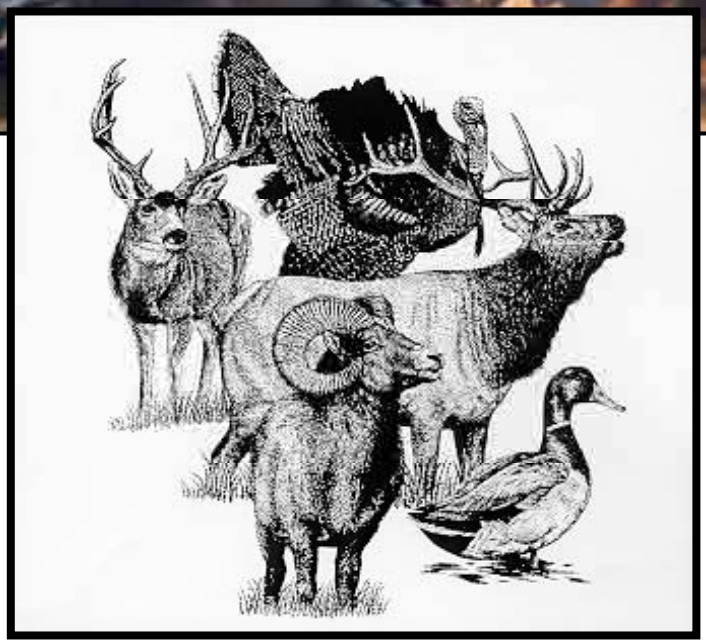
STATE OF WASHINGTON

2008 Game Status and Trend Report



Washington Department of FISH and WILDLIFE

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2008 GAME STATUS AND TREND REPORT

July 1, 2007 – June 30, 2008

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

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

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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 2007 to June 2008. 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. The desired post-hunt fawn:doe ratio is approximately 40 to 45:100 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.

Hunting Seasons and Harvest Trends

Total deer harvest for 2007 for the general season and special permit hunts combined was estimated at 37,892 (Table 1, Figure 2). This is up slightly from 2006. The estimated statewide deer harvest has consistently fluctuated around 40,000 animals for the last eight years.

Black-tailed deer, mule deer, and white-tailed deer generally make up a third of the statewide harvest with some variation between years. Black-tailed deer have accounted for as much as 41 % of the statewide harvest in recent years. The estimated number of mule deer in the harvest has been fairly strong (~13,000) until the last two years and is still slightly higher than the mid to late 1990s. This recent decline in harvest is likely a result of the mule deer population declines in Region 3. The estimated number of white-tailed deer in the total harvest has remained relatively stable for the last seven years with the last three years exceeding 14,000 (Figure 1). From a statewide perspective, antlered white-tailed deer harvest has been increasing over the last six years (Table 2).

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 2007 general hunting season, modern firearm hunter success was 24 %. Muzzleloader hunter success was 20.4 % and archery hunter success was 23 % for the general hunting season.

Table 1. Statewide deer harvest for general season and special permit season by weapon type and deer class for 2007.

General Season	**Antlered**	**Antlerless**	**Total**
Modern Firearm	22,632	2,602	26,234
Muzzleloader	1,062	756	1,818
Archery	2,384	2,151	4,535
Multiple Weapon	367	45	412
Sub-Total	**27,445**	**5,554**	**32,999**
Special Permits	**Antlered**	**Antlerless**	**Total**
Modern Firearm	1,456	2,709	4,165
Muzzleloader	43	216	259
Archery	151	278	429
Multiple Weapon	30	10	40
Sub-total	**1,680**	**3,213**	**4,893**
Grand Total	**29,125**	**8,767**	**37,892**

Table 2. Estimates of statewide deer harvest by deer type and class for 2001-2007.

Year 2001	**Antlered**	**Antlerless**	**Total**
Black-tailed deer	14,277	2,381	16,658
Mule deer	9,211	2,704	11,915
White-tailed deer	8,589	3,777	12,366
Year 2002	**Antlered**	**Antlerless**	**Total**
Black-tailed deer	11,103	1,865	12,968
Mule deer	10,363	3,276	13,639
White-tailed deer	8,783	3,304	12,087
Year 2003	**Antlered**	**Antlerless**	**Total**
Black-tailed deer	11,761	2,172	13,933
Mule deer	9,825	3,455	13,280
White-tailed deer	9,252	4,301	13,553
Year 2004	**Antlered**	**Antlerless**	**Total**
Black-tailed deer	13,842	2,017	15,859
Mule deer	11,137	2,827	13,964
White-tailed deer	10,272	4,412	14,684
Year 2005	**Antlered**	**Antlerless**	**Total**
Black-tailed deer	10,628	1,673	12,301
Mule deer	10,721	1,917	12,638
White-tailed deer	11,445	3,407	14,852
Year 2006	**Antlered**	**Antlerless**	**Total**
Black-tailed deer	10,794	1,878	12,672
Mule deer	7,600	2,474	10,074
White-tailed deer	9,689	5,150	14,839
Year 2007*	**Antlered**	**Antlerless**	**Total**
Black-tailed deer	10,835	1,592	12,287
Mule deer	7,753	763	8,516
White-tailed deer	8,958	3,241	12,199

*estimates only available for general season

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.

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) but for the most part seem to be doing well and are probably increasing slightly.

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. 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 2009.

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.

White-tailed deer and mule deer have been increasing in numbers in several locations in central and eastern Washington and as a result 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. 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. Severe climatic events are somewhat cyclic, happening every 5 to 8 years. Severe winter effects are sometimes localized but often times more broad in 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.

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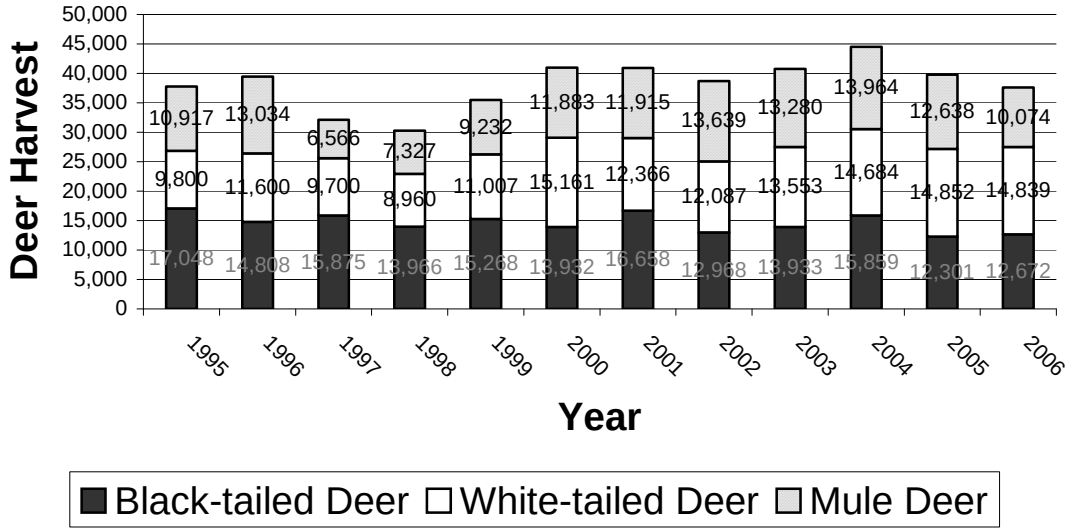

Figure 1. Estimated statewide deer harvest by species for 1995 to 2006 based on hunter report card percentages (1995-2000) or mandatory reporting (2001-2006, estimates of species specific harvest not available for 2007).

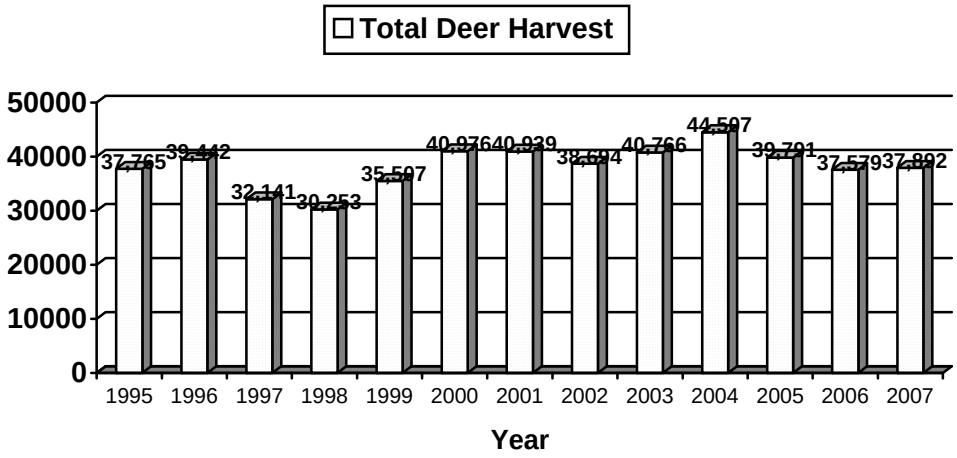

Figure 2. Estimated total deer harvest from 1995 to 2007.

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 possible. 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 2007. The total harvest decreased by 21% from 2006. Muzzleloader and Modern Firearm hunting methods showed a modest decrease in participation and Archery a slight increase from 2006 to 2007 (Figure 2). The number of days hunted per deer harvested went up slightly in 2007 from 2006. Although the days hunted per deer kill rose to 18 days, this figure is only moderately higher than the number of days observed over the last three years (Figure 3).

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 (Table 1). The antlerless white-tail harvest was 3,480 and a total of 6,507 white-tail bucks were taken within PMUs 11 and 13 combined (GMUs 101-124) during the 2007 season (Table 2). Harvest of white-tail bucks dropped from 7,122 in 2006. As in 2006 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 2007. There were 3,440 antlerless white-tailed deer permits allocated for deer hunters within GMUs 101-124 in 2007, an increase of about 7% from 2006. These permits included "Second Deer Tags" issued for two units, GMU 121 (400 tags in 2007), and GMU 124 (500 tags in 2007). Archers could once again apply for Second Deer Tags with 400 permits allocated for the "Northeast Hunt" in 2007, 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 a supplemental management tool as well as a useful means for increasing hunter opportunity. The harvest of antlerless white-tails from permits decreased about 8% in 2007 from 2006. The estimated harvest of antlerless whitetails by Y/S/D decreased by about 5% in 2007 from 2006. Archers had almost the same harvest in 2007 as in 2006 while

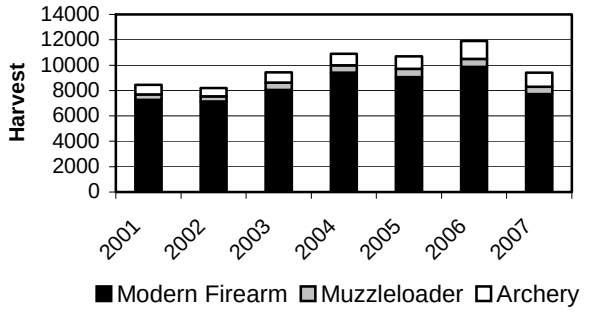

Figure 1. Trend in the total deer harvest for GMUs 101-124.

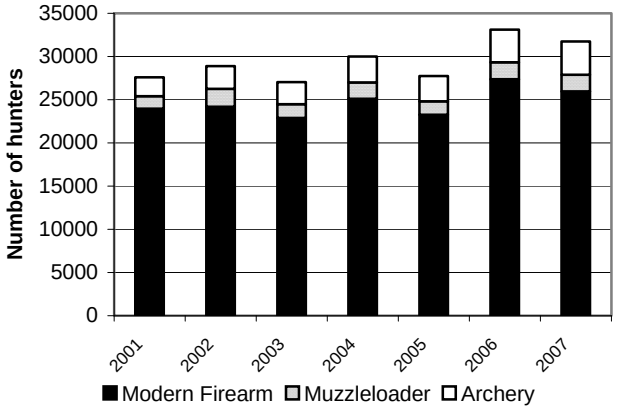

Figure 2. Trend in the number of deer hunters for GMUs 101-124 from 2001-2007.

muzzleloaders went down about 10% in their antlerless white-tail take. As in 2006 archery and muzzleloader hunters accounted for about 19% of the total antlerless white-tail harvest again in 2007.

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%

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. 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 2007 yielded 17% and 19% 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 the apparent recovery 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 dropped drastically from 2006 to 2007 (Table 3). The total checks in 2007 included only 25% (n = 124) yearling white-tail bucks and 20% (n = 41) yearling white-tail does. Fawns made up 27% of the total antlerless harvest checked in 2007, which was back up from a low of 18% in 2006. 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.

For GMUs 105-124 (PMU 13) white-tail buck :doe ratios for summer 2007 dropped slightly, but not significantly ($P \geq 90\%$) from 2006 going from 28 to 27 bucks per 100 does (Table 4). In 2007 the fawn to doe ratio dropped to its lowest point since 1995 at only 47 : 100. The ratio of yearling bucks observed in the August surveys was 54% of all bucks, only slightly lower than in previous years.

Late summer mule deer surveys are conducted primarily in GMU 101 (northern Ferry County). A sample of 323 classified mule deer in 2007 yielded a buck ratio of 29 bucks per 100 does, a decline from the previous years. The fawn ratio on the other hand increased to 77 fawns per 100 does, which is the highest ratio observed for mule deer since before 2001 (Table 5).

Table 2. Hunter harvest of antlered and antlerless white-tailed deer by Population Management Unit in 2007.

PMU	GMU	Antlerless					Antlered	Antlerless per 100 Antlered
		Archery	Permit	Y/S/D	Muzzleloader	Total		
11	101	51	19	209	42	321	532	60
13	105	16	29	102	16	163	320	51
	108	17	78	93	10	198	287	69
	111	3	18	80	25	126	379	33
	113	2	5	72	82	161	367	44
	117	66	81	224	36	407	1144	36
	121	83	363	510	52	1008	1560	65
	124	144	363	417	31	955	1918	50
Total:		**382**	**956+141**	**1707**	**294**	**3480**	**6507**	**53**

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

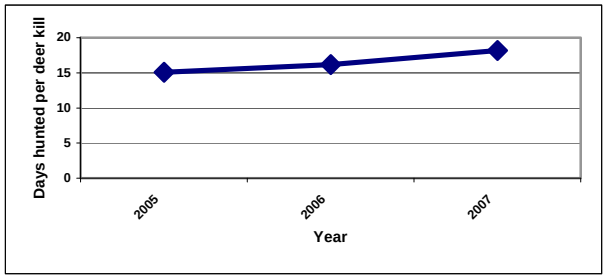

Figure 3. Three-year trend in the number of days hunted per deer harvested within GMUs 101-124.

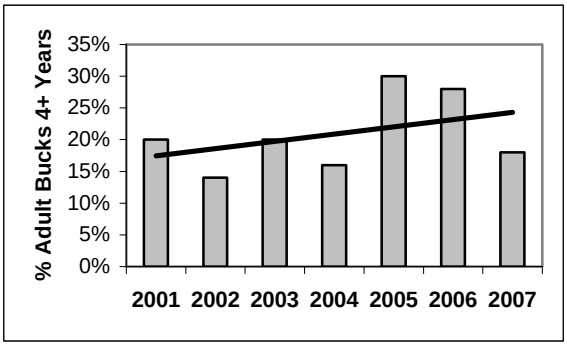

Figure 4. Percent of adult white-tail bucks 4 years and older from hunter check stations.

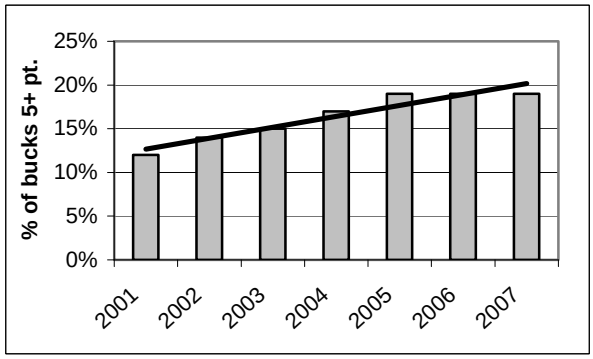

Figure 5. Percent of PMU 13 (GMUs 105-124) white-tail bucks 5 point or better from hunter reports.

Population status and trend analysis

The total 2007 deer harvest declined about 21% from 2006. As with 2006, the antlerless deer harvest increased in 2007, but the antlered buck harvest, particularly for white-tails, declined. This 2007 buck harvest was about 9% lower than in 2006.

Both Archery and Modern Firearm deer harvest levels decreased substantially at about 22% from 2006 to 2007. The level of harvest for Muzzleloader hunters did not drop as dramatically at about 8% in 2007 versus 2006. Total hunter numbers decreased only 4% in 2007 from 2006 with most of this decline in the number of Modern Firearm hunters.

In the late 1990's 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 (Figures 4 and 5). 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. Almost all of the GMUs now have a relatively adequate antlerless whitetail harvest ratio at or above 44 taken per 100 bucks (Table 2). The lower fawn to doe ratio of 47:100 for white-tails within PMU 13 in 2007 (Table 4) may suggest needed caution given the increased hunter effort.

Disease and Predators

WDFW continues to test deer statewide 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 recently been consistently detected in a few areas, but primarily in places where elk occur as well as deer.

Habitat condition and trend

The winter of 2007-08 was above average in severity. Snow cover was especially deep and prolonged well into the spring. Over winter deer survival was likely impacted the most from the Calispel Range east into Pend Oreille County.

More insidious than occasional bad winters in northeastern Washington is the on-going conversion of farm and forest lands into suburban developments and dispersed small acreage residences. White-tailed deer tend to acclimate to people so the general perception seems to be: *The deer are still here and often times are a nuisance; therefore, they must be doing well*. In many cases, however, those are only resident deer. The migratory mountain forest populations have declined and the loss of low elevation wintering habitat is hindering population recovery.

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 Control (Landowner Access) Permits are issued 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 2007, as did the overall deer harvest per unit effort. The ratio of 53 antlerless white-tails per 100 antlered taken in 2007 sustained the improvement over the 40:100 ratio from 2005. As in 2006 the most dramatic gains were in the units with the lowest buck ratios and the most agricultural damage including GMUs 105, 108, and 121 at 51:100, 69:100, and 65:100 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 flattened, 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.

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%

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
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

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

Table 5. Mule deer buck and fawn ratios per 100 does from summer composition surveys within the Colville District from 2001 through 2007.

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

DEER STATUS AND TREND REPORT 2008: 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 2003) guidelines for buck escapement (≥15 bucks per 100 does post-season) and to maintain healthy buck:doe:fawn 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. Species distribution between PMUs is approximately equal, 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 modern firearm buck hunts. WDFW offered a nine-day early modern firearm season (Oct. 13-21) 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. 5-19). 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. The early white-tailed deer season extends from Sept. 1st to the 30th under a 3- point minimum or antlerless regulation in all GMUs. 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 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. 7-13) are offered in GMUs 133 and 142 for both white-tailed

Table 1. Antlered and antlerless harvest in PMU 14 and 15.

	PMU 14			PMU 15		
Year	Antlered	Antlerless	Total	Antlered	Antlerless	Total
1996	1,098	520	1,618	1,162	497	1,659
1997	1,438	155	1,593	2,106	169	2,275
1998	962	229	1,191	1,048	185	1,233
1999	1,228	347	1,575	1,432	209	1,641
2000	1,561	472	2,033	1,774	346	2,120
2001	1,195	295	1,490	1,543	358	1,901
2002	1,391	252	1,643	1,639	344	1,983
2003	1,395	383	1,778	1,451	501	1,952
2004	1,493	386	1,879	1,371	467	1,838
2005	1,547	337	1,884	1,500	421	1,921
2006	1,102	361	1,463	1,080	257	1,337
2007	1,246	361	1,607	1,290	277	1,567

Table 2. Comparison of hunter numbers by weapon type and PMU.

Year	2001	2002	2003	2004	2005	2006	2007
Archery							
PMU 14	490	574	618	699	679	898	916
PMU 15	178	233	185	248	233	231	227
Muzzleloader							
PMU 14	471	724	720	811	757	669	616
PMU 15	220	290	366	411	401	342	302
Modern Firearm							
PMU 14	4590	4679	4598	5143	4651	4257	4318
PMU 15	4983	5547	5561	5836	4961	4310	4395
Combined							
PMU 14	5551	5977	5936	6653	6087	5824	5850
PMU 15	5381	6070	6112	6495	5595	4883	4924

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 mule deer season is offered in GMU 130 from Nov. 20-30.

Harvest trends

Total harvest does not differ substantially between the PMUs, except in 1997 and 2001 when PMU 15 had markedly higher harvest (Table 1). Across both PMU 14 and 15 there was a pronounced reduction in harvest during 2006. PMUs 14 and 15 had 16% and 30% reductions in harvest compared to the average for the previous 5-years. Both displayed large harvest reductions compared to 2005, 22% in PMU 14 and 30% in PMU 15. 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 rebounded some in 2007 but has not reached pre 2006 levels.

Overall the mule deer and white-tailed deer components of harvest are effectively equal at the District level (49% versus 51% respectively). However, mule deer comprise a greater portion (56%) of the harvest in PMU 15, while white-tailed deer comprise a greater portion (58%) of the harvest in PMU 14.

Overall hunter participation increased from 2001 through 2004, but has been on a decline since 2005 (Table 2). This trend is seen across both PMUs and all weapon user types, except for archery hunters in PMU 14 whose numbers dipped in 2005, but rebounded strongly in 2006 with further increases in 2007. Modern firearm numbers showed some recovery in 2007. Hunter success rates for each PMU and weapon type have been variable for the past seven years (Table 3). Overall success rates average 30%, but range from 19% to 46%. There is no observable trend over the past seven years, reflective of the complex combination of variables

Table 3. Comparison of hunter success by weapon type and PMU.

Year	2001	2002	2003	2004	2005	2006	2007
Archery							
PMU 14	31%	26%	29%	26%	34%	31%	32%
PMU 15	22%	19%	24%	25%	25%	24%	35%
Muzzleloader							
PMU 14	39%	25%	39%	37%	35%	33%	36%
PMU 15	46%	30%	36%	28%	33%	31%	29%
Modern Firearm							
PMU 14	25%	28%	29%	28%	30%	22%	24%
PMU 15	34%	34%	32%	29%	34%	27%	32%
Combined							
PMU 14	32%	26%	32%	30%	33%	29%	31%
PMU 15	34%	28%	31%	27%	31%	27%	32%

(deer availability, hunting conditions, access, time-off, etc) that affect hunter success each year.

Results for the first two years of the Palouse special hunt show higher success than in the general hunt (Table 4). If we include those hunters that successfully harvested a buck in GMUs 127-142 during the earlier general season success increases to 56% in 2006 and 45% in 2007. Additionally, 4+ and 5+ bucks make up a greater percentage of the harvest when compared to the general season (77% 4+ and 30% 5+).

Table 4. Palouse special permit hunt results

	2006	2007
Num. Of Hunters*	342	395
Hunter Success	46%	35%
Percent 4+ Bucks	85%	88%
Percent 5+ Bucks	29%	37%

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

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 surveys were conducted during August and September. Pre-season surveys provide an accurate reflection of fawn production for the year. While post-season surveys reflect the effects of harvest on these 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.

Pre-season white-tailed deer ratios in 2007 show an increase for bucks and fawns compared to 2006, but still low compared to 1999 (Table 5). Pre-season mule deer ratios in 2007 show stable buck numbers and fawn numbers higher than the past five years. Post-season ratios were based on only one helicopter survey of GMU 142 and thus may not accurately reflect the composition of the deer herd for the entire district. 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. For white tails the same pattern is seen (2006 ratios; 7 bucks : 100 does : 68 fawns).

Limiting the analysis to mature mule deer bucks produces a buck:doe ratio of 8:100 in 2006 and 7:100 in 2007. For mature white-tailed deer the ratio is 3:100 in 2006 and 5:100 in 2007. Looking at just mature mule deer bucks we are failing to meet the state guidelines for buck escapement (15 bucks :100 does). Using either all bucks or mature bucks only we do not meet the state guideline for buck escapement for white-tailed deer.

Table 5. Deer sex and age composition ratios.

(Buck : Doe : Fawn)

Species	Year	Pre-season	Post-season
Mule Deer	1999	65:100:83	37:100:124
	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]
White-tailed Deer	1999	44:100:87	16:100:122
	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]

* No post-season surveys.

[1] Based on One flight in GMU 142

Population and Habitat

Populations of both species are relatively stable under our current management strategies, except for the deer population along the breaks of the Snake River. Hunter effort has remained stable in GMU 142 while hunter success, number of hunters, and deer harvested per day has declined. This combined with the survey data suggests that the deer in GMU 142 are receiving consistent hunting pressure that is depressing the population below management goals.

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 authorized 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 through out the district, 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 almost nonexistent in 2006 and 2007, allowing local white-tailed deer populations to recover from past years of high mortality. There are some indications that mule deer increased in areas that were formerly occupied by white-tailed deer, and had high white-tailed EHD mortalities. A more formal delineation of the range of white-tailed and mule deer in PMUs 14 and 15 is ongoing.

Management conclusions

Harvest seasons constructed around 3 pt. minimums for mule deer allow us to meet statewide objectives of 15 deer per 100 does post season in some of the GMUs. Closer examination of those GMUs meeting the escapement guidelines, reveals that few mature mule deer are escaping into the post-season, resulting in harvest systems being sustained by yearling – 2.5 year-old deer recruiting into the legal class of bucks over time. In areas where natural habitats provide refuge from harvest, the retention of mature males in the population is higher than in District 2. Private landownership in the District currently restricts hunter numbers and access, yet with these restrictions in place, some GMUs are still experiencing high rates of harvest. With accommodating weather and productive habitats these populations produce a sustained harvest. Reductions in productivity for one or more years can result in pronounced population declines with slow recoveries. Long-term discussions of mule deer management 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 in those GMUs with declining populations. Recreational opportunities to harvest older age class bucks should be enhanced by the switch to a permit only opportunity during the late season.

Those units near urban centers continue to receive high hunting pressure and will need to be closely watched to avoid over 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. Currently, crop damage is reported annually in portions of GMUs 124 through 142. Intensive recreational harvest with a wide range of seasons and opportunities has helped mitigate some damage claims. When a damage problem arises, a concerted effort is made by WDFW personnel to coordinate hunters with the landowner. This seems to be the most successful tool to help control damage and to provide recreational opportunity.

Because of the EHD impacts in 1998, 1999, 2003 and 2004 in both PMU 14 and 15, it will be necessary to monitor the white-tailed deer populations in this area carefully. Due to landowner requests and the productivity of these herds, WDFW 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 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 a 9-day general modern firearm season in 2006, which continued in 2007. In 2007, antlerless only permits for youth, disabled, and senior hunters remained similar to 2006 levels. The initial year of the b-tag antlerless permit hunt on the Methow Valley floor included 50 permits for 2007.

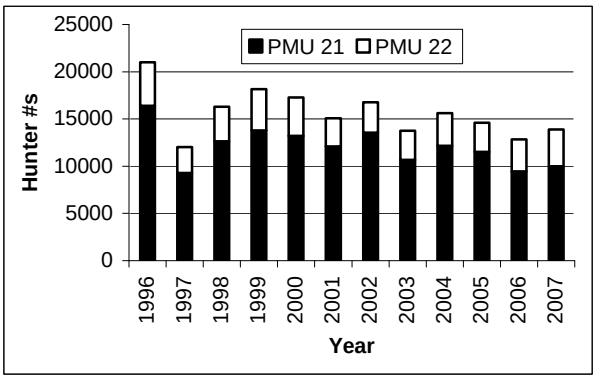

Figure 1. Trend in Hunter numbers in PMUs 21 & 22.

Hunters enjoyed good hunting conditions in 2007. Unlike 2006, access was not affected by wildfires, and early high country snow and low elevation rain got deer moving and improved stalking conditions. As a result, hunter numbers, success rates, and harvest all increased noticeably, particularly in PMU 21 (Figure 1-3).

WDFW Check station personnel surveyed 715 hunters and examined just 67 deer in 2006 (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.

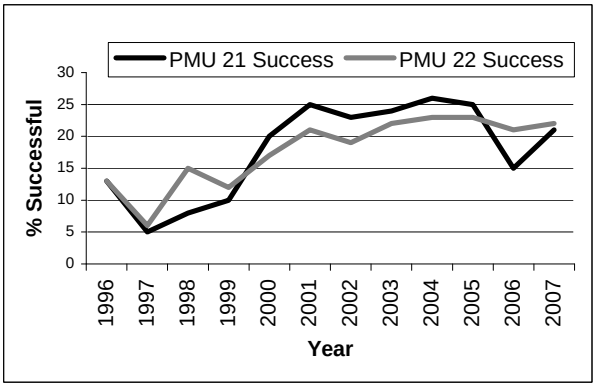

Figure 2. Hunter success trend in PMUs 21 & 22.

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

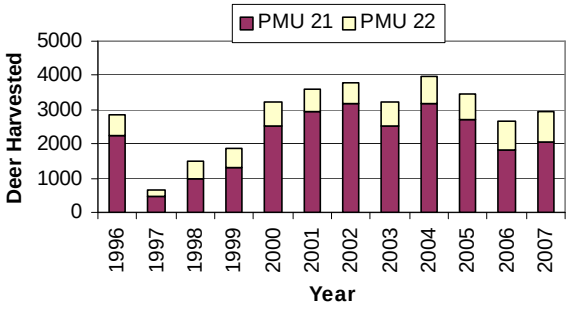

Figure 3. Trend in harvest in PMUs 21 & 22.

entry hunt prompted this effort. The survey produced satisfactory sample sizes, particularly for white-tailed 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.

Table 1. Chewuch Check Station Results.

	Deer Type				
Year	Bucks	Antlerless	Total	Hunters	%Success
1996	24	0	75	1,247	6
1997	3	0	5	729	1
1998	30	0	33	980	3
1999	48	0	53	1,414	4
2000	69	0	72	1,250	6
2001	106	39	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

Biologists classified over 3,600 mule deer during helicopter surveys of PMU 21 in early December 2007 (Table 2). The counts yielded overall buck:doe and fawn:doe ratios of 16:100 and 73:100 respectively. Buck ratios fell somewhat, which is not surprising given the improved access and hunting conditions in 2007. Fawn productivity improved (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 2007, 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	106	138	1450	1053	2747	73:100:17
Okanogan	35	38	485	356	914	73:100:15
Total	141	176	1935	1409	3661	73:100:16

For the third year in a row biologists documented poor fawn recruitment during early spring hiking surveys (Table 4 & 5). This followed the harshest winter since 1996-97, characterized by heavier than usual snow cover, and 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 harvest data. Range condition and population levels likely peaked in the 1960s or 1970s.

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
1996	55	72	127	1956	1284	3367	66:100:6
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

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 2008, by area for PMU 21. F:100A is fawns per 100 adults.

Area	Adult	Fawn	Total	F:100A
Methow	1294	303	1597	23:100
Okanogan	468	133	601	28:100
Total	1762	436	2198	25:100

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 has been in decline the last three years as a result of poor over-winter fawn recruitment in response to harsher winter conditions.

Unlike mule deer, whitetail deer have increased in the district over the long-term. Development patterns

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

Year	Adults	Fawns	Total	F:100A
1997	1167	198	1365	17:100
1998	1279	462	1741	36:100
1999	1393	833	2226	60:100
2000	1496	838	2334	56:100
2001	1593	707	2300	44:100
2002	1661	626	2287	38:100
2003	1516	506	2022	33:100
2004	925	335	1260	36:100
2005	1643	722	2365	44:100
2006	1635	288	1923	18:100
2007	1314	269	1583	20:100
2008	1762	436	2198	25:100

and agricultural practices, may have promoted the expansion of whitetail. Whitetail 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.

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 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.

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.

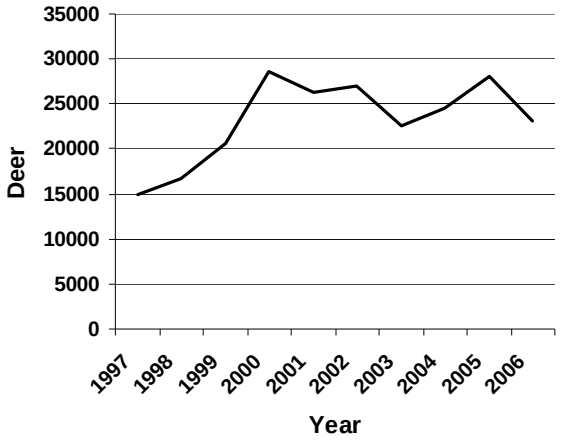

Figure 4. PMU 21 modeled deer population.

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, antlerless permits have been reduced for 2008. 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 beginning in 2007 and likely continuing at least through 2010. 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 needed to alleviate the nuisance/damage issues. The 2007 permit hunt ended conflict free but only produced a harvest of 22 animals from 50 permits, so permit numbers have been doubled for 2008. 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

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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 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 15 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 2007 deer hunting seasons were comparable to 2006, 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.

Limited-entry, special permit hunting was offered for all user groups. Two hundred three November modern firearms any deer permits were offered in six GMUs, 23 November muzzleloader any deer permits in two GMUs, and 347 November and/or December archery any deer permits in three GMUs. Two hundred ten antlerless and youth antlerless permits were issued in GMU 251 along with 15 any deer permits for senior and 25 for disabled hunters, during the general season time frame. Four hundred eighty modern firearm, 200 muzzleloader, 10 archery, 225 youth, and 25 senior antlerless permits were offered in Douglas County in 2006. 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 2007, buck harvest was to 1,505, a 5.7% increase over 2006.

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 2007 was 877 deer, comprised of 598 bucks and 279 antlerless deer. Total harvest decreased by 0.7% deer in 2007; buck harvest increased by 3.3%, while antlerless harvest decreased 6.7%. While some of this decrease is likely due to reduced participation and changing from general to permit only youth, senior and disabled

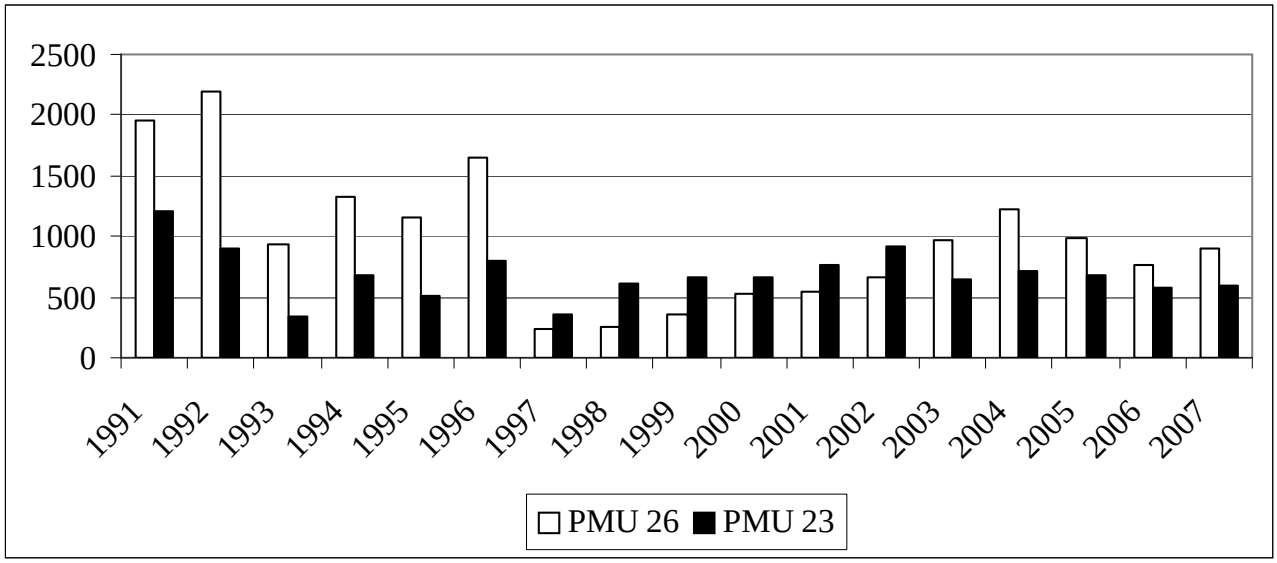

Figure 1. Antlered deer harvested from PMU 23 and PMU 26, 1991 through 2007.

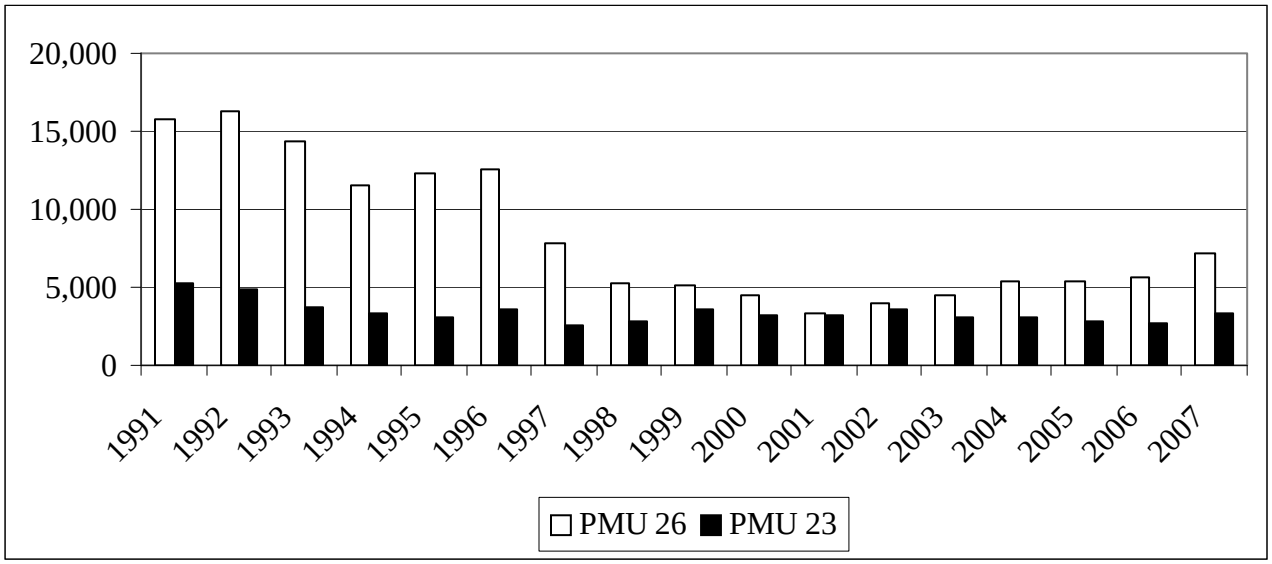

Figure 2. Numbers of hunters reported from PMU 23 and PMU 26, 1991 through 2007.

hunting 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 2007, 907 bucks and 339 antlerless deer were harvested in Chelan County.

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 2007 were 10,501, a 24% increase from 2006 (Figure 2). Hunter numbers increased in the Douglas PMU (23%), and increased 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.

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 70 fawns per 100 does (n=1,143). Adult (age 2+) bucks comprised 70% of Chelan bucks, while yearling (age 1+) bucks comprised 30% of observed bucks in Chelan. The observed winter/spring fawn:adult ratio for the Douglas PMU was 50:100 and for the Chelan PMU, 57:100 .These ratios were derived from a total count of 333 and 492 deer respectively, a relatively low number of deer.

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. In the Chelan PMU, conservative seasons since 1997 allowed this population to increase steadily.

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 270 antlerless deer in 2007. Antlerless permits increased slightly in the Chelan PMU in 2007, resulting in 220 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 postseason despite increasing harvest. 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. Survey conditions may have played a role in producing these low results. Future 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 2007, total bucks per 100 doe ratios in the Chelan PMU were similar to 2005 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. 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 has reached the biological carrying capacity of the winter range in this PMU. As a result, near-term future management will be directed toward maintaining a stable, to slowly increasing, mule deer population.

Antlerless deer harvest was increased in 2006 and 2007, to slow population growth, protect winter range, and provide more harvest opportunity. 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, 290, and BUCKRUN LHP
PMU 25 – GMU 284

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Population objectives and guidelines

In Game Management Units (GMUs) 272 and 284, deer herds are managed to maintain herd size at a maximum level that can be tolerated in relation to deer damage claims/complaints and to maintain a post-hunt buck:doe ratio of $\geq$ 15:100. Part of GMU 272 contains the Buckrun Landowner Hunting Program (LHP), which has special population objectives formulated by Buckrun management in conjunction with WDFW.

In GMU 278, the goal is to maintain a herd size below habitat carrying capacity to minimize deer damage claims/complaints occurring on irrigated agricultural lands that make up a large percentage of this unit. Most deer in this unit occur in non-agricultural areas with a high percentage of public ownership. Herd management is intended to restrict most deer use to these public lands.

In GMU 290, the management goal is to increase herd size to the long-term carrying capacity of habitat available on the Desert and Potholes Wildlife Areas without increasing damage claims/complaints from agricultural land adjacent to the wildlife areas. Additional objectives for this area are to maintain a buck:doe ratio of $\geq$ 30:100 post-hunt and maintain a high percentage of adult bucks ($\geq$ 50 % of the total buck population). This GMU is managed primarily to provide a "quality" mule deer (*Odocoileus hemionus*) buck hunting opportunity through "permit only" deer hunting.

Hunting seasons and harvest statistics

GMU 272. GMU 272 had a 15-day (Sept. 15–30) early archery season in 2007 for 3-point minimum bucks or antlerless mule deer. Any white-tailed deer was legal from September 1–30. In addition to the September season, there was a 19-day (20 November –8 December) late archery season in which 3-point minimum mule deer bucks, antlerless mule deer, or any white-tailed deer were legal. General modern firearm seasons included a 9-day (13–21 October) hunt for any white-tailed deer buck and a 9-day hunt (13–21 October) for 3-point minimum mule deer bucks. With the exception of Buckrun LHP, no limited entry hunts were available in GMU 272. Special seasons and regulations were in effect on Buckrun LHP which occurs within GMU 272. The deer hunting season for Buckrun LHP in 2007 was 1 September–31 December. Hunting was by permit only and there were 50 permits available.

In 2007, 1,210 hunters participated in the general hunting seasons in GMU 272 (Table 1). Seventy-six percent of those hunters did so during the modern firearm seasons. Hunter success was greater during the modern firearms seasons (29%) than during the archery seasons (18%). A total of 321 deer (302 bucks, 19 does) were harvested during general season hunts. Eighty-eight percent of the buck harvest occurred during modern firearm seasons and 95% of the doe harvest occurred during the archery seasons (Table 1).

GMU 278. GMU 278 had a 15-day (15–30 September) early archery season in 2007 for 3-point minimum bucks or antlerless mule deer. Any white-tailed deer was legal from September 1–30. In addition to the September season, there was a 19-day (20 November –8 December) late archery season in which 3-point minimum mule deer bucks, antlerless mule deer, or any white-tailed deer were legal. General modern firearm seasons included a 9-day (13–21 October) hunt for any white-tailed deer buck and a 9-day hunt (13–21 October) for 3-point minimum mule deer bucks. Muzzleloader deer seasons in GMU 278 included an early general season from 6–12 October for any white-tailed buck. No limited entry hunts were available in GMU 278.

In 2007, only 234 hunters participated during the general hunting seasons in GMU 278 and the majority (64%) chose to hunt during the modern firearms seasons (Table 1). Hunter success was greater during the archery (19%) and modern firearm (19%) seasons than during the muzzleloader seasons (14%). A total of 41 deer (40 bucks, 1 doe) were harvested during general season hunts and 73% of the buck harvest occurred during the modern firearms seasons (Table 1).

GMU 284. GMU 284 had a 15-day (15–30 September) early archery season in 2007 for 3-point minimum bucks or antlerless mule deer. Any white-tailed deer was legal from September 1–30. General modern firearm seasons included a 9-day (13–21 October) hunt for any white-tailed deer buck and a 9-day hunt (13–21 October) for 3-point minimum mule deer bucks. Five additional permits were issued for an 18-day (1–18 November) modern firearms season

Table 1. Harvest statistics for general season hunts available in GMUs (Game Management Units) 272, 278, 284, 290, Desert GMUs, and Region 2. Harvest statistics for each GMU are listed by weapon type and include the number of hunters that participated (hunters), hunter success (success), number of hunter days (days), number of days hunted per kill (days/kill), number of bucks harvested (buck), number of does harvested (doe), and total number of deer harvested.

Weapon	GMU[1]	Hunters	Success	Days	Days/Kill	Buck	Doe	Total
Archery	272	281	0.18	2000	39.2	33	18	51
	278	37	0.19	168	24.0	7	0	7
	284	41	0.27	210	19.1	1	10	11
	290	10	0.00	36		0	0	0
	Desert Units	369	0.21	2414	35.0	41	28	69
	Region 2	3660	0.19	20554	26.3	356	427	783
Modern	272	915	0.29	2895	10.9	266	0	266
	278	150	0.19	500	17.2	29	0	29
	284	499	0.33	1604	9.7	166	0	166
	290	0	n/a	n/a	n/a	n/a		n/a
	Desert Units	1564	0.29	4999	10.8	461	0	461
	Region 2	21228	0.16	58961	25.1	3418	0	3418
Muzzle	272	0	n/a	n/a	n/a	n/a	n/a	n/a
	278	35	0.14	110	22.0	4	1	5
	284	69	0.20	224	16.0	14	0	14
	290	0	n/a	n/a	n/a	n/a	n/a	n/a
	Desert Units	104	0.18	334	17.6	18	1	19
	Region 2	575	0.11	2104	31.9	65	1	66
Multiple	272	14	0.29	105	26.3	3	1	4
	278	12	0.00	82	n/a	0	0	0
	284	4	0.25	20	20.0	1	0	1
	290	1	0.00	4	n/a	0	0	0
	Desert Units	31	0.16	211	42.2	4	1	5
	Region 2	309	0.17	2036	37.7	48	6	54
All	272	1210	0.27	5000	15.6	302	19	321
	278	234	0.18	560	21.0	40	1	41
	284	613	0.31	2058	10.7	182	10	192
	290	11	0.00	40	n/a	0	0	0
	Desert Units	2068	0.27	7958	14.4	524	30	554
	Region 2	25772	0.17	110655	25.6	3887	434	4321

[1] Desert = combined harvest statistics for GMUs 272, 278, 284, and 290. Region 2 = combined harvest statistics for all GMUs located in Region 2. Although GMU 290 had no general seasons, statistics are provided for hunters who held a multiple season permit that chose to hunt in that unit.

in which 3-point minimum buck or antlerless deer could be taken. Muzzleloader deer seasons in GMU 284 included an early general season from 6–12 October for any white-tailed buck and an early general season (6–12 October) for 3-point minimum mule deer bucks. Limited entry muzzleloader seasons in GMU 284 included a 12-day (19–30 November) hunt where 3-point minimum mule deer bucks, antlerless mule deer, or any white-tailed deer could be taken, and a 7-day (6–12 October) antlerless only youth hunt.

In 2007, 613 hunters participated during general hunting seasons in GMU 284, with 81% of those hunters doing so during the modern firearms seasons (Table 1). Hunter success was greatest during the modern firearms seasons (33%), followed by the archery seasons (27%), and then muzzleloader seasons (20%). A total of 182 bucks and 10 does were harvested in GMU 284 during general hunting seasons. Ninety-one percent, 8%, and 1% of the buck harvest occurred during the modern firearms, muzzleloader, and archery seasons, respectively (Table 1).

Three hunters during the modern firearm limited entry hunt reported harvesting 3 bucks for 100% hunter success (Table 2). Only 1 hunter participated during Hunt #1114 and did not harvest an animal. Three hunters participated during Hunt #1280 and only 1 hunter harvested a doe (Table 2).

GMU 290. GMU 290 had a limited entry archery season from 13–26 November and a limited entry youth archery season from 15–16 September. Any deer could be taken during both seasons. Limited entry modern firearms seasons included a 12-day (1–12 November) hunt for any deer, a 7-day (26 November–2 December) hunt for antlerless deer, and 2 any deer permits were issued for a 2-day (22–23 September) youth hunt. Limited entry muzzleloader hunts in GMU 290 included a 7-day (25–31 October) any deer hunt and 2-day (8–9 September) any deer youth hunt.

Eight hunters participated during the 2 limited entry archery hunts with no deer being harvested during either season (Table 2). Eleven hunters participated during Hunt# 1052 and harvested 10 bucks (91% success). For the 41 hunters that participated during Hunt#1053, 31 harvested a doe (76% success). No harvest was reported during the 2-day modern firearms youth hunt (Table 2). One hunter during both muzzleloader seasons (Hunt #'s 1114 and 1280) participated and reported harvesting 1 buck for a success rate of 100%.

DEER AREA 2010. Deer Area (DA) 2010 had 3 limited entry hunts available (Table 2). Hunt# 1250 was a modern firearms hunt and occurred from 23–31 October. Hunt# 1290 occurred from 16–31 December and was a special second deer tag that required hunters to use the method/weapon listed on their tag. Hunt# 1115 was a muzzleloader hunt that occurred from 1–15 December. All 3 hunts were for antlerless deer only.

Six of 9 (67% success), 8 of 11 (73%), and 6 of 9 (67%) hunters that participated in Hunts 1250, 1290, and 1115, respectively, reported harvesting a doe (Table 2).

