with assumed favorable nesting and brood rearing conditions. In 1999, the spring was cold and dry. As a result, insect production was likely low, possibly influencing brood success and overall numbers, which would explain the sharp decline in harvest between 1998 and 1999. Precipitation in spring 2007 and 2008 were below normal, which may have reduced insect production influencing chick survival. Decline in hunter success support the assumption that chick survival was poor in 2008.

Augmentation

The Kittitas Field and Stream Club (KFSC) has been purchasing and releasing 500 Chukar annually since 2000. Historically, the club raised approximately 1000 birds for release.

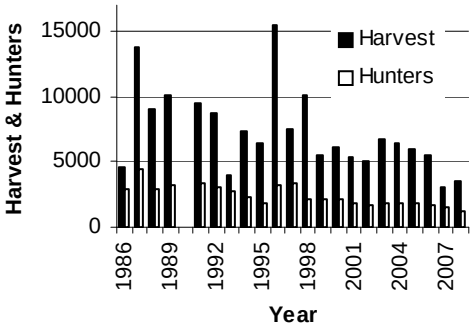


Figure 1. Chukars harvested and Chukar hunters during the period 1986-2008 in Region 3.

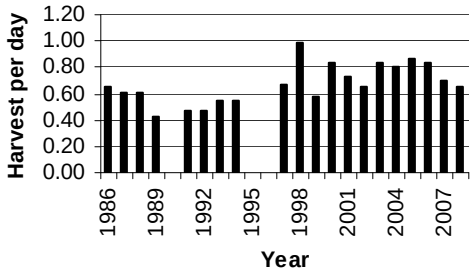


Figure 2. Hunter success measured as number harvested per hunter day during the period 1986-2008 in Region 3.

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. In Region 3, WDFW and Department of Defense (DOD) manage the majority of chukar habitat. WDFW lands have not changed significantly in the last decade. Since 1995, the DOD has excluded cattle grazing. Sections of both WDFW and DOD lands have burned in the last few years. The fires did not appear to have significantly impacted chukar habitat.

Management conclusions

Habitat quantity in Region 3 has remained fairly constant. However, residential development, irrigated

agriculture, and wind energy facilities are now 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. However, they have not responded to apparent favorable weather conditions that have occurred since 1998.

Continued population declines indicate that either habitat is deficient in some unknown component or there may be a population health problem. Habitat quality may have actually improved over time with the abundance of wildfires that have influenced the spread of cheatgrass.

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 in Region 3 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.

References

Westemeier, R. L., J. D. Brown, S. A. Simpson, T. L. Esker, R. W. Jansen, J. W. Walk, E. L. Kershner, J. L. Bouzat, K. N. Piage. 1998. Tracking the long-term decline and recovery of an isolated population. Science 282:1695-1698.

Quail

QUAIL STATUS AND TREND REPORT: REGION 1
Snake River Basin

Pat Fowler, District Wildlife Biologist
Paul A. Wik, Wildlife Biologist, District 3

Population objectives and guidelines

California quail (*Callipepla californica*) management objectives are to maintain healthy populations in all suitable habitats within Region 1 and to provide recreational hunting opportunities consistent with population management objectives.

Hunting seasons and harvest trends

The 2008-2009 general hunting season for California quail and Northern bobwhite (*Colinus virginianus*) in Eastern Washington ranged from mid-October through mid- January. In addition, a youth only hunting season occurred for two days in late September. As in past years, the bag limit for quail was 10/day, with 30 in possession. Mountain quail (*Oreortyx pictus*) season remained closed in Eastern Washington.

California quail harvest continues to remain low compared to the 1960s and 1970s (Figure 1). Regional quail harvest averaged 90,956/year during the 1960's (1964-1969), declining 26% to 68,424/year during the 1970s. Declining harvest continued into the 1980's and 1990's when harvests averaged 31,503/year and 24,312/year, respectively. The average harvest for the Region since 2000 season was 32,581, a 64% decline from the average harvest experienced in the 1960's.

Despite the long-term decline in harvest since the 1960's, the quail harvest in Region 1 may have stabilized at a lower level, based on relatively consistent harvest levels over the last 25 years (Figure 2). Harvest during 2008 declined to 16,504 from 26,902 in 2007. Forty-nine percent lower than the 2000 to 2006 average of 32,581 birds, and 39% lower than the 2006 quail harvest.