DEER AREA 2011. DA 2011 had 4 limited entry hunts available (Table 2). Hunt# 1249 was a youth only modern firearms season that allowed any deer to be harvested and occurred from 13–21 October. Hunt# 1291 occurred from 1–30 January and was a special second deer tag that required hunters to use the method/weapon listed on their tag and harvest only antlerless deer. DA 2011 also included a 23-day (9–31 December) Master Hunter special deer hunt (Hunt# 1306) that allowed the use of any weapon to harvest antlerless deer only. Lastly, DA 2011 had an 18-day (1–18 November) muzzleloader hunt (Hunt # 1116) for antlerless deer only.

Four, 14, and 8 hunters participated during Hunts 1249, 1291, and 1306, respectively. Among these 3 hunts, 16 deer were harvested and hunter success ranged from 0.25–0.79 (Table 2). Only 1 hunter participated during Hunt# 1116 and they did not harvest a deer.

Columbia Basin GMUs combined. During the 2007 season, 2,368 deer hunters hunted in the four Columbia Basin GMUs (Tables 1 and 2). This represented approximately 8% of Region 2 deer hunters. Hunting pressure, as measured by number of hunters in the four GMUs combined, increased by approximately 7.6% in 2007 compared to 2006 (2,201 deer hunters).

Overall hunter success (all weapons) during general seasons in the four GMUs combined was 27% and was slightly lower than in 2006 (34%), but similar to 2005 (26%). Highest hunter success (33%) during a general season occurred during the firearms season in GMU 284 (Table 1). The highest hunter success (91%) for a permit season where > 5 hunters participated occurred during a firearms season in GMU 290 (Table 2).

Buck harvest in the four units combined was 541 in 2007 (Tables 1 and 2) and decreased approximately 12% from that of 2006 (615 bucks) and was also less than the 1993-2005 mean of 593 bucks. Fifty-six percent of the buck harvest in the four units was from GMU 272, 34% from GMU 284,

Table 2. Harvest statistics for permit season hunts available in GMUs (Game Management Units) 272, 278, 284, 290, Desert GMUs, and Region 2. Harvest statistics for each GMU are listed by weapon type and include the hunt #, hunt quota (quota), number of permits issued (issued), number of hunters that participated (hunters), hunter success (success), number of bucks harvested (buck), number of does harvested (doe), and total number of deer harvested.

Weapon	Unit[1]	Hunt #	Quota	Issued	Hunters	Success	Buck	Doe	Total
Archery	290	1152	12	12	6	0.00	0	0	0
	290	1284	2	2	2	0.00	0	0	0
	Desert		14	14	8	0.00	0	0	0
	Region 2		606	574	343	0.47	79	82	161
Modern	284	1051	5	5	3	1.00	3	0	3
	290	1052	15	15	11	0.91	10	0	10
	290	1053	75	72	41	0.76	0	31	31
	290	1251	2	2	2	0.00	0	0	0
	DA 2010	1250	20	19	9	0.67	0	6	6
	DA 2010	1290	20	20	11	0.73	0	8	8
	DA 2011	1249	10	10	4	0.25	1	0	1
	DA 2011	1291	20	20	14	0.79	1	10	11
	DA 2011	1306	20	20	8	0.50	0	4	4
	Desert		187	183	103	0.72	15	59	74
	Region 2		3642	3198	2018	0.60	356	859	1215
Muzzle	284	1114	5	5	1	0.00	0	0	0
	284	1280	50	4	3	0.33	0	1	1
	290	1117	2	2	1	1.00	1	0	1
	290	1281	2	2	1	1.00	1	0	1
	DA 2010	1115	20	20	9	0.67	0	6	6
	DA 2011	1116	10	8	1	0.00	0	0	0
	Desert		89	41	16	0.56	2	7	9
	Region 2		582	416	211	0.36	8	69	77
All	Desert		300	248	129	0.66	17	68	85
	Region 2		4840	4190	2574	0.57	443	1012	1455

[1] Desert = combined harvest statistics for GMUs 272, 278, 284, and 290. Region 2 = combined harvest statistics for all GMUs located in Region 2.

7% from GMU 278, and 2% from GMU 290 (Tables 1 and 2).

In 2007, modern firearm hunters harvested 537 deer and accounted for 84% of the total harvest in the 4 GMUs (Tables 1 and 2). Archers harvested 69 deer for 11% of the total harvest and muzzleloader hunters harvested 38 deer for 4% of the deer harvest in the 4 GMUs.

The four Columbia Basin GMUs produced 15% of the buck harvest in Region 2 in 2007 (Tables 1 and 2). Hunter success during general seasons in the 4 Columbia Basin GMUs was 27% compared to 17% in the remainder of Region 2.

Surveys

Surveys to obtain data to estimate herd composition and size in the Columbia Basin GMUs have been limited in recent years to GMU 272, GMU 290, and GMU 284. No surveys have been conducted in GMU 278.

GMU 272. Post-hunt herd composition surveys have been done annually (except no survey in 1994) in GMU 272 including only areas outside Buckrun LHP. Surveys have been made from a helicopter, airplane, or from the ground from late Oct. through early Jan. From late October–mid November 2007, 714 mule deer were classified in that part of GMU 272 outside Buckrun LHP (Table

2). Post-hunt ratios were 17 bucks and 55 fawns per 100 does. Approximately 38% of the bucks were judged to be adults.

GMU 284. Post-hunt surveys in GMU 284 were done 2000–2004, but not in 2005 or 2006. In 2007, post-hunt surveys were conducted in GMU 284 on 21 December by fixed-wing aircraft. Survey conditions were poor and only 373 deer were classified. Buck/doe and fawn/doe ratios were 6:100 and 49:100, respectively. Although few bucks were observed, approximately 47% were classified as adults.

GMU 290. Post-hunt herd composition surveys were made in GMU 290 from a helicopter in December 1995 through 1997. In 1995, intensive counts from the ground supplemented data obtained from the helicopter and allowed an estimate of herd size to be made. In 1997, the helicopter survey (approx. 2 hours of survey time) failed to produce an adequate sample size to estimate the composition of the herd. From 1998 through 2007, the post-hunt survey for herd composition was made from the ground by volunteers and WDFW personnel. In 2007, the post-hunt survey was made by 50 volunteers.

During the 2007 post-hunt composition survey, 793 deer were classified in GMU 290. Buck:doe and fawn:doe ratios were 38/100 and 32/100, respectively. There is no current estimate of herd size within the 250 square mile GMU 290.

Population status and trend analysis

GMU 272. The buck:doe ratio in 2007 (17:100) was similar to that observed in 2006 and met management objectives of 15 bucks:100 does. The proportion of adult bucks and fawn:doe ratios increased slightly from 2006. Both the number of bucks and fawns per 100 does have shown a decreasing trend over the past 10 years in GMU 272, but appear to have stabilized over the last 5 years (Figure 1). Based on annual buck harvest since 1980, it appears that deer numbers in GMU 272 increased substantially through 2000, but decreased steadily through 2005 and increased again in 2006. The 1980 harvest was 112 bucks compared to the 2000 harvest of 416 bucks.

GMU 284. Buck:doe ratios (6:100) were substantially lower than management goals (15:100) and ratios reported from 2000–2004 ($\geq$ 14:100).

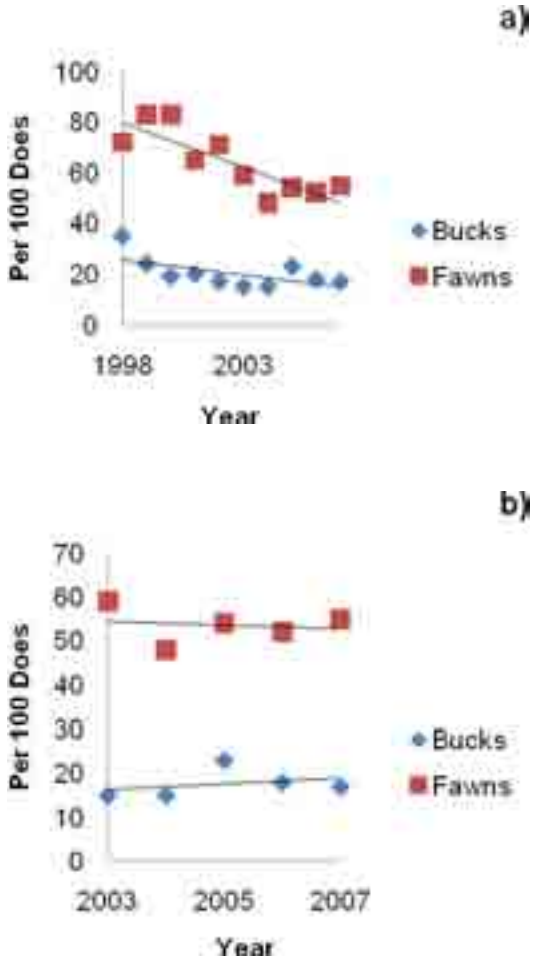

Figure 1. Ten year (a) and 5 year (b) trends for buck:doe and fawn:doe ratios in GMU 272.

Fawn:doe ratios in 2007 (49:100) were also lower than ratios reported from 2000–2004 ($\geq$ 61:100; Table 3). In 2007, 182 bucks were harvested during the general seasons. In GMU 284, a trend similar to that of GMU 272 shows an increase in herd size since 1980. The 1980 harvest was 76 bucks compared to 243 in 2006. Buck harvest since 1980 in GMU 278 has been erratic and rather small but indicates that herd size has increased well above that of the early 1980's. The 1980 harvest was 10 bucks compared to 52 bucks in 2006.

GMU 290. Buck:doe ratios were slightly higher in 2007 (38/100) compared to 2006 (33/100) and were above the management objective of 30 bucks:100 does. Conversely, fawn:doe ratios were lower than ratios reported from 1998–2006 ($\geq$ 35 fawns:100 does). Both buck:doe and fawn:doe ratios have shown a decreasing trend over the past 10 years in GMU 290, but declines have been less severe over the past 5 years (Figure 2).

Table 3. Herd composition data collected during surveys for GMU 284, 2000–2007. Listed values are the number of bucks observed (bucks), number of does observed (does), number of fawns observed (fawns), total number of deer observed (total), proportion of bucks observed that were adults (adult bucks), the number of bucks per 100 does (bucks:100), and number of fawns per 100 does.

Year	Bucks	Does	Fawns	Total	Adult Bucks	Bucks:100	Fawns:100
2000	43	167	121	331	0.42	26	72
2001	25	69	42	136	0.64	36	61
2002	40	156	96	292	0.60	26	62
2003	90	491	300	927	0.27	18	61
2004	63	445	270	778	0.60	14	61
2005	No data						
2006	No data						
2007	15	241	117	373	0.47	6	49

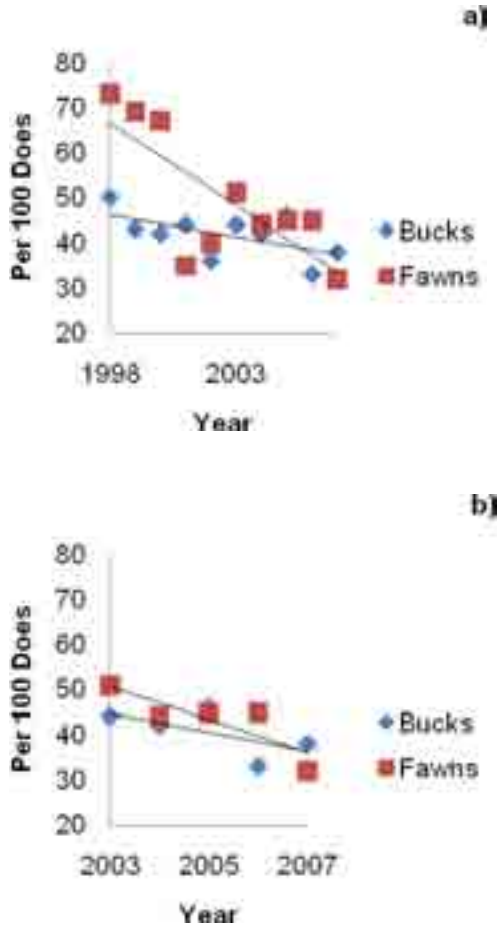

Figure 2. Ten year (a) and 5 year trends for buck:doe and fawn:doe ratios in GMU 290.

Habitat condition and trend

The winter of 2007-08 was moderate in terms of temperature and the amount and duration of snow cover in all GMUs. Winter conditions in all GMUs likely provided no major disadvantage for deer.

Winter food for most deer in GMUs 272 and 284 is green winter wheat and fall/winter, "new" growth of non-cultivated plants. During the winter of 2007-08, these short-stature foods were available to deer most of the winter. Thus, there is no evidence to suggest that winter mortality was higher than normal.

In the late 1980s, several thousand acres of primarily dryland wheat fields were enrolled in the Conservation Reserve Program. Conversion of wheat to grass added permanent cover and some useful forage in the form of forbs primarily, but in some areas has removed a vital winter food resource (i.e., winter wheat).

The spread of Russian olive trees in GMUs 278 and 290 has been rapid and dramatic in recent years. Distribution of deer in these units appears to be positively correlated to the occurrence of Russian olive.

Wildlife damage

Deer related damage claims/complaints in the Columbia Basin GMUs involve primarily orchards, alfalfa haystacks, alfalfa fields, and ornamental trees and shrubs. In recent years, some dryland wheat farmers in GMU 284 have complained that deer introduced weeds into their cropland.

Orchard tree damage and damage to alfalfa haystacks are the most serious types of damage to private property in the Columbia Basin, and elicit the majority of claims/complaints. Orchard damage and the potential for it, is most prevalent in GMUs 272 and 278. Damage can occur at all times of the year, but is most serious in winter. Deer damage to alfalfa haystacks is confined to winter and is usually not a serious problem unless the winter is especially severe.

Management conclusions

Acceptable buck:doe ratios, relatively high percent adult bucks, and near maximum sustainable buck harvests have been achieved in the Columbia Basin units in recent years. The post-hunt buck:doe ratio in GMU 284 had been declining in 2003 and 2004 and was 60% below the management objective of 15 bucks:100 does. Consequently adjustments to harvest may be needed. A decreasing trend in the number of bucks and fawns per 100 does in GMU 290 also suggests that adjustments to harvest may be needed.

Population data for deer herds in the Columbia Basin GMUs are minimal at present. Post-hunt herd composition estimated have been made from sample sizes that are likely too small to provide reliable estimates.

DEER STATUS AND TREND REPORT: REGION 3
PMU 31 – GMU 379, GMU 381

MIKE LIVINGSTON, District Wildlife Biologist

Population objectives and guidelines

This report covers the 2007 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 2007, 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 2007, GMU 379 had a 19-day late muzzleloader season with any deer legal to harvest. Twenty-five 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 (13-21 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. Twenty youth, 15 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 280 (range 147 - 338; SE = 20.9) since 2000. The 2007 harvest was above the 8-year average (Table 1). Modern firearm general season hunters harvested more deer overall (60% of total) and more bucks (81% of total) than all other hunters combined. Harvest contributed by muzzleloaders declined from 22% in 2006 to 18% in 2007. Archery harvest remained minimal (7%) despite abundant opportunity (early and late general seasons). In 2007, success was highest for special permit hunters (39%), second for general modern firearm (28%), third for general archers (29%), and lowest for general muzzleloaders (20%).

Table 1. Deer harvest and hunters in PMU 31 during 2000 - 2007.

Year	Harvest			Hunters	
	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
Avg.	209	71	280	37%	912

Surveys

Surveys to estimate population size have not been conducted in PMU 31. However, in 2007 fixed-wing transects were flown in GMU 381 to delineate deer distributions and initiate collection of population trend data. Flights were conducted on two consecutive days in mid-January within 7 miles of the Snake and Palouse Rivers. Deer migrate, presumably from the north, to this landscape of dryland wheat, Conservation Reserve Program (CRP) and shrub steppe in fall and winter. Numbers decline as spring approaches. The aerial survey area coincided with the area surveyed during roadside composition surveys (discussed below). A total of 2,008 deer were observed. Deer were not classified according to sex, age or species. Foggy weather patterns and scheduling complications with the local aircraft service prevented duplication of fixed-wing surveys in winter 2008.

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 2007/2008 yielded estimates of 21 bucks and 70 fawns per 100 does. The buck ratio declined while the fawn ratio increased from 2006/2007 estimates (Table 2).

Most 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 - 2007.

					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

Population status and trend analysis

In the absence of population survey data it is difficult to assess the status of the deer herd. Continuation of fixed-wing transect surveys each year will eventually yield an index of deer population trends. For the next few years, harvest and post-hunt composition data will be 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). Harvest data, however, indicate that older aged bucks may be declining. The number of bucks with 5 points (on one side) in the harvest has declined every year except one since 2001. Meanwhile harvest of bucks with 4 points has remained fairly stable.

Composition surveys indicated that buck escapement was at the objective in 2004, and exceeded the objective in 2005 through 2007. Estimated fawn ratios from the past four years (x = 67 fawns per 100 does) indicate a healthy fawn survival rate through fall and into mid winter (Table 2).

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 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. Minimal perennial water is available away from the Snake and Palouse Rivers. This is why the deer in fall/winter are thought to be mostly migrants. CRP acreage increased significantly with the 1998 signup, and has increased and improved habitat for deer. Several CRP contracts are up for renewal in 2008. If large numbers of contracts are not renewed important deer habitat will be lost.

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, it is assumed that the deer population has also remained stable. The decline in harvest of older bucks warrants close monitoring over the next couple years.

Current survey data may not be completely reflective of the hunted population. There is strong evidence that deer migrate to the unit in fall and winter. 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 are migratory, 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 should be conducted immediately following the modern firearm general season. Conducting surveys during this period will 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.

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

JEFFERY A. BERNATOWICZ, District Wildlife Biologist

Population objectives and guidelines

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

Hunting seasons and harvest trends

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

Deer hunter numbers decreased slightly in 2007, were below the 10-year average, and about 60% below the highs in the early 1990's (Table 1). A severe winter in 1996-97 reduced deer numbers and a 3-point restriction was implemented. Deer populations started to rebound, but hunters have been slow to return.

Harvest had steadily increased from 1997 to 2005, but has decreased substantially 2005-2006 (Table 2). The 2007 buck harvest increased 11% from 2006, but was below average and down 37% from 2004 and ~80% from the early 1990's. The decline has been most severe in PMU's 32 and 33.

Surveys

In December of 2007, 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 ratio's are at objective and fawn ratio above average in December 2007.

In April 2008, PMU 32 was surveyed to estimate population. The survey indicated the population had increased ~30% from 2007. This is somewhat misleading. Survey conditions in 2008 were ideal and a very high percentage of deer were in open terrain and visible. There was also an increase in fawn numbers. However, an increase in deer with hair loss was also noted. Spring was very late in 2008 and post survey fawn mortality may have been higher than average.

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
10-yr avg	12,112	459	3,415	15,986	10

Population status and trend analysis

Deer populations across all PMUs are declining. Population surveys suggest about a 30-50% decline across PMUs 32, 33, and 36 since 2003. Harvest suggests PMU 35 is down at about 40%. No population survey data is collected in PMU 34, but harvest data suggests only a moderate decline in population.

The expansion of an exotic louse *Bovicola tibialis*,

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
10 yr avg.	424	104	349	110	156	26	105	36	118	36	1,151	311

may be one of the main factors in the population decline in PMUs 32, 33, 35, and 36. Deer with signs of hair loss were observed in 2004 and observations have increased dramatically since then. *Bovicola tibialis* is distinct from the exotic louse *Bovicola cervicola,* which has caused hair loss in the black tailed deer in western Washington and Oregon. The regional outbreak started in PMU 33 and quickly spread to PMU 32 and 35. Deer in PMUs 34 and 36 are now also showing clinical signs of the lice. Observations of deer with hair loss seemed to decrease in 2007, but there are probably 50% fewer deer to be infected.

The population declines observed in PMUs 32, 33, 35 and 36; may not be due just to lice infestations. Drought and winter conditions may also be involved. However, in areas where deer show signs of hair loss, populations have shown the sharpest declines.

Harvest is not the best indicator of population, but is the only long-term index available. The change in harvest management from "any buck" to 3-point minimum regulation in 1997 also makes comparisons difficult. The mean buck harvest for 1991-1996 was 28% higher than the mean buck harvest for the 1970s and 18% higher than the mean buck harvest for the 1980s. The average doe harvest in all 3 decades has been below 500 animals annually.

The current deer populations are well below the long-term average. Harvest peaked in the early 1990s after 7 relatively mild winters. Severe winters in 1992-93 and 1996-97 caused the population to fall dramatically. The lack of harvest and mild winters since 1996-97 resulted in a rebound in deer numbers until 2004-05, when lice were first documented in Region 3. Harvest and surveys indicate the population is now declining, and may be back to 1997-98 levels.

All PMUs have had buck ratios at or above the goal of 15 bucks per 100 does when surveys have adequate sample sizes. It has been difficult getting large sample sizes in recent years. Bucks tend to be somewhat isolated from doe/fawn groups in December. Surveys have often concentrated on high-density ranges and probably underestimated buck ratios. Private lands also tend to have more mature bucks. Surveys were weighted toward public lands with good access.

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 since the 1980s. Cheat grass has increased the frequency of fire and taken over portions of the lower elevation winter range. Over much of the range, grasses and dried forbs are the only available forage. 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 30-50% over most of the range

and the distribution of lice is spreading. Non-migratory populations in arid regions don't seem to be as impacted and hopefully won't be as affected. Management of PMUs 32, 33, 35 and 36 will be difficult if the impacts of lice and hair loss persist. Antlerless harvest will be eliminated from PMUs 32, 33, 35 and 36. The District hasn't experienced a severe winter in 10 years, yet populations have declined. When a hard winter does hit District 8, deer populations may go extremely low.

Managing the populations will also require good data. The current spring surveys provide a good index to the populations, but funding is lacking for adequate coverage. There is no funding for surveys in PMU 34.

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
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
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

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

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 2007 season totaled 1,345 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	64	129	14	2	52	261
Antlered	801	135	32	14	102	1084
Total	865	264	46	16	154	1345

Antlerless harvest for the 2007 season totaled 261 animals (19% of total harvest) with antlered harvest totaling 1084 animals (81% of total harvest). While the number of hunters in GMU 407 has fluctuated since 1999, the number of deer harvested has increased slightly over the last few years and hunter success in 2007 was at 27%, up from 18% in 1999 (Figure 1). The number of hunters in GMU 410 increased slightly from 2006, and hunter success remained high at 41% (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 2007, second deer harvest increased 43% over the 2006 harvest and 192% over the 2005 harvest (Table 2). In GMUs 418, 426, and 437, hunter success has increased from 6% in 1999 to 17% in 2007 (Figure 3).

Table 2. Second deer tag harvest results by island in GMUs 410 and 407 for 2007.

Island Name	Hunters	Antlered	Antlerless	Total	Success (%)
Shaw	11	2	2	4	36
Lopez	36	22	3	25	69
Orcas	50	29	9	38	76
Decatur	7	2	2	4	57
Blakely	22	12	2	14	64
Cypress	20	6	2	8	40
San Juan	25	11	3	14	56
Camano	8	1	4	5	63
Whidbey	54	12	20	32	59
Guemes	22	3	5	8	36

The proportion of deer harvested in 2007 within GMUs 407 – 437 (1,345 animals) as compared to the statewide harvest for the 2007 season (37,892 animals) indicates that these northern Region Four GMUs represent 3.5% of the statewide total harvest. This number is consistent with the 3.4% of the statewide total harvest that came from GMUs 407-437 in 2006. Reported tribal harvest in GMUs 407-437 for the 2007 season totaled 112 animals (75 bucks and 37 does). The tribal harvest was distributed as follows: 15 bucks and 5 does harvested in GMU 407, 21 bucks and 2 does in GMU 410, 16 bucks and 14 does in GMU 418, and 23 bucks and 16 does in GMU 437.

Surveys

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

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

There was no Chronic Wasting Disease (CWD) sampling in 2007. 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.

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 2007.

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.

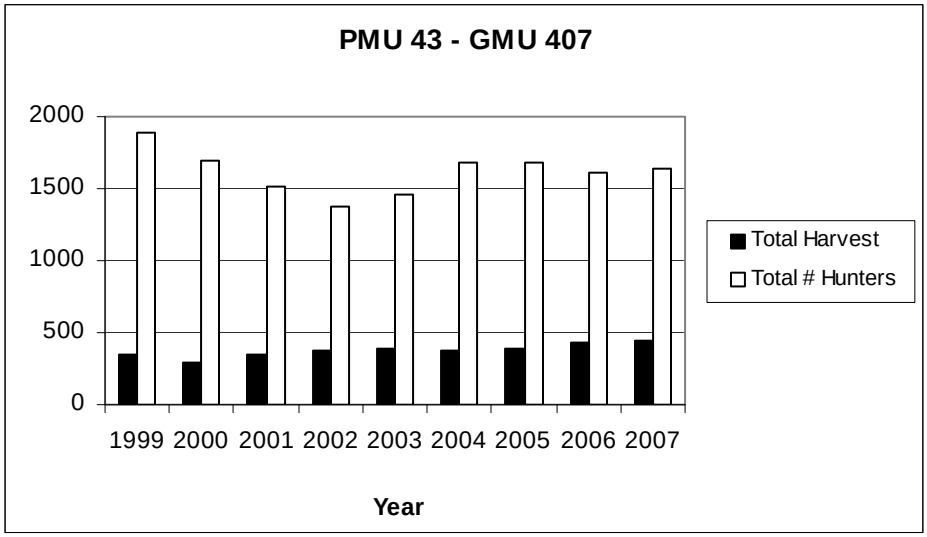

Figure 1. Deer harvest and number of hunters in PMU 43, 1999-2007.

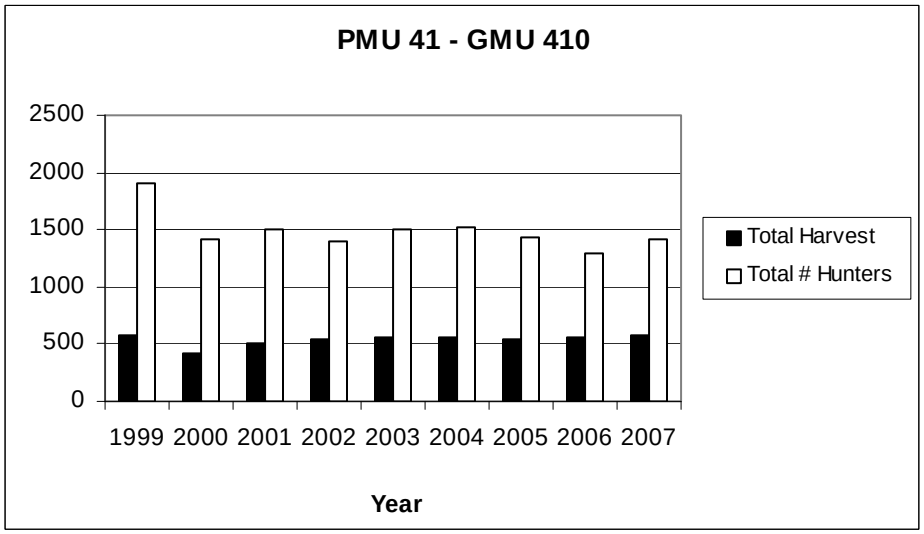

Figure 2. Deer harvest and number of hunters in PMU 41, 1999-2007.

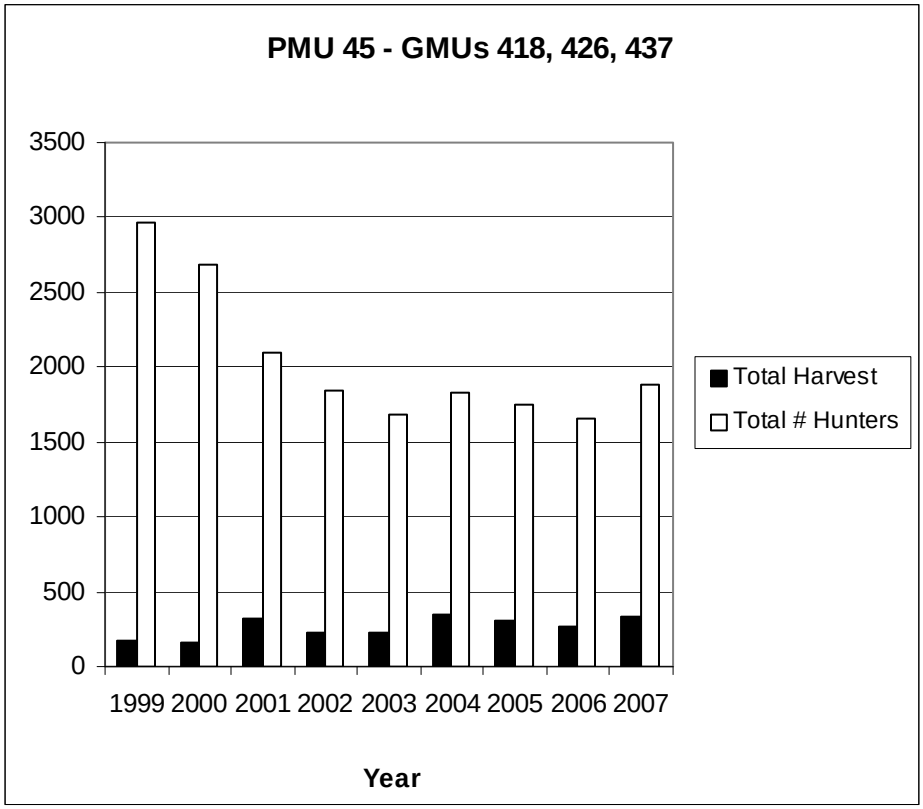

Figure 3. Deer harvest and number of hunters in PMU 45, 1999-2007.

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 prevents 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 moved 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 an average 10.7 deer per year to the total harvest over the last 6 years (prior to 2004-05). 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 over the 1984-1997 period averaged about 41% of the total harvest in GMU 460.

In GMU 460, total deer harvest declined from 1998-2004 with buck take declining by more than 50% (Fig. 4). While archers and modern firearm buck take has declined in this time period, 2004 showed a 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 branched 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 (Fig. 3). 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.

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 parasitism, 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 (Table 3).

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	756 + 610

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

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.

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.

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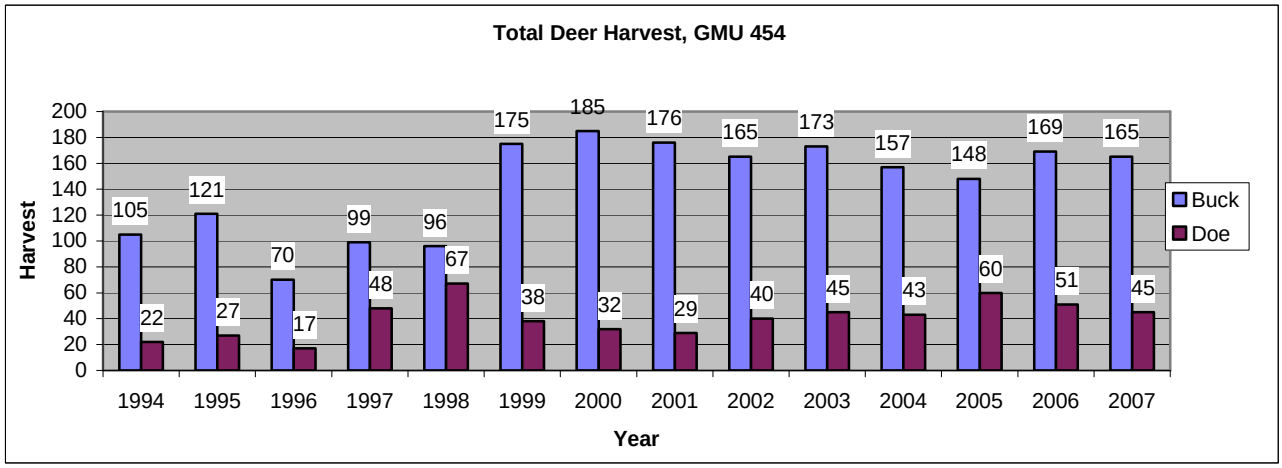


Figure 1. Annual deer harvest in GMU 454, all weapon types, 1994-2007.
*2004 harvest reflects uncorrected raw data reported from hunter report

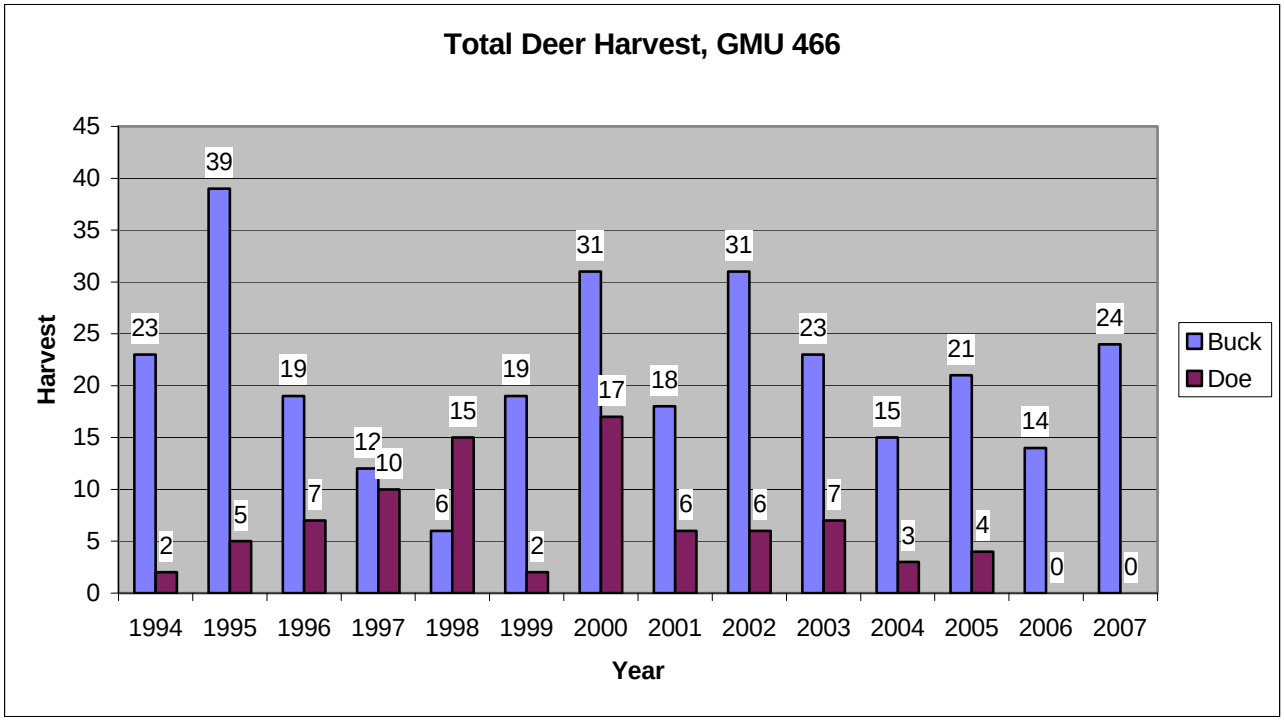


Figure 2. Annual deer harvest in GMU 466, all weapon types, 1994-2007.
*2004 harvest reflects uncorrected raw data reported from hunter reports

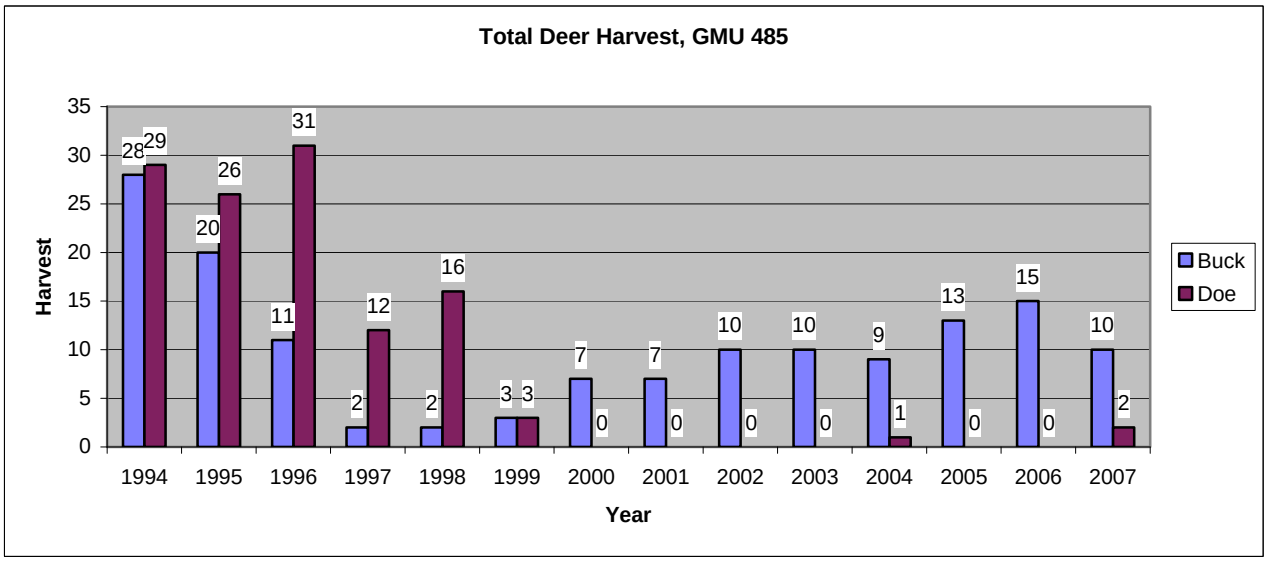


Figure 3. Annual state deer harvest in GMU 485, 1994-2007.

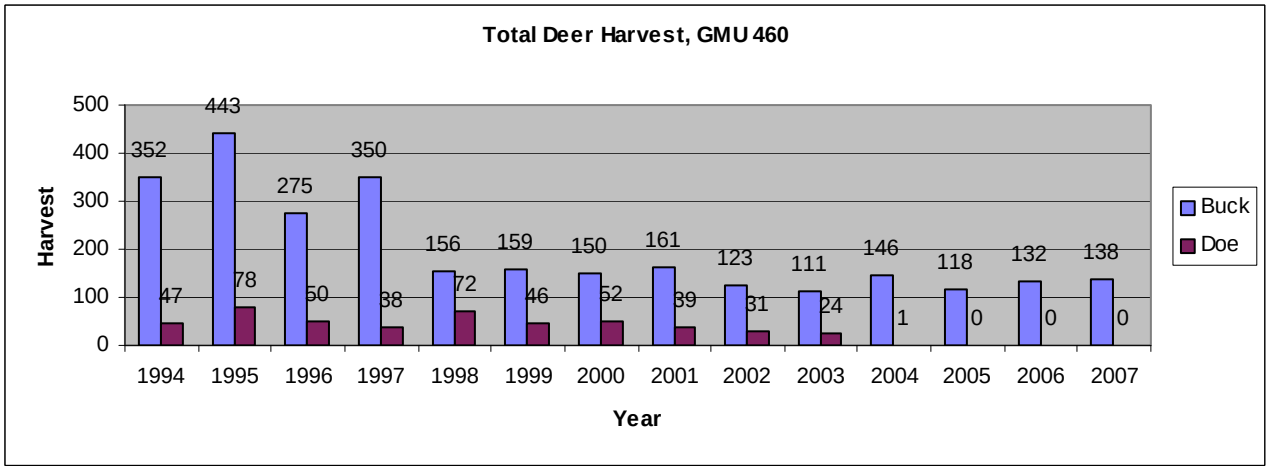


Figure 4. Annual deer harvest, GMU 460, 1994-2007, general season and special permit combined.
*1997 was last year of late buck hunt.
*2004 1st year of buck only archery hunt

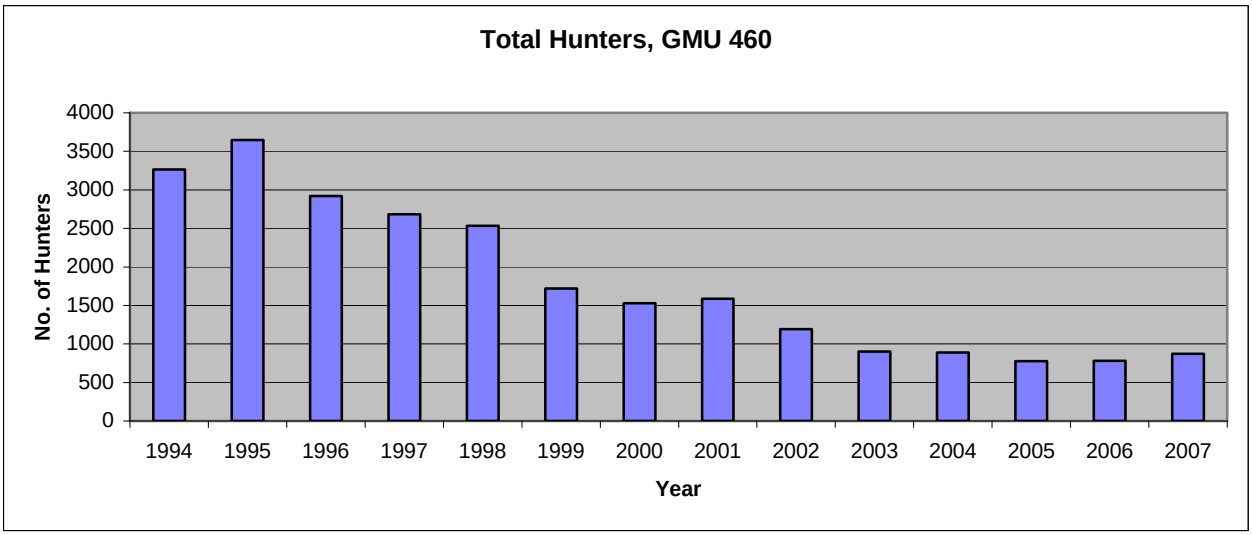


Figure 5. Number of deer hunters, GMU 460, 1994-2007, general season and special permit combined.
*1997 was last year of late buck hunt.
*2002 increase in access fee-Hancock Forest Management.

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 2007 hunting season in GMU 448 was similar to previous years, with the general modern firearm season open for any buck from Oct. 13-31, the early archery season open for any deer from Sept. 1-30, and the early muzzleloader season open for any buck from Oct. 6-12.

Hunter numbers were about the same in 2007 compared to 2006 in GMU 448, continuing a trend of fewer people hunting GMU 448 that has been occurring for well over a decade. Six-hundred seventy-four (674) hunters reported hunting the unit in 2007, compared to 647 hunters in 2006, to 696 hunters in 2005, and 773 hunters in 2004. The decrease in hunter numbers in the current decade although consistent, is relatively minor compared to a nearly 50% decline in hunter numbers seen in 2001 (Fig.1).

One-hundred forty-seven deer were harvested from the unit in 2007 by all weapon users (134 antlered, 13 antlerless), with a 22% hunter success rate. Although harvest numbers have been relatively consistent since 2000, with the number of deer harvested ranging from 115 to 156 in that period, the percentage of successful hunters has slightly increased every year since 1998 (Fig. 2).

Seventy-four hunters reported hunting in GMU 450, with 8 bucks harvested for a 12% hunter success rate. These numbers are consistent with the number of hunters and harvest success rate over last several years. Ten late buck season modern firearm permits are allotted to this PMU. For the 2007 season, 290 hunters applied for the permits, 5 permit holders reported hunting and 3 deer were harvested.

Figure 1. Number of Hunters in GMU 448: 1995-2007

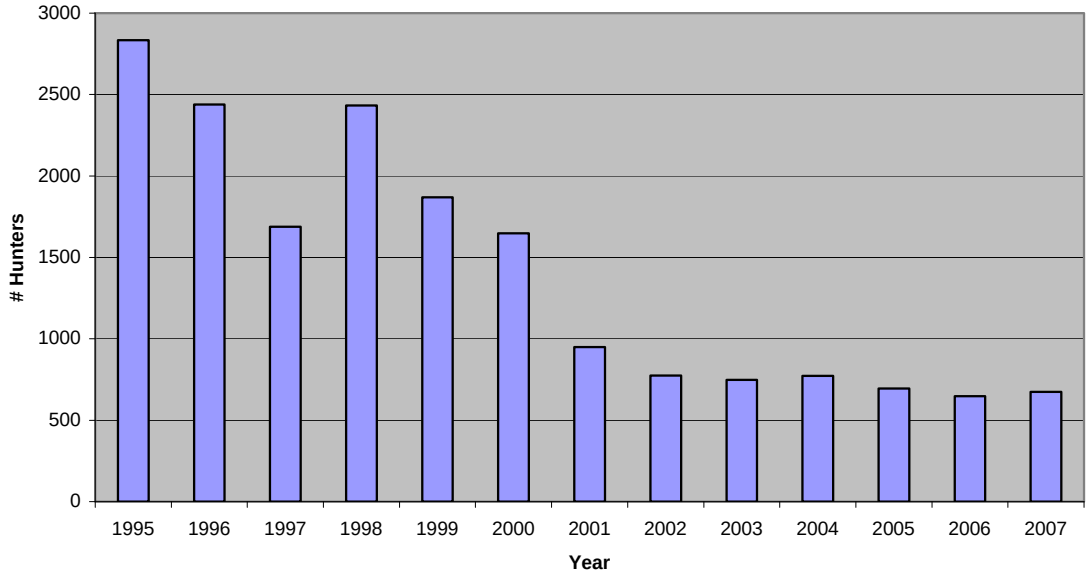
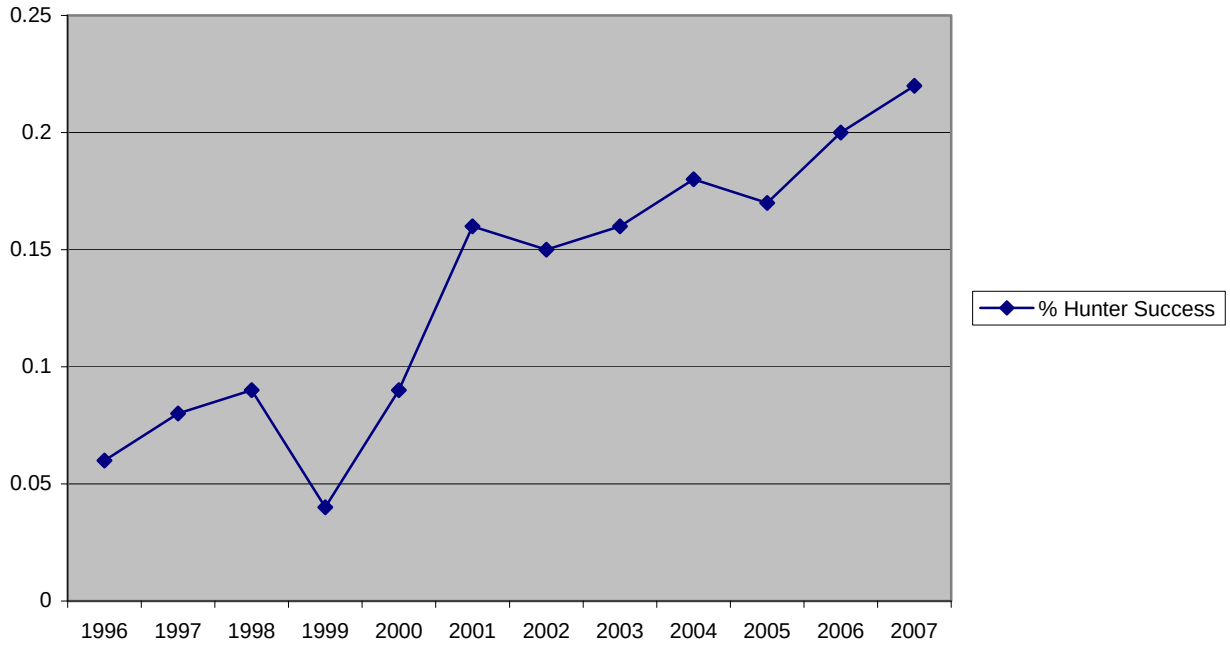


Figure 2. Percentage of Successful Hunters: 1996-2007



In GMU 448, 84% of hunters used modern firearms, and this group harvested 87% of the deer in 2007. Archery hunters comprised 15% of hunters and took 13% of the deer. Muzzleloader hunters accounted for less than 1% of hunters, with only 4 people reporting that weapon type and 0 deer harvested. Sixty-eight hunters hunting in GMU 450 used modern firearms, 4 hunters used archery equipment, and 2 hunters used muzzleloaders. 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 4 bucks and 1 doe from GUM 48 in 2007.

Surveys

Population surveys were not conducted in GMUs 448 and 450 in 2006.

Population status and trend analysis

Insufficient data exist to model the deer population in PMU 46. However, hunter numbers and the number of deer harvested have remained relatively constant for the last 5 years, indicating 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. Recently, an extra-ordinary number of applications for cluster developments and sub-divisions have occurred in Snohomish County. If these applications are implemented, we expect to see additional reduction in available deer habitat.

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, success rates continue to increase, making it a quality experience for those who know where to hunt in GMU 448. Hunters will find that crowding is not a problem in PMU 46.

DEER STATUS AND TREND REPORT: REGION 5
PMU 51 - GMUs 578, 388
PMU 52 – GMUs 564, 568, 574
PMU 53 – GMUs 524, 554, 556
PMU 54 – GMUs 516, 560, 572
PMU 55 – GMUs 510, 513
PMU 56 – GMUs 503, 505, 520, 550
PMU 57 – GMUs 501, 504, 506, 530
GMU 382

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 the existing population within social tolerance and achieve a minimum buck escapement of 15 bucks per 100 does (WDFW 2003).

Hunting seasons and harvest trends

Information on black-tailed deer harvest and hunter effort during the 2007 hunting season was obtained from WDFW's mandatory reporting system. Estimates of total harvest, hunter effort, and hunter success are based upon reports submitted by hunters. All hunters are required to submit these reports. The mandatory reporting system is thought 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, 1500 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. The fundamental structure of each hunting season is grouped into 3-year packages. The current 3-year package encompasses 2006-08.

During the 2007 general deer season in Region 5, modern firearm hunters made up 74% of the hunters, archery accounted for 16%, and those choosing to hunt with a muzzleloader made up 9%. Finally, those utilizing "multi-season" tags accounted for 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 2006-08 three-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 2007, an estimated 32,889 hunters spent a total of 186,325 days deer hunting in Region 5 (Table 1). Total general-season deer harvest in 2007 was 5,404 with a hunter success rate of 16% (Table 1). The percentage of hunters that harvested a deer in 2007 was essentially identical to the 10-year mean of 17%. The total deer harvest was slightly below the mean harvest of 6,006 recorded during the period from 1998-2007.

Table 1. Deer Hunter Numbers and Harvest Statistics for Region 5, 1998-2007.

Year	Hunters	Days	Harvest	Success (%)
1998	62,908	253,517	7,208	11
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

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).

Table 2. Region 5, 2007 Deer Hunters, Harvest per Square Mile, and Hunter Success by PMU.

PMU	Hunters	Kill/SQ Mile	Success (%)
51	4946	.82	17
52	4595	.81	19
53	1311	.49	14
54	4730	.30	10
55	1099	.39	16
56	8095	1.20	15
57	6445	.88	17
GMU 382	1668	.71	34

In addition to the general-season deer hunting effort and harvest discussed above, 858 hunters participated in special hunts open only to permit holders in 2007. These hunters enjoyed a combined success rate of 40%. Table 3 details the hunter effort, harvest, and success rate of special deer permit holders in Region 5 during 2007.

Table 3. Region 5, 2007 Special Deer Permit Hunter Activity and Harvest Summary.

Permit Type	Hunters	Antlered Kill	Antlerless Kill	Total Kill	Success (%)
Modern	447	52	106	158	35
Muzzldr	86	4	19	23	27
Senior	56	4	16	20	36
Disabled	42	2	23	25	60
Youth	167	24	55	79	47
2ND Tag	60	10	25	35	58
SUM	858	96	244	340	40

Surveys

Region 5 deer demographics are 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 13-14, 2007. 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 596 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 2007 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 (2002-2007) 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 2007, 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 2007 productivity surveys, a total of 759 deer were classified. The mean value of .55 fawns/doe is very similar to the historical average of .53 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.

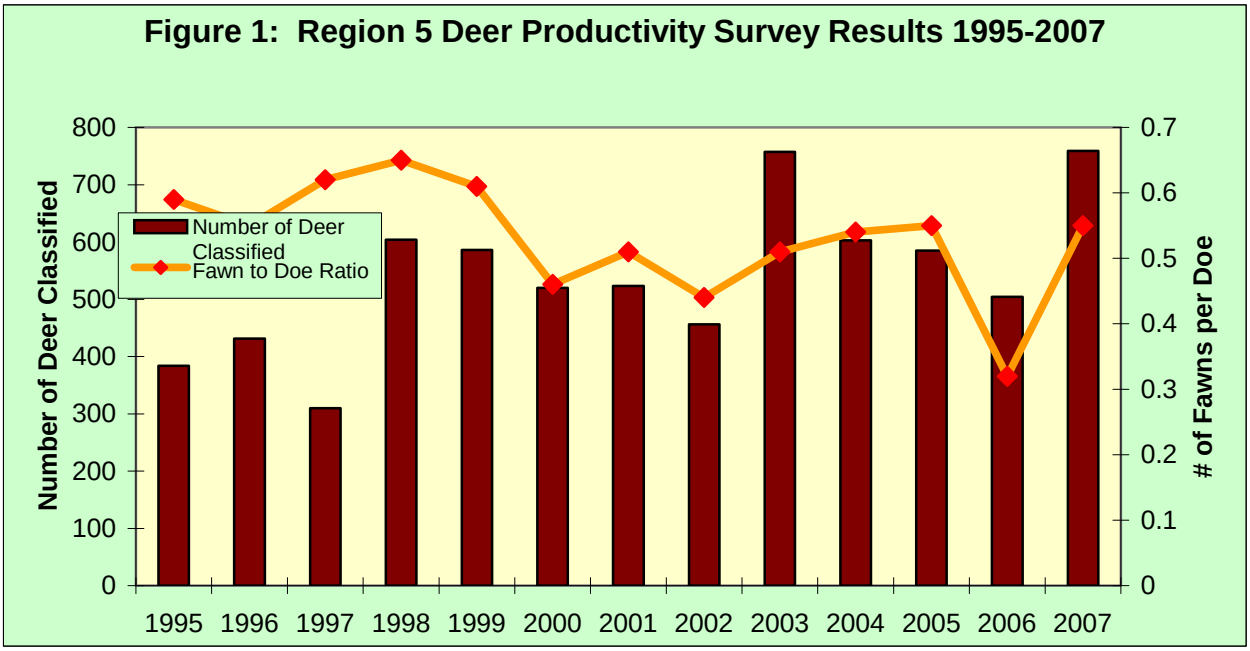
For spring counts, four permanent survey routes centered on the Klickitat Wildlife Area, near Goldendale, were censused on March 17-18, 2008 (Table 4). Transects were driven on the evening of the 17th and morning of the 18th. Deer group sizes and composition were determined. All deer were classified as fawn, adult, or unknown and the fawn:adult ratio was determined. A total of 238 deer were classified during the March 2008 Klickitat deer survey. The resulting fawn:adult ratio of 0.48 is indicative of average over-winter survival. The long-term mean (1980-2008) ratio for this area is 0.47.

Table 4. Historic Fawn:Adult Ratios for the Klickitat Spring Deer Survey, 1994-2008.

Year	Total Deer Classified	Fawn:Adult
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
1994	460	0.34

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

Figure 1: Region 5 Deer Productivity Survey Results 1995-2007



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 changing of the Grayback GMU to a more conservative season structure (3-point minimum and abbreviated modern-firearm season), this relationship was not observable in 2006 or 2007.

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 goal of 15 bucks per 100 does following hunting season. Secondarily, the surveys provide an additional opportunity to evaluate the annual fawn to doe ratio. The more open 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.

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 aerial surveys.

Table 5. Post-Season Deer Composition Survey Summary, GMUs 388 and 382, 2003-07.

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
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

Population status and trend

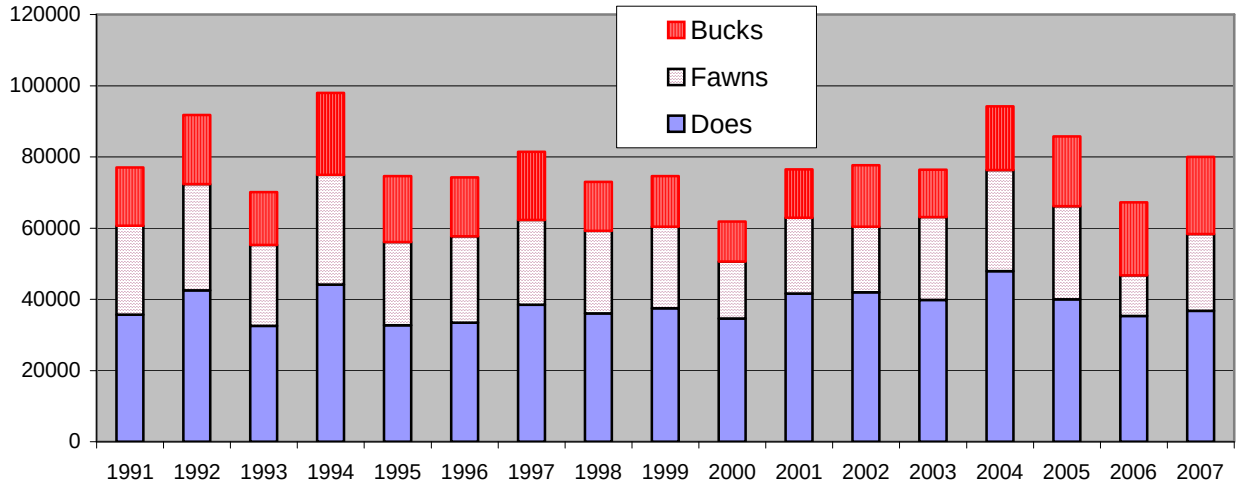
Information compiled from hunting activity suggests stability of the deer population in the Region. Hunter success rates over the past 15 years have remained very consistent (R^2=.00). Similarly, hunter days per kill has not changed (R^2=.02). In contrast, total deer harvest has steadily declined (R^2=.68) from roughly 9000 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 Regional deer population. See Figure 2 for a graphic illustration of the estimated deer population in Region 5, generated from the Sex Age Kill Model.

Habitat condition and trend

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

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

Figure 2: Region 5 Estimated Pre-Season Deer Population 1991-2007



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 clearcut in the 1980s prior to the listing of the northern spotted owl. Those forest stands harvested in the 1980s are now largely at an age (18-28 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, stocking rates for domestic livestock (cattle), have not been appropriately changed to reflect reduced forage availability. A review of the literature lends strong evidence to suggest that cattle may cause elk to shift their diet away from grasses and towards the browse plants favored by deer (Stewart et. a.l. 2002; Coe et. al. 2001). Thus, the lack of forage offered by current forest management practices comes at the further detriment of deer. Finally, 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.

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 10% of the deer observed during the March 2008 Klickitat deer survey had noticeable signs of the syndrome. Late 1990's declines in harvest, increases in buck mortality rates, and reduced productivity in the western portions of Region 5 all roughly coincide with the onset of the hairloss syndrome. Anecdotal reports from hunters, homeowners, and citizens indicate that deer are now absent from areas where they were present in high numbers during the mid 1990s. An effort to quantify some aspects of the hairloss syndrome was conducted by WDFW from 2001-03. In this study, 30-39% of fawns were found to exhibit the syndrome. However, the establishment of an association between mortality and hair loss syndrome was inconclusive (Woodin 2004). Furthermore, 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 associated with black-tailed deer hairloss syndrome is not indigenous to North America (Bildfell et. al. 2004).

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. As recently as the 1980s, habitat conditions in the Region were more favorable, 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.

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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

Population objectives and guidelines

Objectives are to maintain deer numbers at the 2000-population numbers. 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 the analysis of the Mandatory Reporting System, success rate declined slightly from the previous year for the general deer season, but hunter numbers and hunter-days of participation increased (Table 1). Actual success is even higher when permit hunting is incorporated. Region-wide harvest during general season increased from 4,844 (2006) to 5,528 in 2007.

Table 1. Summary of four harvest parameters for Region 6, 1995-2007.

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

Estimates of total annual mortality rates (i.e. from all sources) vary depending on the data source. However, 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 0.23 to 0.37 for various Population Management Units (PMUs). An analysis of 245 antlered deer at the Vail check station showed that 40 % were yearlings. This is the second year of much lower buck mortality rate estimated from this check station over the past 15 years.

Antlerless harvest in GMU 667 provided an estimate of the average annual mortality rate for females of 20% (n=15). This mortality rate is at the upper limit that we would like to see for adult females. Additional restrictions in antlerless permits had been implemented to bring down the doe mortality rate. Estimated mortality rate for females for 2001-2005 was higher (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 gave an opportunity to hunt deer through the rut. These hunts are extremely popular. They provide a new opportunity for deer enthusiasts. These hunts provide a higher quality buck hunt. 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). In GMU 667, a total of 68 deer were classified. Deer check stations were run at Vail on 4 weekends in 2007 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 49:100. The doe mortality rate was .20 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.

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

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

Management conclusions

There are some general declines in deer numbers in some GMUs while others are expanding. This follows the patterns that would be expected from timber rotations, where large magnitude changes in population occur with stand age. Long-term declines are expected and are 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. The deer harvest on the Vail tree farm continues to be below the 200 level. GMU 667 typically shows one of the highest deer harvests on the Westside. Several issues arise in this unit. Timber cutting in the unit has decreased causing less early seral stage forests. This past year the mortality rate recorded at the check station continues to be low for bucks, but was up for does at .20. Also, hunter numbers for all of GMU 667 continued to decline, but success rates increased.

Hunter numbers and hunter-days of participation Region-wide; however, increased (Table 1). These two factors combined can yield a higher harvest. General season harvest for 2007 showed a 14% increase compared to the previous year.

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 the 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. The preseason flights; however, are not showing a decline in production.

Recent research by the Makah Tribe has shown 50% fawn mortality rate through the first 6 months of life caused mostly by bear and cougar predation. This may not be detected in the September fawn ratio flights. It is not known if these results can be extrapolated across Region 6.

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 2007 to June 2008. 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.

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

There are 10 recognized elk herds in Washington: 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 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 between 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 2007 was 8,024 elk (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

The general season elk hunter success rate for all weapon types in 2007 was 8.2 %. General season success rates by weapon type were 7.1 % for modern firearm, 11.1 % for archery, 8.4 % for muzzleloader and 19.9% for the new multiple weapon category.

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 4,800. 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 eight 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 2008. 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 is now over 600 animals and 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 2008. Both the Willapa Hills and Mount St. Helens populations are difficult to monitor due to the nature of the landscape. 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 is cooperating 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 east of the Columbia River in Douglas and Grant counties. In all 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.

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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 (WDFW 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 (2003-2005) season package shifting the archery season later to a standard opening of September 8 and thus running to September 21. That season structure remains 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 and 2007. The season timing and increased opportunity for archers and muzzleloaders has 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).

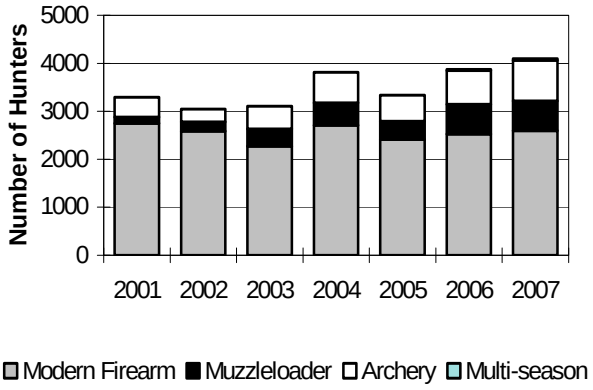

Figure 1.Trend in elk hunters by hunt method for GMUs 101-121.

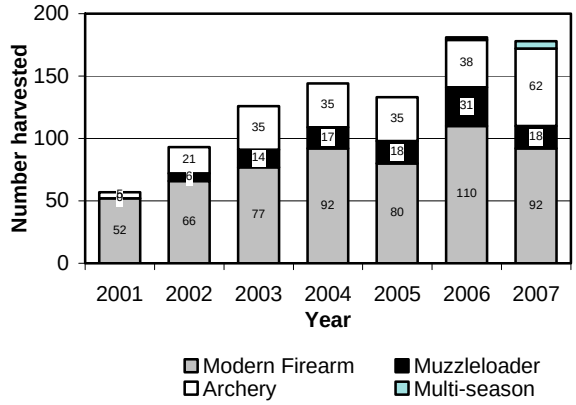

Figure 2. Trend in elk harvested by hunt method for GMUs 101-121.

Since mandatory hunter harvest reporting began in 2001 the number of elk hunters reporting hunting GMU's 101-121 increased from 3,296 to 4,097 or 24%. During that time the total elk harvest increased from 57 to 181 (170%). At least through 2006 the modern firearm elk harvest exhibited a mostly steady increase. 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 and 6 in 2007. Hunter success, however, was substantially higher for multi-season tag holders at 19 % 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. Harvest data from elk permit holders in 2007 continue to confirm that permit holders kill exceptionally few elk in northeastern Washington (Table 2). A total of 80 modern firearm permits were issued in GMUs 111, 113, and 117. Only 53 of these permit holders hunted elk within these units, and only 9 elk were reported taken. Muzzleloaders had 40 permits for the same units. Only 23 muzzleloader permitees hunted elk, and only 2 elk were taken. Permits for "any elk" appear to be providing enhanced recreational opportunity for hunters in these units, but the harvest is negligible, and inadequate to address any 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 by 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. In 2007 the harvest percentage of yearling or 1-2 point bulls was lower than the percentage of 3-5 point "rag" bulls and the only season since 2003 that this has occurred.

No aerial surveys targeting elk have been conducted for several years. Nevertheless any elk observed during winter aerial surveys for moose are classified and tallied. The winter of 2006-2007 was exceptional in that more elk were encountered in that winter survey than any previously. Altogether 45 elk were observed including 13 bulls, 23 cows, and 9 calves for a ratio of 57:100:39. In the winter of 2007-2008 only 27 elk were observed during the moose survey including 11 bulls, 10 cows, and 6 calves for a ratio of 110:100:60. Given the expense of helicopter surveys and the few elk observed compared to moose, post-season aerial surveys for elk are probably not cost effective.

The best opportunity to observe elk from ground-based surveys is in the early spring from mid-March to the end of April. 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 2008 survey efforts yielded a ratio of 39 calves per 100 cows, which is a little lower than the previous six year average (Table 4).

Population status and trend analysis

General observations and anecdotal information suggest that elk populations are as high as they have ever been in northeastern Washington. The widespread distribution of elk coupled 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. Just this year Forest Practice Approvals were granted for treating 5,623 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 this year with a permit season that now includes December 16-31. In addition all user groups now 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, totaling over 2,000 acres that are designed to benefit elk. 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..

2007).

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 only 24% in 2007. While there are no post-season survey data on bull:cow ratios, the prime bull (6 point +) percentage in the 2007 bull harvest was 32% 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 90% of the elk harvest and archery hunters took the other 10%. By 2006 the participation and harvest was dispersed more equitably in proportion to hunter numbers by each method. Modern firearm hunters accounted for 65% of the participation and 61% of the kill. Archers accounted for 16% of the hunters and 17% of the kill and muzzleloaders accounted for 18% of the hunters and 21% 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 418 muzzleloader and 1,448 modern firearm applications for 2007, the resulting harvest was negligible. 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.

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Table 1. Antlered bull and antlerless elk harvest within the Colville District, GMUs 101-121 from 2001 through 2007.

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	132	74	206

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 %

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

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

ELK STATUS AND TREND REPORT 2008: REGION 1
PMU 11 – GMUs 127, 130, 133, 136, 139
PMU 13 – GMU 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.

Hunting seasons and harvest trends

The 2007 general elk hunting seasons for Game Management Unit (GMU) 127-142 were as follows:

- Modern Firearm - Oct. 27-Nov. 4, Any elk
- Archery - Sept. 8-21, Any elk
- Late Archery (GMU 127) - Nov. 20-Dec. 8, Any elk
- Muzzleloader - Oct. 6-12, Any elk
- Late Muzzleloader - Nov. 20-Dec. 8, Any elk
- Advanced Hunter Education (AHE) Master Hunters only - Dec. 9-31, Any elk.

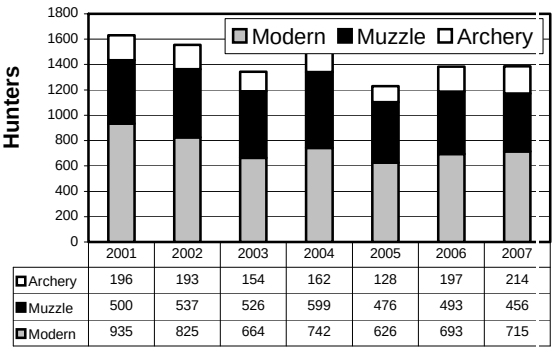
Table 1. GMU 127-142 elk harvest, hunters and hunter days.

Year	Antlered	Antler-less	Total	Hunters	Hunter Days	Hunter Success
2001	61	56	117	1631	7126	7.17%
2002	59	53	112	1555	7150	7.20%
2003	61	66	127	1344	6082	9.45%
2004	67	60	127	1503	6246	8.45%
2005	79	117	196	1230	5042	15.93%
2006	99	99	198	1390	5951	14.24%
2007	101	76	177	1395	6468	12.69%

Harvest strategies in place are directed to control populations where agricultural damage and nuisance problems have persisted or increased. Recently, 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.

This is the first year since 2001, when mandatory reporting began, that the total elk harvest decreased from the previous year (Table 1). Hunter numbers have varied but have shown a downward trend from 2001 from a high of 1631 to a low of 1230 in 2005, with numbers leveling off the last 2 years (Figure 1). In

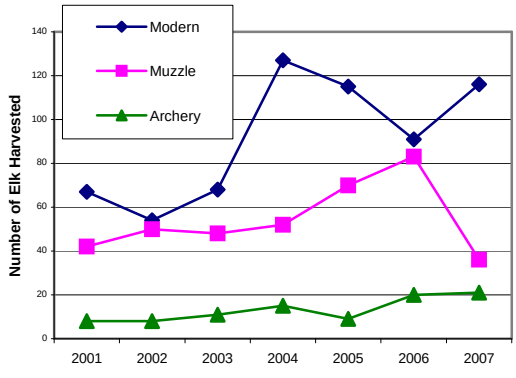
Figure 1. Number of Elk Hunters by Weapon Type



	2001	2002	2003	2004	2005	2006	2007
Archery	196	193	154	162	128	197	214
Muzzle	500	537	526	599	476	493	456
Modern	935	825	664	742	626	693	715

2007, hunter success decreased from the high of 2005 when hunter success nearly doubled compared to the previous 4 years. Success rates during 2006 were the second highest since 1991. The total kill for this year

Figure 2. Harvest of Elk by Weapon Type



was 177 animals, 20 less than last year. Modern firearm hunters were the most successful group in 2007 with a success rate of almost 17%, a switch from 2005 when muzzleloaders had a high of almost 17% (Table 2). Surprisingly, muzzleloader success dropped to 7.89% this year. The number of elk taken by muzzleloaders

has decreased the last 3 years, while archers and modern firearm hunters took a higher number of elk the past 2 years (Figure 2).

Table 2. Hunter Success By Weapon				
	Archery	Modern	Muzzle	All
2001	4.08%	7.17%	8.40%	7.17%
2002	4.15%	6.55%	9.31%	7.20%
2003	7.14%	10.24%	9.13%	9.45%
2004	9.26%	8.09%	8.68%	8.45%
2005	7.03%	18.37%	14.71%	15.77%
2006	10.15%	13.13%	16.63%	14.24%
2007	9.81%	16.22%	7.89%	12.69%
Average	7.92%	12.10%	11.06%	11.30%

Total bulls taken this year were 101, the most bulls taken since mandatory reporting began in 2001. Antler point classes reported in the harvest have varied from year to year (Table 3), and no real trend can be found. However a good sign is that the percentage of both 5 and 6 point harvest has been above 20% the last two years.

Table 3. Percentage of antler points derived from harvest data for GMUs 127-142.				
	1 & 2 Pt	3 & 4 Pt	5 Pt	6+Pt
2001	60.3%	4.1%	19.2%	16.4%
2002	48.2%	7.1%	30.4%	14.3%
2003	45.6%	5.1%	20.3%	29.1%
2004	43.4%	15.8%	26.3%	14.5%
2005	49.5%	11.6%	29.5%	9.5%
2006	38.7%	9.7%	29.0%	22.6%
2007	44.6%	9.8%	24.1%	21.4%

Antlerless harvest decreased from a high of 30 antlerless elk to every 10 mature antlered elk in 2005 to 15 this year and last (Table 4). This change appears largely due to the harvest in GMU 127 where antlerless harvest decreased from 37 in 2005 to 22 and 23 the last 2 years.

Table 4. Five & six point bulls and antlerless elk harvested within GMUs 127-142.				
Year	5 Pt. Bulls	6+ Pt. Bulls	Antler-less Harvest	Antler-less/ 10 5+ Bulls
2001	14	12	56	22
2002	17	8	53	21
2003	16	23	66	17
2004	20	8	60	21
2005	28	11	117	30
2006	36	28	99	15
2007	27	24	76	15

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 and the lack of success at earlier attempts of aerial surveys in the more forested area of GMU 127. Some post-season composition counts are completed during moose surveys conducted in December and January.

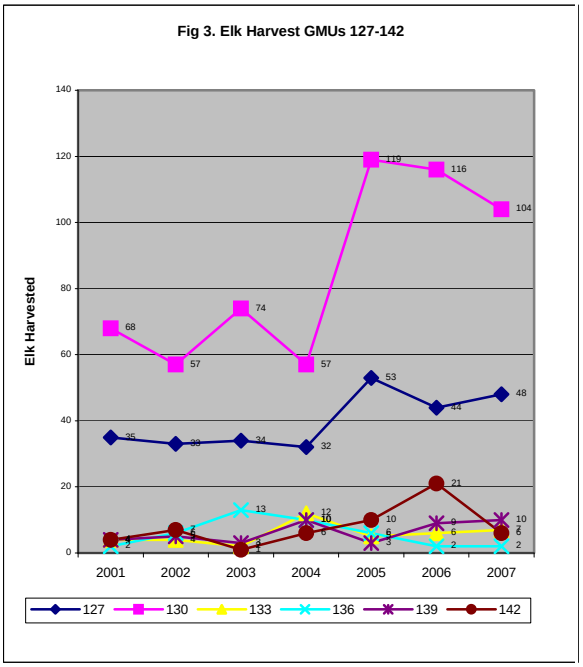
Table 5 shows the composition counts conducted since 1999. Except for 2001, the bull:cow ratio in GMU 130 has been above the 15:100 bull:cow ratio guidelines given in the WDFW Game Management Plan and this past year has increased to 35 bull/100 cows (WDFW 2003).

Table 5. 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
2004	211	106	36	50	17
2006	207	113	49	55	24
2007	139	77	48	55	35

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 104, and GMU 127 with 48 elk harvested (Figure 3).

Up until this year, antler point distribution (Table 3) showed a decreasing trend of young (1 &2pt) bulls being harvested from the population (Table 3). However, this past year showed an increase, possibly indicating good production during 2006 and high survival this past year. Our composition counts do indicate a high cow:calf ratio since 2001 (Table 5).



Habitat condition and trend

The greatest concern within herd ranges in the past had been related to agriculture crop damage 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 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.

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 harvest occurred in 2005, and since that time has decreased by 64%. This indicates a potential decrease in cows, so it will be critical to monitor the overall population of this herd. To better manage this herd, the District needs to conduct more comprehensive herd surveys rather than just in and around Turnbull National Wildlife Refuge.

Literature Cited

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

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
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Population objectives and guidelines

Elk (*Cervus elaphus*) populations in six of eight major elk units are at or near management objective. Low calf survival, and agricultural damage complaints hinder our ability to reach population management objective in Game Management Units 169 and 172. The elk population in the Blue Mountains is still below management objective in the herd plan (2001) by approximately 750 elk, mostly due to the population decline in the Wenaha (GMU-169) sub-herd, which has declined from 2,000+ elk in the 1980's to 600 in 2008.

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 improve breeding efficiency. Bull:cow ratios normally ranged from 2-5 bulls/100 cows. This strategy has improved post-hunt bull:cow ratios in most units. Prior to the regulation, few bulls older than 2.5 years of age were observed post-hunt.

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 improve bull survival. Hunters harvested an average of 752 bulls per year between 1984 and 1988. Between 1997 and 2006, the bull harvest averaged 231 bulls/year. Hunters harvested 180 bulls in 2007 (Table 1), which is 22% below the 10-year average.

Adult bulls are harvested under permit control. In 2007, 79 permits were issued in six units for rifle, muzzleloader, and archery hunters, plus 2 LHP permits in GMU-172, and the auction and raffle tag permits. Sixty-five hunters harvested 35 bulls, for an overall success rate of 54% (Table 2). Six point or larger bulls comprised 94% of the harvest.

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, and Oregon Dept. of Fish & Wildlife. Washington issued 45 Watershed permits in 2007. Weather conditions during the 2007 were not as severe as the 2006 season, and hunter success improved. Normally, some Watershed permit holders do not hunt because they failed to research the area before applying, and were not

Table 1. Blue Mountains Elk Harvest (PMU 13), 1992-07 (includes GMU 157, Watershed)**.**

	Bulls					Antlerless Harvest
Year	Spikes	Adult	Total	Antlerless	Total	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

Table 2. Permit Controlled Bull Elk Harvest-All Weapons, Blue Mtns. WA., 1992-07 (excludes GMU-157 Watershed)**.**

	Bull		Hunter	Percent
Year	Permits	Harvest	Success	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%

aware of the rugged nature of the Watershed terrain. Only 34 permit holders reported hunting, and they harvested 12 bulls and 1 cow for a success rate of 38%. Bulls harvested in the Watershed consisted of 83% 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 unit wide in GMU's 149, 154, 163, 175, and 178. The antlerless elk harvest has increased over the last five years in response to agricultural damage complaints. Eighty-eight antlerless permits were issued under the new Landowner Hunting Permit (LHP) program for the 4-0 Cattle Company in 2007, and 49 elk were harvested. Hunters harvested a total of 151 antlerless elk from six GMU's in 2007. Modern Firearm hunters harvested 111 antlerless elk, muzzleloaders harvested 13, and archers 27.

The antlerless harvest on private land was increased in GMU-162 between 2001-2005 to alleviate agricultural damage. In 2007, permit levels were reduced due to hunter complaints about finding few elk on private land. The strategy of targeting antlerless elk on private land during this period was successful in reducing agricultural damage complaints, while maintaining the 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 2007.

Poaching of adult bulls appears to have returned to normal levels. Only a few were reported in 2007, 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, or air when possible. A total of 671 elk were classified in 2007 with calf/cow ratios in the various sub-herds ranging from 46-62 calves/100 cows, and an overall average of 54 calves/100 cows.

Post-season surveys are conducted to determine population trend and herd composition in late winter. The 2008 survey was conducted between March 10-14 in most units, and April 9 in GMU's 169 and 172. The survey produced a count of 4,237 elk, compared to 3,594 elk in 2007 (Table 3).

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

	Bulls			Cow Calves			Per 100 Cows	
Year	Adult	Yearling	Total			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

Population status and trend analysis

Data from the 2008 survey was analyzed using the Hiller 12-E version of the sightability model (Unsworth et.al 1998). The analysis projected an estimated population of 4,748 elk, approximately 512 elk under MO. Two units were not surveyed (GMU's 145 & 149) and have an estimated population of 100 elk. The Blue Mountains elk population estimate for 2008 is 4,848 elk.

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. The number of elk counted in GMU-154/157 increased to 882 elk, compared to 661 counted in 2007. Winter weather conditions may have moved more elk into Washington from Oregon, resulting in the increased count. The number of elk counted in the Dayton unit increased to 843, compared to 742 in 2007. The Wenaha herd is still below management objective (900) at approximately 500 elk. The elk count in the Tucannon sub-herd (GMU-166) increased from 552 in 2007 to 631 elk in 2008, which includes 156 elk that were just inside the boundary of the Peola unit. The elk count in Mtn. View has declined steadily over the last 3 years, from 772 elk in 2006 to 552 elk in 2007, and 376 in 2008.

However, approximately 100 elk counted in the Couse unit were Mtn. View elk, which would bring the count up to 476, still 200 elk under management objective.

Winter calf ratios improved in 2008 at 29 calves/100 cows, compared to 21 calves/100 cows in 2007.

Post-hunt bull ratios in 2008 ranged from a low of 6 bulls/100 cows in GMU's-175, to a high of 52 bulls/100 cows in GMU-169 Wenaha, and averaged 16 bulls/100 cows for the District. The artificially high bull ratio in GMU-169 can be attributed to a lack of cow-calf groups, which were forced off the Wenaha winter range and into GMU-172 and south of the Wehana River in Oregon by intense shed antler hunting activity. Spike-only units averaged 18 bulls/100 cows.

Research

The Department concluded fieldwork on the Blue Mountains Elk Mortality and Vulnerability Study in the spring of 2007 The project has 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. Elk were monitored 1 – 4 times per month using fixed-wing aircraft from April 2003 – May 2007. 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, however more roads need to be closed in order to reduce harassment and improve habitat conditions for elk.

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

Habitat conditions on 154,000 acres of National Forest and private land will improve over the next 3-5 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. The School Fire was an extremely hot fire that destroyed most of the hiding and thermal cover in the Tucannon drainage. As a result, it will take a number of years for habitat conditions to improve significantly. The Columbia Complex Fire burned 101,000 acres in GMU's 154, 162, 166, 169, and 175. This fire burned at a slower rate, and in a mosaic pattern that greatly reduced old decadent understory 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 will improve habitat conditions over time, and prescribed burns are being implemented throughout the forest to reduce fuel loads and improve stand conditions. Roads are being closed to increase habitat effectiveness.

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. 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 2007 appeared to be less than expected.

Management conclusions

The spike-only management program has been in place for 17 years. As a result, post-season bull:cow ratios have improved, as has the age structure of the adult bull population. The increased number of adult bulls in the population has improved breeding ecology and efficiency. Most cows (93%) are now being bred by October 2, compared to only 55% of the cows bred by that date during the pre spike-only era.

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 ca./100 cows. Winter calf ratios have increased, but are still below management objective. Low calf survival has a negative impact on several sub-herds, and overall hunting opportunity.

Shed antler hunting activity continues to be a problem for elk on the winter range. Shed antler hunting activity in GMU-154 Blue Creek, GMU-162 Dayton, GMU-166 Tucannon, and GMU-169 Wenaha is extremely heavy 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.

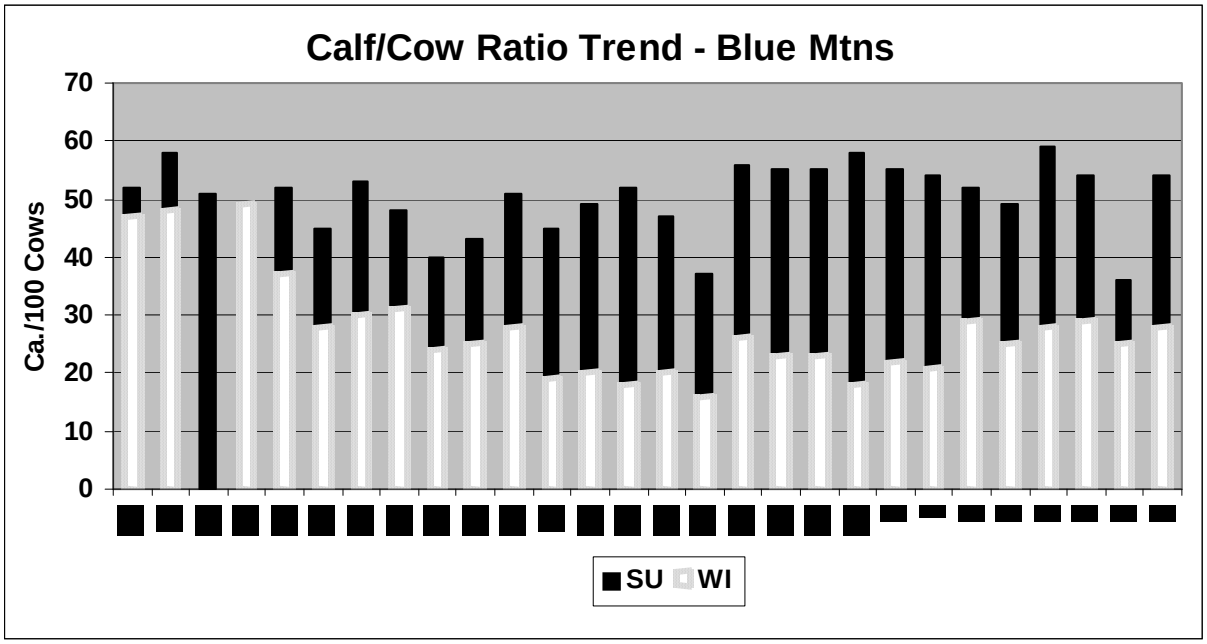
Several factors are limiting the ability of some sub-herds to reach population management objectives. Agricultural damage often forces the department to increase the antlerless harvest, which results in a reduction in targeted elk populations. Damage hunts can impact local sub-herds and sub-herds adjacent to the damage area, resulting in a decline in the overall population. Calf recruitment has improved slightly in many sub-herds, but still needs to improve to reach management objective. Hopefully, calf recruitment will continue to improve.

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 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 750 elk under the management objective listed in the Blue Mtns. Elk Herd Plan (2001). The Wenaha sub-herd is approximately 800 elk under management objective and does not appear to be increasing in numbers. Calf recruitment has improved slightly in recent years, but needs to improve more in order for some sub-herds to reach population management objectives.

Figure 1. Calf Ratio Trend 1980-2007, Blue Mtns., Washington.



ELK STATUS AND TREND REPORT: REGION 3
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

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Population objectives and guidelines

The post-season population objective for the Yakima and Colockum elk (*Cervus elaphus*) herds is 9,025-9,975 and 4,275-4,725, respectively. A goal of <350 animals has been set for the Rattlesnake Hills sub-herd. 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 2007, 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 33,35,36. Late season, November 20- December 8, spike or antlerless all units except GMU 328 (spike only).

Muzzleloader: October 6-12, spike-only.

Modern Firearm: October 27- November 4, spike-only.

PMU 34 has 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 2007, a modern firearm general season for antlerless elk occurred in the Blackrock Elk Area (private land west of Hanford) September 8-21. A general modern firearm season in all of GMU 372 and GMU 382 for any elk occurred October 27-November 4. In GMU 373, a general modern firearm and a general muzzleloader season occurred simultaneously October 27-November 15. In 2007, the reported number of elk hunters in Region 3 decreased for the third year in a row (Table 1). There was a small increase in muzzleloaders while modern firearm and archery hunters decreased slightly.

Harvest and hunter success was below average for both the Colockum and Yakima herds. Both herds are at or below objective and antlerless harvest is being decreased to maintain/increase the herds. Lower herd totals are also meaning lower recruitment and fewer bulls to harvest. The Colockum bull harvest was the lowest in recent history and the Yakima bull harvest was the 4th lowest. Below average harvest and success is expected to continue, but hopefully not as low as 2007.

Harvest from the Rattlesnake Hills sub-herd has ranged between 44 and 95. The highest harvest (212 elk) occurred following a large fire on the Hanford ALE in June 2000 that displaced elk onto private land. In 2007 another fire on ALE displaced elk onto private land again. WDFW hunter report data indicated a 2007 harvest of 95 elk (39 bulls, 56 antlerless). However, local interviews with hunters and landowners indicated a harvest of 141elk (54 bulls, 87 antlerless). Many harvested elk in the Rattlesnake Hills were taken on landowner damage permits outside of general seasons and may not have entered the database.

Harvest in GMUs 373 and 382 were 2 (1 bull, 1 antlerless) and 10 (3 bulls, 7 antlerless), respectively. 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 2007. Survey units were stratified and randomly selected. Approximately 90% 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.

Observed calf recruitment in both the Yakima and Colockum herds increased slightly from 2007 (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. The number of mature bulls was fairly low, but the large yearling bull recruitment from 2007 was evident (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. It is unknown what happened to the bulls. The most logical explanation is that the bulls are not wintering within the survey area. However, the actual bull ratio is probably still well below objective. Over the last 5 years, Colockum yearling bull recruitment through the hunting seasons has averaged 71, while adult bull harvest (including estimated tribal) has averaged over 90. The net loss of bulls to the herd has probably been about 150 if wounding loss and natural mortality are included.

Population status and trend analysis

In February/March 2007, the Colockum and Yakima herds were estimated at 3,890 $\pm$ 20 and 9,478 $\pm$ 389(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. Damage harvest in the Colockum herd continues to limit herd growth.

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

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
Mean[a]	415	306	1,031	1,045	21,526	4,176	5,601	31,110	9	11	9	9

[a] 10 Year Mean Ending 2005

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 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 PMU 34 population 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 the ALE wildfire, reduced the herd to about 520 on ALE. A low antlerless harvest in 2001-2006 has prevented achievement of the <350 elk population objective. Surveys in 2008 yielded a minimum count of 510 elk (270 cows, 103 calves, 137 bulls). Measures of variability are not available for the 2008 population estimate because the August 2007 fire on ALE made predictions of elk distributions inaccurate. Software used to calculate variances require accurate knowledge of elk locations prior to conducting surveys.

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 is shifting toward a late seral stage emphasis. This change in forest management is likely to reduce forage production on a portion of summer range. The reduction in forage production along with an increased awareness of watershed impacts is beginning to generate concern about cumulative ungulate grazing.

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.

In PMU 34, the major change to habitat was a fire that consumed most winter range for elk in June 2000. The short-term effect of the fire was to reduce herd productivity and push elk onto private ranches. The long-term effect is unknown. Repeated fires influences 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

Table 2. Colockum elk winter composition 1990-2006.

	Antlerless		Bulls			Ratios (per 100 cows)	
Year	Cow	Calves	Spike	Branched	Total 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

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

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, elk in PMU 34 cause the most significant damage in Region 3. Claims have largely been for damage to dryland wheat fields south of ALE. Typically elk enter the fields from ALE after sunset and return to ALE prior to sunrise. Starting in 2005 landowners have been issued damage prevention permits beginning in mid-May 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 PMU 34 elk to valuable tree crops further increases the risk. Several orchard and vineyard managers west of ALE have either 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 2007, 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 appears healthy. 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.

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 and safety, nor habitat management perspective. Hazing and targeting problem elk has reduced, but not eliminated damage. Landowner tolerance and WDFW's ability to pay for damage are finite. If the 2007 wildfire had occurred prior to wheat harvest, like it did in 2000, the number of crop damage complaints would have been substantially higher. The PMU 34 herd must be reduced to <350. 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

[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

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. 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 >250 animals. 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 (WDFW 2002).

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 1994-2007 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 1994-2007 in GMU 460 is presented in Fig. 2.

GMU 466 continues to be included in the general season with 1998 being the last year an antlerless elk could be taken. GMU 466 elk intermix with GMU 485 elk, and collared elk have been shown to move to winter range down the east side of the Cascades on Manastash Ridge to the L.T. Murray Wildlife Area (D. Vales, pers. comm.).

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.

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 have not hunted cows in GMU 466 for several years.) 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 2005-7 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).

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

Table 2. GMU 485 Post-hunt elk herd composition, 1984-2007 (ratios per 100 cows).

Year	Total Bull	Calves
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	6.3	14.8
1998 [a]	27	7
1999	14.7	6.4
2000 [a]	19.2	8.1
2000 [a]	22.8	9.9
2001	7.9	23.7
2002 [a]	16.1	32.3
2003 [a]	30.3 [b]	15.2
2004	23	27
2005	27	54
2006	36	47
2007	25	43

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

occurring within the City limit 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 (Table 3).

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.

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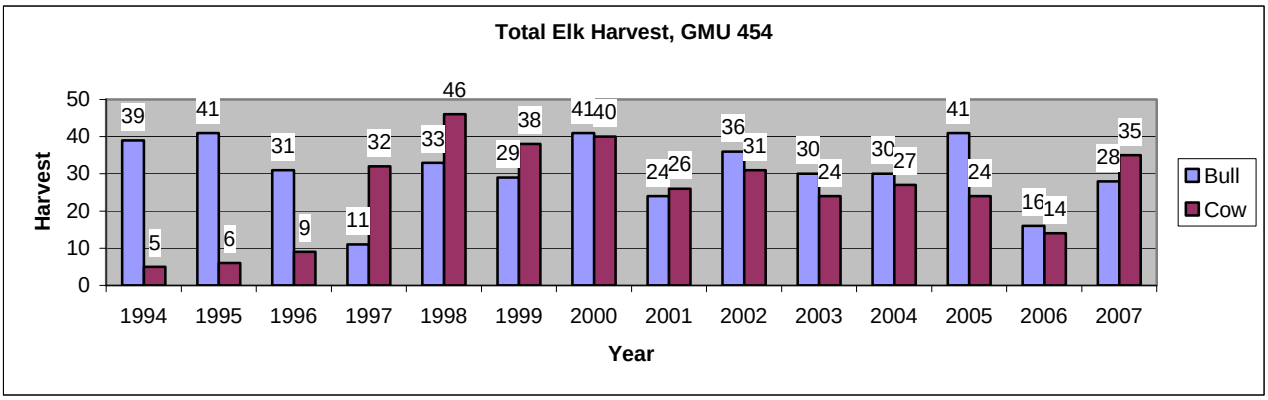

Figure 1. Annual elk harvest, GMU 454, 1994-2007 (all weapon types combined)

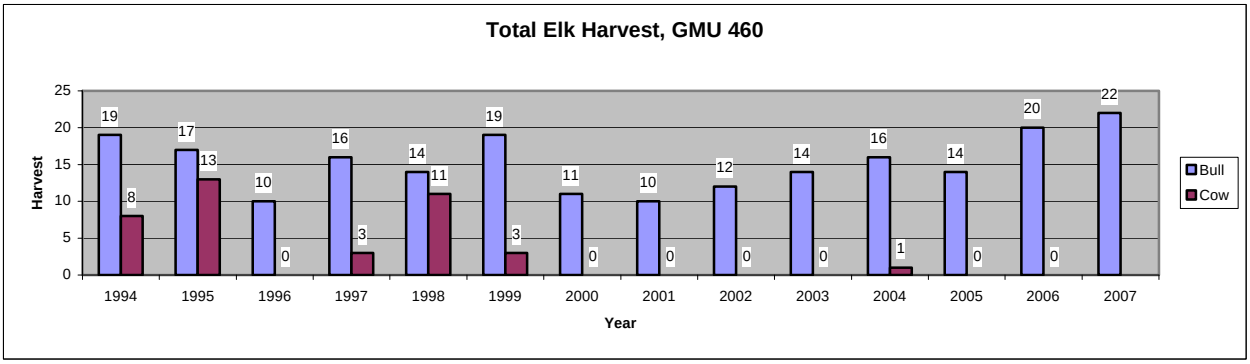

Figure 2. Annual elk harvest, GMU 460, 1994-2007 (all weapon types combined)

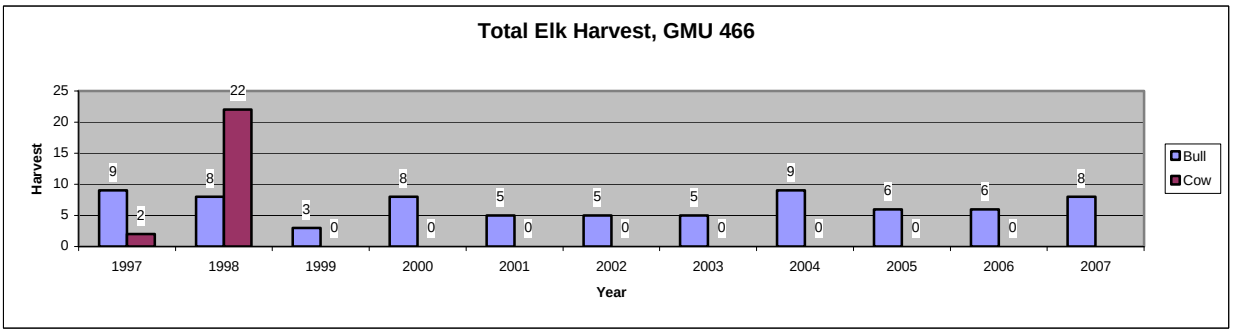

Figure 3. Annual elk harvest, GMU 466, 1997-2007(all weapon types combined)
*2004 harvest reflects uncorrected raw data reported from hunter reports

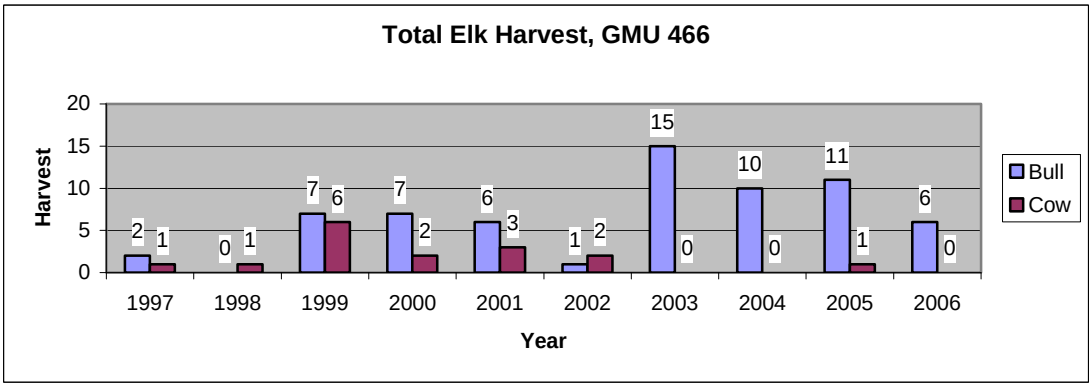

Figure 4. Annual elk harvest by tribes, GMU 466, 1998-2006; from http://www.nwifc.org/wildlife/bigame.asp

ELK STATUS AND TREND REPORT: REGION 4
PMU 45 – GMUs 418, 437
PMU 46 – GMU 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 2007, a bull only special permit hunt was initiated in GMU 418. 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. Both the Westside raffle tag holder and the auction tag holder hunted in GMU 418 in 2007. Out of the 15 state permits, 14 bulls were harvested and all but one modern firearm hunter were successful. 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). In addition to the special permit hunt in GMU 418, reported tribal harvest during 2007 was 1 bull in GMU 407, 1 cow in GMU 418, and 5 bulls and 5 cows in GMU 437. General season non-tribal harvest during the 2007 season was 1 bull taken by a modern firearm hunter in GMU 407 and 9 bulls and 3 cows taken by either archery or muzzleloader hunters in Elk Area 4941 (GMU 437). This is up from the 2 bulls and 5 cows taken in 2006. Tribal and non-tribal hunters harvested an additional 1 bull and 5 cows in the Acme area (GMU 418) using kill permits to address damage complaints.