Population status and trend analysis

Based on harvest data, California quail populations have declined dramatically since the mid-1970s (Figure 1). However, recent harvest levels may indicate stabilization at a lower level than that of the 1960s and 1970s (Figure 2), with a slight increase over the 1990s decade (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.

Quail production data has not been gathered for approximately 15 years, primarily due to the amount of time needed to collect accurate data, and the relatively low priority of establishing new survey routes. However, incidental observations indicate that quail production in 2004 and 2005 was above the previous few years,

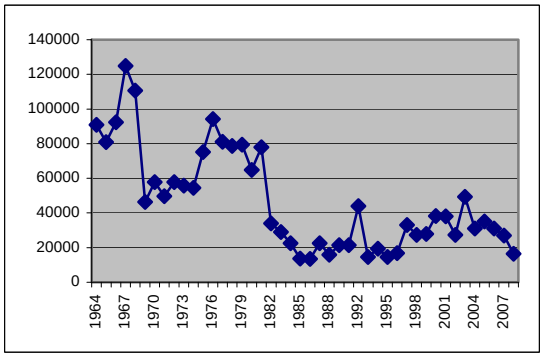


Figure 1. California and Northern bobwhite quail harvest history in Region 1.

perhaps due to favorable weather conditions during the nesting season. Observation data from 2006 – 2008 was not available.

A three-year project to enhance Mtn. Quail populations in southeast Washington was implemented in March 2005. Mtn. 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. A graduate student from the University of Idaho will be publishing the 2 years of research.

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 were no birds released during the spring of 2007.

Calling surveys were conducted during the spring of 2007 and 2008 in the Asotin Creek drainage. Mountain

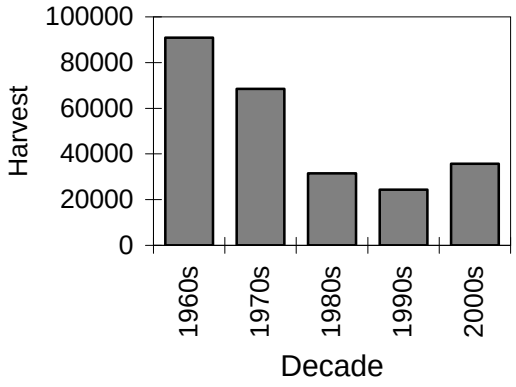


Figure 1. Mean annual quail harvest by decade, Region 1.

quail were either heard or observed during both surveys. Another supplemental release may be considered in the future, depending upon available stock.

Habitat condition and trend

Land development and agricultural practices have reduced habitat for upland game dramatically since the introduction of "clean farming". The spread of noxious weeds also threatens existing habitat in some areas.

The Conservation Reserve Program (CRP) has benefited wildlife habitat since its inception. After previous CRP contracts expired, farmers had to reapply for CRP acreage in 1997 and many requests were rejected. CRP acreage was limited to existing contracts and extensions during 2001. Within Region 1, roughly 580,000 acres are currently enrolled under CRP. This program provides large amounts of suitable habitat near agricultural croplands, and will enhance habitat conditions for upland birds over the set aside period.

Augmentation and habitat enhancement

WDFW's Private Lands Program has developed more than 8,000 acres of upland bird habitat in Region 1. Habitat development and enhancement activities include: planting of grasses, forbs, trees and shrubs; and, installation of approximately 85 guzzlers.

Management conclusions

Acreage set aside under CRP and habitat enhancement projects implemented by the Private Lands Program and the Conservation Reserve Enhancement Program (CREP) will benefit quail and other upland wildlife populations. Especially important to California quail is protection and enhancement of riparian habitat in all areas of Region 1 through the CREP.

The mountain quail augmentation project for southeastern Washington has been scheduled to continue based on direction provided by the WDFW Game Management Plans. In order to release more quail, 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.