There were 5 documented poaching/closed season violations between July 2007 and June 2008 with all 5 elk taken illegally in GMU 418. Other reported sources of human-related mortality include 6 elk-vehicle collisions and 1 capture mortality from a collaring effort.

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. In 2008, WDFW and Tribal biologists deployed GPS (Global Positioning System) collars on 10 elk (8 cows, 2 bulls) as part of a Sauk-Suiattle project examining elk habitat use. An additional 2 bull elk received radio-collars in April 2008 to increase the bull sample size for the estimation model. The North Cascade Elk Herd Plan (WDFW 2002) identifies the development of a statistically valid population estimation model as the highest research priority for this herd.

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. Current population estimates for the Nooksack Herd based upon aerial surveys done in March 2008 are between 600 and 700 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	All Bulls:Cow	Branch Bulls:Cow	Calves:Cow
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)

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. A grant has been awarded to the Sauk-Suiattle Tribe to put GPS collars on 10 Nooksack elk and 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 hunter. 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 75 – 150 animals in 2007. 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 kill permits, appear to have reduced the number of animals in using this area considerably. Tribal personnel, in coordination with WDFW, successfully trapped and relocated 2 cows and 3 yearlings out of the Acme area in March 2008. Despite these efforts, elk damage complaints in the traditional problem areas persist. From July 2007-June 2008 there were 17 documented elk damage complaints in the Hwy 20 corridor from Sedro-Woolley to Concrete. Two damage claims have been received (1 in GMU 418 and 1 in GMU 437) but no damages had been paid as of September 2008. 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. A bull only special permit hunt in GMU 418 is planned for the 2008 season.

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 (75-150 animals).
- Continue to collect genetic samples from the North Cascade elk herd.
- Complete a Habitat Landscape Evaluation for GMU 437 (Sauk).

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

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Population Objectives/Guidelines

The Washington Department of Fish and Wildlife's (WDFW) population management goals for elk (*Cervus elaphus*) in all Game Management Units (GMUs) of Region 5 are to "manage for viable and productive elk populations with desirable population characteristics" and "to provide recreational opportunity and sustainable annual harvests" (WDFW 2003). Specific Region 5 objectives include: (1) manage general hunting GMUs to achieve post season bull elk escapement objectives of 12-20 bulls per 100 cows, (2) manage limited entry GMUs for 15-25 bulls per 100 cows, and (3) discourage the proliferation of elk in several units by using liberal regulations to reduce damage. In general, herd productivity is managed to maintain the population objective within 5% and is re-evaluated every six years (WDFW 2003). The St Helens Elk Herd Plan was approved in November 2006 and its guidelines follow those above with an overall goal of decreasing the elk population to approximately 10,000 (WDFW 2006) to address biological and social parameters.

Hunting Seasons and Harvest Trends

Historically, data on elk harvest, hunter success, and hunter effort were obtained annually through the WDFW hunter questionnaire and mandatory hunter report cards issued with each elk permit. Beginning in 2001, all hunters were required to report their hunting activity via the phone or Internet prior to obtaining their next years' license. This new mandatory harvest reporting structure increases the precision of harvest data.

Elk are hunted under WDFW's resource allocation strategy. Hunters must choose a weapon type (modern firearm, muzzleloader, or archery), each of which has distinct seasons of varying length designed to minimize hunter crowding and the chance of over-exploitation, as well as to provide equal opportunity. Season length and timing are determined by 3-year hunting packages. The current hunting package operates from 2006 to 2008.

As previously mentioned, in 2007 elk were managed under four principal harvest strategies in Region 5. During the modern firearm season these were:

- Any-elk (where any elk is legal) GMUs 564, 568, 574, 578, and 388 (previously GMU 588).
- 3-pt minimum (any bull with 3 or more antler points is legal) GMUs 503, 504, 505, 506, 510, 513, 516, 520, 530, 550, 554, 560, and 572.
- 3-pt or antlerless GMU 501.
- Permit only (limited entry, hunting by permit draw only) GMUs 524, 556, and 522.

Beginning in 2003, antlerless harvest in GMUs 506, 520, and 530 was reduced in modern firearm antlerless permits and there was an elimination of early-season archery cow harvest. This harvest strategy was modified in 2005 with an increased antlerless harvest in all 3 units. Antlerless harvest has been curtailed for all user groups entirely in GMUs 510, 513, and 516. In all other units, apart from the permit only GMUs, antlerless harvest was allowed during archery seasons. Antlerless harvest was also allowed during late muzzleloader in GMUs 503 and 505, and by permit during general firearm and muzzleloader seasons.

Since 2006, permit levels have increased for modern firearm, muzzleloader and archery (both bull and antlerless permits). A total of 588 additional permits were distributed within 17 new hunts in the Region for the 2007 season.

Antlerless permits were substantially increased in 2007 for all seasons within all of the Mount Saint Helens herd GMUs to assist with the population reduction goal. Additionally, permit hunts on the Mount Saint Helens Wildlife Area within GMU 522 continued in 2007. Twelve permits for antlerless elk and twelve permits for any elk were offered to disabled hunters, eighteen permits for antlerless elk were offered to youth hunters, and eighteen permits for antlerless elk were offered to senior hunters.

Hunting conditions were hotter and drier than average at the beginning of the 2007 elk season and continued with a damaging windstorm and a wet late season with higher than normal snowpack in the cascades. In Region 5, a total of 30,671 elk hunters spent 173,748 days afield in 2007. Region 5 general season harvest was 2,754 elk and permit season was 1,026; total harvest in the Region was 3,780. Overall hunter success during the general season was 9% and 43% during the permit season. The 2007 general season elk harvest of 2,754 was down 4% from the 2000 harvest of 2,865, and 8% higher than last year's harvest of 2,544 (Table 1).

The results of elk harvest in Region 5 are presented in Tables 2a and 2b. Most units in Region 5 had fairly similar harvest rates in the general season compared to 2006. GMU's 560, 572, and 520 had notable increases as compared to 2006. Permit harvest rates were higher in most units with the increased permit levels.

Surveys

Since 1996, fall composition counts have been conducted. Data from these counts are used to evaluate (1) whether elk herds are meeting productivity and escapement goals, (2) the effect of alternative harvest strategies on bull elk population structure, and (3) information as input into the elk reconstruction model (Bender and Spencer 1999).

In 2007-2008, herd composition counts were conducted in both the fall and early spring. Fall composition counts are used to generate calf:cow, bull:cow, and bull age structure ratios. Fall calf:cow ratios are an index of population productivity. Since bulls, cows, and calves freely intermix during and immediately after the rut, fall composition counts may provide adequate indices of bull:cow ratios, however, dominant bulls tending harems may be more likely to be surveyed than subordinate bulls on the periphery. Bull:cow ratios are used to assess bull escapement, which provides information on the number of bulls available for breeding and harvest. Bull age structure is used to estimate annual bull elk mortality rates and, in conjunction with population reconstruction, post-season escapement. Spring composition counts were conducted in areas where fall sample sizes were poor and to help better understand the over-winter survival of young animals.

Counts were conducted from a helicopter. All elk encountered were recorded. All sample units (SUs) were sampled only once and SUs were widely spaced (>5 miles between SUs). Since sampling was accomplished within a short time period, the possibility of double count bias was minimized. In 2007, fall surveys were conducted on September 4, 5, 24, 25, 26 and October 3. Observed elk were classified as calf, cow, or bull. Bull elk were further classified by number of antler points to determine the percentage of spike, raghorn (2 to 4 antler points), and mature (heavily beamed, five or more antler points) bulls present in the herds. Data were used to generate calf:cow and bull:cow ratios, expressed as the number of bulls or calves per 100 cows. Ninety percent confidence intervals were constructed around the ratios following Czaplewski et al. (1983).

A total of 1,689elk were classified during the fall 2007 surveys (Table 3). Sample sizes were very low for Yale (GMU 554).

Post-season surveys were conducted on March 6, 2008 to evaluate the utility of surveys during this time period. Post-season surveys offer an opportunity for direct observation of population ratios following hunting season and therefore, directly measure objectives set forth in the Game Management Plan. Furthermore, survey logistics are arguably more favorable in winter due to lower temperatures and lack of leaves on deciduous trees. Low-elevation snowfall concentrated elk on lower slopes.

Observers classified a total of 108 elk during winter surveys in 2008. Sample sizes were small for both units surveyed. Winter surveys during 2008 were very limited due to budget constraints. The results of post-season elk surveys in Region 5 are presented in Table 4.

Demographic parameters are presented in Tables 3, 4, and 5. Confidence intervals continue to be wide in relation to the given parameter. Survey sample sizes greater than 200 elk tend to yield tighter estimates. It will likely require more effort than current funding allows to reduce these confidence intervals to desirable levels. One approach would be to sample fewer units more thoroughly on a bi- or tri-yearly basis.

Permit Units

The bull mortality rate in Toutle (GMU 556) was 20% and in Margaret (GMU 524) was 26% (Table 6). Both the bull:cow and calf:cow ratios were within the acceptable ranges.

We are meeting our escapement objectives in these 2 units (Table 7). The winter of 2007-08 was an especially harsh one in the cascade region; 213-250% normal snow pack reported in the mountains. This year 158 elk died on the Mount Saint Helens Wildlife Area as a result of these conditions. Emergency feeding operations were put in place on the mudflow (Elk Area 5099) due to the abnormally harsh winter conditions, high number of elk on the Wildlife Area, and public input, but high mortality still existed. To meet the herd reduction goal as well as to address low public tolerance to winter mortality, especially in highly visible areas like the Toutle River valley near Mount Saint Helens, increased permit levels in all the St. Helens herd permit units were issued to help provide additional harvest in the area. Additional hunts and permits were also added on the mudflow (Elk Area 5099/GMU 522).

Open Entry Units

Productivity ratios were good throughout the Region, falling between 42 and 46 calves to 100 cows (Tables 3, 4, 5, 6, and 8). Fall bull ratios were adequate. Spikes made up the majority of bulls at 49% and raghorns comprised 42%. The presence of mature bulls increased from 2006 (3%) throughout the open-entry units. Mature bulls comprised 9% of the sampled bull population, which was the average in these units prior to 3-pt minimum regulations.

Surveys indicate that 3-pt minimum regulation has mostly resulted in the achievement of bull mortality rate objectives. In GMU 550, bull mortality was 46%. Bull mortality and escapement in GMUs 506 and 530 has been of concern (Table 9). Surveys conducted in GMU 506 during 2007-08 showed 52% bull mortality and small sample size (n=75) confounded the GMU 530 data. Both the units shall continue to be closely monitored.

Productivity in GMU 506 is adequate with a 46

calves to 100 cows ratio. This indicator of recruitment is good for overall elk numbers but will not be enough to address the low proportion of males in the population.

Conditions of closed canopy persist in the Cascade elk units, still making adequate sample sizes difficult to obtain. Differences exist in habitat, climate, and access between the Cascades and the lowland areas. Survey effort must continue in both to insure the 3-pt minimum regulations allow our elk populations to meet escapement goals (Table 10).

Survey data and modeling indicate that the lowland units continue to fall within objectives for escapement. However, the long-term trend for bull mortality in the Willapa units, both GMU 530 and GMU 506, must be closely monitored. Bull mortality rates for the two lowland PMU's (56 and 57) were 46% and 57% this year (Table 5). However, for PMU 57 inadequate sample size in GMU 530 (n=75) biased meaningful data analysis.

Population Status and Trend

Estimates using population reconstruction are very responsive to harvest levels. Therefore, in a year where many units had increased harvest, the population estimate also showed an increase. We are cautious to interpret this estimate in isolation, and look to multi-year trends in survey ratio's, harvest figures, and population estimates for a more robust interpretation. In addition, applying these numerical indicators to a larger geographic scale will help to reduce errors in interpretation. Again, larger survey sample sizes and accurate harvest reporting are the means to better population modeling and estimation.

Habitat Condition and Trend

In most years, climate tends to have a negligible effect on regional elk populations west of the Cascade Crest. Localized effects, however, can be drastic. Although snowfall at higher elevations may be heavy, subsequent freezing conditions seldom occur. Elk summering at higher elevations tend to be migratory in response to snow, whereas elk at lower elevations exhibit year-round fidelity to those areas. The primary effect of climate on elk west of the Cascade Crest is the influence it exerts on hunting pressure.

Winter conditions in 2007 began with a severe windstorm and wet conditions with early snows. Public concern and harsh winter conditions on the Mount St. Helens Wildlife Area (MSHWA) led to discussions about feeding the elk on a temporary, emergency basis. Feeding began in early January and continued through early April of 2008. During this time, per the MSHWA management plan, the MSHWA was closed to public entry from December 1 until May 1. A total of 131 tons of alfalfa hay were fed. High counts of elk using the wildlife area during the feeding operation were approximately 800; this count being an all-time high for elk on the area. The wildlife area was re-opened to the public on May 1st. This emergency feeding effort is not considered a long-term solution to the problem of poor habitat quality and high elk numbers in the St. Helen herd area. Even with emergency feeding, 158 elk were documented in the spring elk mortality survey on the MSHWA.

East of the Cascade crest climate will periodically result in significant winterkill of elk. The last significant winter kill occurred during the winter of 1991-1992. The winter of 2002-03 was mild at the lower elevations, with very little snowfall. A small fraction of Region 5 elk occurs east of the Cascade Crest. On a Regional basis, and only during extreme winters, will weather significantly influence elk population numbers.

Commercial forest owners in the two Willapa Hills units (530 and 506) have increased timber harvest activity in the past 4 years. Much more acreage is now in early successional stages and harvest rates of elk were up in 2005 but declined in 2006 and 2007. Complaints of damage to both replanted forest areas and agricultural crops are increasing, especially in GMU 530.

Region 5 continues to face loss of elk habitat through: (1) establishment of extensive Late Successional Reserve (LSR) on US Forest Service (USFS) lands that reduce forage habitat, (2) increased residential development along the three hydroelectric reservoirs (Merwin, Swift, and Yale Reservoirs) that had inundated historical winter range, decreases in winter range acreage along the Lewis River watershed, and (3) general increases in development and human encroachment throughout the lowlands of Region 5, which can result in a lower tolerance by landowners to the presence of elk.

Mitigation for the loss of winter range along the Lewis River watershed has been addressed in the Merwin Wildlife Management Plan. The Plan is a cooperative management agreement for Merwin Reservoir between Pacificorp (Portland OR); the utility company managing Merwin, Swift, and Yale Reservoirs; and the WDFW. Similar efforts have recently been initiated on company lands surrounding Yale and Swift Reservoirs.

Augmentation / Habitat Enhancement

The WDFW continues to take steps to enhance forage quality on the North Toutle mudflow through plantings and fertilization. Enhancement activities in the past year included planting 12,000 saplings for riverbank stabilization as well as constructing wood piling structures to deflect water from the banks and gather sediment behind the structures. Fertilizing was accomplished on 43 acres of forage, with lime applied to 33 acres.

The herd plan for the Mount Saint Helens elk herd was adopted in November of 2006. Many factors, which include increased human population, damage complaints, and declining habitat on USFS and other timberlands, when combined, suggest a proposed herd reduction from approximately 13,500 to 10,000 elk to bring the herd into

balance with the amount of available habitat. Other objectives specified in the Mount Saint Helens Elk Herd Plan are to continue post-season bull ratio and mortality rate goals for open-entry, three-point, and permit-entry units as stated at the beginning of this report. 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. This plan was submitted for public review and three public meetings were held to gather input from citizens.

Management Conclusions

Post-hunt bull escapement ratios in the Region's 3-point units fell within WDFW's objectives of 12-20 bulls per 100 cows in those GMUs that were evaluated (Table 7). Permit entry GMUs 524 and 556 had bull:cow post-season ratios of 23 and 26:100, respectively; achieving the management goal of 15-25 bulls:100 cows established for limited entry GMUs.

Historically, PMU 56 has not met some goals, and changes in management may be needed. However, detailed studies of those portions of Region 5 west of Interstate 5 were not conducted in 2007-08.

Recent survey coverage has been inadequate to provide representative sampling of most parts of the Region. Increased effort in the Cascade units, where historically survey sample sizes have been low, should continue.

Population modeling is dependent on good data input. Due to the variability in the Region's elk units, representative survey data must be collected annually. Pre-season survey intensity needs to remain high, in order to increase sample sizes, reduce confidence intervals, and provide the best model inputs unless, or until, more effective techniques can be identified and evaluated. Post-season surveys seem like a more worthwhile effort if time and funds are available to conduct them consistently.

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Table 1. Southwest Washington (Region Five) Elk Harvest for the 2007 General Hunting Season.

WEAPON TYPE	BULL HARVEST	COW HARVEST	TOTAL HARVEST	# HUNTERS	HUNTER SUCCESS	HUNTER DAYS	DAYS/ KILL
M. FIREARM	1,182	166	1,348	17,662	0.08	88,882	65.9
ARCHERY	440	466	906	7,308	0.12	51,066	56.4
MUZZLELOADER	270	193	463	5,454	0.08	31,719	68.5
TOTAL	1,919	835	2,754	30,671	0.09	173,748	63.1

Table 2a. Southwest Washington (Region Five) Elk Harvest for the 2007 General Hunting Season by Population Management Unit (PMU) and Game Management Unit (GMU).

PMU	GMU	BULL HARVEST	COW HARVEST	TOTAL HARVEST	# HUNTERS	HUNTER SUCCESS	HUNTER DAYS	DAYS/ KILL
P51	578	81	92	173	1,928	0.09	9,752	56.4
	388	5	3	8	258	0.03	1,366	170.8
	SUM	**86**	**95**	**181**	**2,192**	**0.08**	**11,118**	**61.4**
P52	564	44	76	120	729	0.17	3,715	31.0
	568	28	36	64	675	0.10	3,268	51.1
	574	26	63	89	1,226	0.07	5,944	66.8
	SUM	**98**	**175**	**273**	**2,555**	**0.11**	**12,927**	**47.4**
P53	554	8	6	14	294	0.05	1,568	112.0
	SUM	**8**	**6**	**14**	**294**	**0.05**	**1,568**	**112.0**
P54	516	119	0	119	1,739	0.07	9,032	75.9
	560	318	72	390	4,542	0.09	26,588	68.1
	572	121	28	149	1,942	0.08	10,718	71.9
	SUM	**558**	**100**	**658**	**7,973**	**0.08**	**46,338**	**70.4**
P55	510	11	0	11	165	0.07	695	63.2
	513	40	0	40	494	0.08	2,419	60.5
	SUM	**51**	**0**	**51**	**655**	**0.08**	**3,114**	**61.1**
P56	503	37	21	58	948	0.06	4,475	77.2
	505	41	48	89	1,251	0.07	6,438	72.3
	520	300	175	475	4,708	0.10	28,161	59.3
	550	243	40	283	3,836	0.07	21,284	75.2
	SUM	**621**	**284**	**905**	**10,360**	**0.09**	**60,358**	**66.7**
P57	501	52	47	99	1,183	0.08	5,952	60.1
	504	40	7	47	674	0.07	4,214	89.7
	506	188	56	244	2,264	0.11	12,918	52.9
	530	217	65	282	2,757	.010	15,189	53.9
	SUM	**497**	**175**	**672**	**6,633**	**0.10**	**38,273**	**57.0**

Table 2b. Southwest Washington (Region Five) Elk Harvest for the 2007 Permit Hunting Season by Population Management Unit (PMU) and Game Management Unit (GMU).

PMU	GMU	BULL HARVEST	COW HARVEST	TOTAL HARVEST	# HUNTERS	HUNTER SUCCESS
P51	578	0	1	1	8	0.13
	SUM	**0**	**1**	**1**	**8**	**0.13**
P53	522	5	10	15	32	0.47
	524	37	89	126	195	0.65
	554	20	18	38	113	0.34
	556	78	132	210	405	0.52
	SUM	**140**	**249**	**299**	**745**	**0.40**
P54	516	2	0	2	3	0.67
	560	7	132	139	463	0.30
	572	3	49	52	170	0.31
	SUM	**12**	**181**	**193**	**636**	**0.30**
P55	513	0	0	0	1	0.00
	SUM	**0**	**0**	**0**	**1**	**0.00**
P56	503	0	17	17	25	0.68
	505	1	22	23	62	0.37
	520	5	90	95	198	0.48
	550	1	196	197	293	0.67
	SUM	**7**	**325**	**332**	**578**	**0.57**
P57	504	3	51	54	175	0.31
	506	0	15	15	34	0.44
	530	0	42	42	71	0.59
	SUM	**3**	**108**	**111**	**280**	**0.40**

Table 3. Fall Helicopter Survey Data and Ratios, Sept - Oct 2007.

PMU	GMU	Spike	Rag	Mature	Bull	Cow	Calf	Unk	Total	BU: CO	CA: CO	Bull mort
P53	524	19	30	23	72	247	85	0	404	29±4	34±4	.26
P53	554	2	3	0	5	12	4	0	21	NA	NA	NA
P53	556	12	45	2	59	190	92	20	361	31±6	48±9	.20
P56	520	28	25	7	60	182	78	0	320	33±6	43±7	.47
P56	550	24	24	4	52	193	81	0	326	27±6	42±7	.46
P57	506	15	11	1	27	119	55	0	201	23±6	46±12	.52
P57	530	6	1	1	8	47	20	0	75	NA	NA	NA

NA – Sample size too small for meaningful analysis

Table 4. Winter Helicopter Survey Data and Ratios, Mar 2008.

PMU	GMU	Spike	Rag	Mature	Bull	Cow	Calf	Unk	Total	BU: CO	CA: CO
P54	560	1	0	0	1	38	18	0	57	NA	NA
P54	572	0	2	0	2	36	12	0	50	NA	NA

NA -- Sample size too small for meaningful analysis

Table 5. Demographic Parameters Combined by PMU, Sept - Oct. 2007.

PMU	SAMPLE SIZE	BULL: COW	CALF: COW	BULL MORTALITY
P53	786	30±4	40±5	.24
P56	646	30±5	42±6	.46
P57	276	21±4	51±8	.57

Table 6. Historic Survey and Demographic Data from GMU's 524** and 556, 1995-2007.

GMU	YEAR	SPIKE	RAG	MATURE	BULL	COW	CALF	TOTAL	B:CO	CA:CO	BULL MORT
524	2007	19		53***	72	247	85	404	29±4	34±4	26%
	2006	7	67	19	93	211	54	358	44±5	26±4	8%
	2005**										
	2004	26	65	16	107	257	73	437	42±5	28±3	24%
	2003	19	43	16	78	124	53	255	63±*	43±*	24%
	2002	22	42	19	83	132	77	292	63±5	58±9	26%
	2001	37	38	15	90	153	95	338	59±8	62±8	41%
	2000	39	55	13	107	189	85	381	57±5	45±4	36%
	1999	13	39	11	63	145	44	252	43±8	31±6	21%
	1998	38	37	20	95	193	70	358	49±6	36±5	40%
	1997	35	39	26	100	210	100	410	48±5	48±5	35%
	1996	34	29	27	90	167	75	332	54±6	45±5	38%
	1995	25	28	20	73	128	70	271	57±9	55±9	34%
556	2007	12	45	2	59	190	93	361	31±6	48±9	20%
	2006	12	34	0	46	166	54	280	36±7	33±7	26%
	2005	13	22	2	37	75	33	145	49±13	44±12	35%
	2004	10	27	4	41	139	55	235	30±4	40±5	24%
	2003	11	42	3	56	133	70	259	42±10	53±12	20%
	2002	24	60	11	85	199	74	369	48±4	37±3	25%
	2001	10	21	12	43	144	65	252	30±7	45±9	23%
	2000	17	27	4	48	140	73	261	34±7	52±10	35%
	1999	5	20	3	28	84	29	141	33±10	35±11	18%
	1998	29	20	7	56	158	52	266	35±7	33±7	52%
	1997	18	17	11	46	131	64	241	35±7	49±10	39%
	1996	25	27	16	68	109	53	230	44±9	49±9	37%
	1995	18	13	9	40	92	47	179	43±11	51±13	45%

- * Anomaly in population model estimate prohibited confidence interval calculation.
- ** 524 not flown in 2005 due to budget constraints.
- ***Differentiation between rag and mature not made during survey. Classified as branched bull.

Table 7. Southwest Washington (Region 5) post-season Bull:Cow ratios 2007-2008 by GMU. [GMU 560 includes former GMU 558.]

SEASON	GMU	POST-SEASON BU:CO	REGION OBJECTIVE BU:CO
Limited entry	524	23:100	15-25
Limited entry	556	26:100	15-25
General	550	16:100	12-20
General	560	18:100	12-20

all evaluated through population modeling

Table 8. Historic Pooled Demographic Parameters from GMU's 520* and 550, 1995-2007.

YEAR	BULL:COW	CALF:COW	BULL MORTALITY	SAMPLE SIZE
2007	30±5	42±6	46%	646
2006*	34±10	53±14	52%	169
2005	42±6	46±7	42%	506
2004	32±8	38±9	52%	253
2003	59±14	44±11	57%	230
2002	61±4	50±4	52%	415
2001	40±7	48±8	61%	390
2000	46±9	49±10	62%	291
1999	30±10	51±15	38%	143
1998	37±8	33±7	68%	267
1997	26±5	42±7	74%	296
1996	26±9	42±12	70%	151
1995	24±6	54±11	82%	293

*520 not flown in 2006 due to budget constraints.

Table 9. Historic Demographic Parameters for GMU 530, 1995-2007.

YEAR	BULL:COW	CALF:COW	BULL MORTALITY	SAMPLE SIZE
2007	17±6	43±10	75%	75
2006	29±12	41±16	60%	87
2005	45±11	47±12	60%	179
2004	40±14	32±11	46%	112
2003	28±7	54±11	58%	78
2002	53±6	60±6	62%	196
2001	42±18	46±21	64%	261
2000	63±11	54±15	71%	145
1999	36±12	56±17	67%	128
1998	26±10	47±16	50%	107
1997	31±11	39±13	64%	122
1996	21±8	39±12	56%	135
1995	39±12	47±14	50%	134

Table 10. Pooled Survey Data by Geographic Area, 2007.

SURVEY	LOCALE	PMU	SPIKE	RAG	MATURE	BULL	COW	CALF	TOTAL
FALL	CASCADES	53	33	78	25	136	449	181	766
WINTER	CASCADES	54	1	2	0	3	74	30	107
FALL	LOWLANDS	56+57	73	61	13	147	541	234	922

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

H. M. ZAHN, District Wildlife Biologist

Population objectives and guidelines

The year 2007 hunting season was the second 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 will need to be cooperatively developed and implemented with Olympic Peninsula Treaty Tribes.

Hunting seasons and harvest trends

For the year 2007 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 580 special elk permits were authorized by the commission of which 571 were actually issued. These permits were issued to all user groups including Advanced Hunter Education graduates, youths and persons of disability. Only 142 of these permits were issued on the Olympia 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 1008 (771 antlered, 237 antlerless) during general elk seasons, up 26 percent over the previous year. The estimate of the number of elk hunters in Region 6 increased by about 2 percent for the same period. The percentage breakdown of the total elk harvest by user group was 43%, 34%, and 22% for modern firearm, archery, and muzzleloader users respectively. General seasons harvest estimates of antlered elk by Population Management Units (PMU) are listed in Table 1.

Table 1. Antlered elk harvest by PMU for general seasons 2001-2007.

PMU	2001	2002	2003	2004	2005	2006	2007
61	310	399	383	363	403	319	374
62	57	68	89	73	75	83	98
63	73	86	80	70	66	46	56
64	3	5	7	1	2	0	0
65	105	90	127	108	97	89	114
66	40	74	67	45	52	48	77
67	47	52	54	50	61	29	52
Total	635	774	807	710	756	614	771

Special permit holders took an additional 150 elk during permit seasons (33 antlered and 117 antlerless). 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 771 in 2007. This is a 26 percent increase over the previous year. An additional 33 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 374. 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 (2002-2006) GMU 673 (Williams Creek) has supported an average annual general elk season antlered harvest of 124 bulls. The 2007 harvest for this unit was 113 antlered elk, which was also the estimated 2006 harvest. 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 114 bulls, an increase of 28 percent over the previous year.

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. Due to a Department moratorium on aerial captures no bull elk were radioed in the fall of 2007. However, tagging continued in July of 2008 when 12 branch-antlered bulls and 2 yearling bulls (spikes) were radioed. As of the beginning of the early archery season in September 2008 we were monitoring 24 branch-antlered bulls and 2 spikes.

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 survey 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 post-season surveys (conducted April 3 and 4, 2007) are summarized in Table 3. 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, given the assumptions of a stable population and a stable age structure in the population. 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 2007 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 – 1990s although still below the 1980s 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 harvest continues 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 previous 3-year season package were carried over into the year 2007 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 (September 27,28, 2007)

		Antlerless		Antlered		Ratios per 100 cows		
GMU	*n*	Cows	Calves	Spikes	Branch	Calves	Spikes	Branch
673	131	79	34	11	7	43	14	9
658	152	102	32	9	9	31	9	9

Table 3. Results of post-season elk surveys (April 9-10, 2008).

		Antlerless		Antlered		Ratios per 100 cows		
GMU	*n*	Cows	Calves	Spikes	Branch	Calves	Spikes	Branch
673	294	184	75	30	5	41	16	3
658	139	89	37	8	5	42	9	6

Mountain Goat

MOUNTAIN GOAT STATUS AND TREND REPORT: REGION 2
Methow Unit 2-2

SCOTT FITKIN, District Wildlife Biologist
JEFF HEINLEN, Wildlife Biologist

Population Objectives/guidelines

Currently, the Methow unit 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, are encouraged.

Hunting Seasons And Harvest Trends

Hunters enjoyed good conditions in 2007 with the high country remaining accessible throughout the season. The two issued permits yielded one harvested goat in 2007 (Table 1), and hunters saw an average of 4 goats. For 2008, WDFW again issued two permits in the Methow Unit.

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	100%	4

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. Surveys during the summer of 2007 yielded a count of 61 animals; with only 8 animals observed in the Mt Gardner portion of the unit despite excellent survey conditions. 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 surveys were conducted in 2008 (Table 2).

Table 2. Population composition counts from the Methow Unit, 1995-2008.

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	--	--	--	--	--

*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. Data collection is complete on the two mountain goats that were radio-marked in Goat Unit 2-2. Valuable information on seasonal movements and habitat was obtained and is now being analyzed. These animals were part of a larger effort to assess population parameters and habitat relationships. Also, a sightability model is being developed to improve survey data accuracy and consistency.

Population Status And Trend Analysis

Consistent funding has allowed for a consistent survey effort in the Methow Unit for several years. The population appears to be relatively 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; however, anecdotal information from outfitters and others suggests no major changes in abundance or distribution.

Habitat Condition And Trend

Goats in the Okanogan District had to contend with a moderately hard winter this past year and a cold spring. Some winter mortality may have occurred however, this is difficult to quantify in Mt. Goat populations.

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

Early indications from ongoing research suggest a conservative approach to mountain goat harvest is warranted. Setting appropriate harvest levels hinges on reliable survey data. As a result, emphasis should remain on providing the resources necessary for a consistent survey effort. Sightability of the animals can be quite variable in portions of the unit. Current research to develop a sightability index will produce more accurate and dependable survey results.

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 splitting the Unit into two separate portions 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. In light of these conditions, a conservative harvest strategy in the Methow Unit should continue. 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. The herd productivity goal is 25 kids: 100 adults, and harvest opportunity is only considered for stable or increasing populations exceeding 50 adults and meeting the productivity goal. For goat populations meeting or exceeding these guidelines, harvest is limited to no more than 4% of the observed adult population.

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. None of these permits were successful except in 2004 when one male goat was harvested.

Surveys

Two survey methods have been used to monitor mountain goat populations in Chelan County, in addition to incidental observations. As part of a hydropower license agreement, the Chelan Public Utility District (PUD) annually completes 12 winter wildlife surveys by boat on Lake Chelan (Chelan County's largest contiguous mountain goat habitat). For Lake Chelan, the total number of known goats is the result of comparing all surveys completed during each winter. This is the only consistently collected, long-term data for Chelan County goats.

In other areas of Chelan County, helicopter surveys have been used in recent years in selected mountain goat ranges. Because of difficult terrain and low population densities, mountain goats are expensive to monitor. Population objectives have been established for each geographic mountain goat range within the Wenatchee District, but are rarely attained (Table 2). There were no helicopter surveys in 2007-2008.

Population Status And Trend Analysis

Mountain goat populations in Chelan County appear to be below historic levels of the 1960s to 1980s. 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 declining (Table 2).

In July 2004, two adult nannies were collared in the District and one in January 2004, as part of a statewide goat research project. 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 time we have documented that the Wenatchee District and Region 4 share goats between areas. In fall 2006, 3 goats that were collared on Gamma Ridge were found east in Chelan County.

The current Lake Chelan goat population is considerably less than the estimated 500 goats in the area in the 1960s. The Lake Chelan populations have been closely monitored by the Chelan PUD for the past 20 years. There is no apparent trend in this population since 1994 (Table 3). Kid:adult ratios are within productivity goals of 25 kids:100 adults, over a three year period, averaging 27 kids:100 Adults for 2005-2007. During 2005-2007 the Chelan PUD estimated

Table. 1. Summary of harvest information for mountain goats for north Lake Chelan, 2001-2007.

Year	Permits	Hunters	Harvest	Success	Goats seen/hunter	Days hunted	Average days/kill
2001	2	2	2	100	24	6	3
2002	1	1	0	0	0	20	
2003	1	1	0	0	12	8	
2004	1	1	1	100	3	3	3
2005	1	1	0	0	25	15	
2006	1	1	0	0	0	1	
2007	1	1	0	0	27	12	

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

Area[a]	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	Population objective
N. Lake Chelan	42	80	64	58	68	44	71	72	118	91	75	97	100
S. Lake Chelan	13	44	41	40	31	28	39	56	49	57	102	42	50
Stehiekin	4		5		6	2				4			25
Chiwawa	14	15				12	19						30
N. Wenatchee River	42	6	27		35								30
E. Stevens	33	14	13			1	18						30
Total	123	163	150	98	140	87	147	128	167	152	177	139	265

[a] Chiwawa = Chelan County north of Little Wenatchee River, east of Cascade Crest; East Stevens = North of highway 2, south of Little Wenatchee (Nason Ridge); North Wenatchee River = West of highway 97, north Chelan/Kittitas county line, east of Cascade Crest, south of highway 2.

Table 3. Chelan PUD's mountain goat population composition for Lake Chelan, Chelan County, 1994-2007.

Year	No. kids	No. adults	Unk.	Total Count	Kids:100 adults
1994	25	98		123	26
1995	12	109		121	11
1996	7	47		54	15
1997	18	105		123	17
1998	17	93		110	18
1999	19	79		98	24
2000	24	76	5	100	32
2001	14	60		74	23
2002	21	89		110	24
2003	25	103		128	24
2004	29	138		167	21
2005	29	120	3	152	24
2006	48	129		177	37
2007	26	113		139	23
Average	22	97		120	23

the north shore population at 95 goats (range:75-118), with 22 kids:100 adults (range: 18-29). The south shore population was estimated at an average of 69 goats (range: 49-102), with 36 kids:100 adults (range: 29-44).

The north and south shores of Lake Chelan were flown two times (Jun, Jul) during summer 2005, as part of the development of a sightability model for mountain goats. Based on the average of June and July counts in survey blocks done during both months in 2005, an estimated 76 goats were on the north shore and 66 goats on the south shore using a preliminary model.

Statewide mountain goat strategies recommend that before a population is hunted that the population be at least 50 goats with at least 25 kids:100 adults over a 3-year period. During 2005-2007 the south shore Lake Chelan population was estimated at an average of 69 goats (range: 49-102) with 36 kids:100 adults (range:29-44) using Chelan PUD's data. Based on these criteria, a permit could be issued for the South Shore. An estimated 66 goats were found on the south shore in 2005 using the sightability model. Because the south shore population is small, it is vulnerable to stochastic weather events that could cause it to decline. This population should continue to be surveyed annually to ensure population and production objectives are met.

The North Shore Lake Chelan, currently hunted under a single permit, is estimated to have a population size of 95 goats, averaged over the last three years (range 75-118), based on Chelan PUD winter surveys. However, observed kid: non-kid ratios have only averaged 22:100, over the same three-year period. This is below the 25:100 threshold for hunting harvest. The four-year success rate of 25% is also below the minimum 50% threshold. Only one goat has been harvested the past 5 seasons, for a 20% five year success rate. Including the first season when 2 hunters harvested two goats, the seven-year success rate has been 28%. Despite the low kid:adult ratio, and harvest success below management objectives, goat counts have been relatively high, and harvest of 3 billies in six years from a population averaging 95 goats over the last three years (range 75-118) is extremely unlikely to be detrimental.

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 winter range. This fire profoundly changed nearly all goat winter range on the north shore, and may impact this population; whether positively or negatively remains to be seen.

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.

On August 5, 2007 a lighting strike caused the Domke Lake fire on the south shore of Lake Chelan. A total of 11,900 acres were burned and much of it was in occupied goat habitat. This fire is anticipated to reduce habitat over the next 1-2 years but should increase forage after this time.

Management Conclusions

Mountain goat populations in Chelan County are below historic and objective levels. Population trends in areas besides Lake Chelan, which are surveyed by Chelan PUD, cannot be effectively monitored without additional survey resources. Based on the PUD data set, average kid production is slightly below objectives on the north shore and at objectives on the south shore.

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 50 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 2007, there were 6 permits spread over 3 units open to hunting (Tables 1-4). Only 4 people reported, with 3 goats taken.

Surveys

Tables 1-4 show annual survey results for Goat units. In 2008, only Naches/Corral Pass was surveyed. Surveys were planned for late August, but weather was uncooperative. 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.

Population Status And Trend Analysis

The status of mountain goat populations is difficult to determine. The data suggests individual groups are often missed on some surveys. The best we can do is guess at trends from the available data and 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 has 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; while the current estimate is about 70. Harvest has likely impacted the population and has only recently been reduced. The high kid production in 2004 and 2008 seems to have helped the population rebound.

Blazed Ridge was historically included as part of the Naches Pass unit.. In 1996, permits were issued for the new Blazed Ridge unit. Over-harvest was likely in the unit until 2000. 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 was possibly passing through the unit, as they have not been seen since. There was confusion on groups in 2006 and a double count was expected, so an actual estimate is not available. The estimate of about 80 animals in 2007 was similar to 2004.

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. If the unit were expanded, to be as large as Bumping, goat numbers might be similar.

Habitat Condition And Trend

The majority of goats in the Bumping, Tieton and Naches Pass summer in wilderness areas where short-term habitat is mostly influenced by weather cycles. However, fire suppression has probably 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 be a major factor. Harvest has only recently been reduced, but populations appear to be recovering. Determining the current population level and if it is stable and healthy is difficult. 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

*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				37	79	116	47

*Includes 15 unclassified

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
1992-95	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

* Includes auction/raffle permit hunter

[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	0			No	Survey		
2007	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. Two male goats were harvested in these units in 2007 (Table 1).

Surveys

In August 2007, 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, the Upper Skagit 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 390 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 similar to the July 2005 and 2006 surveys, except the number of yearlings observed was comparatively low in 2007 (Table 3).

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

Table 2. 2007 mountain goat survey results for the Mt. Baker/Loomis Mountain area.

Block	Total	Adults	Yearlings	Kids	Unknown
Black Buttes	29	19	3	7	0
Heliotrope	36	27	3	6	0
Chowder Ridge	118	77	16	25	0
Sholes Glacier	6	5	1	0	0
Coleman Pinnacle	103	66	7	30	0
Lava Divide	36	25	2	9	0
Lake Ann	42	23	6	12	1
Loomis Mountain	20	15	1	4	0
Total	390	257	39	93	1

Table 3. Mt. Baker* mountain goat surveys 2003-2007.

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

*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.

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

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 will be used to evaluate movements and habitat use. Collared animals will also provide information to assess sightability bias (i.e. whether or not an animal or group is seen) during population surveys.

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 increase.

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.

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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. Goat Rocks-Tieton River unit probably has the highest goat population in the state of Washington. Hunting in all three units is allowed by permit only. Current population goals for these three areas are to maintain or expand current population levels. A productivity goal of 20-25 kids per 100 adults is applied to these populations. Legal harvest levels are designed to remove 4% or less of the population.

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 2007 Smith Creek= 1; Tatoosh= 1; and Goat Rocks-Tieton River= 5.

Hunting seasons in all three units have traditionally been 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 per permit, of either sex, with horns longer than 4 inches. 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 may be 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 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 2007 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 2007 is depicted in Table 1. Historically, success rates in the Goat Rocks Unit approach 100% and this was the case in 2007. 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 2007 did not harvest a goat. Goat sightings per hunter are mixed, though many sightings are from areas north of the hunt unit boundary, in Mount Rainier National Park.

Goat hunting 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. In 1993 hunting was archery only. Permit allocation was conservative (n=3) for the first few of years of hunting. Overall harvest was acceptably low and population response was favorable. Subsequently, permits were increased to 5 in 1995. The change in 1997 to any weapon resulted in a return to 3 permits. The number of goats seen, however, has been declining. As a result, in 2001 the permit number was decreased to one. The single permit holder in 2007 reported killing a goat.

Surveys

Recently survey coverage has expanded to include all three Mt Goat Units in Region 5. Part of this expanded coverage is a portion of a Mt Goat study that is being conducted by WDFW. Funding for these surveys is coming from a variety of sources and may fall to a lower level when the present study is complete. One of the study objectives is to estimate sightabilty 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 2007, all areas of goat habitat in the Smith Creek and Tatoosh units were surveyed on the same day. No surveys were conducted in Goat Rocks-Tieton due to lack of funding and personnel availability

Population Status And Trend Analysis

Goat populations in Tatoosh seem to be low. In the surveys during 2002-2007, all the goats observed were in the National Park. Permit levels will be maintained at 1 and surveys will continue. Populations in Smith Creek are also low and becoming a concern to managers. This population may require greater scrutiny in the future with continued sightability flight methodologies to estimate population size. The number of kids seen by hunters increased this year. Hunter survey results from 2007 indicated a higher number of kids than recent observations.

Population status in the Goat Rocks is hopefully on the increase. Survey data from 2004 through 2007 indicate an increased number of goats, even when the Tieton River unit influence is incorporated Knowledge of the movement between the Goat Rocks unit and Tieton still must be examined. Based upon studies conducted in other mountain goat habitats, we are observing between 59% and 75% of the total population in the July or August aerial surveys.

Results of the cooperative Cispus AMA study with the USFS indicate that goat populations are expanding in several areas of the Region. Sightings of goats are becoming common around the Mt. St. Helens area, and the north-south ridge systems south of the Cispus River contain good numbers of goats (see Management Conclusions below). A small herd of goats was observed in the caldera of Mt St Helens in the summer of 2007. These goats are likely migrants from the nearby McCoy Peak and surrounding area. Historic sightings of ear-tagged Smith Creek transplants in the Mt. Adams Wilderness indicate that goats are likely expanding their range. Informal surveys are also observing goats in areas to the south and west of Smith Creek. Long-term changes in habitat (see Habitat Condition below), particularly in the Smith Creek Unit, may limit certain goat populations in the future.

Habitat Condition And Trend

High elevation openings characteristic of goat habitat are being lost in the Smith Creek Unit due to conifer encroachment. Alpine meadows are critical mountain goat foraging areas. Given the limited extent of suitable goat habitat in the Smith Creek Unit, their decline represents a serious threat to the sustained viability of this goat population. Results of the cooperative Cispus AMA project indicate that in the four study areas (Stonewall ridge, South Point ridge, Smith ridge, and Castle Butte), a total of 404 acres of alpine meadow have been lost in the period 1959- 1990 (Kogut 1996).

High alpine meadows are thought to be primarily created through disturbance such as avalanche, disease, wind-throw, and fire (Hemstrom 1979). Periodic fire is considered to be one of the most important factors in the creation and maintenance of alpine meadow (Olmsted 1979). United States Forest Service policy currently dictates the suppression of both man-made and naturally occurring fires. This policy has probably resulted in the losses of alpine meadow documented in the above study. In the 10 years since the completion of this study, the loss of meadow has likely increased.

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

Habitat Enhancement

Continued budget cuts and other constraints in both the USFS and WDFW make the possibility 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 next decade, as more and more habitat in the Smith Creek Unit is lost to conifer encroachment.

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

Management Conclusions

All three mountain goat units in Region 5 are valued for both viewing and hunting opportunities. Consequently, harvest quotas are maintained at a conservative level to maximize both the consumptive and non-consumptive recreational attributes of these populations. Permit levels for the Tatoosh have been reduced to a minimum level to encourage expansion of the goat population.

Research is needed to develop population estimates and models for the goat populations in Region 5. A study initiated in 2002 is beginning to address these needs in Smith Creek and Goat Rocks/Tieton River. The continuation of annual aerial surveys is needed to document trends in population and productivity

Without a population estimate, attainment of a harvest rate of <4% of the population is difficult to measure. Due to low inherent productivity and high mortality rates among 1 and 2 year olds, mountain goats are highly susceptible to over-harvest (Festa-Bianchet and Urquhart 1994). Presently, our information about goat population dynamics is limited. Although hunter report cards provide information on demographic parameters, these data are highly variable. This is likely due to hunters observing and counting the same groups of goats repeatedly, variability of days spent hunting, some misclassification, and lack of sampling independence. 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) coverages 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. This will require USFS funding and environmental approvals.

Augmentation/translocation Recommendations

None are needed nor recommended.

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Table 1. Hunter survey summary statistics for Region 5 mountain goat harvests, 1993-2007.

Unit	Year	Permits Issued	Harvest*	Success (%)	Avg. goats seen	Kid:Adult seen	Avg days to harvest
Smith Creek	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	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	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 ( ) s 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 - 2007.

Goat Unit	Year	Adult	Yearling	Kid	Unknown	Total	Kid:Adult
5-2 Tatoosh	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	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	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

Bighorn Sheep

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 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 Mtn View), but subsequent transplants have consisted of Rocky Mtn (*O. c. canadensis*) bighorn sheep from Hall Mountain Washington, herds in Montana, Wyoming, and from the Wallowa Mountains in Oregon. Very little California bighorn genetics likely remain in the Blue Mtns. 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. Also, the School Fire in 2005 killed 7 - 9 (~50%) of the remaining sheep (thought to have been about 17) in the Tucannon drainage. Currently, herds in the Blue Mtns consist primarily of Rocky Mountain bighorn sheep.

Population management objectives for each herd are based on habitat conditions within their respective territories. 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 participants 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, 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 the Blue Mountains after the *Pasturella* die-off in 1996, with the exception of the Tucannon herd. Permits were terminated in the Tucannon in 1999, after this herd suffered a major population decline.

One raffle permit per year was authorized by the Fish & Wildlife Commission in 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 2005, the Tucannon, Black Butte, and Wenaha were available.

Starting in 2006, Black Butte, Mountain View, and Wenaha units were opened to the raffle permit holders, and the Tucannon was closed again. Also 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). Raffle permit holders have been successful in harvesting rams in all years; 2005 – Tucannon herd, 2006 – Wenaha herd, and 2007 – Mountain View herd. In 2007, a draw permit was issued for the Wenaha unit as well as the raffle permit, which resulted in a 13.5-year-old ram being harvested. In 2008, draw permits were issued for the Wenaha and Asotin herds. The Asotin permit is the first permit ever issued in that population.

General hunt permits will not be implemented in other herds until each bighorn sheep population meets criteria established in the Bighorn Sheep Management Plan. Treaty hunting by the Nez Perce tribe has been unregulated. The WDFW has documented some take to tribal hunting, with 7 rams total over the last 6 years. There have also been reports of ewes harvested by tribal hunters.

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. 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.

Surveys

Aerial surveys are conducted in March using a

sightability model currently being developed through the Hells Canyon Initiative. These surveys are conducted in conjunction with annual post-season elk surveys in order to determine population 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 2007 resulted in a count of 227 bighorn sheep, 125 ewes, 28 lambs, 74 rams for a ratio of 59 rams and 22 lambs per 100 ewes (Table 1.). A population estimate from modeling has not been developed for 2008 at this time, but biologists estimate that there are approximately 230 - 250 bighorns in the 5 herds. .