QUAIL STATUS AND TREND REPORT: REGION 2
Upper Columbia River Basin

RICH FINGER, District Wildlife Biologist

Population objectives and guidelines

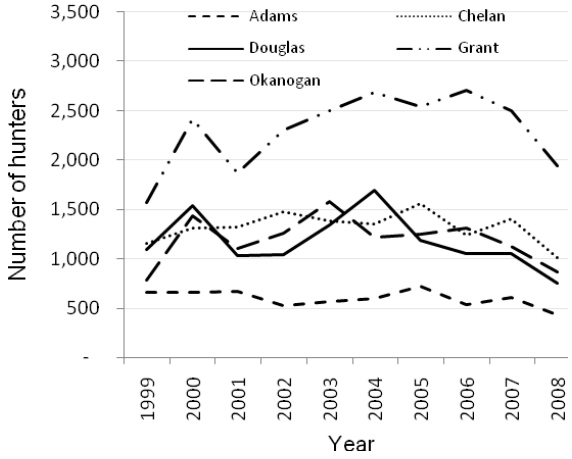
Objectives for California quail (*Callipepla californica*) are to maintain healthy quail populations in all suitable habitats within the Region, and provide maximum recreational opportunities consistent with population management objectives.

Hunting seasons and harvest trends

Quail hunting seasons and bag limits have remained relatively constant in recent years. The season typically begins from early- to mid-October and ends early- to mid-January with a daily bag limit of 10 quail. Since 2006 there has been a youth hunting season during the third weekend of September.

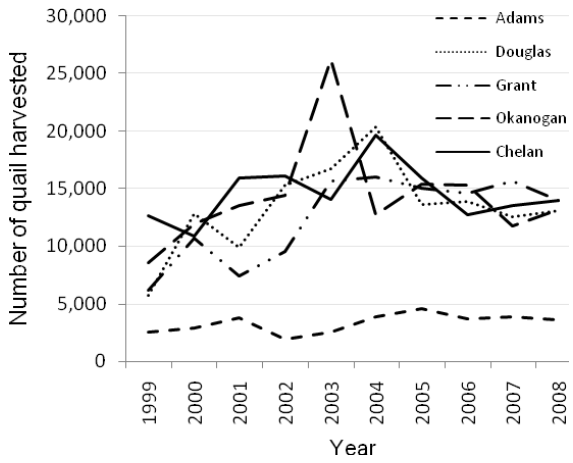
Region 2 remains one of the more popular quail hunting regions despite the fact that quail hunter numbers have been in decline for all counties in recent years (Fig. 1). Quail hunters declined 25% since 2007 and have declined 24% from the 10-yr average (1998-2007) of 6,582 hunters.

Figure 1. Number of quail hunters per county in Region 2, Washington, 1999-2008.



The 2008 harvest of 57,869 represents a 1% increase from 2007 and a 5% increase above the long-term average (1998-2007) of 55,181 birds. Chelan Co. has yielded the largest harvest during most years and Adams County the smallest (Fig. 2).

Figure 2. Number of quail harvested in Region 2, Washington, 1999-2008.



Surveys

Formal population/production surveys for quail have not been conducted since 1999.

Population status and trend analysis

The number of quail harvested in Region 2 peaked during 2003-04 but has stabilized in recent years. Incidental observations indicate that major annual declines in population size usually follow severe winters with persistent snow cover especially when combined with poor production during the previous and/or subsequent summer. Mild winters allow populations to increase.

Habitat condition and trend

The winter of 2008-09 was average to moderately severe in most parts of Region 2. Persistent snow cover may have impacted quail populations in some areas. The cool and relatively wet spring may have reduced the relative productivity for early nesting hens but conditions eased up later in the season. In the Columba Basin, late spring rains typically occur in small isolated showers, and may have caused localized reductions in quail numbers. However, late season conditions could have made up for the sub-optimal conditions experienced early in the breeding season. Further, the adult quail population in summer of 2009 should be sufficient for good reproductive output.

Most hunted populations of quail occur in shrub-steppe habitat near riparian zones; however, a large percentage of the quail population in Region 2 occurs in cities or towns. Quail density in the irrigated farmland area of the Basin is low compared to dry land areas with suitable habitat. In general, quail habitat quantity in the region is relatively stable. Changes in habitat quality appear to result primarily from amount and timing of precipitation in non-irrigated areas.

Augmentation and habitat enhancement

Historically, Private Lands Program and Wildlife Area personnel trapped and transplanted quail within Region 2, however, no quail were trapped in 2008. Quail are usually captured in urban and suburban areas of Okanogan County and released at WDFW-managed sites throughout the region.