Population status and trend analysis

Lamb survival has been a major problem since the *Pasturella* die-off in 1996, with lamb survival varying greatly between years. 2007 lamb productivity in the Black Butte and Mountain View herds remained very low with lamb ratios of 4 and 0 lambs/100 ewes. Wenaha, and Asotin herds had lamb ratios of 33 and 32 lambs/100 ewes, respectively. The School Fire burned all bighorn sheep range in the Tucannon in August 2005, with 7 directly confirmed mortalities resulting from the fire (1 ram, 6 ewes). During March 2008 surveys, 9 bighorn sheep were observed in the Tucannon (3 ewes, 3 lambs, and 3 rams). Two older rams were observed (Class III and IV) that survived the fire of 3 years ago.

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 2007, with the Black Butte, Mtn View, and Wenaha herds all suffering from lamb die-offs. It is expected that population numbers will continue to 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 very 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 resulted in poor recruitment of rams into the population. The number of Class-III and IV rams in the population is currently declining, and still remains substantially below the number that existed prior to the die-off (Table 1). Poor lamb recruitment, cougar predation, pneumonia, and harvest are lowering the average age of rams within 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 is necessary before additional sheep can be released. The elk fence prevents sheep from moving north onto private land where they may come in contact with domestic sheep or goats.

Habitat condition and trend

Habitat conditions are moderate to good in most areas. However, the spread of noxious weeds, mostly yellow starthistle (*Centaurea solstitialis*) and rush skeleton weed (*Chondrilla juncea*) are threatening herds in the Snake River and Grande Ronde River drainages. 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 2 –3 years. An aggressive weed control program on the Wooten W.A. is currently in effect on WDFW and USFS lands to prevent the expansion of noxious weeds.

Disease and parasites

Pasturella continues to plague three bighorn populations; Black Butte, Wenaha, Mtn. View. The Asotin and Tucannon herds have escaped *Pasturella* pneumonia, but do suffer from scabies (*Psoroptes ovis*). Bighorn populations in the Blue Mtns. have not recovered from the *Pasturella* die-off as quickly as most herds, possibly from the constant 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.

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 a problem in all five herds. The Tucannon herd was decimated by a major die-off caused by scabies when it was infected in 1999.

One healthy lamb was collected from the Asotin herd in June 2007 for comparison with lambs dying of pneumonia in other herds. The information is part of ongoing bighorn sheep research occurring at Washington State University.

Management conclusions

Three of the five bighorn sheep herds in the Blue Mountains are struggling with *Pasturella*, which originated in the die-off that occurred in 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 will not 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 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 Mtns. Some rural landowners are using domestic sheep and goats to control weeds. This practice poses a severe threat to all herds in Hells Canyon, as it has been shown through HCI research 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. 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, Blue Mtns 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 has 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.

Three of the five bighorn sheep herds do not meet the criteria listed in the Bighorn Sheep Management Plan for establishing 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 2008. Only the Wenaha herd had a permit issued in 2007. 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 1994-2008

			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

*The Wenaha 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

* 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	37	26:100:4

Table 4. Mountain View herd population trend and composition counts, 1974-2008, 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

Table 5. Tucannon herd population trend and composition counts, 1975-2008, 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

* 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 categories.

			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

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. Herd composition objectives stipulate a lamb to ewe and ram to ewe ratio each of at least 50:100. The Hall Mountain Herd is not hunted; however, some form of limited-entry hunting could be evaluated and considered in the future. 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 seem to be losing some 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 probably 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 2007-2008 combined with an incidental sighting of 11 sheep at the U.S. Forest Service District Compound at the north end of Sullivan Lake. The most comprehensive survey took place on April 3, 2008 and included 4 rams, 16 ewes, and 9 lambs for a total of 29 sheep (Table 1). This survey took place from vantage points along Sullivan Lake Road using high-powered optics to look east up the steep slopes of Hall Mountain. So far this technique appears to be the most efficient means of surveying this herd. Even though the lamb count was high this year, it will require a high rate of annual survival for this herd to grow.

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 fifth 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 seem to 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 several visits to obtain a reasonable composite count. As the sheep disperse over a wider range for forage, they are less likely to be observed at 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 sustaining limited hunting opportunity, the herd will need to be monitored even more closely.

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Table 1. Population composition counts of Hall Mountain Bighorn Sheep since herd establishment in 1972 to 2007. (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

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 2008: 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 increase bighorn sheep numbers to a self-sustaining population capable of supporting both consumptive and non-consumptive recreation. The population objective is to reach a self-sustaining population size of 70 or more bighorn sheep, with a maximum of 95-100 (WDFW 2003).

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 occupy two main areas throughout the year – the original Lincoln Cliffs area and the cliffs around Whitestone Rock, about 7 miles downriver from Lincoln. However, as of late 2006, sheep have been observed using the cliffs above Sterling Valley, the area just west of Lincoln Cliffs, as well. Bighorns have not yet been observed north of the Lake on the Colville Indian Reservation.

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

	Applications	Seen by Permitee		
Year	Received	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

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 the past two years the permitee has spent only one day hunting per kill decreasing the running 3-year average to four 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, 14 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
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 also 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 an effort is being made to conduct two aerial surveys per year – one in the spring and one in late fall (Table 3). 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

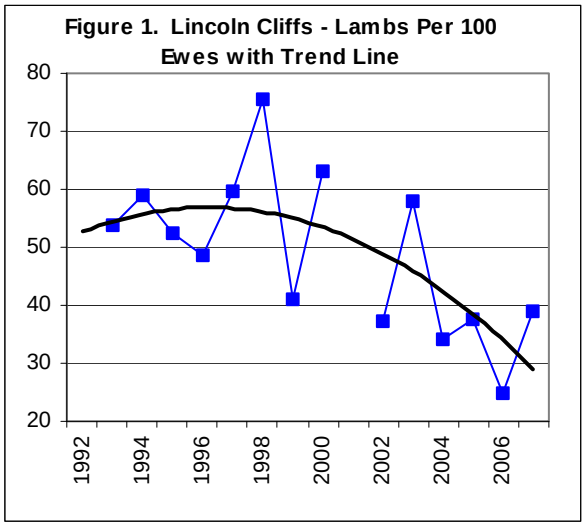
Population status and trend analysis

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. Two of the translocated ewes were found dead in the spring of 2003. The 1 translocated ram was found dead in May 2004 and another dead ewe was found in November 2004. From May 2003 to May 2007, 21 known sheep mortalities have occurred -- 9 from hunting, 1 from a car, 3 from cougar, 2 natural, and 6 unknowns -- a total of 15 rams and 6 ewes. Mortality rates for the 15 sheep released in 2003 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 three of those deaths.



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.

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 not received damage complaints related to bighorns in the Lincoln Cliffs area. However, the local human population and associated construction of new housing, 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. The current rough estimate sets the population level around the management objective of 60-70 sheep for the Lincoln Cliffs herd as stated in the Game Management Plan (WDFW 2008). This very rough estimate should be improved through the radio collaring of 10-15 sheep for use in creating a sightability model for this herd.

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 2008-2009 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.

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BIGHORN SHEEP STATUS AND TREND REPORT: REGION 1
Vulcan Mountain

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Population objectives and guidelines

California Bighorn Sheep were introduced to the Vulcan Mountain area of northern Ferry County, Washington in 1971. Eight Bighorn Sheep including 2 rams and 6 ewes were trans-located from the Colockum State Wildlife Area to U.S. Bureau of Land Management land near Little Vulcan Mountain. The population goal for the Vulcan Mountain Bighorn Sheep Herd is to maintain 80-110 animals on the available range. This herd makes considerable use of private rangeland, which has been a contentious issue with 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.

Bighorn sheep were counted and classified on October 23 and November 13, 2007. Table 1 provides the composite count for the fall of 2007.

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 jump 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 4.4 year old ram by the State permittee. In 2006 a 2.5 year old ram was harvested by the State permittee (Table 2). 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).

Herd health and productivity

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

were observed at any time in 1998 or 1999 and only 2 lambs appear to have been produced in 2000.

Parasite levels in the Vulcan Mountain Herd have been monitored almost annually since 1999 by fecal

Table 1. Annual population composite counts of the Vulcan Mountain Bighorn Sheep Herd from 1980 through 2007.

			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

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

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).

samples collected and submitted to the Washington State University Veterinary Sciences Laboratory for analysis. Levels of dorsal-spined nematode larvae have remained much lower since 2002 than during 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 2007.

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	

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 likely returned to the population goal of 80 – 110 animals.

The 2004 fall census results indicated that the Vulcan Herd could once again sustain limited-entry hunting. The population parameters for establishing a permit were met (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 has issued one general ram permit and two ewe permits for senior (age 65 +) hunters only.

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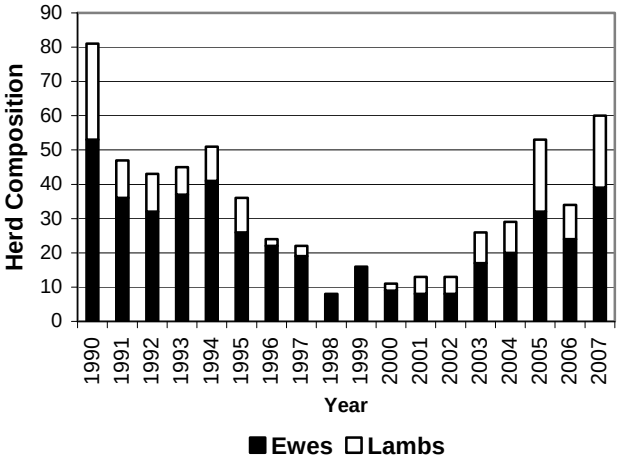

Figure 1. Vulcan Mtn. Bighorn sheep ewe and lamb composition, 1990-2007.

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 the Wenatchee District, California bighorn sheep are found west of the Columbia River. They have been reintroduced into Swakane Canyon, the north shore of Lake Chelan and Chelan Butte. There are also bighorns from the Quilomene herd that use the south part of the District in the Tarpiscan Creek, Colockum Creek, Stemilt Creek watersheds, and along Jumpoff Ridge.

Management objectives for the Wenatchee District are: (1) increase the size and range of existing populations; (2) ensure genetic strength 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 keeping these species apart; (4) reintroduce bighorn to suitable historic but unoccupied habitat within the District; and (5) provide public viewing opportunities.

There were an estimated 70-75 bighorns in the Swakane herd in June 2006. The population objective for Swakane is 50-60 adult sheep. The north shore of Lake Chelan population was estimated at 98-129 animals in June 2006, and the current population objective for the herd is 200 adult sheep.

On January 23, 2004, 35 bighorn sheep from the Clemans Mountain herd were released on Chelan Butte, south of Lake Chelan. Composition of the release was 20 ewes, 12 lambs (7 female, 5 male) and 3 rams (2.5, 2.5 and 3.5 years old). All released bighorns were marked with a white eartag in the right ear, and 8 adult and 4 yearling ewes were radio-collared. A population objective has not been established, however 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 for 2000-2001. The hunting season runs September 15-October 10. All of the hunters have been successful at killing a trophy ram ($\geq$3/4 curl). For 2002, one permit was offered for the Swakane and the auction hunter also hunted the area. Both hunters took large $\geq$3/4 curl rams. Only one permit was offered for Swakane from 2003-2007, to ensure a sufficient number of older rams for public viewing. At least 19 non-hunting bighorn mortalities occurred between 2002-2007 in the Swakane herd, eighteen caused by vehicle collisions on highway 97-A. On the north shore of Lake Chelan, 2 permits were offered from 2005 to 2007, with a total of six rams taken. The 2007 auction permit holder also harvested a ram from the Lake Chelan herd. For 2008, there will be one bighorn ram permit in Swakane, and two permits on the north shore of Lake Chelan. No hunting will occur in the Chelan Butte herd until at least 5 years post-introduction, per management guidelines.

Surveys

The Swakane area has considerable tree and shrub cover limiting aerial survey effectiveness. For the Swakane herd, population data come primarily from incidental reports from WDFW personnel, permit hunters, and the public, and from ground surveys during the spring and rut period (Table 1). Placing 12 radio transmitters on bighorn sheep within the Swakane herd is planned for Winter 2008-09. This will help locate groups of sheep and improve survey data.

Table 1. Observed population composition of the Swakane bighorn sheep herd, Chelan County, 1992-2007.

			Rams							
Year	Lambs	Ewes	Yrl	<3/4curl	≥3/4 curl	Total rams	Total sheep	Population estimate	Lambs: 100 ewes	Rams: 100 ewes
1992	4						4	20		
1993	2	9			1	6	17	25	22	188
1994	6	8		1	7	8	31	30	75	100
1995	6	6		3		12	27	30	100	200
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	13	24	5	4	12	21	58	70-75	54	88

*20 rams observed on coordinated volunteer survey June 3, 2003, but only 12 classified;

**post-season 2003 estimate (1 ram harvested 2003)

The Lake Chelan herd was not surveyed by helicopter in 2006 due to funding constraints. However, in January 2007, Chelan PUD started classifying rams in addition to making total counts of sheep during their Lake Chelan big game surveys. Bighorns are opportunistically observed on Chelan Butte, both on organized ground surveys and by volunteers working there. Plans are in place to survey sheep herds by helicopter in late fall of 2008.

Population status and trend analysis

From 1992 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 from a new alfalfa field in the Swakane, which attracted ewes and lambs, facilitating detection. This trend continued in 2002 and 2003, which likely represents increased sightability, rather than just population growth. Additionally, each succeeding permit hunter has used the knowledge of the previous hunters to help locate rams, which has enhanced our counts of males in the population. A survey by advanced hunter education graduates in June 2003 helped increased the ram count. A minimum count of 13 lambs was made in 2003, and 10 in 2004, compared to the observed average of 4.4 lambs for 1992-2001. Bighorn observations decreased in 2004, due to a combination of hazing efforts along Highway 97-A and very mild, open winter conditions, which reduced sightings. Proliferation of residential developments and associated ornamental plantings along the west shore of the Rocky Reach pool may be enticing bighorns to cross Highway 97-A with increasing frequency and annual duration. Other possibilities include attraction to chemical deicers, and displacement by public activity. For over 30 years, no bighorn mortalities attributable to vehicle collisions were documented. Since 2002, at least 19 Swakane bighorns have been killed by vehicles on Highway 97-A (7 male, 9 female, 3 unk), and the Washington Department of Transportation, State Patrol and Burlington-Northern Railroad have contacted the Wenatchee field office due to concerns with increased frequency of bighorns on this highway. It is likely these mortalities impacted herd growth. In Spring 2004, the Wenatchee Sportsmen Association convened a multi-agency working group to address deer and bighorn sheep vehicle collisions on Highway 97-A, and are seeking means to reduce both deer and sheep collisions on this highway. This group is seeking funding to build a game proof fence west of Highway 97-A to reduce wildlife vehicle collisions. Due to problems securing funding and easements, this project has consistently been delayed. Now, with rising fuel costs and funding shortfalls, only half of the original 7-mile fence will be constructed. WADOT

Table 2. Observed population composition and minimum estimated population of the Lake Chelan bighorn sheep herd, Chelan County, 1999-2008.

			Rams							
Year	Lambs	Ewes	Yrl	<3/4 curl	≥3/4 curl	Total rams	Total sheep	Lambs: 100 ewes	Rams: 100 ewes	Population estimate
1999	2	10	1	2		3	15	20	30	15
2000	6	33	5	6		11	50	18	33	50
2001	12	24	8	4		12	48	50	50	50
2002	17	36	8	6		14	67	47	39	70-75
2003	20	54	0	4	1	5	79	37	9	83-113
2004	16	62	0	11	5	16	94	26	26	98-129
2005	10	28	0	12	5	17	59*	36	61	98-129
2006	5	28	0	1	14	15	79*	18	54	98-129
2007	10	55	3	9	16	28	93	18	51	98-129
2008	6	31	7	4	5	16	98**	19	52	98-129

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

**High count observed during winter 2008.

Table 3. Observed population composition and minimum estimated population of the Chelan Butte Bighorn sheep herd, Chelan County, 2004-2007.

			Rams					Lambs:	Rams:	Population
Year	Lambs	Ewes	Yrl	<3/4 curl	≥3/4 curl	Total rams	Total sheep	100 ewes	100 ewes	estimate
2004	10	23		3		3	36	43	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	10	32				21	63	31	66	60-70

projects that the southern portion (3.5 miles) of the fence will be constructed in early 2009.

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. Lamb survival has been high. Ninety-four sheep were observed during the June 2003 survey. In late June 2003, the National Park Service at Stehekin reported 3 ewes at Rainbow Falls, 3 miles above the mouth of the Stehekin River; this is over 20 air miles from the next farthest northerly observation. Based on high lamb and ewe survival, it is likely that ram survival is also high; however, few rams were observed prior to 2004. In 2004, June survey data were used to calculate 2002-2004 population trends, based on a 2001 population of 50; trends in ewe counts, which are likely the most reliable trend due to the banding behavior of ewes and presence of 10-14 radioed ewes annually prior to 2005, indicated a 3 year average annual population growth rate of 38%. Total count trends indicate a three-year average annual population growth rate of 25%. Based on these trend estimates, the population was 70-75 in 2002, 83-113 in 2003, and 98-129 in 2004. However, winters 2004-2006 were extremely mild, and it is believed that this herd was either stable, or increased. As a result, the 2004 population estimate of 98-129 is retained for 2008, as a conservative estimate. At the other extreme, applying the 38% population growth rate figure to the 2004 estimate indicates the population could be as high as 135-178 in 2007.

In the Chelan Butte herd, only one radioed ewe has died, hit by a train in February 2005. A total of 63 sheep were observed in 2008, and the population is estimated at 60-70 (Table 3).

It was believed that less than 20 bighorns used the Colockum and Stemilt watersheds within the Wenatchee District. These sheep are part of the Quilomene herd. In July 2005, a wildlife officer observed 12 ¾-curl or larger rams in a field near east end of Jumpoff Ridge. In 2006 a WDFW wildlife biologist observed 10 rams south of Colckum head quarters. Additionally, residents reported a small group of 9 ewes and lambs on Jumpoff Ridge and that

these animals occur there from spring to fall. If these are resident sheep, this observation suggests the potential of a larger population than previously estimated or that 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. Supplemental feeding of airlifted alfalfa hay was done in November 2002, to ensure survival of the transplanted herd of bighorns. Winter conditions were extremely mild, and the alfalfa was not utilized to a large degree. Weed surveys were conducted in July and August 2003, to ensure this effort did not introduce new weed species to the Lake Chelan basin. 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 bighorns in this area. In Swakane Canyon, several fields have been planted in alfalfa and oats, which enhanced bighorn habitat, and were used by ewe/lamb bands. 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. A transmission line was construction over Burch Mountain in 2006/07. This transmission line bisects critical bighorn habitat of the Swakane herd and may influence sheep behavior. The long-term impacts of the transmission line on sheep are unknown.

Due to the dependence of California bighorns on low elevation habitats that are also desirable for human developments, there is long-term habitat loss 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 4 herds.

Wildlife damage

No reports of agricultural damage attributed to bighorns were received in 2004-2008. In previous years, Ohme Gardens, an irrigated horticultural development in cliff habitat at the edge of the Swakane bighorn range, has complained of bighorn use of these ornamental plantings. An orchardist in southern Chelan County complained about Quilomene herd bighorns use of his cherry orchard. No complaints have resulted in a claim for compensation.

Augmentation and habitat enhancement

The Chelan herd is likely continuing to grow, and presumably has good genetic diversity due to the variety of founder sources. For Swakane, augmentation is desirable for the long-term health of this population, given the historic stagnant nature of the population and small founder population. However, because Swakane bighorns have a documented history of intermixing with domestic sheep from nearby grazing allotments, the risk of *Pasteurella* pneumonia for bighorns would likely increase as the herd expands in size. Augmentation will be postponed until conflicts with domestic sheep are resolved.

The Moses Coulee area in Douglas County offers potential habitat for 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 centered more on lack of interest in working with WDFW and concerns about endangered species, 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 Swakane bighorns. Domestic sheep were documented 3 times within the core habitat of Swakane bighorns in 2000. Domestics were twice reported and once confirmed in the core area in 2003, and domestic sheep in the core area were euthanized by WDFW with prior permission from the presumptive owner in 2003 and again in 2007. Bighorn rams were documented in domestic sheep allotments twice during 2000. The WDFW and Wenatchee National Forest attempted to reduce the risk to bighorns from domestic sheep on Forest Service allotments, but no solutions were found. Bighorns in Swakane are still at high risk for disease transmission from domestic sheep. The

Swakane herd would benefit from augmentation, but such efforts will be postponed until domestic sheep conflict issues are resolved.

The Swakane bighorn population is somewhat unique in being highly accessible to the viewing public during the winter months. Viewing opportunities, in particular large adult rams, are highly valued by the viewing public. Harvest management should be conservative to maintain this viewing opportunity. Further investigations of strategies to reduce highway mortalities are warranted and ongoing.

The population objective of 200 for the Lake Chelan herd is extremely 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. Conservative 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. Consideration should be given to significantly increasing this population objective.

Aerial surveys of sheep groups outfitted with radio-telemetry presents the best opportunity to monitor the status of Swakane, Chelan Butte and Lake Chelan herds. There are no active transmitters in the Swakane, and many of the collars in Chelan have died or are reaching the end of battery life. WDFW plans to collar 12 bighorn sheep in the Swakane and 12 bighorn sheep in the Lake Chelan herds in 2009 to facilitate accurate monitoring of herd size, productivity and composition. Optimum monitoring would involve 2 helicopter surveys per year, during June following lambing to monitor production, and during the November rut to monitor rams.

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BIGHORN SHEEP STATUS AND TREND REPORT: REGION 2
MT. Hull Unit 10

SCOTT FITKIN, District Wildlife Biologist
JEFF HEINLEN, Wildlife Biologist

Population objectives and guidelines

Mt Hull Herd. The population objective for the Mt. Hull herd is 55-80 animals. Currently herd size exceeds this level, thus the management focus is shifting from steady population growth to herd stability or a slight herd reduction. 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. In 2007 fifty-one animals were surveyed, just meeting the desired population objective. The Sinlahekin herd is 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 2007. WDFW permit holders harvested two mature rams in 2007, and the harvest of one mature ram occurred under the Colville Confederated Tribe any sheep permit (Table 1).

Sinlahekin herd. No permits were issued for the Sinlahekin Unit in 2007.

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

[a] CCT=Colville Confederated Tribes

Surveys

Mt Hull Herd. Biologists conducted a helicopter survey of the Mt. Hull Unit in early December 2007 and classified 90 sheep, including 23 rams, six of which were $\geq$ ¾ curl (Table 2). Lamb production increased slightly from that observed in 2006. Good survey conditions resulted in visual classification of greater than three fourths of the estimated herd total.

Sinlahekin herd. Biologists also conducted a helicopter survey of the Sinlahekin Unit in early December 2007 and classified 51 sheep, including 12 rams, seven 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 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, herd size may be exceeding carrying capacity.

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, heavy use, 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.

In recent years the number of bighorn sheep crossing west of Highway 97 is increasing. During the winter of 2005-2006 at least three bighorn sheep perished in vehicle collisions, and three additional fatal collisions occurred last winter. 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 declining range quality.

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 is occurring within the Sinlahekin Wildlife Area. This is reducing tree encroachment and increasing forage. This effort, combined with an aggressive weed control program should also improve habitat conditions within the Sinlahekin Wildlife Area. Biological control of diffuse knapweed has been particularly effective.

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 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 three 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; however, changes in sheep behavior and falling productivity 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 slightly reduce the Mt Hull population to help increase range quality, reduce road mortalities, and reduce landowner conflicts. Capture efforts to relocate 15-20 sheep are planned for the 2008-2009 winter months. The 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
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

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

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 2,3,4 and 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 issud 2 permits each for Clemans and the Yakima Canyon (Umtanum and Selah Butte), but their harvest is unknown.

Surveys

Quilomene, and Umtanum/ Selah Butte are typically surveyed via helicopter. Clemans Mountain is ground surveyed in June and/or at the feeding station in January. 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. 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 and herd growth have increased and exceeded to population goal of 150 animals in 2000 (Table 2). Since January 2001, over 100 animals have been captured and trans-located or used for research. Winter counts at the feed site indicate the population is still slightly above objective.

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 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 excellent again in 2007. The population

is now over the initial objective. The area has a lot of suitable habitat, and production indicates carrying capacity is probably higher than initially estimated.

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 recent years, domestic goat ranching has increased dramatically 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 new concern 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
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
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	
Tieton	2004	2	2	
	2005	2	2	
	2006	3	4	Harvest includes auction hunter
	2007	3	2	1 no report

Table 2. Quilomene June Population Compostion

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

Table 3. Clemans Mt. June Population Compostion

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	25	85	64	40		174	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

* 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	26	40	8	0	74	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 2007, there were 74 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 2007, drawings were offered in GMU 117 for 7 "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 7 antlerless moose tags under the 49 Degrees North B Permit Hunt, 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 61 moose were killed including 50 bulls and 11 cows within the Colville District units in the 2007 season (Table 1). The hunter success rate was 82% and hunters averaged 5.3 days hunting per moose harvested. The 49 Degrees North B, C, and Youth Hunts for persons with disabilities, Senior, and Youth Hunters respectively had 6 antlerless moose harvested out of the 7 permits issued for an 86% success rate. Hunters there averaged 5.8 days hunted per harvest.

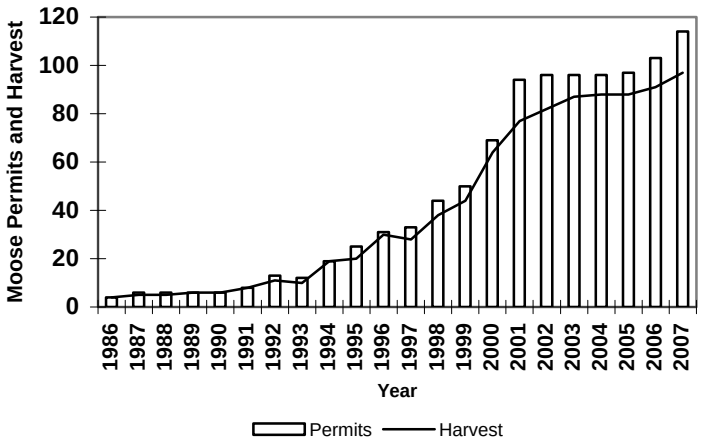

Figure 1. Statewide moose permit levels and harvest, 1986-2007.

Surveys

The 2007-2008 winter helicopter survey focused on the Selkirk Mountains (GMU 113), 49 Degrees North (GMU 117), and Huckleberry Range (GMUs 121 / 124W.). The overall sighting rate was 20.5 moose per flight hour, which was about half the sighting rate from the previous winter. The overall bull and calf to cow ratio was 90 bulls and 37 calves per 100 cows respectively (Table 2).

Moose hunters provide their observations with the mandatory report. Hunters reported observing 761 moose within the Colville District during the 2007 season for a mean sighting rate of 10.6 moose per hunter (Table 3).

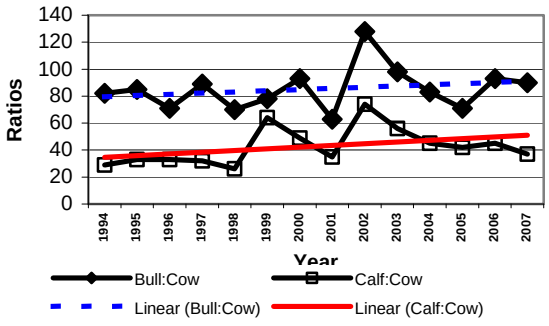

Figure 2. Composition and trends of moose herds as determined by early winter helicopter surveys 1994-2007. Areas surveyed vary annually.

Population status and trend analysis

Early winter composition survey flights have been accomplished each year for the last 14 years (Table 4 and Figure 2). The December 2007 survey yielded a modest decrease in the bull to cow moose ratio with an overall ratio of 90 bulls observed per 100 cows. The calf to cow ratio also dropped to 37 calves per 100 cows. For both bulls and calves the fourteen-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 2007, the mean antler spread of harvested bull moose was 38 inches. The average age of bull moose taken in 2007 was 5.0 years. Last year slightly more adult bulls, age 5+ years were harvested which has been the case in 7 of the 16 years from 1992 through 2007 (Table 5).

The limited hunter harvest has likely had inconsequential impact on the overall population of moose within the Colville District. The hunter success rate, however, dropped in 2007 from the traditional 90% or higher level down to 82%. This drop in hunter success is likely indicative of a threshold in the "catch per unit effort".

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. Just this year Forest Practice Approvals were granted for treating 5,623 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. Last year, 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 reduced to maintain the traditionally high harvest success rate.

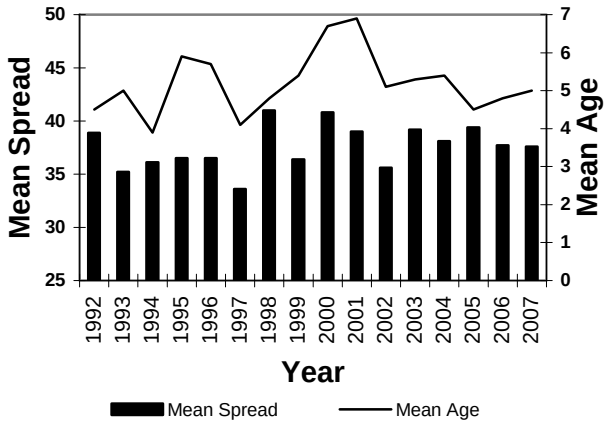

Figure 3. Average age (years) and antler spread (inches) of bull moose harvested within the Colville District, 1992 - 2007

Table 1. Colville District (GMUs # 101/105, 108/111, 113, 117, and 121/124 West) moose harvest and hunter effort, 1992 – 2007.

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

Table 2. Composition counts of moose for helicopter-surveyed areas in the 2007-2008 winter.

Area	GMU	Date	Bull	Cow	Calf	Total	Bull / Cow / Calf Ratio Bulls :100 Cows : Calves	Hours	Moose/hour
Selkirk Mountains	113	12/7/2007	27	28	10	65	96 : 100 : 36	4.3	15.1
49 degrees North	117	12/10/2007	28	41	14	83	68 : 100 : 34	3.0	27.7
Huckleberry Range	121/124W	12/31/2007	23	18	8	49	128 : 100 : 44	2.3	21.3
Overall :			*78*	*87*	*32*	*197*	*90 : 100 : 37*	*9.6*	*20.5*

Table 3. Moose hunter observations and days per kill in the Colville District for the 2007 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	1	1	8	8	4
Three forks	8	8	6	54	7	10
Selkirk Mtns.	25	24	20	140	6	6
49 Degrees N	33	33	29	504	15	4
Huckleberry Mtns.	6	6	5	55	9	3
Overall :	*74*	*72*	*61*	*761*	*Mean = 10.6*	*mean = 5.3*

Table 4. Summary of early winter survey effort by helicopter on moose within the Colville District from 1994 through 2007.

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

Table 5. Tooth age and antler spread in inches for harvested bull moose in the Colville District from 1992 through 2007.

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 %

MOOSE STATUS AND TREND REPORT 2008: 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 (waived for 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.

A total of 40 permits were available in the two units, 30 in Mt. Spokane and 10 in Hangman. Applications in 2007 increased to 15,763 up from 14,811 in 2006 and 14,638 in 2005. The Hangman and Mt. Spokane units each had an either-sex moose hunt and an antlerless-only hunt. The Mt. Spokane unit also had a youth-only antlerless hunt consisting of 8 permits.

Thirty-five permittees reported having hunted moose in 2007, with participation rates ranging from 62.5 percent in the youth-only hunt to 100 percent in the either-sex hunt. A total of 35 moose were killed (14 bulls, 21 cows) in 2007 compared to 33 in 2006, for an overall hunter success rate of 100%. The mean number of days hunted per hunter decreased to 3.2 improving from 5.4 days in 2006 (Table 1). The success rate for all actual hunters in both units has been 100% for the last two years, and a 98.4% overall success rate since 2001.

When hunter density was at a functional maximum in the Mt. Spokane Unit in 2002 with permits at a high of 45, hunters commented that they were competing for hunting locations and opportunities. Responding to these comments, given the once in a lifetime restriction, permits in the Mt. Spokane unit were reduced to 30 in 2003. However, permits in the Hangman unit were increased from 5 in 2002 to 10 in 2007.

The mean antler spread for bulls harvested in the Mt. Spokane unit in 2007 was 39.2 inches, the widest it has ever been, up from 29.2 inches in 2006. The mean antler spread for the Hangman unit in 2007 was 32.3 down from the 2006 average of 34.1 inches (Figure 1).

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 almost 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 2 for a comparison of moose observed and Table 3 for a comparison of moose density by unit as derived from aerial survey data.

Population status and trend analysis

Several pieces of information support the hypothesis that the moose population in District 2 has increased over time. 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 (Table 3). Hunting success has averaged over 98% since 2001 with many hunts returning 100% success. 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 5). In 2007, observed moose density within Mt. Spokane was the highest density ever recorded for this unit (Table 3). Since 2002, densities have ranged from 0.13 to 0.50 moose/km^2. For 2007, in the Mica Peak area of the Hangman unit, the observed density was 0.60moose/km^2. The Tekoa Mtn area, south of Mica

Peak, was surveyed for the first time this year and resulted in a density of 0.46 moose/km^2.

As seen in Table 2, 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. 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, and for 2007-2008 68 complaints were filed. As indicated by the almost 3-fold increase in complaints this past winter was 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.

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. 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 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	Hunter Success	Bulls	Cows	Total	Days/Kill
1993	3	100%	3	0	3	5.3
1994	4	100%	3	1	4	11
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	100%	18	19	37	8.7
2002	45	97%	15	25	40	8.2
2003	38	100%	13	24	37	4.1
2004	38	92%	13	22	35	6.6
2005	38	95%	17	18	35	4.1
2006	40	100%	14	19	33	5.4
2007	40	100%	14	21	35	3.2

Table 2. Number of moose observed for each unit for years 1999-2007.

Unit	Number of Moose Observed (aerial surveys)						
	1999	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Mt. Spokane	88	45	43	150	22	66	77
Hangman	0	46	17	57	53	28	35

Table 3. 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**
Mt. Spokane	0.15	0.15	0.13	0.47	0.30	0.39	0.50
Hangman (Mica Peak area)		0.66	0.24	1.18	1.09	0.58	0.60
Hangman (South of Mica Peak)							0.46

Table 4. 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	1990	-	-	-	7	39:100:61
Mt. Spokane Unit	1992	-	-	-	7	50:100:25
Mt. Spokane Unit	1999	8	22	11	41	36:100:50
Idaho-Unit*	1999	6	27	14	47	22:100:52
Mt. Spokane Unit	2002	11	23	8	42	48:100:35
Hangman Unit	2002	5	33	16	54	15:100:48
Mt. Spokane Unit	2003	9	22	12	43	40:100:55
Hangman Unit	2003	4	9	4	17	44:100:44
Idaho-Unit*	2004	31	46	21	98	67:100:46
Mt. Spokane Unit	2004	14	22	16	52	64:100:73
Hangman Unit	2004	18	19	20	57	95:100:95
Mt. Spokane Unit	2005	4	12	6	22	33:100:50
Hangman Unit	2005	13	30	11	54	43:100:37
Mt. Spokane Unit	2006	22	30	13	65	73:100:43
Hangman Unit	2006	7	14	6	27	50:100:43
Mt. Spokane Unit	2007	26	33	18	77	79:100:54
Hangman Unit	2007	8	19	8	35	42:100:42

* Survey unit primarily in Idaho

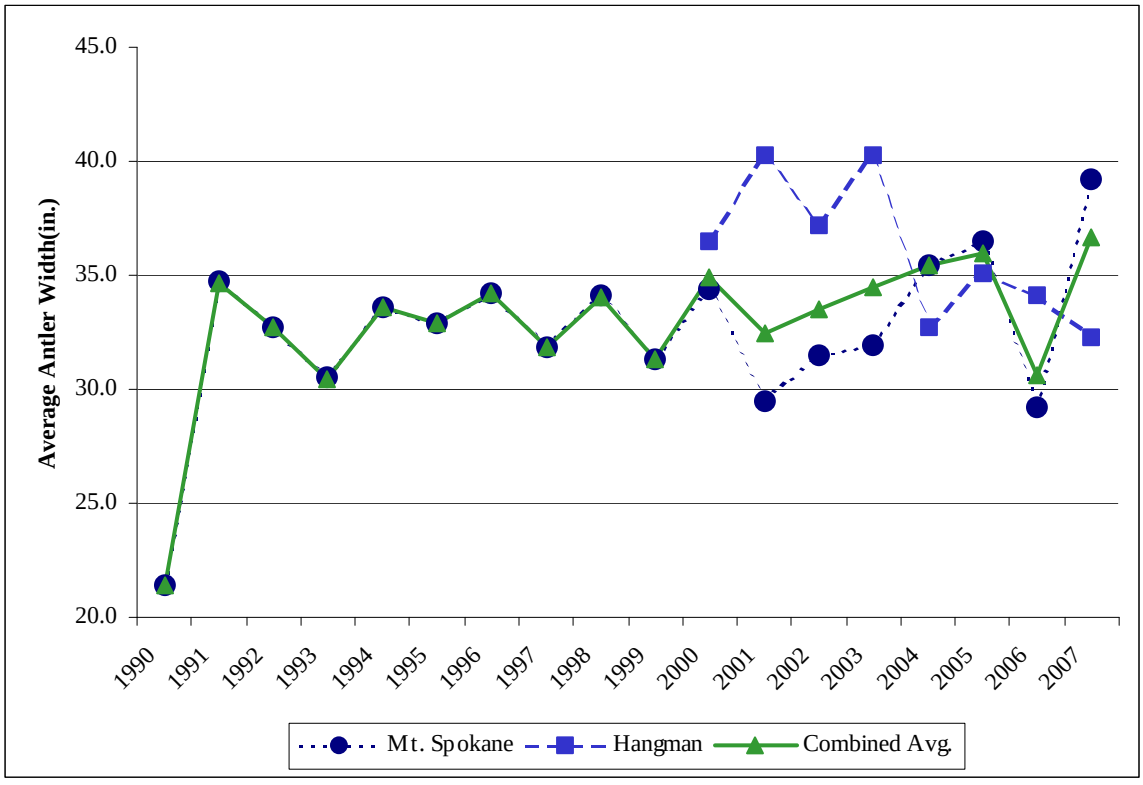

Figure1. Average antler width (in.) for bulls harvested in the Mt. Spokane (GMU 124), Hangman (GMU 127 and 130) units and the combined average for both.

Black Bear

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

Black bear season in the primary bear harvest units (GMUs 101-117) of the Northeastern BBMU opened September 4, 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 5,268 hunters hunted these units in 2007, which was about a 10% increase from 2006. The 2007 harvest of 468 black bears was close to the 2006 kill of 450, but 20% above the 2001-2005 average harvest of 374. Hunter success remained at the 6-year mode of 9% (Table 1, Figure 1).

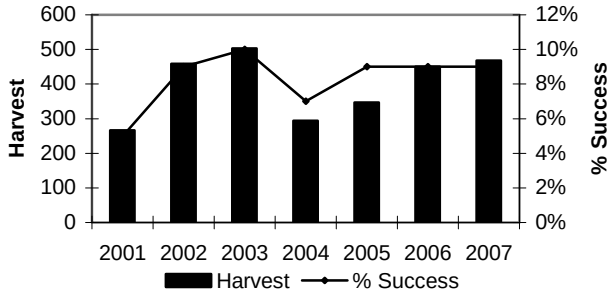

Figure 1. Total harvest and % hunter success, BBMU 7, 1997-2007.

Population status and trend analysis

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. All these parameters were 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 dealt with aggressively, usually resulting in the black bear being euthanized.

Habitat condition and trend

Huckleberry and other soft mast production was fair in 2007 and excellent in the late summer of 2008; however, the long-term bear habitat condition and trend appears 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. Just this year Forest Practice Approvals were granted for treating 5,623 acres mostly within south Stevens County, which includes GMUs 117 and 121. The consequence to bears from this wide scale of herbicide application could be at least a localized reduction in carrying capacity.

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.

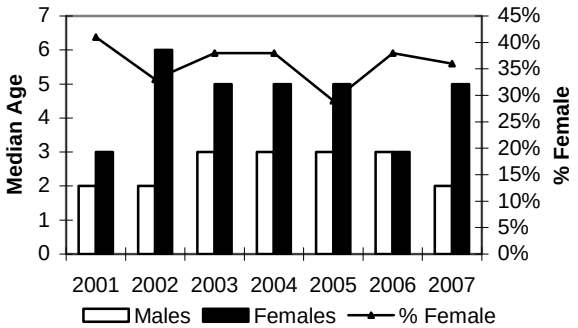

Figure 2. Median ages of harvested bears and % female in the harvest, BBMU 7, 1997-2007.

Table 1. Black bear harvest, hunter effort, and median age, Northeastern Black Bear Management Unit, 2001-2007.

								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%

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 2007. In addition the median age of harvested females returned to the minimum management guideline.

Spring 2007 was the first year for a new permit season on black bears. The WDFW issued 70 permits within 6 GMUs for spring black bear hunts to run from April 15 through May 31, 2007. Only 29 of the 70 permittees reported hunting. The spring harvest level was even more modest with only 11 bears taken for a success rate of 38%. Once again in 2008 there were 70 spring black bear permits authorized.

Hunters have unlawfully killed 3 grizzly bears by mistaken bear identity within the last 10 years. A bear identification and certification program is currently being discussed 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 frequent the area.

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 optimal recreational 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 73 days in 2007 (Sept. 4 - Nov. 15). A permit controlled spring bear season runs from April 15 to May 31, with 105 permits distributed between 7 game management units. In 2007, 155 permits were distributed through the 7 GMU's.

The permit controlled, spring hunting season was added in 1999 in order to improve the distribution and composition of the bear harvest. From 1999-2007, 959 permits have been issued with 579 hunters participating in the hunt. Hunters averaged 28% success, harvesting 159 bears; 112 males, and 47 females. Hunters during the spring of 2007 had a success rate of 42%, and a harvest of 29 bears; 17 males, 12 females (Table 2).

The combined harvest for the 2007 spring/fall seasons was 102 bears; 70 males, 32 females. Hunter success during the fall general season was 5%, with a harvest of 73 bears (53 males, 20 females). The 2007 general season bear harvest decreased 20% compared to the 2006 harvest, but is still within 6% of the 1992-06 average harvest of 78 bears/year.

The percentage of male bears in the general season harvest averaged 64% between 1992 and 2007. Over the last 3 years, the percentage of males in the harvest has increased, averaging 72%, which is slightly higher than the long-term average.

The age of bears harvested in 2007 ranged from 1 to 19 years. Males ranged in age from 2 to 7 with a median age of 4.0 (N = 11). Females ranged in age from 1 to 19 years with a median of 6.0 years (N = 9).

Age data from 1999-2006 indicates a difference in the vulnerability of age classes of bears to harvest in the spring vs. the fall hunting season. Younger bears appear to be more vulnerable in the fall, and older bears in the spring. Between 1999-2006, 42% of the males and 47% of the females harvested in the fall were older than 4.5 years old. In the spring, 76% of the males and 75% of the females were older than 4.5years old. Also, in the spring, 32% of the males and 32% of the females were older than 10.5 years, compared to the fall when only 12% of males and 19% of females were older than 10.5 years.

The difference in vulnerability between age classes in the spring and fall hunting seasons is probably due to a two factors; 1) older bears are much more visible in the spring, and hunters more selective, and 2) young bears are more visible in the fall and hunters are less selective.

Nuisance and damage

The number of bear complaints received has remained fairly stable over the last few years.

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 wildfires burned 153,000 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).

Management conclusions

The black bear population in the Blue Mountains appears to be stable. The Wenaha-Tucannon Wilderness and Mill Creek Watershed are remote areas that contain healthy bear populations, but receive very little hunting pressure. These areas supplement bear populations in adjacent units through emigration.

Combining the general bear season with a permit controlled spring bear season enhances our ability to provide optimum recreational opportunity and a well-balanced harvest by game management unit.

Table 1. Black Bear General Season Harvest Summary 1992-2007, Blue Mtns., Washington.

	Bear Harvest			# of hunters	% Success	Hunter Days	Days per kill	Median Age	
Year	Male	Female	Total					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

Table 2. Spring Bear Hunt Statistics. 1999-2007

			Bear Harvest				Spring Season	General Season
Year	Permits	Hunters	Males	Females	Total	Hunter Success	% Male in Hv.	% 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	72	21	5	26	29%	81%	71%
2007	155	69	17	12	29	42%	59%	73%
Total	959	579	112	47	159	28%	70%	67%

BLACK BEAR STATUS AND TREND REPORT: REGION 2
Okanogan Black Bear Management Unit (BBMU 5)

SCOTT FITKIN, District 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 2007 black bear season in the Okanogan BBMU occurred between August 1-November 15. Hunters enjoyed generally favorable conditions during the season. Hunter numbers rebounded a bit in 2007, while harvest remained fairly stable. As a result, hunter success declined in the Okanogan Unit (Table 1). Bears had to work harder to find late season berries in 2007, with the best sources in more remote country. This may have made bears less vulnerable to harvest.

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 fell to 27% in 2007. On the other hand, median ages for harvested animals dropped to 12-year lows for both sexes; however, 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. Conditions in 2007 produced a great early season berry crop, but late season berries (particularly huckleberries and mountain ash berries) remained spotty to non-existent east of the cascade crest. This may have contributed to numerous nuisance complaints this spring. Complaint levels fell off as early season berries ripened in 2008, and the late berry crop looks good. This may translate into reduced bear incidents this fall and early next spring.

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.

New efforts to expand off-road use on public land in the District could negatively affect the bear population. Increased motorized use on the landscape will likely increase animal disturbance, degrade habitat and increase illegal harvest. This could undo many of the habitat gains associated with many years of aggressive, wildlife-related road management by several state and federal agencies. On the other hand, successful efforts to recover wild salmonid stocks could increase the bear forage base and positively affect bear populations.

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	36%
1997	30	20	50	858	6%	3,967	79	6.5	6.5	38%
1998	62	32	94	1,514	6%	6,823	73	4.5	5.0	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	8.0	75%
2001	77	41	118	1,922	6%	13,905	118	3.0	7.5	35%
2002	90	55	145	2,039	7%	14,077	97	8.0	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	5.0	33%
2006	82	37	119	1,396	9%	8,461	71	4.0	5.0	31%
2007	83	30	113	1,594	7%	8,461	75	2.0	3.0	27%

Management conclusions

In general, harvest pressure appears to be stabilizing in recent years. 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.

WDFW now posses two state-of-the-art culvert traps for use in the North Cascades courtesy of the North Cascades Grizzly Bear Subcommittee and Technical Group. WDFW should continue to replace older style culvert traps with modern aluminum versions that minimize tooth and claw damage to captured bears.

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 5204 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. Median female age increased to 12 years in 2007, based on a small sample of 5 females. 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 that 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, 1989-2007.

							Median Age		
Year	No. males	No. females	Total	No. hunters	% success	Hunter days	Males	Females	% females in harvest
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	12	27
Avg.	129	62	190	4,745	5	31,889	4	6	32

[a] No harvest data available.

BLACK BEAR STATUS AND TREND REPORT: REGION 4
North Cascades Black Bear Management Unit (BBMU 3)

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 2007 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 2007 compared to 2006 (1922 hunters (2007) vs. 1465 hunters (2006)). Hunter success remained the same at 10.2% in 2007 compared to the 2006 success rate of 10.1%.

The statewide harvest objectives for Black Bear include: maintain a female harvest of 40% or less of the total harvest, with median age at harvest for males at 2.5 years or older, and for females at 5 years or older. Median ages and female percentage of total harvest are given in Table 1. Median age for males harvested in 2007 remained at 4 years (N=25), which is above the minimum age targeted for the statewide objective. Median age for females was 6 years (N=10), which is above the targeted age for females. Percentage of females taken during the harvest was 29%, which is well within the desired standard.

Nuisance and damage activity

Thirty-nine depredation permits were issued to industrial timberland owners concerned about tree damage in spring 2007, with 44 animals killed (24 males, 16 females, 4 gender not reported). This is slight increase over 2006 when 35 permits were issued and 38 bears were killed. To help alleviate bear damage in some locations, a spring permit hunt was approved for the 2008 season for 2 areas in BBMU3. Beginning in spring 2008, 25 permits will be issued in a portion of GMU 448, and 20 permits will be issued in portions of GMU 418.

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.

Table 1. Harvest data for BMU 3, North Cascades, 1995-2007.

Year	male	female	total harvest	days/kill	# hunters	% hunter success	median age male age	median 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

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 basically met the statewide target in 2007, although the median age for females was slightly below the statewide harvest objective. In general, Black Bear management in BMU 3 appears to be positive.

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 has been September 1-15 since 1980, with bag/possession limits of 10/20.

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 sites surveyed in 2007 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, 2007 survey period.

Mourning dove call-count survey

The mourning dove survey was completed between May 20-31, 2008 following USFWS (2008) 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, 2007. Hunters failing to comply with reporting requirements were ineligible to participate in the 2008 season.

Mourning dove harvest estimation

Mourning dove harvest was estimated as part of the statewide hunter survey conducted by WDFW (WDFW 2008).