Habitat enhancement for quail is conducted by Private Lands Program staff on private land through cooperative agreements and by Wildlife Area staff on Wildlife Areas. In addition to vegetation management for food and cover, management activities usually include maintaining feeders for providing grain during winter.

Management conclusions

The California quail is a major upland game bird species in Region 2 and a species of significant interest to wildlife viewers. Management activities will continue to address the importance of quail by maintaining and developing habitat. Relocating birds to vacant suitable habitat and feeding during winter may also be considered. Wildlife Area staff may also maintain feeders for quail during winter on Wildlife Areas.

QUAIL STATUS AND TREND REPORT: REGION 3
Yakima and Lower Mid-Columbia River Basins

MIKE LIVINGSTON, District Wildlife Biologist

Population objectives and guidelines

Objectives for California quail (*Callipepla californica*) are to maintain healthy populations in all suitable habitats within the region. At the same time, WDFW seeks to maximize recreational opportunities consistent with population management objectives.

Hunting seasons and harvest trends

The youth quail season was 20-21 September and the regular season was 4 October 2008 to 19 January 2009. Quail harvest declined 10% from 2007 and was 24% below the 10-year average. Effort (total hunter days) increased 6% from 2007 levels (Figure 1). Hunter success, measured as birds per hunter-day, declined 15% from 2007, and was 7% below the 10-year average (Figure 2).

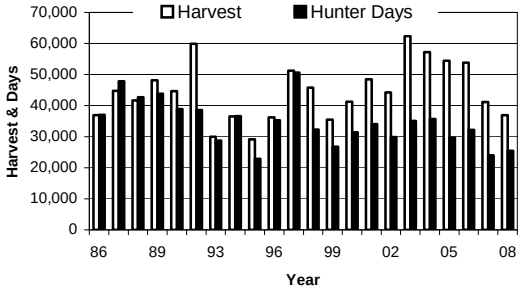


Figure 1. Quail harvest and hunter days for the period 1986-2008 in Region 3.

Surveys

Brood count surveys were discontinued in Region 3 in 1999. The post-hunting season questionnaire is used to estimate harvest and currently provides the best index of population status.

Population status and trend

Total quail harvest indicated that 2008 was a below average year for quail production in Region 3. Total harvest was the second lowest in the last 10 years (Figure 1). Temperatures and precipitation in Spring 2008 were below normal. Insect production was therefore likely reduced, which influenced poor chick survival in 2008. Hunter success (1.5 birds) remained above average (1.3 birds) for the 8th straight year (Figure 2). Upland bird hunters may be shifting their effort to quail in response to declining pheasant populations. Over time, their skill at hunting quail may be improving, which would explain the continued success despite fluctuations in quail populations.

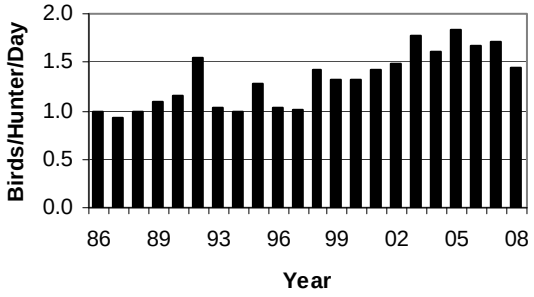


Figure 2. Quail hunter success during the period 1986-2008 in Region 3.

Habitat condition and trend

Similar to other agriculturally associated wildlife, quail habitat quantity and quality has declined for decades. The main cause has been farming practices that remove cover bordering fields, riparian areas, and irrigation canals. Herbicides and pesticides are used to keep crops free of weeds and insects, with insects being critical for quail chick survival.

The highest quail densities are typically associated with brushy riparian habitat. While the spread of invasive Russian olive trees has negatively impacted some native wildlife species by displacing native riparian habitat, these trees appear to benefit quail populations. Some of the highest quail densities in Region 3 are associated with Russian olive trees. Russian olive trees can provide nearly impenetrable, thorny cover often in areas where dense, brushy cover for quail was historically lacking.

A relatively unknown impact has been urbanization. Quail can adapt well to irrigated and landscaped neighborhoods. Residents often enjoy feeding and watching quail year round. In some areas, urban quail populations with relatively high survival may act as population reservoirs by providing brood stock to adjacent non-urban areas where survival is lower.