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 2007 survey results are available through USFWS (2008), but the 2008 analysis will not be available until 2009.

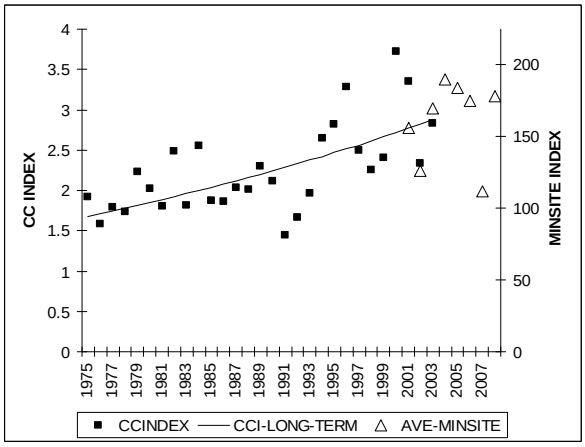

Figure 1. Band-tailed pigeon call-count results and mineral site raw data summaries.

Mourning dove call-count survey

Mourning dove survey results are presented in USFWS (2008).

Band-tailed pigeon harvest

Harvest and hunter activity for the 2002-2007 seasons are summarized in Figures 2-3 and Table 3.

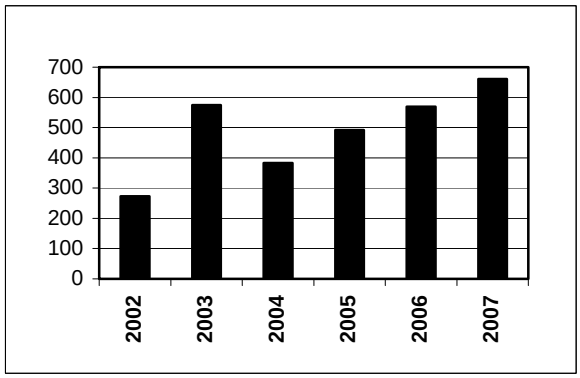

Figure 2. Band-tailed pigeon harvest.

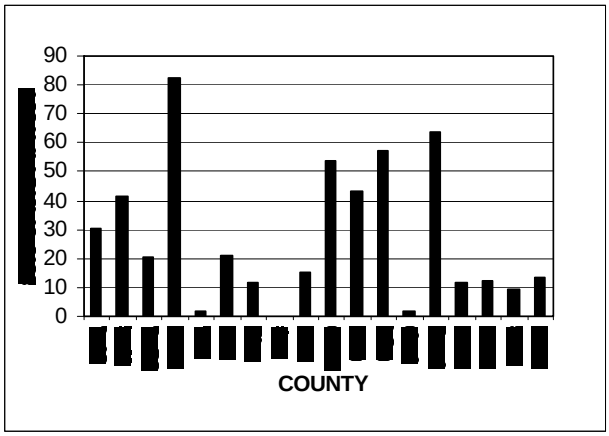

Figure 3. Band-tailed pigeon 2002-2007 average annual harvest by county.

Mourning dove harvest

As measured by WDFW surveys, harvest in 2007 was estimated at 68,725 doves, down 3% from 2006 (Figure 4). Hunter numbers were estimated at 5,657, down 2% from 2006. Number of days hunted was 14,606, down 8% from 2006.

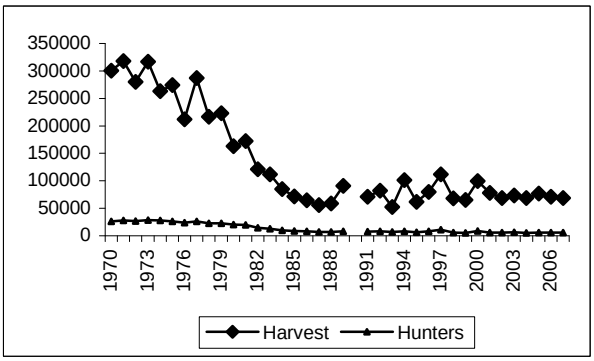

Figure 4. Mourning dove harvest and hunter numbers.

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 2008 mineral site survey raw data summaries point to maintenance of increased numbers of band-tails present during the breeding season, compared to historic surveys.

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Table 1. Band-tail call-count survey results - route regression method.

Start Year	End Year	Change	Lower 90% CI	Upper 90% CI	Routes Used	Sig. level
1975	1992	-7.8%	-14.0%	-2.0%	63	p<0.05
1991	1992	10.1%	-50.0%	75.0%	11	n.s.
1975	1993	-6.0%	-11.0%	-1.0%	65	p<0.05
1992	1993	44.0%	-49.0%	152.0%	13	n.s.
1975	1994	-3.4%	-8.2%	1.4%	69	n.s.
1993	1994	71.0%	1.4%	141.0%	24	p<0.05
1975	1995	-2.7%	-9.8%	4.5%	70	n.s.
1994	1995	12.1%	-31.3%	55.3%	12	n.s.
1975	1996	-0.8%	-6.5%	4.9%	59	n.s.
1992	1996	24.3%	10.4%	38.2%	30	p<0.01
1995	1996	36.4%	-35.9%	108.7%	18	n.s.
1975	1997	-0.8%	-6.0%	4.3%	62	n.s
1993	1997	8.9%	0.2%	17.6%	32	p<0.10
1996	1997	-14.3%	-35.4%	6.7%	18	n.s.
1975	1998	-1.5%	-5.5%	2.4%	65	n.s.
1994	1998	2.1%	-8.7%	13.0%	34	n.s.
1997	1998	-11.0%	-45.8%	23.9%	11	n.s.
1975	1999	-0.1%	-4.1%	3.8%	67	n.s.
1995	1999	-3.3%	-11.5%	4.9%	38	n.s.
1998	1999	26.7%	-19.7%	73.1%	14	n.s.
1975	2000	-0.3%	-6.2%	5.5%	70	n.s.
1996	2000	5.9%	-2.3%	14.1%	41	n.s.
1999	2000	21.1%	-12.5%	54.8%	24	n.s.
1975	2001	1.7%	-2.3%	5.7%	70	n.s.
1997	2001	15.8%	8.0%	23.6%	44	p<0.01
2000	2001	1.8%	-16.6%	20.2%	36	n.s.
1975	2002	0.7%	-3.7%	5.0%	71	n.s.
1998	2002	9.4%	2.6%	16.2%	45	P<0.05
2001	2002	0.9%	-27.5%	25.8%	32	n.s.
1975	2003	1.8%	-1.7%	5.4%	71	n.s.
1999	2003	0.6%	-4.8%	5.9%	48	n.s.
2002	2003	5.2%	-30.5%	40.8%	25	n.s.

Table 2. WDFW band-tail pigeon mineral site survey results.

SITE	2001	2002	2003	2004	2005	2006	2007	2008
Altoona				64	0	5	0	
Cedar Cr.	328	215	157	215	185	231	191	312
L. Cavenaugh				108	172	76	71	117
Lilliwaup	60	77	108	199	143	273	141	89
McAllister	82	118	174	124	174	87	25	136
Mud Bay	164	154	222	134	371	294	95	203
Oyster Cr.	362		455	474	542	293	157	331
Newaukum				634	167	335	309	219
Potlatch	135	147	90	297	285	306	168	295
Red Salmon	52	103	121	179	103	64	33	107
St. Martins				220	128	191	189	141
Sumas	67	71	31	46		68		
U. Kalama				110	225	327	120	350
Warm Beach				48	58	62	83	36
Willapa				3	24	10	3	0
Mean	156	126	170	190	184	175	113	180

Table 3: WDFW band-tailed pigeon harvest report summary.

	2002	2003	2004	2005	2006	2007	6-YR AVE
NUMBER OF PERMITS ISSUED	522	657	766	809	909	894	760
TOTAL DAYS (SUCCESSFUL)	357	337	209	382	315	364	327
TOTAL HARVEST	273	574	383	492	569	661	492
HARVEST BY COUNTY							
CLAL	37	35	14	25	35	37	31
CLAR	29	45	29	35	60	51	41
COWL	28	54	4	2	3	32	20
GRAY	47	53	104	76	71	145	83
ISLA	0	0	0	0	9	0	2
JEFF	10	16	31	26	14	29	21
KING	4	23	13	6	11	14	12
KITS	0	1	0	0	0	0	0
LEWI	7	13	11	34	5	22	15
MASO	26	38	48	62	63	84	54
PACI	13	21	37	35	73	80	43
PIER	20	82	30	62	85	63	57
SANJ	0	0	12	0	0	0	2
SKAG	33	99	15	97	74	65	64
SKAM	5	16	0	10	16	21	11
SNOH	15	29	3	12	11	3	12
THUR	0	13	8	2	24	10	9
WHAT	0	34	24	6	14	4	14

Waterfowl

WATERFOWL STATUS AND TREND REPORT: STATEWIDE
Breeding Populations and Production

MIKAL MOORE, Waterfowl Specialist

Introduction

This report summarizes waterfowl productivity data collected during 2008, 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. East-west transects at 10 mile intervals were established in the Potholes stratum from a random starting point, and flown with a helicopter. Not all transects in the stratum were surveyed, but we present the results of several sample transects completed in 2008.

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 2008 index of breeding duck populations in eastern Washington was 120,897 (Table 2; Fig. 2), down 6% from 2007 and 22% below the long-term average. Eastern Washington breeding waterfowl experienced an average 9.3% decline during 2000-2005 (Table 2, Fig. 2). This decline was associated with drought-like conditions in eastern Washington during the same time period. Improved precipitation conditions appear to be contributing to a moderate rebound in breeding duck indices.

Breeding pair counts declined in all four eastern Washington strata (Fig. 4, Table 3). The Irrigated strata declined 2% from 2007, 9% below the 1979-2006 average (Figs. 4 and 5, Table 3). With the exception of mallards (+11%) and northern shoveler (+32%), all major breeding dabbler species in the Irrigated strata declined from the previous year. Mallard (+15%), gadwall (+19%), and northern shoveler (+18%) breeding pair counts in the Irrigated strata were above the long-term average in 2008. These trends are almost entirely attributed to gains in the Yakima Basin. 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. Breeding mallard counts have been increasing in the wasteways since 2005, possibly in response to *Phragmites* control efforts and wetland excavation projects.

The Potholes strata was down 7% from 2007, 36% below the long-term average. Breeding mallards

(+24%), gadwall (+20%), and redheads (+19%) were all up from 2007 levels in the Potholes strata. All other major breeding species experienced declines. 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 2007 and 2008, the Potholes strata supported 33% 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 and have leveled off between 7,000 and 8,000 breeding birds. Currently Potholes mallards are 36% below the long-term average (n = 9,801) for the strata. Gadwall exceed the long-term average by 14%. All other common dabbler and diver species, with the exception of goldeneye (+13%), are below the long-term average in the Potholes strata.

The Northeast stratum was 11% below the 2007 count and 17% below the long-term average. This stratum represents 15% of breeding ducks in all eastern Washington strata in 2008. Redhead (+97%), ring-necked duck (+114%), and goldeneye (+76%) exceeded 2007 counts. All other major breeding duck species declined in the Northeast strata. In 2008, goldeneye (+60%) was the only major breeding species to exceed the long-term average.

Breeding pair counts in the Palouse strata were 47% below the previous year and 62% 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 50,647, up 10% from 2007, and 4% below the long-term average (Fig. 3, Table 2). The Irrigated strata hosts 72% of eastern Washington breeding mallards. Breeding mallard counts declined in the Potholes over a seven year dry period but have recovered after the past three years of normal precipitation recharged the aquifer and filled wetland basins.

Gadwall breeding indices have declined for the second straight year, after peaking in 2007 (Fig. 3, Table 2). However, 2008 gadwall breeding populations exceeded the long-term average by 11%. 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. Recently, this trend may be largely attributed to the Yakima Irrigated transect, where major efforts to restore wetland function and native upland breeding habitat are occurring, and gadwall numbers are 221% above the long-term average. Gadwalls 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 16% from 2007 and 76% 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 2008 were down 6% from the previous year and 47% below the long-term average. Redheads are detected in greatest abundance in the Lincoln County Potholes and Columbia Basin Irrigated transects. Redheads increased for the third year in a row in the Potholes strata, but have declined 97% over the long-term average in the 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

Observers surveyed 224.5 miles along 8 east-west transects spaced 10 miles apart. These transects fell within the Potholes strata and included parts of Douglas, Okanogan, Lincoln, Adams, Whitman, and Spokane counties. The flights covered approximately 0.8% of the strata area. Ruddy ducks were the most abundant duck species on the survey (34,721 +/-18,532), followed by redhead (29,362 +/-12,188), gadwall (27,913 +/-8,158), and mallard (27,517 +/-6,863) (Table 4). In addition, observers counted 16,312 (+/-9,647) Canada geese. The survey will expand in the future to include other areas of eastern Washington.

Results: Western Washington Survey Area

The western Washington duck surveys estimated the breeding population index for mallards at 8,898, 1% above the 2007 index and 3% below the 1997-2007 average. The wood duck breeding index was 2,556, -7% below the 2007 index, and 10% above 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 Area (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 2008 pond index was 5,495, 18% below 2007 levels, and 18% below the long-term average. Pond counts were down on all transects in the strata over the previous year with the exception of the Far East Okanogan transect. The Okanogan and Omak transects were slightly above the long-term average in 2008 (Table 6). Despite abundant snow pack in eastern Washington, a slow thaw resulted in little runoff and a lower than average pond counts.

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. However, 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 2008 duck brood production survey index for the Potholes, Palouse, and Northeast strata was down 6% from 2007 and 28% 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 (+8%) were the only dabbling duck broods above the long-term average (Table 7). Canvasback (+179%), goldeneye (+163%) and bufflehead (+51%), and merganser (+59%) broods all exceeded the long-term average (Table 7).

Brood production varied across the strata with annual gains in the Channeled Scablands (+117%) and Okanogan (+44%; Table 8). Long-term gains in brood production were seen in the Okanogan (+65%) 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 2008 index of goose nests was steady across the survey area. However, only 8 out of 21 surveys were conducted due to variable survey schedules. Overall the nest index was 1% above the 2007 count and 17% below the 20-year average (Table 10, Fig. 10). The 20-year average provides a fair comparison for current goose nest counts. This was the second lowest count in 20 years (Figs. 9 and 10, Table 10).

The nest surveys in the Upper Columbia were 8% below the 2007 nesting effort and 44% 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). Rufus Woods and Wells Pool were the source of decline in 2008, continuing a downward trend attributed in part to mammalian predation.

The total number of nests found on the Lower Columbia increased by 2% from 2007, 6% below the 20-year average (Table 10, Fig. 11). However, only 2 of 7 surveys were conducted on the Lower Columbia in 2008. The transect with the most consistent survey is below the I-5 Bridge to Puget Island. For this area, 399 nests were recorded in 2008, a 9% increase from 2007, and 11% below the long-term average.

Goose nesting effort on the Snake River in 2008 was down 9% from the previous year and 11% below the 20-year average. The Army Corps of Engineers

(USACE) reported removing some goose nesting tubs near parks on the Snake River pools to discourage nuisance geese. The Snake River cliffs are no longer surveyed by the USACE. Consideration should be made to remove this transect from the survey.

The total number of nests found in the Columbia Basin was up 10% from 2007, 8% below the 20-year average (Table 10, Fig. 11). The Moses Lake survey, conducted every other year, yielded 34% more nests (n = 168) than the previous survey. The highest goose nest count on Moses Lake (n = 249) occurred in 1992.

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 2008 index increased 23% over 2007, 4% below the 20-year average.

In western Washington, the population index for Canada geese was 4,050, an increase of 198% from 2007, and 54% above the 10-year average of the survey (Table 5, Fig. 13).

Potential Improvements to Waterfowl Breeding and Production Surveys

- Expand this report to better cover western Washington
- Design and initiate helicopter transect surveys for breeding duck populations compatible with adjacent states and provinces.
- Expand databases to include older data.
- Explore the possibilities of including data from National Wildlife Refuges and National Forests.
- Clearly delineate strata and check accuracy of weighting factors and sample size.
- Evaluate the goose nest survey areas for accuracy of frequency and completeness of surveys.

Fig. 1. Breeding duck surveys in eastern Washington.

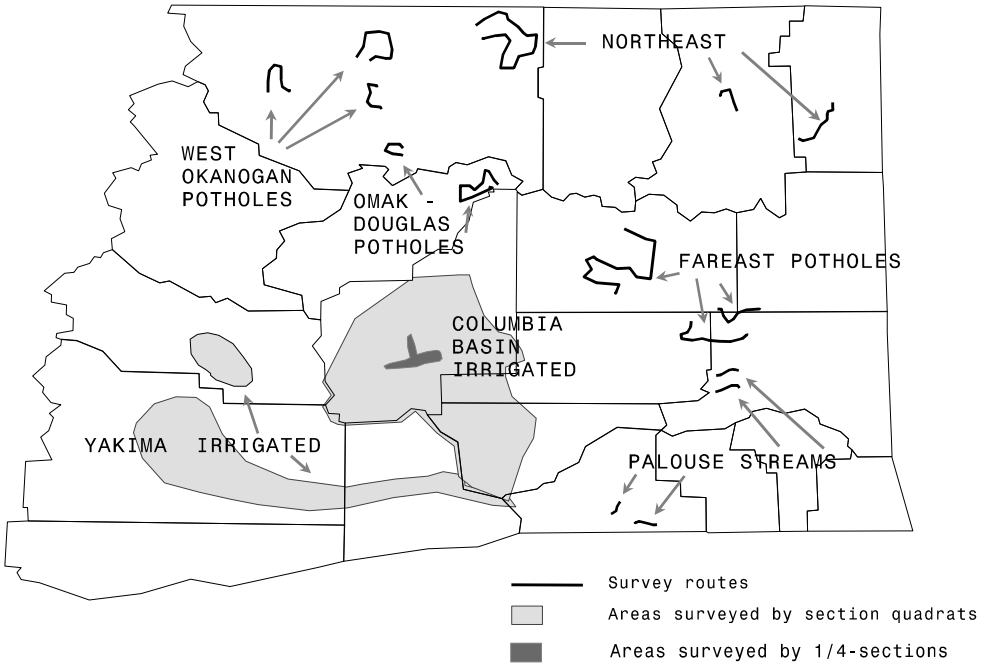


Figure 2. Total breeding duck population index for eastern Washington, 1961-2008

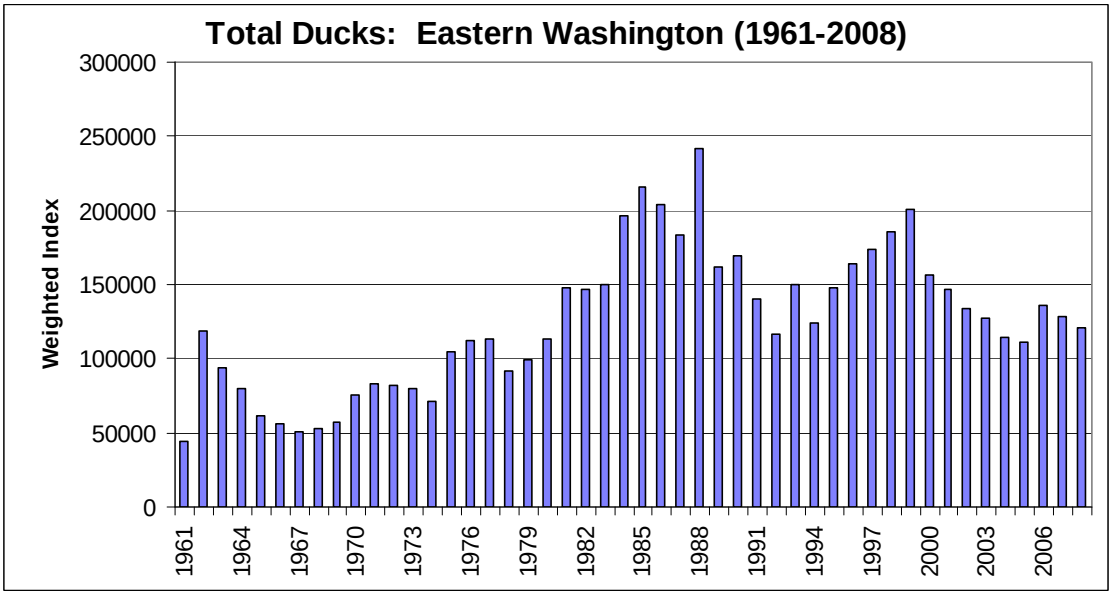


Figure 3. Indices of common breeding ducks in eastern Washington, 1962-2008.

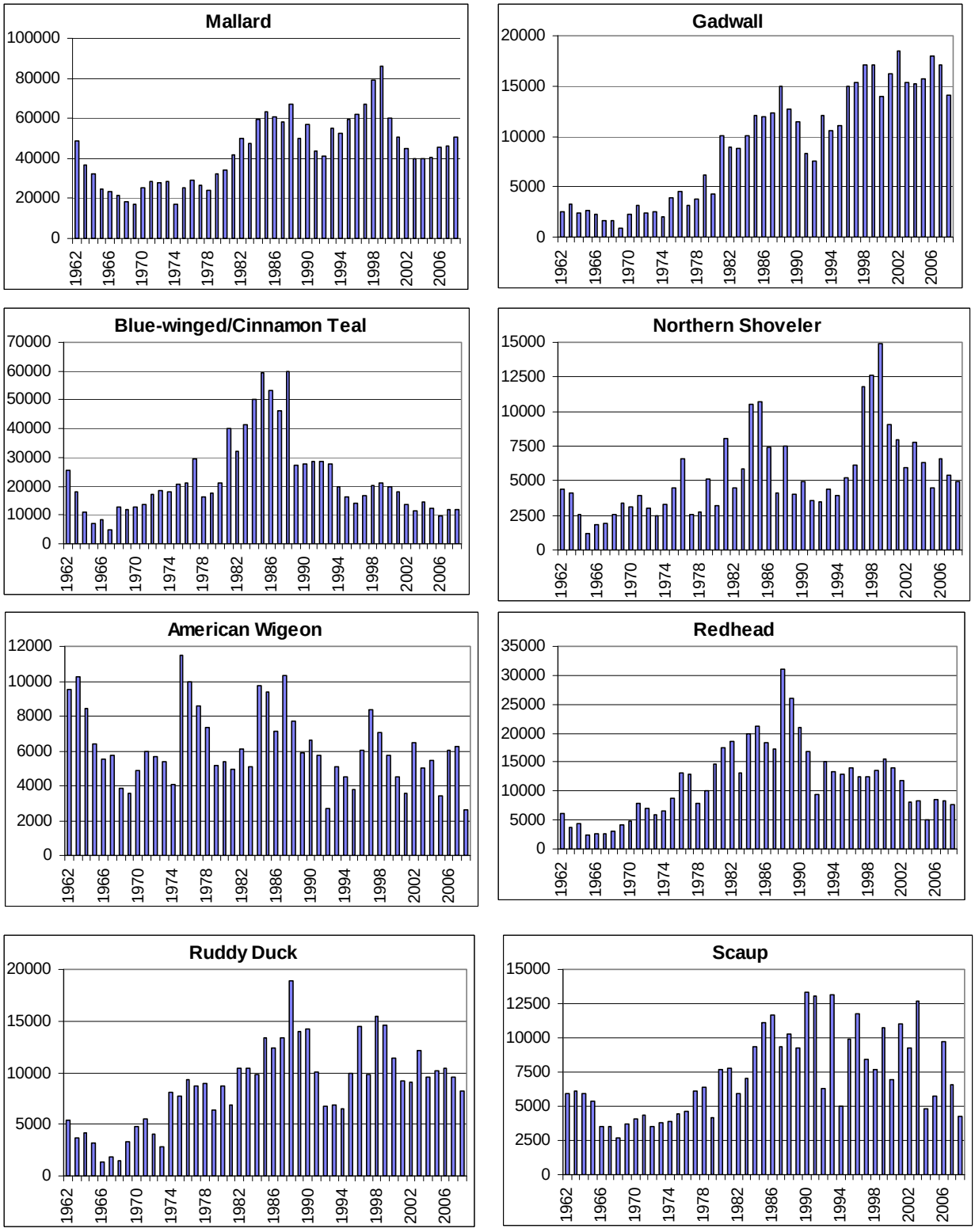
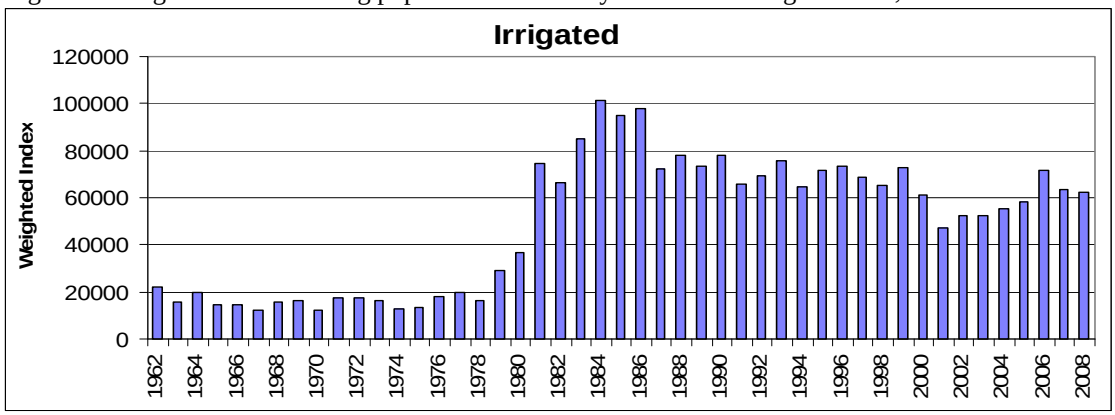
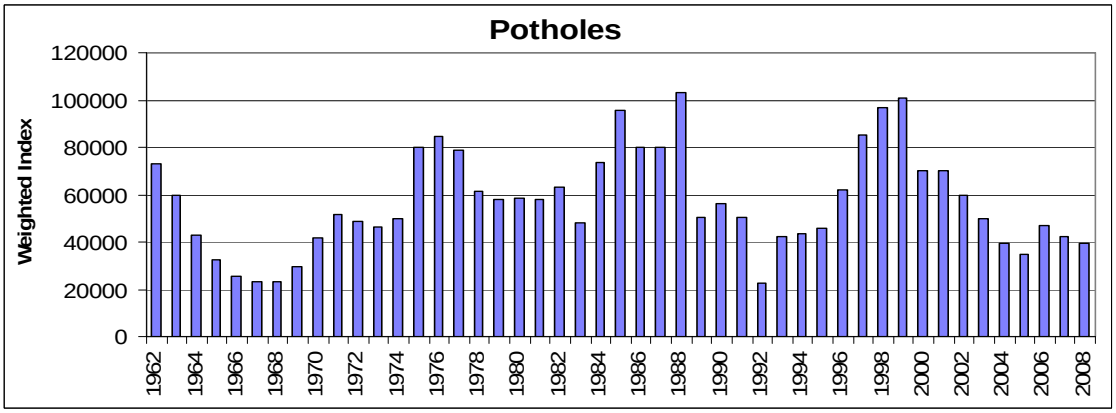
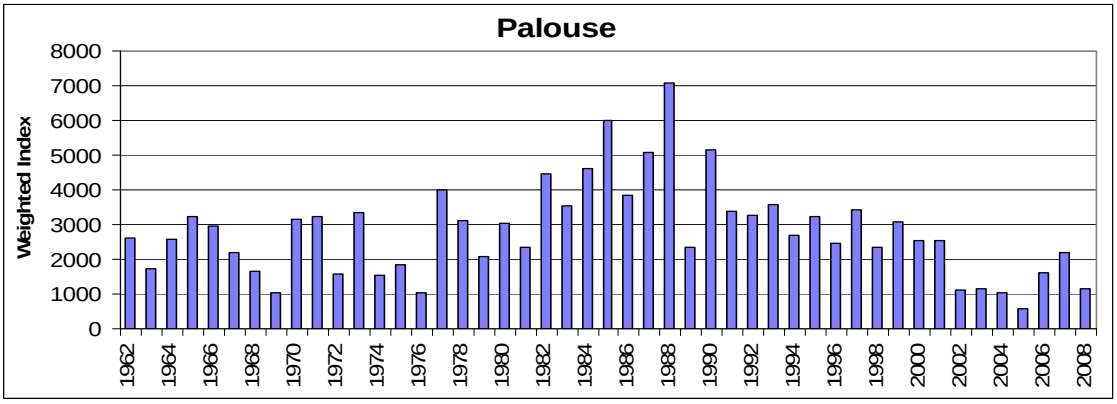


Figure 4. Weighted duck breeding population indexes by eastern Washington strata, 1962-2008.







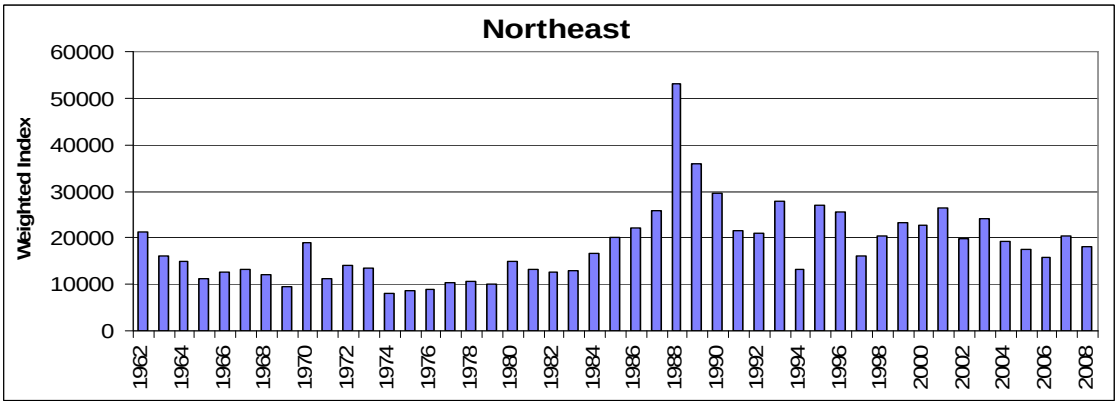


Figure 5. Weighted duck breeding population indices for 2 transects in the Columbia Basin, 1983-2008.

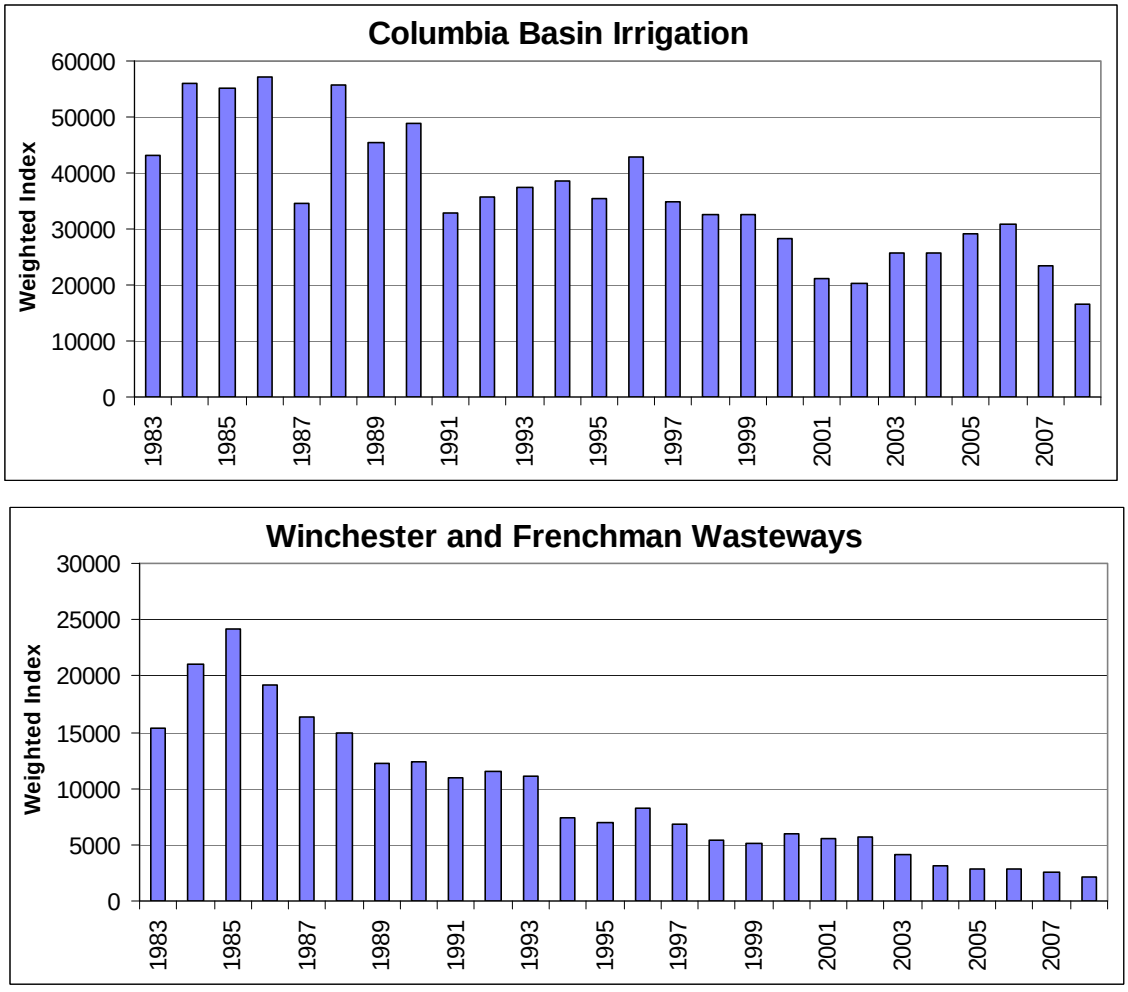


Figure 6. Proportion of blue-winged and cinnamon teal in eastern Washington breeding population surveys (1983-2008).

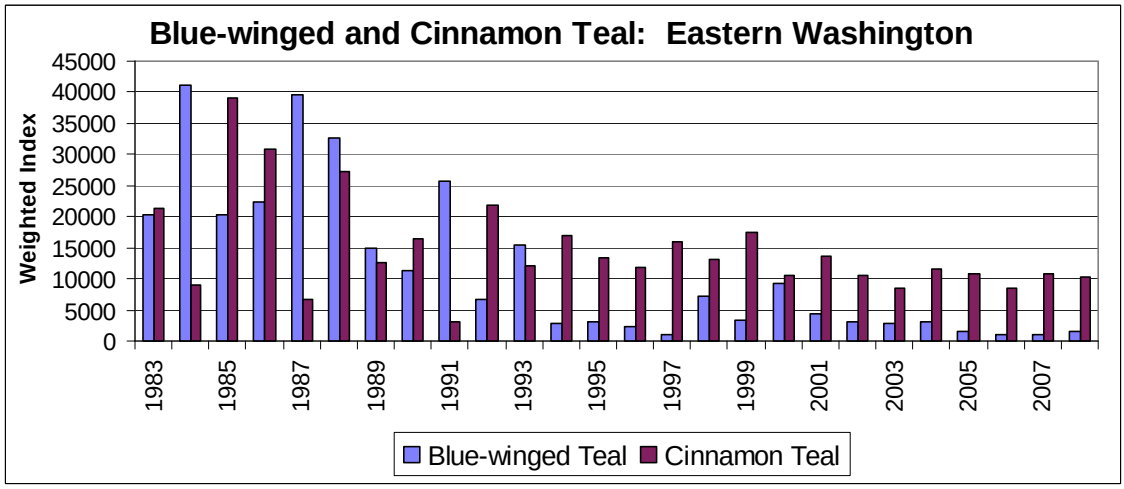


Figure 7. Western Washington total population indices for breeding ducks, 1997-2008.

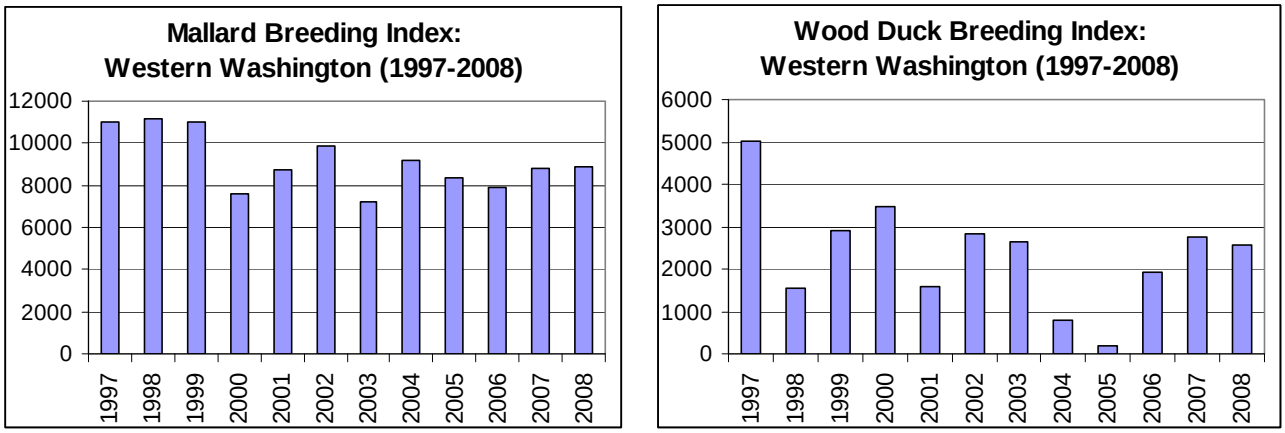


Figure 8. Index to pond numbers in the Potholes Strata, 1979-2008.

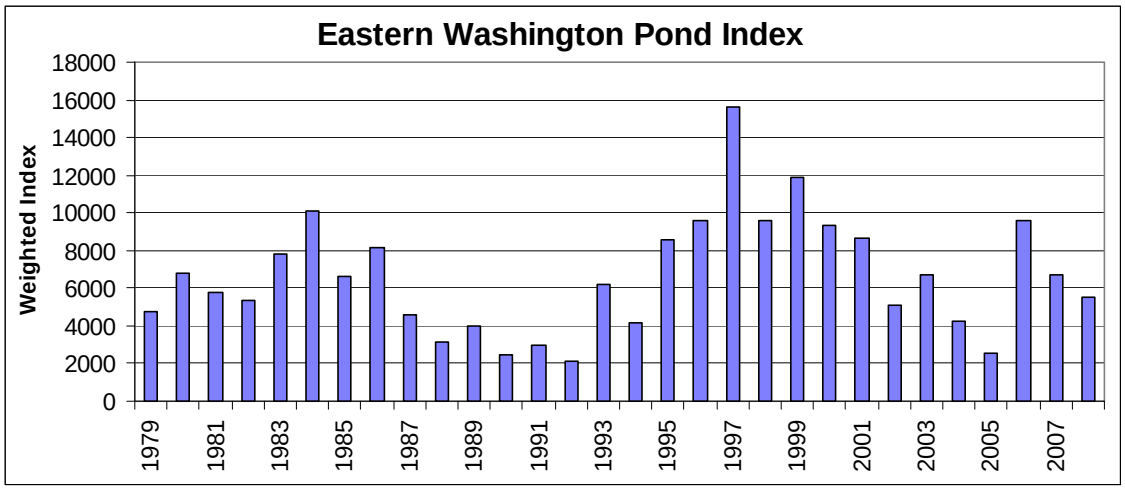


Figure 9. Weighted duck brood index (all species) for 3 eastern Washington strata, 1979-2008.

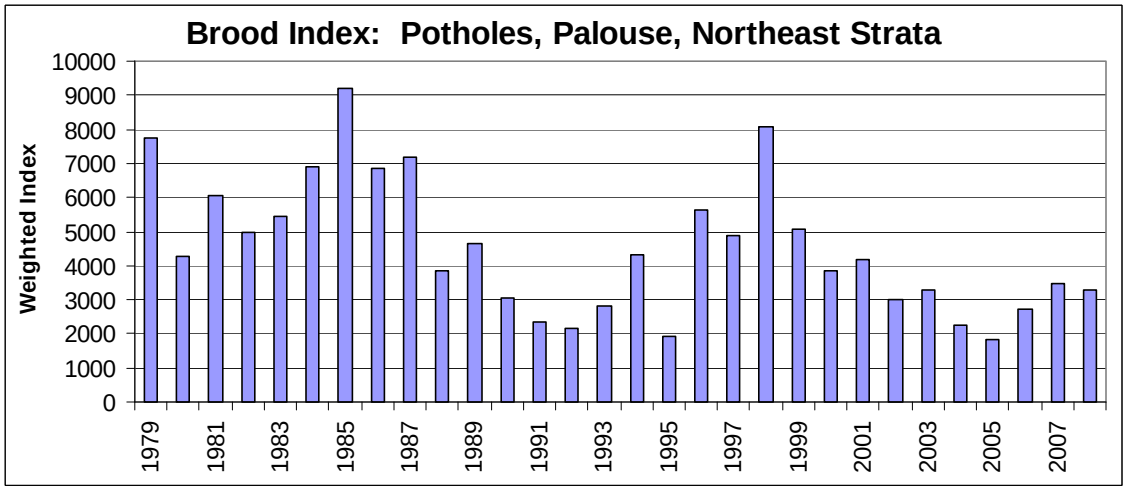


Figure 10. Total Canada goose nest attempts found on Columbia and Snake Rivers and in Columbia Basin, 1982-2008.

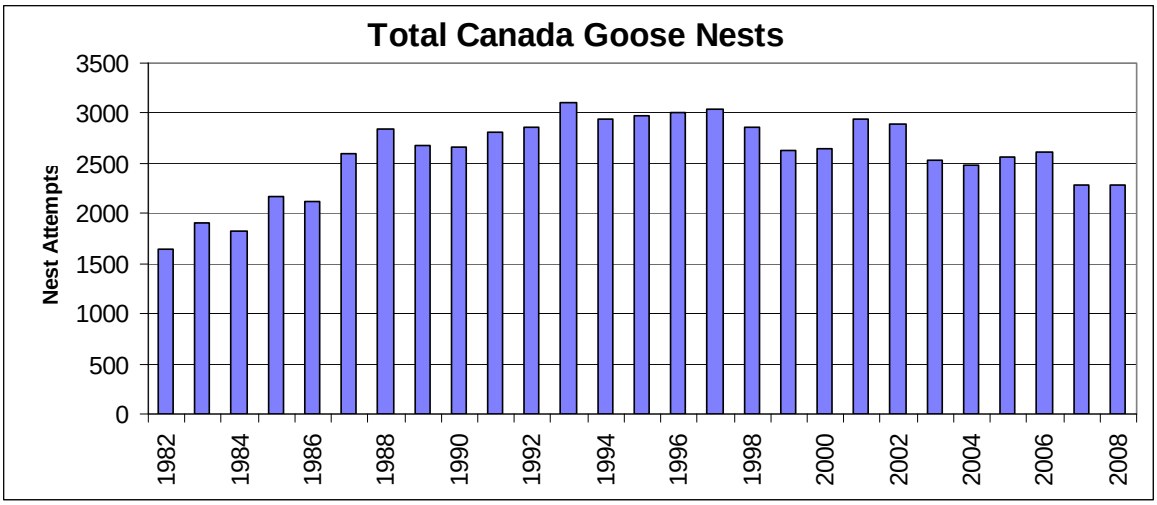
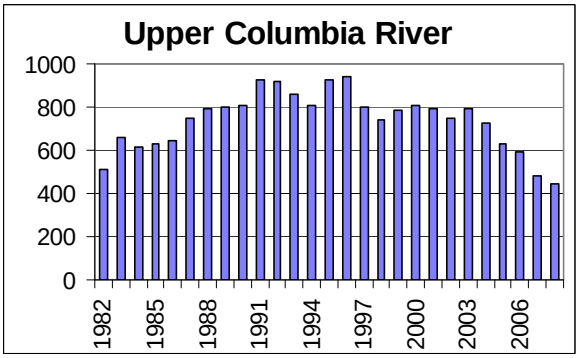
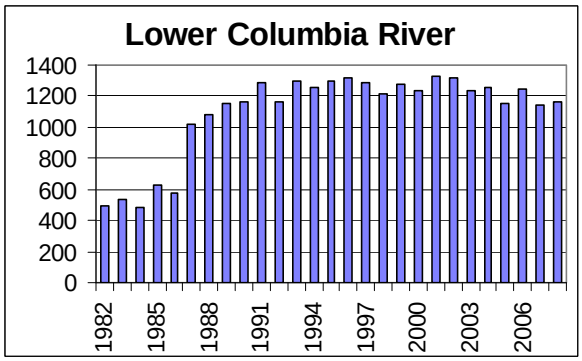
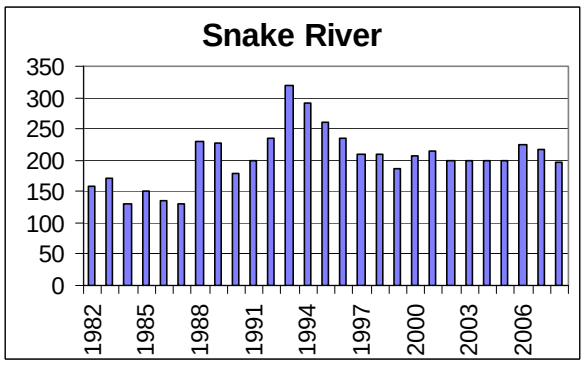


Figure 11. Canada goose nest surveys (number of nest attempts) by strata, eastern Washington, 1982-2007.







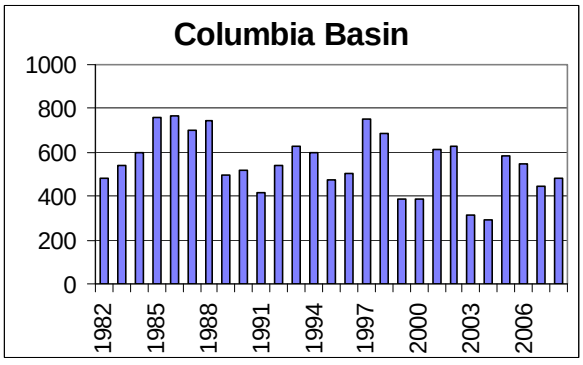


Figure 12. Breeding Canada goose index from eastern Washington breeding duck surveys, 1979-2008.

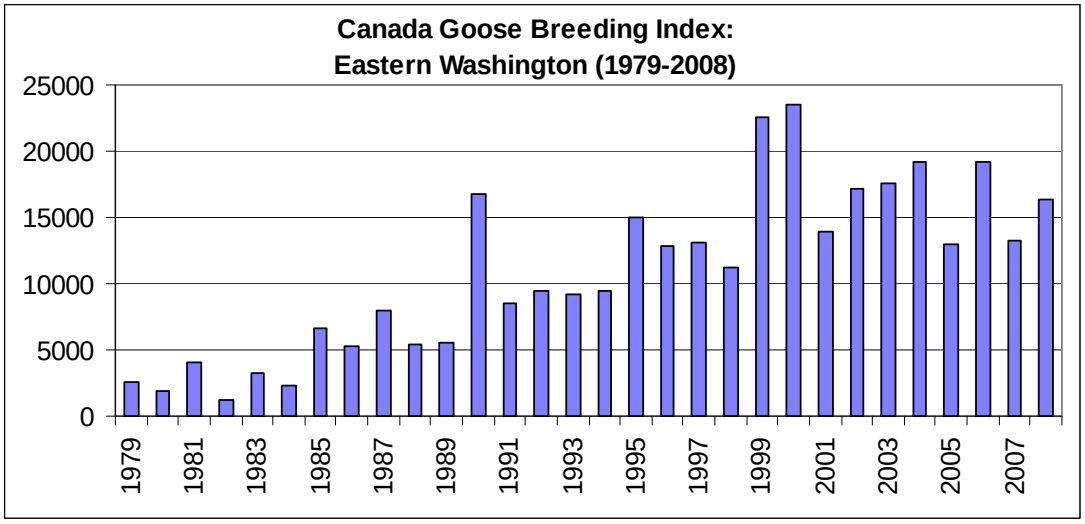


Figure 13. Breeding Canada goose index from western Washington duck surveys, 1997-2008.

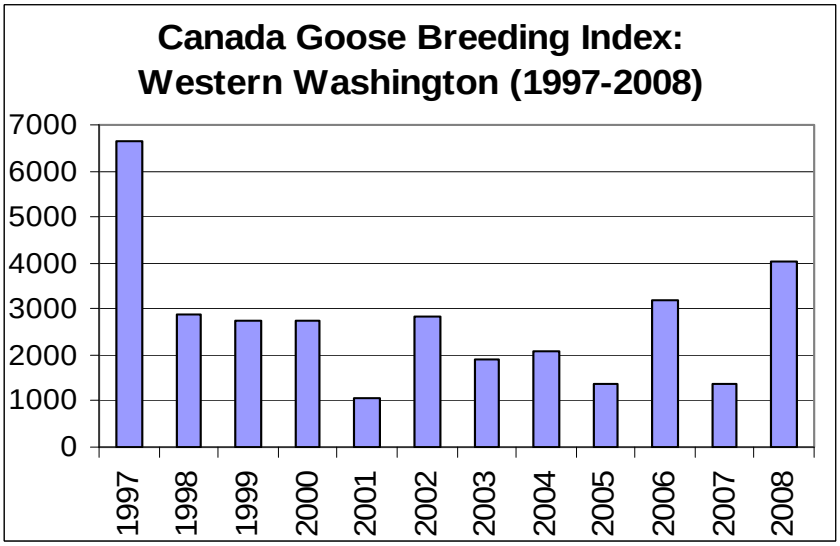


Table 1. Breeding duck routes, weighting factors and percent of area surveyed for areas and subareas surveyed for weighting breeding duck, goose, and ponds indices in Washington.

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 (1999-2008).

Species	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	1979-2007 average	2008 vs. 2007	2008 vs. LTA
Mallard	86243	60434	50464	44676	39843	39958	40794	45485	46053	50647	52924	0.10	-0.04
Gadwall	17130	13908	16261	18527	15353	15185	15665	17995	17165	14065	12684	-0.18	0.11
Am. Wigeon	5721	4523	3593	6501	5028	5442	3439	6012	6240	2618	5971	-0.58	-0.56
Am .green-winged teal	3665	3320	3037	2673	1749	1477	2406	4095	4060	1590	3117	-0.61	-0.49
Blue-winged teal	3409	9308	4351	3064	2864	2998	1659	1110	1085	1507	13801	0.39	-0.89
Cinnamon teal	17507	10540	13580	10653	8410	11620	10744	8434	10914	10414	13133	-0.05	-0.21
Blue +cinn teal	20916	19848	17931	13717	11274	14619	12404	9544	11999	11921	26934	-0.01	-0.56
Northern shoveler	14926	9100	8000	5968	7794	6293	4477	6581	5409	4898	6740	-0.09	-0.27
Northern pintail	2145	970	1018	395	608	1096	644	1089	723	450	1774	-0.38	-0.75
Wood duck	2496	1841	2223	1863	616	1553	1375	1549	1870	1781	1678	-0.05	0.06
Redhead	13568	15584	13915	11831	8117	8365	4978	8492	8265	7757	14755	-0.06	-0.47
Canvasback	1032	603	1073	1507	919	618	610	1460	756	1132	799	0.50	0.42
Scaup spp.	10697	6982	10976	9289	12722	4807	5741	9709	6530	4244	8956	-0.35	-0.53
Ring-necked duck	3835	5100	3931	1405	3063	850	2525	3640	2732	2995	2809	0.10	0.07
Goldeneye spp.	1993	2126	3643	4036	4713	3255	3567	2847	2837	3841	2663	0.35	0.44
Bufflehead	1094	410	826	1606	3034	1280	2425	6361	2809	3728	1551	0.33	1.40
Scoter spp.	0	0	0	0	0	0	0	0	0	0	10		-1.00
Ruddy duck	14566	11419	9156	9023	12175	9624	10150	10464	9538	8262	10851	-0.13	-0.24
Merganser spp.	182	161	356	327	757	463	304	121	1279	969	420	-0.24	1.31
Total ducks	200210	156328	146402	133343	127764	114883	111503	135442	128265	120897	154636	-0.06	-0.22
American coot	43832	25945	40172	18171	19328	19085	12346	22151	33763	22069	31273	-0.35	-0.29
Canada goose	22598	23449	13890	17179	17596	19137	13022	19253	13244	16342	10721	0.23	0.52

Table 3. Weighted breeding duck population indices by area for eastern Washington (1979-2008).

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	**62265**	**39360**	**1171**	**18101**	**120897**
1979-06 Avg	68182	61678	3096	21679	154636
2007 vs. 2006	-2%	-7%	-47%	-11	-6
2007 vs. LTA	-9%	-36%	-62%	-17	-22

Table 4. Helicopter transect survey results: Eastern Washington potholes strata, 2008.

	2008	
Species	**BPOP**	**SE**
Mallard	27,517	6,863
Gadwall	27,913	8,158
Northern shoveler	10,583	5,313
Cinnamon teal	9,525	3,258
Am. Green-winged teal	5,556	1,385
American wigeon	2,117	1,284
Wood duck	265	268
Northern pintail	529	536
Blue-winged teal	0	0
Redhead	29,362	12,188
Ruddy duck	34,721	18,532
Scaup spp.	13,982	9,188
Ring-necked duck	9,787	7,192
Bufflehead	3,572	1,859
Goldeneye spp.	529	278
Common merganser	265	232
Canvasback	0	0
Hooded merganser	0	0
Canada goose	16,312	9,647
American coot	33,323	21,113

Table 5. Breeding waterfowl population indices for western Washington, 1997-2008

Species	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	97-07 avg	2008 vs. 2007	2008 vs. LTA
Mallard	11012	11127	10979	7608	8766	9874	7232	9163	8378	7913	8781	8898	9206	+1	-3
Wood Duck	5036	1535	2922	3490	1571	2828	2631	779	199	1924	2739	2556	2292	-7	+10
Canada Goose	6637	2889	2741	2762	1042	2844	1903	2104	1394	3169	1361	4050	2749	+197	+54

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
1979-2007 avg	996	629	334	3637	1065	6661
2008 vs. 2007	-46%	-13%	-5%	-18%	+10%	-18%
2008 vs. LTA	-36%	+7%	+6%	-24%	-1%	-18%

[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, 1999-2008.

Species	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	79-07 Average	% change from 2007	% change from Average
Mallard	2978	3226	1864	1762	1123	1328	1634	1557	1608	1786	1419	1720	-21%	-17%
Gadwall	842	332	281	740	383	230	230	26	179	132	292	385	121%	-24%
Wigeon	93	153	102	153	102	179	204	255	102	54	48	274	-11%	-83%
Green-winged teal	641	306	255	204	77	102	26	26	230	94	151	140	60%	8%
Blue-winged teal	466	357	281	281	230	179	153	26	26	0	42	585	-	-93%
Cinnamon teal	699	153	51	281	51	26	51	51	26	103	91	95	-11%	-4%
Northern shoveler	406	255	230	357	179	204	51	0	77	15	59	173	287%	-66%
Northern pintail	342	77	230	128	153	102	51	0	0	0	0	130	-	-100%
Wood duck	70	0	51	51	0	26	77	26	128	107	28	42	-74%	-32%
Redhead	684	536	230	128	179	255	51	0	179	211	252	439	20%	-43%
Canvasback	26	51	26	51	77	128	26	26	128	26	90	32	251%	179%
Scaup	127	102	26	0	0	102	0	0	51	14	21	49	47%	-58%
Ring-necked duck	31	77	0	0	0	26	128	0	281	26	50	50	96%	0%
Goldeneye	282	332	77	230	26	26	357	179	485	444	412	156	-7%	163%
Bufflehead	0	0	0	0	179	26	0	26	0	40	14	9	-64%	51%
Ruddy duck	411	255	102	51	0	179	102	204	460	222	219	228	-1%	-4%
Merganser	14	26	26	0	0	26	26	0	128	204	77	48	-63%	59%
TOTAL BROODS	**8112**	**6239**	**3830**	**4417**	**2757**	**3089**	**3166**	**2400**	**4085**	**3477**	**3265**	**4556**	**-6%**	**-28%**

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
LTA	2577	856	927	203	4563	179
2008 vs. 2007	117.4%	43.5%	-54.8%	-66.7%	-6.1%	NA
2008 vs. LTA	-63.3%	65.0%	-9.1%	-68.0%	-28.5%	-66.0%

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	04-08
UPPER COLUMBIA				+4.1%	+1.8%	-2.3%	+1.4%	-10.9%
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%	+0.1%
Snake River	1975	Army Corps	Annual					
Snake River Cliff	1979	Army Corps	Discontinued					
LOWER COLUMBIA				+18.9%	+4.0%	-1.2%	0	-0.1%
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	+8.9%
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%	-5.6%
Geese counted on duck surveys		WDFW	Annual	+31.9%	+32.1%	+7.0%	+18.8%	-7.0%

Table 10. Canada goose nest surveys in important areas of Washington, (1974-2008) and weighted number of geese observed during duck population surveys (1979-2008).

	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
1988-07 avg	783	222	1235	527	2767	10609
08 vs. 07	-8%	-9%	+2%	+10%	+1%	+23%
08 vs. 20-yr avg	-44%	-11%	-6%	-8%	-17%	+54%

WATERFOWL STATUS AND TREND REPORT: STATEWIDE
Winter Waterfowl Populations and Harvest

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Introduction

This report summarizes the 2007-08 Washington winter waterfowl surveys, waterfowl hunting regulations, waterfowl harvest, and waterfowl hunter trends. This summary compares current data with data collected over the past 25 years in the state as well as the Pacific Flyway. These data are part of a long-term database archived by the Washington Department of Fish and Wildlife (WDFW) Waterfowl Section. Several of the data sets extend back to the late 1940's.

Population surveys

Methods

The primary survey to determine status of wintering waterfowl throughout the Pacific Flyway is the January Midwinter Waterfowl Survey (MWS). This is a coordinated, comprehensive survey of the most important waterfowl wintering areas, using a combination of standardized surveys from fixed-winged aircraft and ground observation locations. The MWS is a combined effort among several agencies, including WDFW, ODFW, Yakama Nation, USFWS, and Canadian Wildlife Service.

Because the MWS does not capture migration peaks or patterns of habitat use throughout the fall/winter, additional fixed-wing and ground surveys take place in key wintering areas from October–March. Specific age structure surveys also take place in the north Puget Sound area for snow geese, brant, and swans, along standard ground observation routes.

Midwinter Waterfowl Survey Results

WDFW and U.S. Fish and Wildlife Service (USFWS) personnel completed the 2007-08 MWS in January 2008. Washington's midwinter index for total waterfowl and coots was estimated at 841,053, a decrease of 21% from the previous year and 27% below the 10-year average (1998-2007; Table 1).

The Pacific Flyway midwinter index for total waterfowl was 7.2 million waterfowl. This represents an 8% decrease from 2007 (7.8 million), 9% above the 10-year average (6.7 million), and 9% above the long-term average (6.7 million; 1955-2007).

The 2008 midwinter indices for total ducks in the 11 Pacific Flyway states was 5.4 million (Fig. 1), down 12% from the 2007 count (6.1 million), 1% above the 10-year average (5.3 million), and 6% below the long-term average (5.7 million; 1955-2007).

In Washington, the 2008 total duck population was 597,608, down 30% from 2007 levels of 854,855, and 29% below the 10-year average (Fig. 2). The Washington total duck count represents 11.2% of the Pacific Flyway wintering population, 30% below the state's 10-year average of 16.1% (Fig. 3). This is the lowest ratio of Pacific Flyway ducks recorded in the MWS in Washington in over 10 years and represents the fifth year of decline.

The 2008 mallard total for the Pacific Flyway was 973,585, down 25% from 2007, 24% below the 10-year average (1998-2007), and 40% below the long-term average (1955-2006). The total number of mallards counted in Washington in 2008 was 313,871, a 37% decrease from the previous year, and 34% below the 10-year average (Table 1). Washington holds a high percentage of the Pacific Flyway mallard population with a 10-year average of 37.4% (Fig. 4). This proportion has remained over 30% 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. The highest Pacific Flyway MWS counts of Canada geese occurred in the 1990s when wintering geese first numbered over 400,000. The highest count on record is the 1999-00 survey when 498,026 Canada geese were recorded in the Pacific Flyway. In 2007, the flyway count of 476,908 was 17% above the previous year's count, and 13% above the 10-year average.

The number of Canada geese wintering in Washington has been variable over the past 20 years. Canada geese numbered over 90,000 during the winter of 1998-99 and 2000-01. The 2008 total of 60,173 Canada geese was up 41% from 2007, and 7% 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. have had good reproductive success in recent years. Favorable weather conditions and low predation levels on Wrangel Island during the nesting season are contributing to an increasing population. Midwinter snow goose aerial photo counts by Canadian Wildlife Service in January 2008 numbered 94,859. This represents a 14% increase over the February 2007 count of 83,148 snow geese, 52% above the 10-year average. (Table 1, Fig. 6). During 1991-2000, the Skagit Valley snow goose populations averaged 12.5% juveniles per year, indicating a period of reduced production or juvenile survival. However, the 2001-2007 surveys averaged 22.7% juveniles, suggesting a significant increase in recruitment.

The number of brant counted in Washington during the 2008 midwinter survey was 19,775, a 56% increase from 2006, and 49% 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, 2008, was 11,744, up 49% from the previous year. The largest concentrations of brant were in Samish Bay (70%), Lummi Bay (12%), and Padilla Bay (9%). All brant counted in Skagit County are considered to be Western High Arctic (WHA) brant. However, color composition surveys were discontinued in 2004-05. During the 2006-07 and 2007-08 seasons, breast color measurements were taken from brant at Skagit County check stations collecting avian influenza samples. In 2006-07, 51% of harvested birds (n=188) were gray-bellied brant (Munsell 4-8). In 2007-08, only 21% of harvested birds (n=133) were gray-bellied brant. These results call into question the assumption that all brant counted in Skagit County during the MWS are WHA brant.

The 2008 northern Puget Sound (Skagit, Whatcom, and Snohomish counties) trumpeter swan MWS totaled 7,373 (Table 2), 16% below the 2007 count of 8,783. The 2007 count is the highest total count recorded in Washington. Juveniles accounted for 15.2% of the 2008 survey (Table 2), slightly below the 1999-2007 average of 16.2%.

The northern Puget Sound tundra swan midwinter index from 1996-97 to 2006-07 has averaged 1,964 birds per year. The 2008 count of 2,046 was 4% above the average, and 7% above the 2007 count. Juveniles represented 10.6% of the population (Table 2), the lowest ratio on record for this survey. The 1999-07 average juvenile percentage of tundra swans in this survey is 13.8%.

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 and 2007-08, hazing activities were used to discourage swans from using the lake. The successful hazing of swans from Judson Lake coincided with an approximate 50% reduction in lead-caused swan mortalities both winters (114 and 103 mortalities respectively) when compared to the average of 209 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 2006-07 and 2007-08 compared to previous years. A shot density assessment is planned for major roost sites in these counties to further clarify the role of Judson Lake as a source of lead-caused swan mortalities. The results of this multi-year effort to find the source of lead poisoning in wintering swans suggest that Judson Lake is a major source of lead, but that it is not the only source responsible for the lead-caused swan mortalities. Depending on funding availability, hazing activities will continue in 2008-09, 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 and WDFW (Table 2).

Biologists surveyed northeastern Puget Sound dabbling ducks on January 9, 2008. This was the only duck survey in northeastern Puget Sound during winter 2007-08. The January count of 141,400 dabbling ducks was low compared to the previous January count of 322,455 (Table 2). The record high count took place in December 2006 (n = 974,180). Waterfowl frequently move between the Frazier River Delta and Boundary Bay, B.C. depending on weather conditions. It is likely that waterfowl were not concentrated during the January count due to moderate temperatures prior to the survey.

The highest count in the North Columbia Basin

during 2007-08 occurred during December with 347,573 total waterfowl (including coots), however this survey was not complete due to weather-related concerns. The December survey did not include pools on the Columbia River north of Wanapum, as well as the Jameson/Grimes lakes. For the South Columbia Basin the highest count was in January, with 251,019 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 27,427 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 22,370 undifferentiated Canada geese on the two lakes in October 2007. This count was 7% below the long-term average (1976-2006) of 24,163 (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 2009.

Hunting Season Regulations

The 2007-08 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. 22-23. There were no species-specific "seasons-within-seasons" for ducks. The daily bag-limit was 7 ducks, to include not more than with 2 hen mallard, 1 pintail, 3 scaup, 2 canvasback, 2 redhead, 1 harlequin, 4 scoter, and 4 long-tailed duck (Table 3).

Substantial waterfowl populations in the Pacific Flyway over the last 8 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 2007-08 (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 2007-08, with season days of Saturdays and Wednesdays during February 2 – March 5, 2008 and a season quota of 5 duskys for the area.

For the 2007-08 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 2008, with 7 hunt days allowed in both Pacific County and Skagit 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, 2008. Hunters failing to comply with reporting requirements were ineligible to participate in the 2008-09 season.

The harvest of dusky Canada geese is determined at mandatory hunter check stations in southwest Washington. In 2007-08, 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 Vancouvers.

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 2007-08 Washington duck harvest of 429,287 decreased 11% from the 2006-07 harvest of 482,750. 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 until the 2001-02 season. The harvest has since stabilized over the past 5 years.

Mallards made up 57% of Washington's 2007-08 harvest, followed by American wigeon (15%), American green-winged teal (12%), and northern pintail (4%) (Table 6).

The total Canada goose harvest for 2007-08 was 59,595, down 18% from the 2007-08 record harvest of 72,721. A record low harvest of 26,479 occurred in 2004-05. 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 harvest of large Canada geese, which dropped an average of 21.8% per year during 2001-2005, has rebounded over the past 3 years (Fig. 11). The 2007-08 large Canada goose harvest (n = 38,154) was down 20% from the previous year and 54% above the long-term average.

The harvest of small Canada geese in 2007-08 (n = 21,441) decreased 15% from the previous year, 19% below the long-term average (Fig. 11). The highest recorded harvest of small Canada geese in Washington was 47,270 in 1979-80. The lowest harvest (8,880) took place in 2003-04. The reasons for the dynamic small goose harvest are uncertain. A shift in wintering areas may be occurring from central Washington to the mouth of the Columbia and Willamette Valley. 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 2007-08 season when Region Two had 25.5% of the harvest followed by Region Four (24.7%), Region Three (20.7%), Region Six (11.6%), Region One (10.5%), and Region Five (6.9%).

Mandatory Harvest Reporting Results

The 2007-08 sea duck harvest survey, based on the fourth year of mandatory harvest report cards, indicated a total harvest of 2,222 (Fig. 13, Table 8). The harvest was dominated by surf scoters (70%), followed by white-winged scoters (18%), long-tailed ducks (5%), harlequin ducks (5%) and black scoters (3%). From a total of 1,941 authorizations, an estimated 497 hunters were successful and hunted a total of 1,006 days. The harvest was reported from 14 counties with Island County reporting 29% of the harvest followed by Skagit (18%), Mason County (14%), and Thurston County (12%). 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 2004-07-harvest estimate of 2,016, the average Puget Sound scoter harvest rate is less than 3% and within sustainable levels for the population.

The 2007-08 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 453, similar (+3%) to the 2006-07 harvest of 441 (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 688 (1994-06). The season was closed from 1983 to 1986.

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). The harvest in 2007-08 was 15,690, a 177% increase over the 2006-07 harvest of 5,663, 587% above the long-term average. This is largely attributable to an over-wintering population of 94,856 snow geese in the Skagit-Fraser area, increased numbers of juveniles, and the increased bag limit on white geese. 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 1996-2006 and didn't take a dusky in 2006-07 were automatically sent a new permit for 2007-08. New hunters and those harvesting duskys in 2006-07 were required to take a new test. A total of 3,134 permits were issued in 2007-08 (up 7% from 2006-07), which included 214 new hunters. The 2007-08 regular season ran to completion in all quota zones. The percentage of duskys in the harvest was 1%, unchanged from 2006-07. A total of 2,647 geese were checked during the regular season, an increase of 9% from 2006-07 and 3% above the 5-year average of 2,566 (Table 11. Fig. 16). A total of 461 individuals (down 3% from the 2006-07 season) checked birds at check stations. The 2007-08 late season had 61 Advanced Hunter Education (AHE) program participants, of which 45 checked geese at check stations. Total late season harvest was 218 geese, which was 6% below the 2006-07 late season and 18% above the 5-year average. A combination of uniformed and undercover officers documented hunter compliance through individual field checks throughout the regular and late seasons. Compliance with regulations was estimated to remain within acceptable levels as determined by past emphasis patrols.

Hunter Numbers and Success

The Washington small game hunter survey is used to estimate the number of waterfowl hunters in the state. During the 2007-08 season, an estimated 26,813, hunters participated in the Washington waterfowl season down 4% from 2006-07 (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 estimated average number of ducks harvested per hunter in 2007-08 was 16.0, down from the record high success of 17.3 in 2006-07 (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.

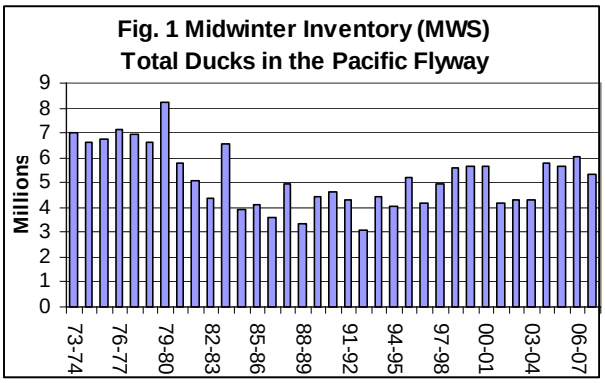


Fig. 1 Midwinter Inventory (MWS)
Total Ducks in the Pacific Flyway
Millions
0
1
2
3
4
5
6
7
8
9
73-74
76-77
79-80
82-83
85-86
88-89
91-92
94-95
97-98
00-01
03-04
06-07

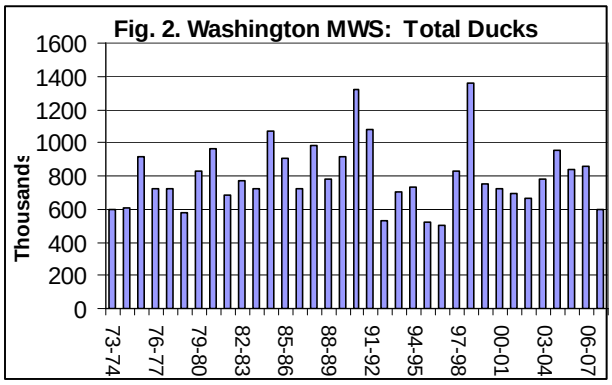


Fig. 2. Washington MWS: Total Ducks
Thousands
0
200
400
600
800
1000
1200
1400
1600
73-74
76-77
79-80
82-83
85-86
88-89
91-92
94-95
97-98
00-01
03-04
06-07

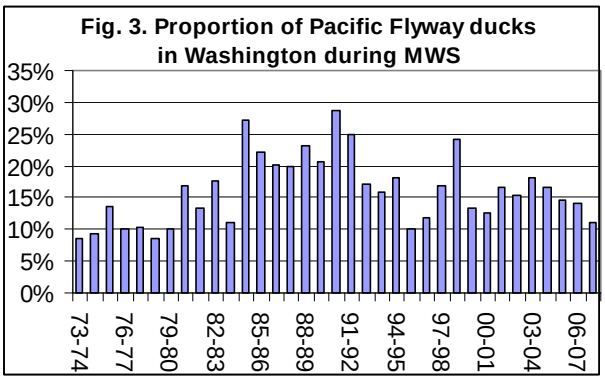


Fig. 3. Proportion of Pacific Flyway ducks
in Washington during MWS
0%
5%
10%
15%
20%
25%
30%
35%
73-74
76-77
79-80
82-83
85-86
88-89
91-92
94-95
97-98
00-01
03-04
06-07

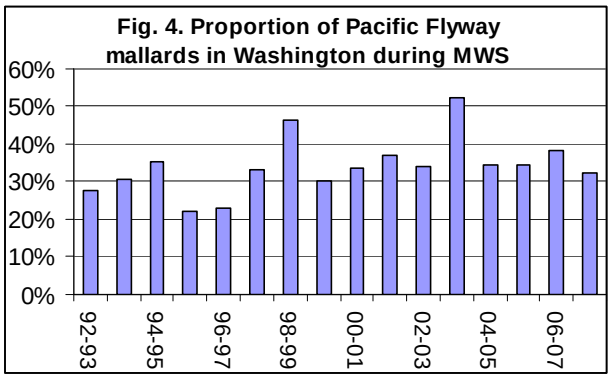


Fig. 4. Proportion of Pacific Flyway
mallards in Washington during MWS
0%
10%
20%
30%
40%
50%
60%
92-93
94-95
96-97
98-99
00-01
02-03
04-05
06-07

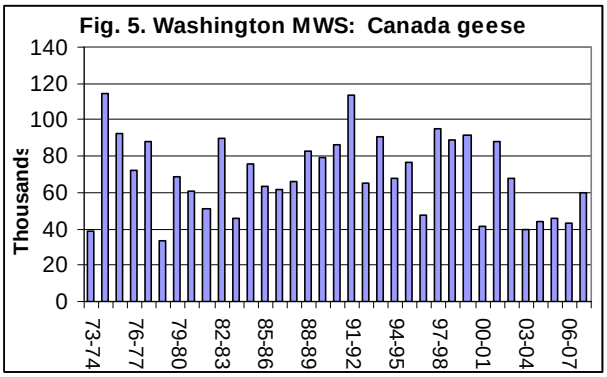


Fig. 5. Washington MWS: Canada geese
Thousands
0
20
40
60
80
100
120
140
73-74
76-77
79-80
82-83
85-86
88-89
91-92
94-95
97-98
00-01
03-04
06-07

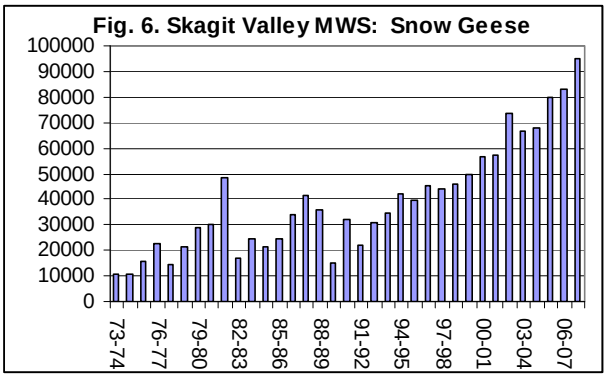


Fig. 6. Skagit Valley MWS: Snow Geese
0
10000
20000
30000
40000
50000
60000
70000
80000
90000
100000
73-74
76-77
79-80
82-83
85-86
88-89
91-92
94-95
97-98
00-01
03-04
06-07

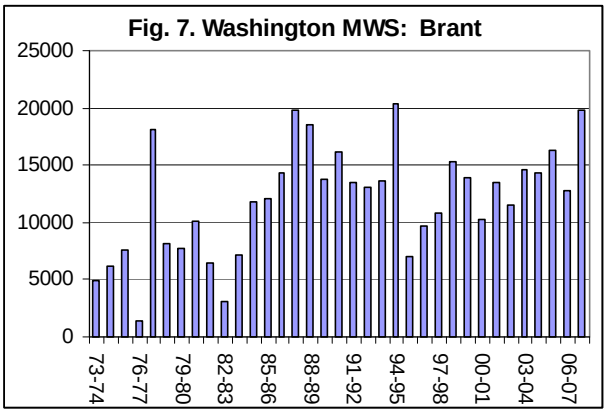


Fig. 7. Washington MWS: Brant
0
5000
10000
15000
20000
25000
73-74
76-77
79-80
82-83
85-86
88-89
91-92
94-95
97-98
00-01
03-04
06-07

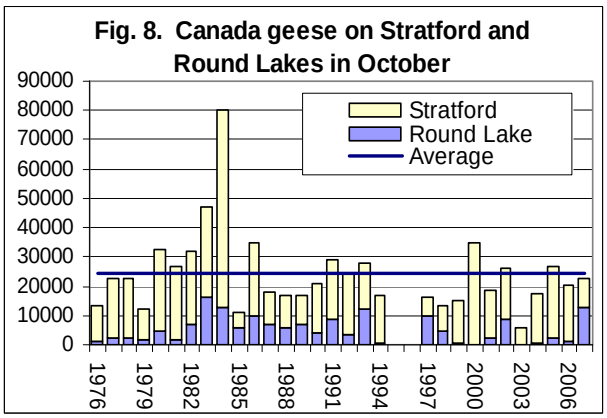


Fig. 8. Canada geese on Stratford and
Round Lakes in October
Stratford
Round Lake
Average
0
10000
20000
30000
40000
50000
60000
70000
80000
90000
1976
1979
1982
1985
1988
1991
1994
1997
2000
2003
2006

Figure 9. Washington Goose Management Areas

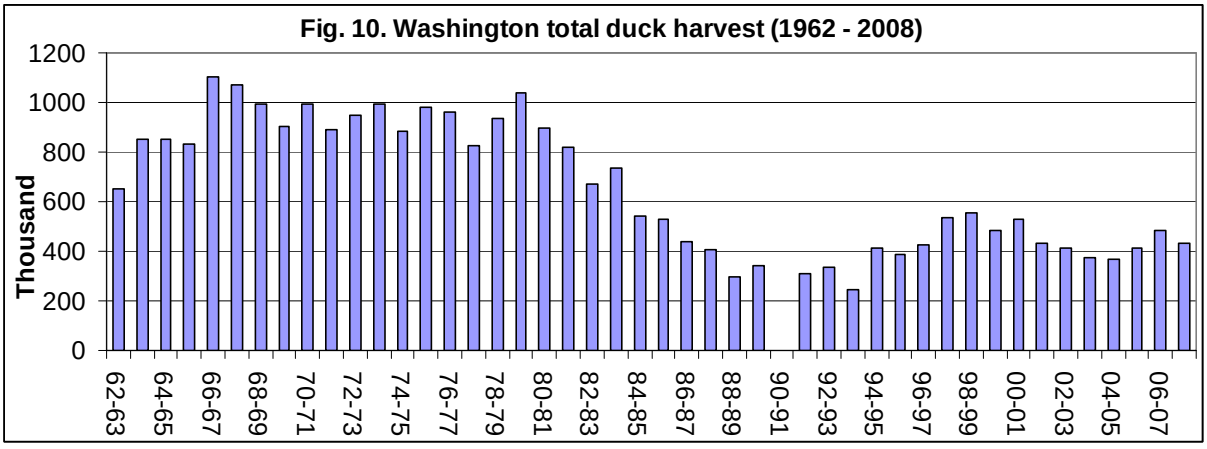
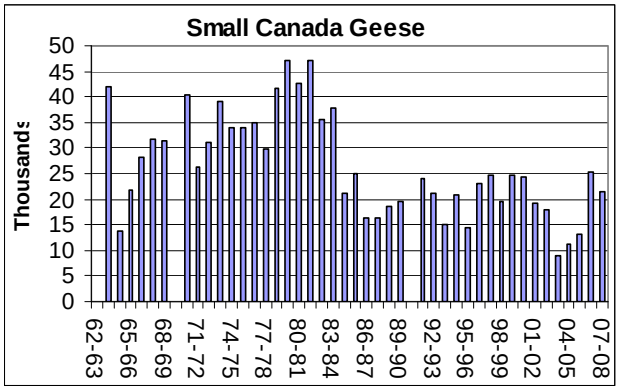


Fig. 11. Washington Canada Goose Harvest



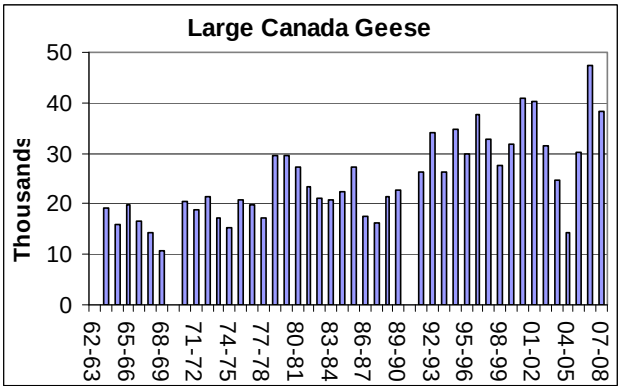


Fig. 12. Waterfowl Harvest by Region

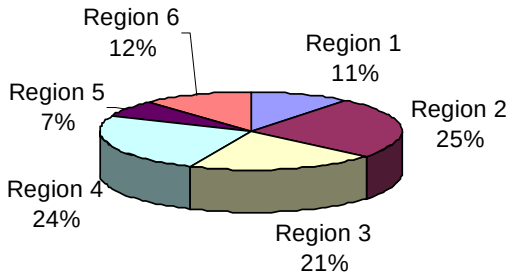


Fig. 13 Sea Duck Harvest (2007-08)

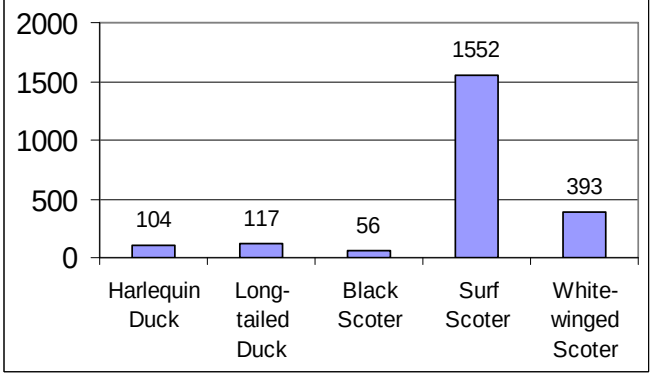


Fig. 14. Washington brant harvest

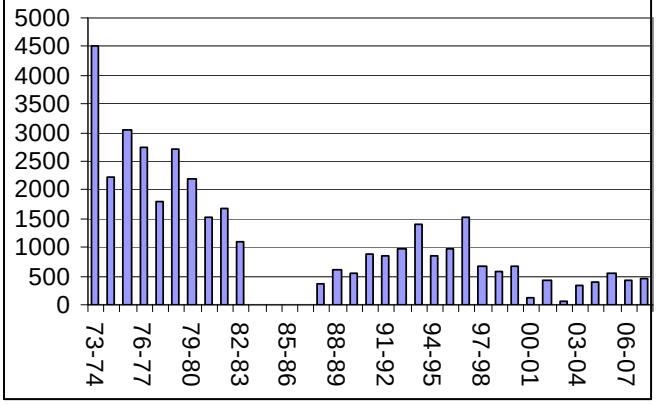


Fig. 15. Skagit snow goose harvest

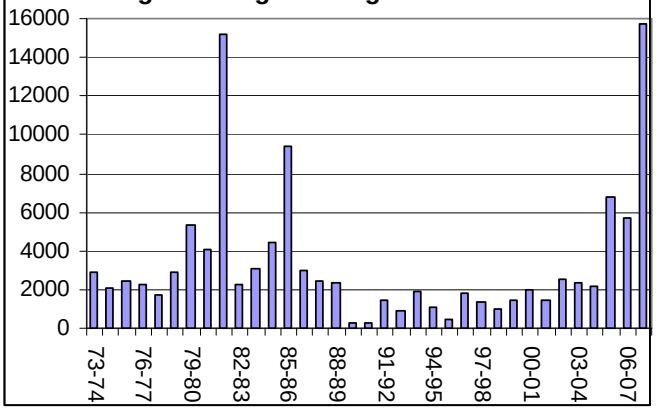
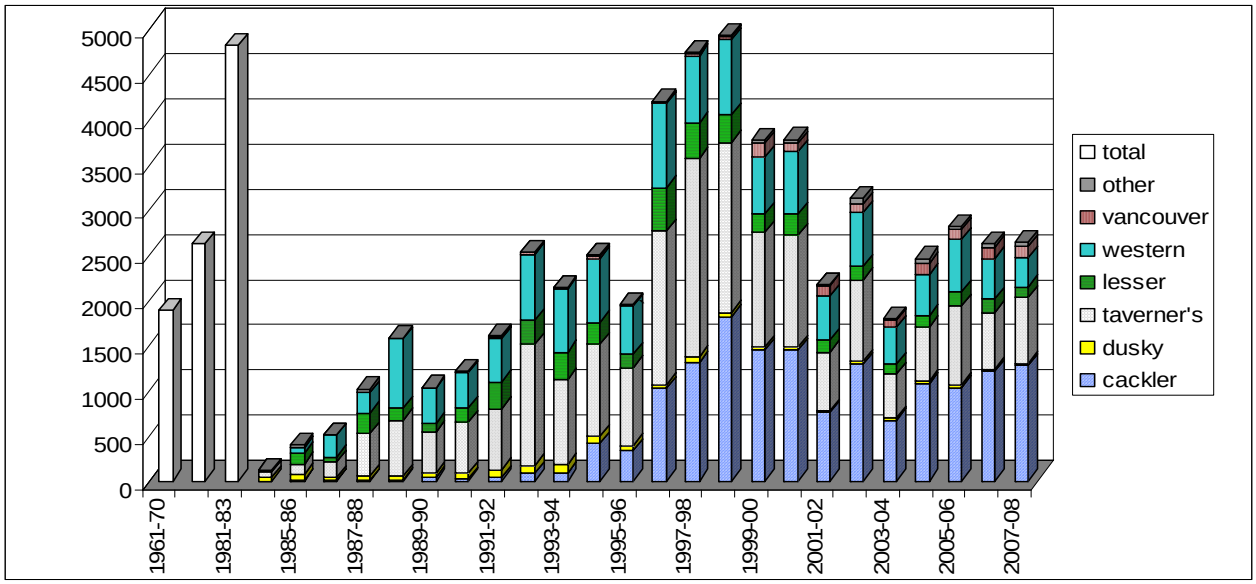
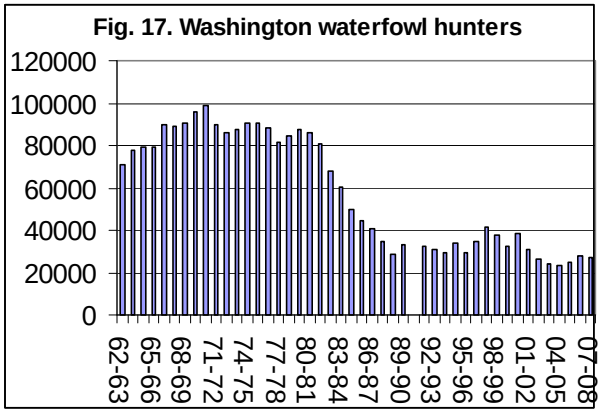


Figure 16. Southwest Washington goose harvest, 1970-2008, special permit zones 2A and 2B.





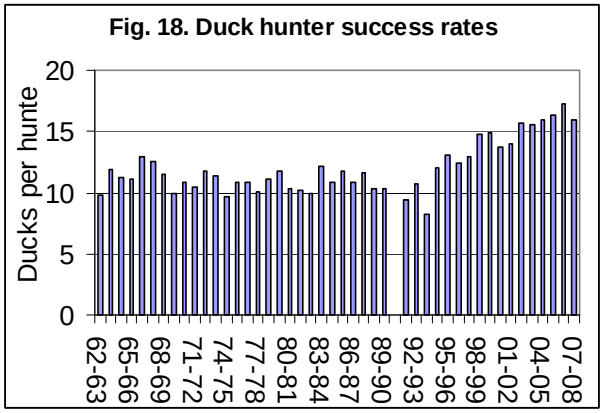


Figure 19. The waterfowl regulated access program promotes quality hunting opportunities by reducing hunting pressure.

Table 1. Washington Annual Midwinter Waterfowl Survey, 1997-2008.

SPECIES	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	08 vs. 07	98-07 avg	08 vs avg
Mallard	547134	979679	442811	356830	348841	325459	432570	470186	374881	494597	313871	-37%	477299	-34%
Gadwall	7482	5243	8043	10571	10595	11391	9252	10904	5780	5314	5854	10%	8458	-31%
Wigeon	117536	172049	112926	133465	124301	113838	151981	195798	170491	90734	89614	-1%	138312	-35%
Green-winged Teal	6729	12486	11089	6098	13695	8083	14565	33358	29492	30947	15506	-50%	16654	-7%
B.W. & Cinn. Teal	0	2	0	0	484	57	11	4	5	272	2	-99%	84	-98%
Shoveler	3100	2890	3036	1358	1852	5801	3445	2553	4130	8763	2210	-75%	3693	-40%
Pintail	43763	81653	70040	75597	72106	57465	49567	117296	94327	113949	45848	-60%	77576	-41%
Wood Duck	72	329	84	206	356	59	132	472	173	99	378	282%	198	91%
Redhead	2495	2335	1505	27918	11353	6867	2621	4795	13026	3645	2443	-33%	7656	-68%
Canvasback	6261	4841	2898	6020	3272	2131	3350	2929	2504	1501	3790	152%	3571	6%
Scaup	28684	28274	26933	28833	31970	41832	40744	34884	52519	29711	35052	18%	34438	2%
Ringneck	3327	3240	7488	6386	7306	6457	4583	8358	8507	12642	16568	31%	6829	143%
Goldeneye	12894	10851	13157	17177	15711	20098	14035	15941	19184	13973	15106	8%	15302	-1%
Bufflehead	14780	17185	18017	20647	20266	26426	20009	23293	21857	17511	21230	21%	19999	6%
Ruddy Duck	2712	2476	3819	3075	3457	4966	2936	1937	1718	2179	3096	42%	2928	6%
Eider	0	0	4	0	0	0	0	0	0	0	0	0%	0	0%
Scoter	21386	21507	20326	15932	16597	14125	15876	16753	18265	15307	16742	9%	17607	-5%
Oldsquaw	575	645	450	559	423	573	478	654	927	804	504	-37%	609	-17%
Harlequin	791	696	843	603	653	797	963	793	1015	733	902	23%	789	14%
Merganser	5750	6653	7762	9535	10564	12325	10495	10202	8355	7443	6377	-14%	8908	-28%
Unidentified Ducks	7364	3527	2577	1539	1606	3552	2660	5869	7458	4731	2515	-47%	4088	-38%
Snow Goose*	42666	38185	48843	47743	55480	73363	66801	47111	80060	75141	82583	10%	57539	44%
White-fronted Goose	1	0	3	34	21	2	5	27	17	82	42	-49%	19	119%
Canada Goose	95444	88698	91229	41351	88092	67941	39301	43908	45857	42759	60173	41%	64458	-7%
Brant	10881	15252	13859	10197	13478	11455	14544	14286	16305	12712	19775	56%	13297	49%
Tundra Swan**	3424	2802	4342	4597	2521	6393	1447	2778	3422	3548	3570	1%	3527	1%
Trumpeter Swan**	2352	3215	3896	4047	4562	4263	3996	5508	7904	9104	7747	-15%	4885	59%
Unknown Swan**	371	11	402	49	254	168	2432	2381	232	842	292	-65%	714	-59%
Coot	58199	104706	62387	74250	80631	91284	91387	105522	119856	72265	69305	-4%	86049	-19%
TOTAL	1046173	1609430	978769	904617	940447	917171	1000186	1178500	1108267	1071308	841053	-21%	1075487	-22%
*B.C. Snow Geese	806	1418	7759	879	8675	1770	0	21030	0	8007	12276	53%	5034	144%
Skagit/B.C. Total	43472	39603	56602	48622	64155	75133	66801	68141	80060	83148	94859	14%	62574	52%

**Comprehensive western Washington swan surveys in 1989, 1991, 1996, 2001, 2006

Table 2. 2007-08 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. 7-8**	**Dec. 9**	**Jan. 15-16**
Mallards		80,319	257,098	75,196
Total Ducks		150,176	288,631	112,849
Total Geese		20,918	4,053	9,260
Total Swans		362	191	156
Total Coots		103,474	54,809	40,256
SURVEY TOTAL		273,382	347,573	162,521
	No survey		Incomplete survey	
South Columbia Basin	**Oct.**	**Nov. 6**	**Dec. 8**	**Jan. 17**
Mallards		52,934	127,731	152,428
Total Ducks		66,832	149,120	197,482
Total Geese		39,465	46,132	41,994
Total Swans		55	113	45
Total Coots		30,955	22,653	11,498
SURVEY TOTAL		137,307	218,018	251,019
	No survey			
Yakima Basin	**Oct.**	**Nov. 8**	**Dec.**	**Jan. 16**
Mallards		12,992		23,481
Total Ducks		17,750		25,758
Total Geese		287		1,629
Total Swans		5		40
Total Coots		174		0
SURVEY TOTAL		18,216		27,427
	No survey		No survey	
Northern Puget Sound				
Mallards				78,750
Northern pintail				23,325
American wigeon				32,045
Green-winged teal				8,590
Brant				
TOTAL DABBLERS				141,400
	No survey	No survey	No survey	

Snow Goose Aerial Photo Counts	**Date**	**Skagit/ Snohomish**	**Fraser**	**Total**	**% Young**
	12/12/07	77,670	25,187	102,857	21.8%
	1/9/08	82,580	12,276	94,856	

Brant Aerial Surveys	**Date**	**Skagit Co.**	**Whatcom Co.**	**Total**
	1/8/2008	9,195	2,549	11,744

Age-ratios obtained from field observations – Northern Puget Sound				
Species	**Date**	**Sample size**	**Juveniles**	**% Young**
Trumpeter Swan	1/13-18/2008	7,373	1,120	15.2%
Tundra Swan	1/13-18/2008	2,046	217	10.6%

Table 3. Waterfowl hunting season regulation summary 2007-08.

	Area	SEASON DATES (inclusive)	Daily Bag Limit	Possession Limit
DUCKS *Sea ducks require written authorization (d)*	Statewide	Sept. 22-23, 2007(Youth hunting only)(a)	7 (b)	14 (b)
		Oct. 13-17 and Oct. 20, 2007 – Jan. 27, 2008.	7 (b)	14 (b)
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 and 3	Sept. 8-13, 2007	5 Canada geese	10 Canada geese
	Goose Mgmt. Area 2A	Sept. 8-13, 2007	3 Canada geese	6 Canada geese
	Goose Mgmt. Area 2B	Sept. 1-15, 2007	5 Canada geese	10 Canada geese
	Goose Mgmt. Areas 4 & 5	Sept. 8-9, 2007	3 Canada geese	6 Canada geese
	Statewide, except in Goose Mgmt. Areas 2A & 2B	Sept. 22-23 (Youth hunting only) (a)	4 Canada geese	8 Canada geese
	Goose Mgmt. Area 1 (d)	Oct. 13-25 & Nov. 3, 2007-Jan. 27, 2008, except snow, Ross, or blue geese may only be taken Oct. 20, 2007-Jan. 27, 2008.	4	8
	Goose Mgmt. Area 2A (d)	Except Ridgefield NWR, Sat., Sun., & Wed., only, Nov. 10-25 & Dec. 5, 2007-Jan. 27, 2008, Ridgefield NWR: 8am-4pm Sat., Tues., and Thurs. only, Nov. 13-24 and Dec. 6, 2007-Jan. 19, 2008, closed Nov. 22, 2007	4 (c)	8 (c)
	Goose Mgmt. Area 2B (d)	8 a.m. – 4 p.m. Sat. and Wed. only, Oct. 13, 2007-Jan. 12, 2008	4 (c)	8 (c)
	Goose Mgmt. Area 3	Oct. 13-25 and Nov. 3, 2007-Jan. 27, 2008	4	8
	Goose Mgmt. Area 4	Oct. 13-15 and Sat., Sun., Wed. only, Oct. 20, 2007-Jan. 20, 2008; Nov. 12, 22, 23, Dec. 24, 25, 27, 28, 2007; Jan. 1, 2008, and every day Jan. 21-27, 2008.	4	8
	Goose Mgmt. Area 5	Oct.13-15, & Oct. 20, 2007-Jan. 27, 2008	4	8
Brant (d,e)	Skagit Co.	Jan. 17, 19, 20, 22, 24, 26, 27, 2008	2	4
	Pacific Co.	Jan. 10, 12, 13, 15, 17, 19, 20, 2008	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, 3 scaup, 2 canvasback, 2 redhead, 1 harlequin, 4 scoter, and 4 long-tailed duck.
Possession limit: 14 ducks – to include not more than 4 hen mallard, 2 pintail, 6 scaup, 4 canvasback, 4 redhead, 1 harlequin, 8 scoter, and 8 long-tailed duck. See limited season dates for canvasback.
Season limit: 1 harlequin (see sea duck authorization requirement)
c) **Daily bag limit:** 4 geese – to include not more than 1 dusky Canada goose, 1 Aleutian goose, and 2 cackling geese.
Possession limit: 8 geese – to include not more than 1 dusky Canada goose, 2 Aleutian geese, and 4 cackling geese
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

[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)

* 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 (2007-08)[1]

Species	No. Harvested	% of total
Mallard	241,577	57.1%
Northern pintail	17,958	4.2%
American wigeon	63,892	15.1%
Green-winged teal	48,687	11.5%
Other ducks	51,006	12.1%
Total ducks	429,287	
Large Canada	38,154	51.3%
Small Canada	21,441	28.9%
White-fronted	654	0.9%
Snow	13,603	18.3%
Brant	450	0.6%
Total geese	78,869	
Total waterfowl	508,156	

[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 (2007-08)

Regions	Ducks Harvested	% of State Total Ducks Harvested	Geese Harvested	% of State Total Geese Harvested
Region 1	41,516	9.6%	12,027	15.2%
Region 2	104,026	24.2%	25,635	32.5%
Region 3	87,355	20.3%	18,052	22.9%
Region 4	110,626	25.8%	14,684	18.6%
Region 5	30,584	7.1%	4,544	5.8%
Region 6	55,180	12.9%	3,927	5.0%
Total	429,287		78,869	

Table 8. Sea duck harvest, 2007-08[1].

Species	No. Harvested
Harlequin duck	104
Long-tailed duck	117
Black scoter	56
Surf scoter	1,552
White-winged scoter	393
ALL SCOTERS	2,001
TOTAL	2,222

[1] These figures are based on analysis of mandatory report returns, corrected for non-response bias.