Augmentation and habitat enhancement

In the past, efforts have been made to trap and translocate urban quail to augment populations in areas where numbers appeared to be reduced. With the quail's high reproductive potential, relatively few birds are needed as brood stock for localized populations to recover on their own, as long as habitat and weather conditions are favorable.

Management recommendations

In certain areas an emphasis could be placed on quail management on state-managed wildlife areas. Quail need a diversity of cover types. For nesting they will use bunchgrass mixed with shrubs, for roosting and escape cover they use riparian shrubs and trees including Russian olive, and for foraging they use sagebrush or greasewood with short bunchgrass. Maintaining/enhancing greasewood or sagebrush areas adjacent to riparian areas should provide quality quail habitat.

Russian olives are an invasive species that many public/tribal land mangers are actively trying to control. However, the cost of control efforts is high, success is often low, and several species including California quail use Russian olive throughout the year. In order to reduce operation cost, reduce habitat disturbance and benefit quail, some Russian olive stands could be left standing.

If Russian olive trees are removed, the long-term goal should be to replace them with a diversity of shrubs and trees (sagebrush, greasewood, wild rose, currant, sumac, dogwood, and willow). Removal efforts should be conducted at a pace that permits their replacement with desired woody species on a timely basis.

Given suitable habitat, species with high reproductive potential, such as quail, are usually capable of quickly rebuilding populations depressed by poor breeding conditions in previous years without artificial augmentation. In areas where quail are not able to quickly rebuild populations after severe winter weather, quantity and/or quality of available habitat is probably lacking.

Forest Grouse

FOREST GROUSE STATUS AND TREND REPORT: STATEWIDE

MICK COPE, Upland Game Section Manager
H. M. ZAHN, District Wildlife Biologist
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.

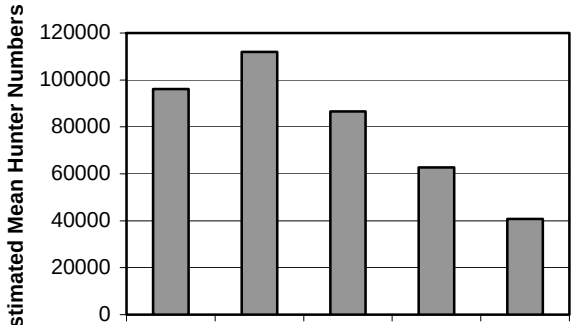


Figure 1. Long-term trend in grouse hunter numbers, 1963-2008.

Estimated hunter numbers and harvest have declined from the historic highs of the 1970's (Figures 1 and 2). Statewide hunter harvest in 2008 was down 5% 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.

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.

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).

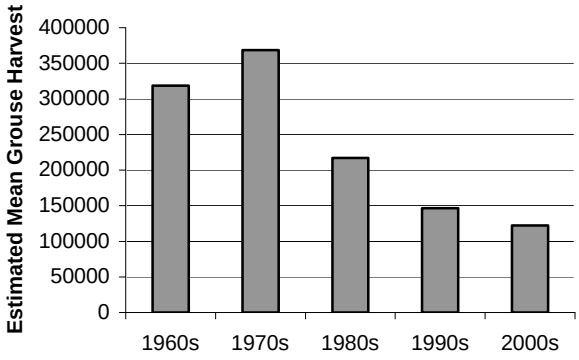


Figure 2. Long-term trend in grouse harvest, 1963-2008.

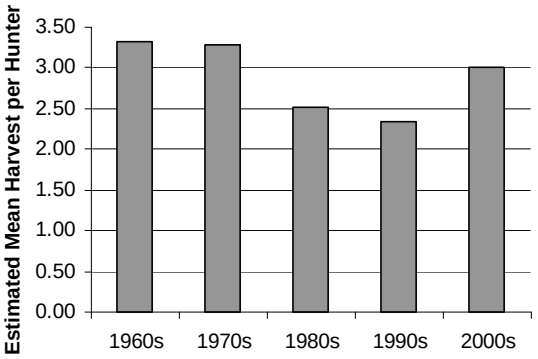


Figure 3. Estimated grouse harvested per hunter in WA. 1963-2008.

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 13,745 hunters in 2008 - similar to 2007. 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 2008, approximately 34,034 grouse were harvested (Table 1), which is down 22% from 2007 and 38% from 2006. The 2008 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 20% fewer days hunting Region 1 in 2008 than they did in 2006 (81,639 in 2008 and 102,616 in 2006).

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.

Hunters harvested 22,884 forest grouse in Region 2 in 2008, which was very similar to the 2007 harvest and about 7% higher than 2006. Harvest was 2% higher than the average annual harvest from 2002 to 2006. Hunter numbers decreased 9% from 9,067 in 2007 to 8,251 in 2008, and were near the 2002-2006 average. The average number of grouse harvested per day per hunter in Region 2 was 0.5, which was higher than 2007 and higher than the state-wide average of 0.32 grouse per day.

In 2008, total grouse harvest in Region 3 (10,339 birds) was 28% above the 2007 estimate. The number of grouse hunters was 4% higher than 2007 and hunter success, as measured in grouse harvest per day, increased 12% from last year.

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). The number of grouse harvested per hunter in 2008 was 1.8.

Table 1. Number of forest grouse hunters and reported harvest by Region for 2008. *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	13,745	34,034
2	8,251	22,884
3	5,632	10,339
4	4,311	6,721
5	7,915	10,251
6	9,543	17,456
TOTAL:	38,950	101,685

Grouse harvest in Region 4 during the 2008 season was 6,721. This was a 17% decrease from the 2007 season harvest total of 8,056 and a 17% decrease from the previous five-year average (2003-2007). Reduced access due to recent road closures, fewer hunter days, and a possible decline in grouse populations may help explain the lower than average harvest in 2008. The 2008 harvest in Region 4 represents 6.5% of the total 101,685 grouse harvested statewide. Grouse hunters report increased harvest success when hiking or mountain biking forest road systems behind locked gates.

In 2008, total grouse harvest (10,251) in Region 5 decreased 29% from 2007, the first decrease in three years. In addition, the number of hunters increased in 2008 by 11% from 2007 levels. Hunter numbers were 5% higher than the 5-year average. Hunter success, as measured in grouse harvested per day, was 25% lower than 2007. 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 17,456 birds in 2008. This represents a 22% decline over the year 2007 season estimate and a 26% decline over the recent 5-year average (2003-2007). 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 increased by 13% over the 2007 season and by 15% over the recent (2003-2007) 5-year average. A large proportion of grouse hunting effort in Region 6 occurs incidental to other hunting activities, especially deer hunting. Estimated success rate (grouse per hunter-day) was 0.24 a 23% decline over 2007 and a 27% decline over the recent 5-year average. The

three counties with the highest percentages of the Region 6 grouse harvest were: Grays Harbor (24%), Clallam (22%) and Pierce (13%).

Region 1 typically has the highest number of both forest grouse hunters and birds harvested. While the percentage declined from 2007, the Region 1 grouse harvest was still the highest in 2008 with approximately 33% of the statewide grouse harvest (Table 1). Okanogan County had the greatest forest grouse harvest in 2008, followed by Stevens and Ferry counties. Lewis 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 2008; 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

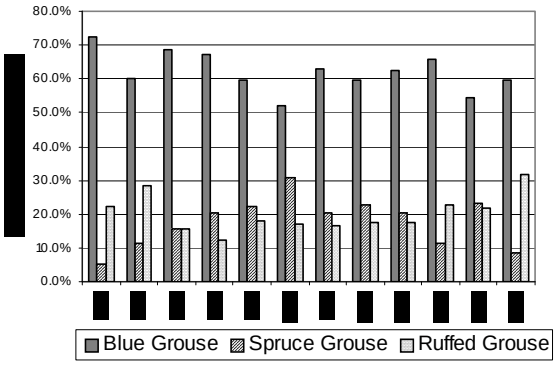


Figure 4. Forest grouse harvest species distribution in north-central Washington 1993-2008 (Schroeder, 2007).

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. 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 respond 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:

1. Improving harvest estimation, especially on lands managed for wildlife.
2. Development of population monitoring techniques for each species of grouse.
3. Developing forest grouse habitat guidelines for public distribution.
4. Evaluating harvest strategies.