Table 9. Brant harvest report summary[1]

YEAR	MONTH	PERMITS ISSUED	SUCCESSFUL HUNTERS	HUNTER DAYS	SEASON DAYS	SKAGIT CO. HARVEST	WHATCOM CO. HARVEST	PACIFIC CO. HARVEST	TOTAL HARVEST
1990	DEC	490	338	763	11	808	0	73	881
1991	DEC	654	330	647	11	790	3	52	845
1992	DEC	747	319	709	11	950	9	18	977
1993	DEC	1194	496	765	11	1347	7	53	1407
1994	DEC	1069	287	484	9	825	0	23	848
1995	DEC	1207	343	552	11	918	0	44	962
1996	DEC	1445	254	549	11	1493	0	41	1534
1997	JAN	1331	197	326	5	597	0	59	656
1998	JAN	1348	243	350	5	570	0	18	588
1999	JAN	1336	218	386	9	581	0	86	667
2000	JAN	1295	39	59	5*	0	0	108	108
2001	NOV				5	56	0	20	76
2001	JAN				5	347	0	17	364
2001	ALL	1436	187	277	10	403	0	37	440
2002	NOV				5	18	0	9	27
2002	JAN				5*	0	0	33	33
2002	ALL	1387	27	277	10	18	0	42	60
2003	NOV				5	22	0	13	35
2003	JAN				5	235	0	64	299
2003	ALL	1187	152	200	10	257	0	77	334
2004	NOV				5	36	0	11	47
2004	JAN				5	308	0	34	342
2004	ALL	1612	126	209	10	344	0	45	389
2005	JAN	1707	220	336	5	504	0	53	557
2006	JAN	1793	199	272	7	367	0	74	441
2007	JAN	1795	166	243	7	341	0	112	453

[1] These figures are based on analysis of mandatory report returns, corrected for non-response bias.

Table 10. Snow goose harvest report summary[1]

YEAR	PERMITS ISSUED	SUCCESSFUL HUNTERS	DAYS (SUCCESSFUL)	ISLAND CO HARVEST*	SKAGIT CO HARVEST*	SNOHOMISH CO HARVEST*	TOTAL 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

[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
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

Note: Mandatory check stations initiated in 1984-85 season, prior estimates from USFWS harvest survey

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 were 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.

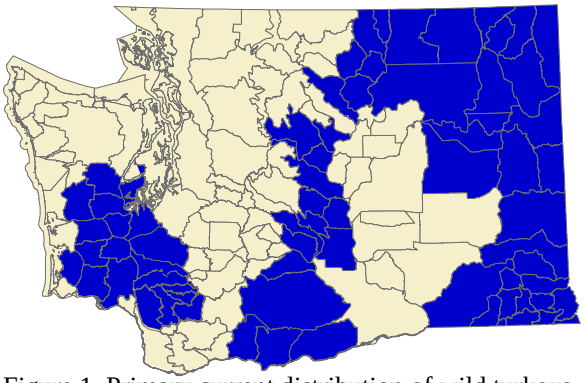


Figure 1. Primary current distribution of wild turkeys in Washington based on Game Management Units.

Current population management activities are focused on providing hunting opportunities in much of Washington State (Figure 1). Very minimal translocation activities have occurred as a last resort response to damage and nuisance complaints. Trapped birds have been released away from populated areas.

In January 2006, the Department adopted a statewide turkey management plan. Population management strategies are included in the plan. Of special note is a potential introduction site in Snohomish, Skagit, and Whatcom counties. Potential introduction sites are to be evaluated using a multi-tiered approach that includes, but is not limited to niche overlap analysis, evaluation of potential impacts to native species, and identification of potential nuisance and damage issues.

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. In 2006, the 14-day early fall (late Sept.-early Oct.), either sex general season (originally instituted in 2004) was expanded into GMU 101 thus including GMU's 101-124. This season is designed to utilize hunting to control turkey populations in areas where turkey populations are high and they have become an unacceptable nuisance.

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 2007. The season was held November 20-December 15, 2006 and offered 800 permits. In each of the past two seasons, the 800 permits were undersubscribed.

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. Overall harvest continues to increase, especially in eastern Washington (Figure 2).

To make management of turkey populations more effective, GMUs are grouped into Population Management Units (PMUs). Washington State was 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 2007, 5,453 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 2007 spring harvest in Region One increased approximately 3% from 2006 and accounted for approximately 80% of the overall statewide spring turkey harvest (Table 2), down from 84% in 2006.

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.

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 2007 increased once again, reaching 221 birds harvested in the spring season. Biologists noted that harvest was distributed throughout the forested areas of the region, but the Teanaway River drainage was the most productive area. Mild winters, the release of 574 birds from 1999-2001, and increased hunter awareness has undoubtedly contributed to the increased harvest.

Turkey harvest started slowly in Klickitat County in the 1960s but increased into the 1980's 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 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 2006 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 two of the most productive established transects during the December 15, 2007 – January 31, 2008 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.

The communities of Colville and Newport have participated in the annual Audubon Christmas Bird Count since 1998 and 2003 respectively. Birders identify and count all birds observed within a 7.5-mile radius permanently established for the count. Wild turkey have become one of the most common species observed, and the trend continues to increase.

In 1998 only 42 wild turkey were observed on the Colville count, but by 2003 there were 310 and in 2006 as many as 865 turkey were tallied. At Newport the count for the same 2003 to 2006 went from 68 to 264 birds. The total count for 2006 just for these two small areas totaled 1129 wild turkey.

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 significantly. 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 appear to have reached some level of population stability. Generally available habitats are occupied. The spring harvest in the primary PMU 10 has experienced relatively small increases since 2002 (Figure 2, Table 2).

The turkey population in Chelan County and northeastern Kittitas County continues to increase slowly based on counts of turkeys at winter concentration areas and increasing trends in gobbler harvest during the spring season. The turkey population in Okanogan County has been increasing in recent years. Future harvest data will indicate if populations are leveling off or continuing to increase. A small number of turkeys were harvested during 2007 (10) from Douglas and Grant Counties.

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 2007 point to a stable, slightly increasing 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 from previous years with an all-time high spring harvest of 487 turkeys. 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, increasing 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 and the 2006 harvest was. 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 number one winter food source of 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 2004-2007 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 significant changes in habitat management or weather conditions that would have affected turkey survival.

Augmentation and habitat enhancement

There were no new releases of turkeys made in PMU P20 (Chelan or Okanogan counties) during 2003-2007. 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. Supplemental feeding was a potentially important factor for the success of introduction of turkeys in this area because most birds were concentrated on feeding sites during winter and few birds appeared not to use feed sites. Only a few small flocks of 3-6 birds appeared not to use feed sites. Most birds did not venture more than 200 yards from supplemental feed during winter. It is unlikely the current population level of turkeys in this area could be maintained without supplemental feed. Few conflicts have been documented as a result of introductions within Chelan County, with four complaints related to turkeys reported during 2000 through 2004.

No releases were made 2001-06 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, the Department of Fish and Wildlife decided to not 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 the Department 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. Identification of specific habitat enhancement projects in underway, with possible projects in Klickitat County.

Management conclusions

The 2007 spring turkey harvest in Region One increased from the level of harvest between 2002 and 2005 (Figure 2; Table 2). Once again, PMU-10 and PMU-15 hunters experienced the highest success rates in the state with 42.7% and 33.3% harvest success respectively. Management decisions will focus on retaining good hunter success in this area while also addressing nuisance issues.

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 (up to 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.

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 of PMU P10 as well as a few reports in north-central and western Washington. Additional hunting opportunities were created in the area to help address these nuisance complaints.

Some hunting areas in PMU P10 are becoming so popular that hunter crowding and safety are becoming a concern on opening day and weekends. In 2007, liberalized fall hunting opportunity will be continued within PMU P10 to provide additional recreation as well as to help address population concerns.

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. 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 may be considered for the Methow watershed of Okanogan to reduce damage conflicts with turkeys.

Releases of Merriam's turkeys in Yakima and Kittitas counties have increased harvest and hunter participation. Radio tracking and observations indicate the birds have become widespread. Recruitment has been best in Kittitas County.

In 1994, regulations were changed to allow the harvest of up to 3 turkeys/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.

Following releases of over 600 eastern wild turkeys in PMU P50 (southwestern Washington) since 1998, there have been no plans drafted 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.

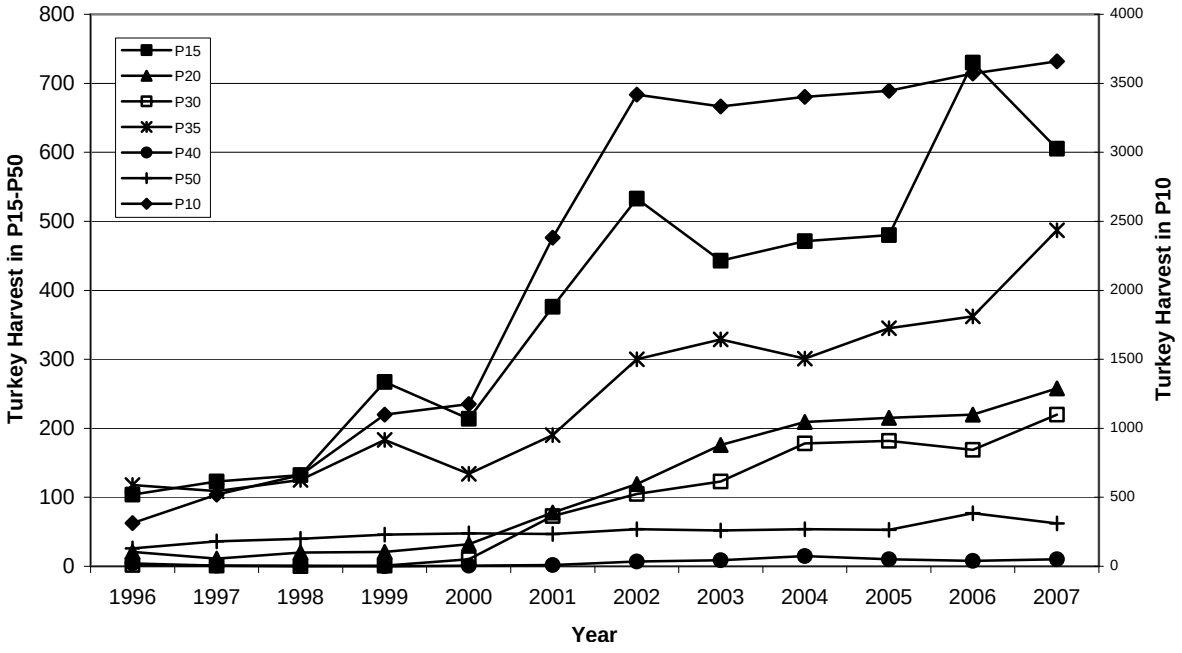


Table 2. Estimated spring turkey harvest in each turkey Population Management Unit (PMU) 1996-2007.

PMU	1997	1998	1999	2000	2001*	2002	2003	2004	2005	2006	2007
P10	519	662	1098	1176	2382	3418	3333	3401	3445	3571	3660
P15	123	132	267	214	376	533	443	471	480	730	605
P20	11	20	21	32	78	119	176	209	215	220	258
P30	1	0	1	10	73	105	123	178	182	169	221
P35	109	125	183	134	190	300	329	301	345	362	487
P40	1	1	0	1	2	7	9	15	10	8	9
P50	36	40	46	48	47	54	52	54	53	77	62
Total:	***800***	***980***	***1616***	***1615***	***3148***	***4536***	***4465***	***4629***	***4730***	**5137**	**5302**

* = 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	2001*		2002		2003		2004**		2005		2006***		2007	
	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	451	195	1992	433	1300	599	400	71	400	79	865	204	883	207
P 15	50	17	50	20	50	17	50	27	50	15	300	59	300	54
P 20	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P 30	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P 35	76	17	75	20	75	14	75	23	75	27	75	16	75	17
P 40	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P 50	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total:	***577***	***229***	***2117***	***473***	***1425***	***630***	***525***	***1276***	***525***	***1535***	***1240***	***1213***	***1258***	***1205***

* = First year of mandatory reporting system. **= 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 upland game birds and their habitats to ensure healthy productive populations for a sustained harvest.

Population Status

Surveys (crowing count and brood index) conducted between 1982 and 1998 indicate a decrease in pheasant numbers in eastern Washington (Rice 2003). 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 been steadily declining. 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).

In 2001 the Department changed the small game survey protocols to increase harvest and participation estimate precision. Harvest estimation techniques did not change between 1984 and 2000, however, and those surveys indicate a decline in pheasant numbers (Figure 2).

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.

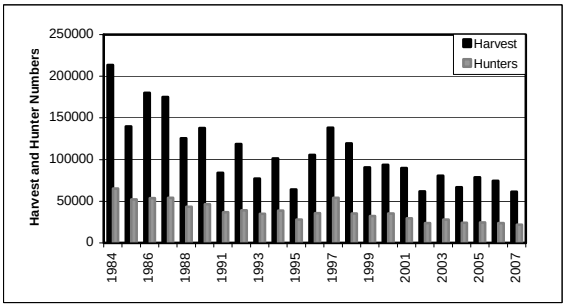


Figure 2. Estimated annual pheasant harvest and hunter participation in Washington 1984-2007.

While indicators show statewide declines (Figures 1 and 2), harvest estimates for the Yakima, Columbia, and Snake River Basins reflect variable decreasing trends in populations from 1991 to 2007 (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).

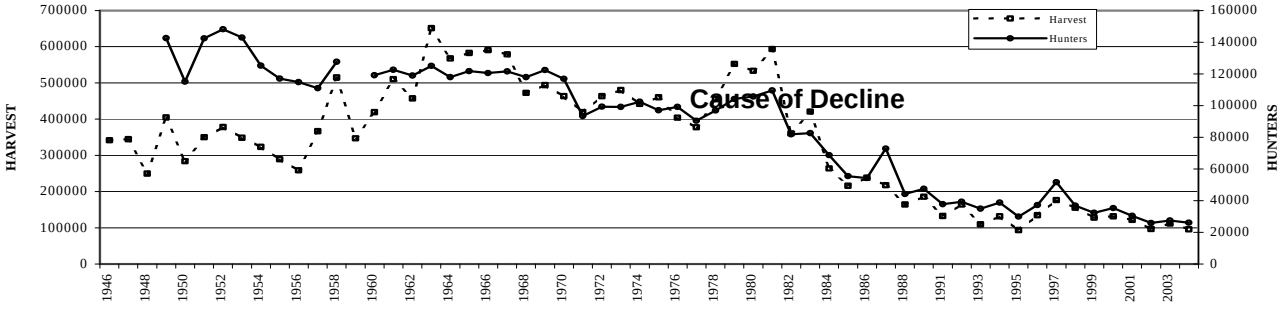


Figure 1. Estimated annual pheasant harvest and annual hunter participation in Washington 1946-2007

The cause of the decline in pheasant populations in Washington is undefined, but it likely results from several causes. Research in many parts of the United States indicates that loss of habitat is the primary reason pheasant populations decline. Of particular importance is breeding habitat (including nesting and brood rearing habitat), habitat for wintering and habitat that provides escape cover from predators.

According to Farm Service Agency (FSA), approximately 35% of Eastern Washington Conservation Reserve Program (CRP) will expire in the next three years. With both wheat and alfalfa trading at record highs, landowners have already terminated some CRP contracts and have destroyed key habitats to plant these crops. Orchards and vineyards have also replaced habitats in some areas. The Department is working with the FSA and the Natural Resource Conservation Service (NRCS) to develop programs for private landowners to develop, restore, and enhance wildlife habitat in priority areas.

Farming practices are evolving and most changes have a negative impact on pheasants. 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. Also, biologists are now seeing wheat stubble leaving the fields as a commodity, which further degrades residual habitat values.

Upland game bird fall population densities, and related harvest, also depend on spring weather conditions. Chicks struggle to thermoregulate in cold, wet conditions, and they depend on calorically dense, high protein insects as a major portion of their diet (Savory, C. J. 1989). Cold, wet weather in early summer increases the likelihood of chicks dying of exposure and early spring drought conditions, with even normal temperatures, decrease insect availability. When pheasant populations are already depressed, early spring droughts with cold, wet conditions during the peak of hatch, may cause a dramatic decline in future population densities.

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 have pheasants utilized in the past. In some areas of Southeastern Washington and in the Columbia Basin, housing developments have replaced valuable pheasant habitat.

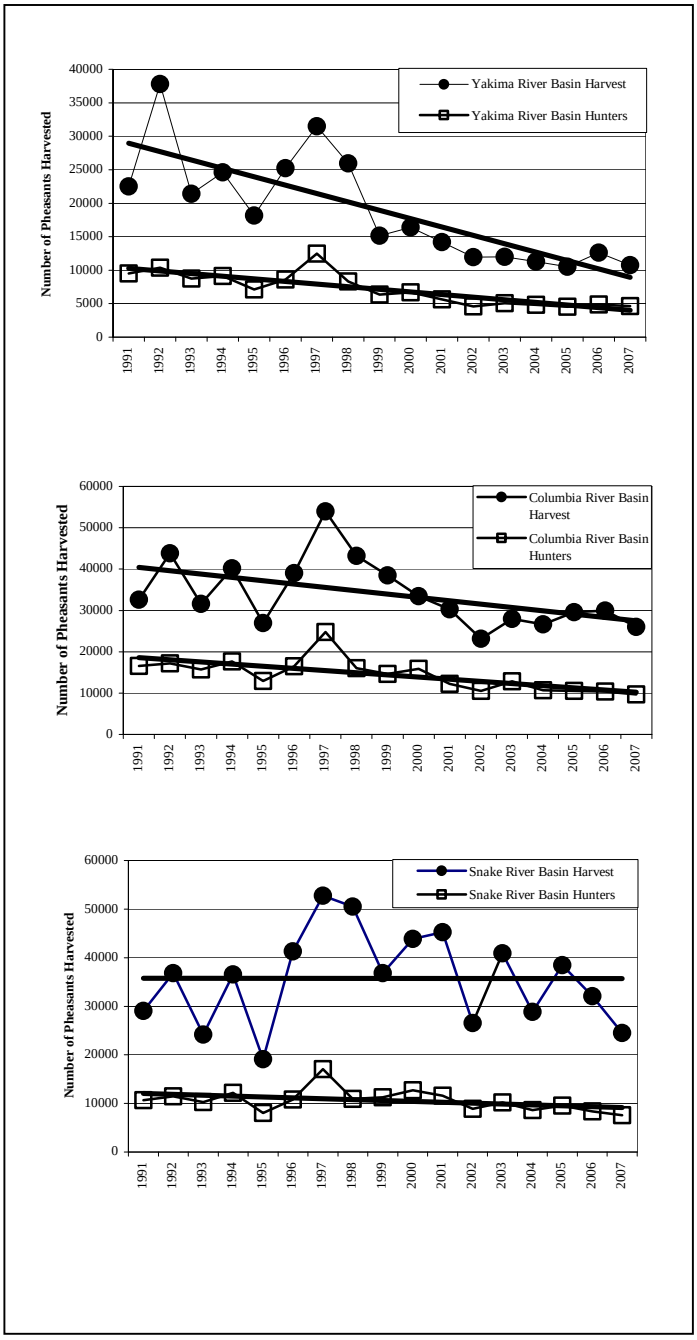


Figure 3. Estimated harvest and hunter participation for the Yakima River, Columbia River, and Snake River basins from 1991-2007.

Pheasant Management Workshop

In March of 2003, a workshop was held to identify management strategies for increasing naturally occurring pheasant populations in Washington. Pheasant experts from Kansas, South Dakota, Iowa and from the Wildlife Management Institute provided recommendations (Table 1) for reversing declines in Washington pheasant populations. Approximately 75 people attended the meeting including state agency personnel and the general public.

Table 1. Pheasant workshop recommendations from 2003 and WDFW actions.

Workshop Recommendations	***WDFW Actions***
Focus your efforts in select areas to avoid spreading resources too thinly.	*WDFW focuses pheasant management in Southeast Washington, which includes the best pheasant habitat statewide.*
Work at a regional scale to impact whole populations. Avoid focusing on small, isolated parcels of habitat.	*WDFW has designated a pheasant focus area that includes agricultural areas that receive 14 or more inches of precipitation in Whitman, Walla Walla, Columbia and Garfield counties.*
Prioritize habitat improvements that address limiting factors of pheasant populations.	*WDFW seeks to create and to restore nesting cover and brood-rearing habitat as a first priority.*
Pheasants require adequate nesting cover and sufficient insect abundance during brood rearing. Insects are associated with diverse plant communities with substantial forb components.	*WDFW convinced FSA to allow inter-planting CRP with forbs in Whitman County.* *WDFW's Partnerships for Pheasants program develops forb-rich habitat plots in riparian areas.*
Pheasants flourish when15% to 25% of the landscape is in relatively undisturbed grass with a significant forb component. Nesting and brood-rearing habitat should have few trees taller than 15-feet to reduce predation by raptors.	*WDFW Biologists stress the importance permanent habitat with private landowners.* *Using Geographic Information System (GIS) technology, WDFW is evaluating existing and identifying potential pheasant habitat areas.*
Releasing pen-raised pheasants for population establishment is expensive and ineffective.	*WDFW releases rooster pheasants only as put-and-take enhancement of hunting opportunity, not as a population management tool.*
The Farm Bill has many programs that can help landowners improve habitat conditions for pheasants.	*WDFW works closely with USDA to promote development of habitat for pheasants. This is critical as CRP contracts expire over the next couple of years.*

Workshop Recommendations	***WDFW Actions***
Habitat improvements must be compatible with farming practices to be effective across working landscapes.	*Biologists work with NRCS, FSA and PFP to provide incentives to landowners for establishing pheasant habitat that is compatible farming practices.*
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.	*WDFW's PFP program included landowner payments for leaving stubble, but landowners are intolerant of weeds and usually remove stubble after harvest.*
Tall wheat stubble retains soil moisture and can increase grain wheat yields.	*Few landowners have the expensive drill that can plant wheat through tall wheat stubble.*
Direct seeding (no-till drilling) can increase soil quality, reduce erosion and increase value of the property for wildlife.	*Fewer than 5% of landowners have transitioned to no-till farming, which is initially costly.*

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, management recommendations and WDFW actions can be found in table 2 also based on the results of the pheasant management meeting held in March 2003.

Table 2. Management recommendations and WDFW actions as a result of 2003 pheasant workshop.

Management Recommendations	***WDFW Actions***
Full-service Private Lands Biologists are needed to focus on pheasant management and enhancement within identified focus areas of the state.	*In 2002, seven Private Lands Biologists worked within the pheasant focus area. Due to the loss of federal monies, three Biologists now assume their duties. Increasing landowner cooperation will require increased funding.*
Work with USDA programs on a statewide basis and work with NRCS staff within the state.	*Upland Game Bird Specialist lobbied successfully to integrate desired forbs in CRP specifications written by state FSA and administered by NRCS. Private lands biologists continue to work with FSA and NRCS staff in all eastern Washington regions.*
Pheasant habitat on WDFW owned or managed lands may be targeted as habitat improvement demonstration areas.	*Since WDFW staff is limited, the focus has been on developing quality pheasant habitat on private lands or habitat on WDFW owned land that does not require intensive, ongoing maintenance.*

Management Recommendations	***WDFW Actions***
Establish incentive programs for enhancing pheasant habitat on private lands.	*The Game Farm Alternative Program (GFA), which provided funds to restore habitat to over 1500 acres of key riparian areas, concluded in October 2007.* *The Partnerships for Pheasants program provides incentives for similar, but more intensive, riparian habitats targeted by GFA. Additional programs will require additional funding.*
Farm Bill implementation: *Work with NRCS local working groups.* *Work closely with landowners.* *Provide technical assistance for all USDA Farm Bill programs as well as other federal and state funding sources.*	*Biologists utilize multiple fund sources, including state and federal agencies and NGOs such as Pheasants Forever, to accomplish habitat improvement goals.* *Biologists continue to work with NRCS local working groups and local Conservation Districts to emphasize wildlife habitat as a priority in their districts.* *Biologists advocate developing pheasant "production cover", especially quality brood rearing habitat.* *The Upland Game Specialist is developing pheasant population monitoring protocols to measure productivity of habitats in areas of emphasis.*
Increase pheasant populations on irrigated lands in eastern Washington by enrolling landowners in Farm Bill Programs.	*Program options may be limited to establishing Continuous CRP buffers, Environmental Quality Incentives Programs and wetland enhancement projects.*
Releasing pen-raised pheasants in eastern Washington is important to some hunters and is mandated in Eastern Washington through the EWPEP.	*WDFW will continue to release pen-raised pheasants, but these releases will not be part pheasant population management efforts.*
Work with Washington State University (WSU) and the Extension Agent Program to help develop and promote farming practices that are beneficial to pheasants and retain or improve profitability for the landowner. This would include, but not be limited to, field preparation, seeding, and harvesting.	*Upland Game Bird Specialist reviewing research findings from other states to see how they may apply to Washington.* *Participating in WSU and the Pacific Northwest Direct Seed Association field tours.*

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PHEASANT STATUS AND TREND REPORT: REGION 2 Columbia Basin

Rich Finger, District Wildlife Biologist

Population objectives and guidelines

Population objectives for pheasants in Columbia Basin include:

1. Maintain a viable population that will provide hunting opportunity and harvest.
2. Increase population size above that of the past 5 years.

Hunting seasons and harvest trends

In 2007, the hunting season for pheasant in eastern Washington was 17 days longer than in 2006. The season opened on Oct. 20 and closed Jan. 21, 2007. The daily bag limit was 3 cocks and the possession limit was 15. Daily bag and possession limits remained unchanged.

In Grant and Adams counties, the number of pheasant hunters in 2007 was 34% below the long-term average (1988-2007) of 9,322. The number of hunters in the two counties combined decreased 8% from 2006 to 2007 (Table 1).

Table 1. Number of pheasant hunters in Grant and Adams counties, Washington, 1988-06.

Year	Grant	Adams	Total
1988	9,052	2,793	11,845
1989	10,615	2,688	13,303
1990	--	--	--
1991	7,630	2,337	9,967
1992	8,321	2,644	10,965
1993	7,655	2,151	9,806
1994	8,439	2,443	10,882
1995	5,947	1,749	7,696
1996	7,482	2,486	9,968
1997	12,207	4,392	16,559
1998	7,560	2,536	10,096
1999	6,748	2,262	9,010
2000	7,745	2,507	10,252
2001	5,817	1,765	7,582
2002	5,645	1,314	6,959
2003	5,181	1,464	6,645
2004	5,497	1,435	6,932
2005	4,273	1,483	5,756
2006	5,549	1,150	6,699
2007	5,012	1,184	6,196

Most pheasant hunting in the Columbia Basin occurs on private farmland. The long-term trend indicates a decrease in amount of effective pheasant hunting cover in the irrigated farmland.

An unknown, but likely significant, amount of pheasant hunting occurs on the Columbia Basin Wildlife Areas (CBWA) and private lands under agreement in WDFW's hunter access program. The CBWA contains several hundred acres that provide good pheasant hunting opportunity. The hunter access program in Grant and Adams counties included 178 cooperators with a total of 328,256 acres of hunting access in 2007. Although a large percentage of the acres in the access program were non-irrigated arid land, pheasants were available to hunters in much of it.

In Grant and Adams counties, pheasant harvest in 2007 was 32% below the long-term average (1988-2007) of 25,037 birds. The harvest in the two counties combined decreased 16% from 2006 to 2007 (Table 2).

Table 2. Pheasant harvest in Grant and Adams counties, Washington, 1986-2006.

Year	Grant	Adams	Total
1986	35,932	11,804	47,736
1987	37,631	11,222	48,853
1988	22,928	7,111	30,039
1989	27,322	7,622	34,944
1990	--	--	--
1991	15,116	4,206	19,322
1992	20,819	7,267	28,086
1993	14,046	4,422	18,468
1994	18,117	5,001	23,118
1995	11,029	3,798	14,827
1996	15,667	7,790	23,457
1997	27,034	9,769	36,803
1998	22,391	5,602	27,993
1999	17,083	6,462	23,545
2000	17,686	4,948	22,634
2001	14,028	4,848	18,876
2002	12,798	2,397	15,195
2003	14,504	4,244	18,748
2004	13,378	3,129	16,507
2005	15,072	4,273	19,345
2006	17,011	3,208	20,219
2007	14,746	2,324	17,070

Pheasant hunter success (number of pheasants harvested/hunter day) increased 8% in Grant County and decreased 5% in Adams County from 2002-06 to 2007 (Table 3).

Table 3. Pheasant hunter success rate (number of pheasants harvested/hunter day), in Grant and Adams counties,WA 1988-04.

Year	Grant	Adams
1988	0.57	0.66
1989	0.53	0.69
1990	--	--
1991	0.38	0.41
1992	0.53	0.58
1993	0.42	0.62
1994	0.46	0.52
1995	0.46	0.51
1996	0.53	0.87
1997	0.41	0.53
1998	0.64	0.62
1999	0.46	0.59
2000	0.46	0.53
2001	0.47	0.61
2002	0.44	0.41
2003	0.56	0.70
2004	0.51	0.51
2005	0.58	0.61
2006	0.66	0.63
2007	0.59	0.54

Surveys

Data are obtained annually in irrigated farmland portions of Grant and Adams counties to provide indices to breeding population size and production of chicks. The population index is useful in determining long-term trends in population size and major short-term population changes. The production index is used primarily as a predictor of hunting prospects and may provide information useful in identifying reasons for annual changes in population size.

Until 1997, 6 permanently established crowing count routes along farm roads and highways in irrigated farmland of Grant and Adams Counties were surveyed twice annually (≥1 week between surveys) between April 25 and May 15 to provide data for an index to population size. Only 1 route (Warden) was surveyed 1997-2003. In 2004-2007, four of the historical routes were surveyed. The index to population size presented is the mean number of crows per stop and is assumed to represent the number of roosters present (Table 4).

Pheasant sex ratio surveys (counts) were made in farmland areas adjacent to all established crowing routes annually through 1999. Data from all survey sessions in an area were totaled for an estimate of number of hens/rooster. Only 1 area was surveyed for sex ratio counts from 2000 through 2004. This area was adjacent to the Warden crowing route. No sex ratio surveys were made in 2005– 2008 (Table 4).

Table 4. Pheasant breeding population indices for the Columbia Basin Irrigation Project, Washington, 1998-2007.

Year	Crows/ Stop	Hens/ Rooster	Brood stock Index*
1998	8.5	3.0	25.8
1999	13.4	4.0	53.6
2000	3.9	--	--
2001	5.5	2.5	13.8
2002	5.9	3.4	20.1
2003	5.1	3.3	16.5
2004	5.9	2.6	15.5
2005	3.1	--	--
2006	3.2	--	--
2007	4.0	--	--
2008	No	Survey	

* Crows/Stop x Hens/Rooster. Assuming calls from roosters could be heard if the rooster was within 0.5 miles, the hen index is an estimate of the number of hens/502 acres.

The production index was derived from surveys of 6 permanently established pheasant brood routes located in the same general areas as crowing count routes through 2002. In 2003 and 2008, brood routes were not surveyed (Table 5). In 2004-2007, two of the original 6 routes (same routes both years) were surveyed. The production index presented is the number of broods, chicks, or total pheasants seen per observation day.

Table 5. Pheasant production index for the Columbia Basin Irrigation Project, 1993-2007.

Year	Broods Obs./Day	Chicks Obs./Day	Tot. Ph. Obs./Day	Percent Juvenile
1993	1.8	7.9	10.5	75
1994	3.0	13.3	16.9	79
1995	1.4	6.4	9.6	66
1996	2.8	13.6	16.6	82
1997	1.2	6.3	8.5	74
1998	3.8	21.8	25.4	86
1999	1.4	4.4	6.7	66
2000	1.5	6.9	9.2	75
2001	1.5	4.8	6.4	75
2002	1.7	6.6	8.1	79
2003	No	survey		
2004	1.3	5.5	7.0	79
2005	2.0	12.8	17.3	88
2006	1.5	7.0	8.5	82
2007	1.8	13.3	15.5	85
2008	No	survey		

Population status and trend analysis

The number of pheasants in the Columbia Basin Irrigation Project has plummeted since the early 1980's. The decline has been dramatic with little indication of recovery. In the early 1980's, the hen population at the beginning of nesting season was estimated to be in excess of 100/section. The mean hen index for 1983 and 1984 was 141hens/502 acres (area within a 0.5 mile radius) or 181 hens/section (640 acres). In the spring of 1996, hen density was estimated to be 14/section. Spring hen numbers increased to 52/section and 68/section in 1997 and 1999, respectively. Hen numbers declined to a much lower level in 2003 and 2004 (Table 4). Breeding season rooster density declined concurrently with hen density, and almost as dramatically. Density of roosters in the early 1980's was approximately 20/section. In 2007, rooster density was approximately 5/section.

Habitat condition and trend

The winter of 2007-08 was moderate and the duration of snow cover was short. Pheasant mortality due to stress caused by winter weather was likely low. Weather during May and June 2007 was cool but still conducive to successful, albeit slightly delayed pheasant reproduction.

Loss of permanent cover (untilled land) in the irrigated part of the Basin continues. Conversion of small fields with fence rows, ditches, and other adjacent cover to large circle irrigated fields resulted in a major loss of habitat. Another major loss of pheasant habitat, one that has accelerated in recent years, is from the construction of homes and farm buildings at locations that previously provided resources, including permanent cover, for survival of pheasants.

Acreage of cropland for production of alfalfa hay has increased in recent years and has often replaced crops that were beneficial to pheasants. Management practices (especially harvest) associated with production of alfalfa hay cause high mortality for pheasants, especially hens, chicks, and nests. Orchards and vineyards have also replaced crops more beneficial to pheasants. Wheat stubble (and its associated waste grain, an important food source for farmland pheasants) is now commonly tilled under in the irrigated part of the Basin in summer shortly after the wheat is harvested. Farming practices are constantly evolving and most changes appear to have a negative impact on pheasants.

Augmentation and habitat enhancement

The Private Lands Program in WDFW's Region 2 work closely with the Natural Resources Conservation Service (NRCS) and the Farm Service Agency (FSA) on various USDA farm programs (e.g., WHIP, EQIP) as well as other government agencies, Conservation Districts, Bureau of Reclamation, Irrigation Districts, and organizations such as Pheasants Forever to develop and maintain pheasant and other upland game bird habitat.

In 2007, approximately 3,300 game farm rooster pheasants were released in Grant and Adams Co.'s during the hunting season. The intent of these releases was to provide increased opportunity for pheasant hunters. The Pheasant Enhancement Program likely contributes to hunter success. Since 1997**,** pen-raised roosters have been released and subsequently reported in the harvest. Therefore, inferences about the wild pheasant population status based on harvest are likely biased high, and should be made cautiously.

Management conclusions

Pheasant populations in the Columbia Basin have declined dramatically in recent years and remain at very low levels compared to the pre-1990s. Documented causes of the decline do not exist. The lay public and wildlife managers alike frequently voice opinion as to reasons for the decline. While very little objective information specific to identification of potential causes of the decline is available, the most commonly held theory for the population decline is the loss of suitable habitat.

PHEASANT STATUS AND TREND REPORT: REGION 3
Yakima and Lower Mid-Columbia River Basins

MIKE LIVINGSTON, District Wildlife Biologist

Population objectives and guidelines

Pheasant management objectives are outlined in the Game Management Plan (WDFW 2003). The overall objective is to manage pheasants for a variety of purposes including a sustained harvest.

Hunting seasons and harvest trends

The youth pheasant season was 22-23 September 2007 and the regular season was 20 October 2007, to 21 January 2008. Participation was down 7% from 2006, and 17% below the 10-year average. Effort of 31,764 days was 13% below last year's level. Harvest was the lowest recorded in 22 years. It decreased 18% from 2006 and was 21% below the 10-year average (Fig. 1).

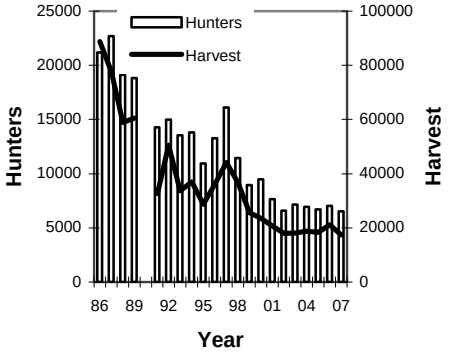


Figure 1. Pheasant hunters and harvest, 1986-2007.

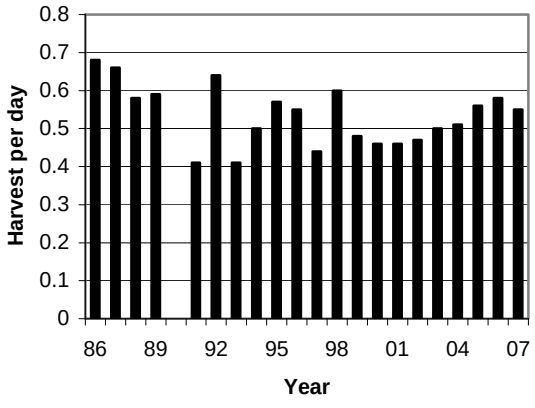


Figure 2. Pheasant harvest per day, 1986-2007.

In the past, hunter success (birds/hunter/day) has ranged between a high of 0.68 in 1986 to a low of 0.41 in 1991 and 1993 (Figure 2). In 2007, hunter success was 0.55 a decline of 5% from 2006 whereas it was 6% above the 10-year average.

Surveys

Brood surveys were discontinued in Region 3 in 1999. The post-hunting season questionnaire used to estimate harvest currently provides the best estimate of population status.

Population status and trend analysis

The long-term trend has been characterized by a marked decline in total pheasants harvested and in total hunter participation (Fig. 1). Assuming total harvest is an accurate index to population status, the long-term population trend is substantially downward since 1986. However, harvest the last five years has remained fairly consistent. Moreover, the number of birds harvested per hunter has actually increased since 2001 (Fig. 2). The Pheasant Enhancement Program likely contributes to hunter success. Since 1997**,** pen-raised roosters have been released and subsequently reported in the harvest. Therefore, inferences about the wild pheasant population status based on harvest are likely biased high, and should be made cautiously.

Habitat condition and trend

Pheasant habitat quality and quantity has declined for decades and continues to do so. Changes in farming practices, particularly in irrigated agriculture, has been a primary cause of habitat quality degradation. "Clean" farming practices remove cover from bordering fields, riparian areas, and irrigation canals. Forbs, weed seeds, and insects are critical to pheasant chick survival, but herbicides and pesticides are heavily used to keep crops free of weeds and insects. The frequency and timing of alfalfa harvest can be a significant source of chick mortality. Modern irrigation technology permits harvest to occur during the peak nesting and brood rearing periods. Modern machinery used to harvest alfalfa moves fast and can be deadly for pheasant chicks.

Changes in crops from primarily annual grains and pasture to perennial crops such as orchard, vineyard, and hops have decreased habitat quantity. These crops do not provide enough year-round food or cover. Vineyards and hop fields are typically kept free of ground cover, and grass cover within orchards is

usually mowed.

Urban development has also negatively affected the pheasant population in Region 3. Homes and infrastructure have been built in areas that historically provided pheasant nesting and hunting opportunity. This trend is expected to continue as the human population increases.

In Washington State, the federal Conservation Reserve Program (CRP) has paid farmers to convert over 1 million acres of highly erodible dryland wheat fields to permanent grass, forbs, and shrub cover. CRP has not significantly improved pheasant habitat in Region 3 as it has in other areas of the state. Precipitation is too low in Region 3 CRP areas for pheasants to benefit from the cover. Because most agriculture in the Yakima and lower mid-Columbia Basins is irrigated, few acres have been enrolled in CRP and few benefits to pheasant habitat have been realized.

One of the last strongholds for pheasant in Region 3 is the lower Yakima Valley, primarily the Yakama Reservation. Here the irrigation system is antiquated with numerous unlined, open canals. These earthen canals are often surrounded by riparian vegetation and wetlands sustained by water leaks. Many canals will likely be lined and piped in the future in an effort to conserve water. If canal piping and lining reduces weeds, riparian vegetation, and idle farmland, the pheasant population decline will continue.

Recent increases in grain prices have resulted in several idle farm fields on the Reservation being returned to cultivation. The long-term impact on the pheasant population is uncertain, but is not likely going to be positive.

Augmentation and habitat enhancement

The number of harvestable birds in Region 3 was augmented in 2007 by releasing approximately 6,500 pen-raised roosters through the Pheasant Enhancement Program. While these releases did not enhance the wild population, it might have helped maintain some hunters' interest.

WDFW has acquired several parcels in Region 3 in recent years. The acquired lands contain pheasant habitat and/or the opportunity to enhance populations. WDFW's Lands Division and Pheasants Forever have also been actively working to enhance habitat for pheasants. Tree, shrub, food, and nesting cover plots are being established throughout the Region. These activities have helped maintain or increase pheasant populations and hunter opportunity in localized areas. Acquired and enhanced lands, however, are not presently keeping pace with large-scale habitat loss.

Management conclusions

The pheasant population decline in Region 3 will likely continue. Current enhancements on state and private lands through the Lands Division, CRP, and other programs are not likely to offset habitat degradation throughout the Region.

The highest priority for habitat enhancement efforts should be the establishment of permanent herbaceous cover, preferably grasses and forbs. Food plots and non-irrigated shrub cover should be of second priority. The establishment of tree and shrub plots that require continual irrigation to survive should be discouraged due to their relatively high cost and on-going maintenance requirements. These practices will only improve conditions at a very small scale.

A large-scale approach that considers habitat connectivity between restoration areas must be implemented. Small, piecemeal efforts that are isolated from one another will only act as habitat sinks. These areas may attract gamebirds during the fall and winter because surrounding farm fields are bare or provide only minimal cover. Hunter success will be relatively high in these areas, but so will predation on hens. Many areas in the intensely irrigated farmland of Region 3 are not conducive to large-scale management, and should be eliminated from restoration efforts.

As part of the Eastern Washington Pheasant Enhancement Program, several thousand pen-raised rooster pheasants will continue to be released. While stocking rooster pheasants might help maintain an interest in pheasant hunting for some people, it can also shift some hunters' focus away from habitat and erode their enthusiasm and advocacy for habitat protection. In addition, after several years of repeated pheasant releases some wildlife areas may be showing the impacts. Concentrated hunter numbers at release sites negatively impact other species such as California quail. To meet desires of various factions of the hunting public, birds should not be released where there is quality habitat and good wild production.

Chukar

CHUKAR STATUS AND TREND REPORT: REGION 1
Snake River Basin

Paul A. Wik, Wildlife Biologist

Population objectives and guidelines

The objective of chukar (*Alectoris chukar*) management is to increase the population to, or beyond, historic levels. The chukar population in Region 1 reached an all time high in between 1979 and 1981, but crashed in 1982. Determining the 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 to mid-January, with a limit of six birds per day.

Chukar hunting was a major recreational pursuit in southeast Washington during the 1970s, when chukar populations peaked. During this period, the chukar harvest averaged over 66,000 birds per year 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 5,513 from 2000 through 2007, 92% below the harvest level experienced in the 1970's.

The Region 1 harvest remained low in 2005, 2006, and 2007 at 4,716, 3,912, and 1,788 respectively (Table 1). The continued decline in harvest numbers and hunter numbers is expected to continue into 2008, based on poor nesting conditions (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 chukars in Region One (Figure 1).

Surveys

Chukar populations were surveyed by helicopter between 1987 and 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 crash is unknown. Some of the best chukar habitat has been inundated with yellow starthistle (*Centaurea solstitialis*) over 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. 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 2007 appeared to be mediocre, based upon field observations and severe drought conditions. This was reflected in the lowest harvest rate in the last 10 years.

Habitat condition and trend

Noxious weeds, especially yellow starthistle, 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 tend to be over-grazed and covered with 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. As the acreage of yellow starthistle increases in the Snake River Basin, the availability of cheatgrass is declining significantly. This may be one of the reasons chukar populations have failed to improve since 1981.

Augmentation and habitat enhancement

Weed control programs appear to be faltering because of the huge 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.

Management conclusions

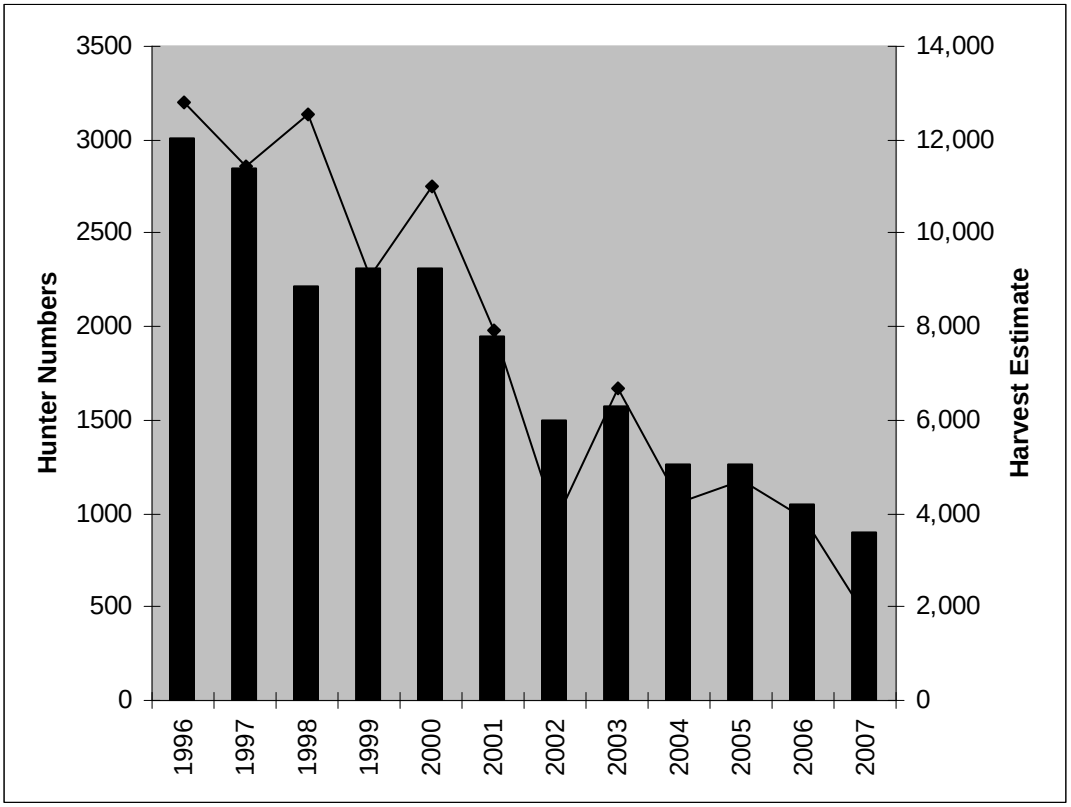
Chukar populations in Region 1 are far below the

peak levels of the 1970s and early 1980s. Habitat deterioration and the lack of good land management practices will result in the loss of additional habitat. 2007 harvest estimates were well below the 10-year and long-term averages. Chukar populations will not return to historical levels until the spread of noxious weeds is reversed, and several years of optimal nesting conditions allow for high productivity and survival. It is unknown whether factors other than habitat conditions (i.e. disease) are contributing to the continuing decline in chukar numbers.

Table 1. Region One Chukar Harvest Summary 1996 - 2007.

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Asotin	6,781	5,111	5,006	3,547	4,788	3,687	1,440	3,246	3,315	2,111	1,876	1,297
Columbia	695	561	273	111	155	179	147	163	42	112	533	62
Ferry	0	0	0	0	0	0	0	0	0	0	0	0
Garfield	864	2,057	2,648	1,337	724	769	673	676	155	626	308	89
Walla Walla	112	155	0	0	55	429	384	410	61	133	5	18
Whitman	1,531	1,075	2,319	1,875	2,953	2,644	1,058	2,024	650	987	1075	264
Lincoln	807	77	135	148	174	76	137	108	0	223	68	58
Spokane	17	405	154	55	146	111	32	46	100	524	47	0
Stevens	0	0	0	0	0	10	0	0	0	0	0	0
Pend Ore	0	0	0	0	0	0	0	na	0	0	0	0
Total	12,803	11,438	12,533	9,072	10,995	7,905	3,871	6,673	4,243	4,716	3912	1,788

Figure 1. Region 1 Chukar harvest and hunter numbers for the 1995/1996 season through the 2007/2008 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 (*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 2007, an estimated 8,104 chukar were harvested in Region 2, which is the lowest harvest in the last 12 years. This also represents a 28% decrease from the 2006 harvest and a 24% decrease from the 10-year average. Chukar harvest in the region reached a low of 6,915 in 1994, increased to 13,042 in 1997, and fluctuated between 9,053 and 15,506 from 1996 to 2006 with no apparent trend (Figure 1). There were 2,329 chukar hunters in 2007, which was an 8% decrease from 2006 and a 14% decrease from the 10-year average. Increased development and change in land ownership near chukar habitat has resulted in some loss of habitat and has limited chukar hunting access.

Surveys

In Region 2, three routes are driven (Colockum-Tarpiscan, Swakane-Nahahum, and Chelan Butte) in early August to monitor chukar and other game bird populations. Each route is approximately 20 miles long. Volunteers count total chukar seen while driving these routes. In 2007, each survey route was driven three times. For the first time in ten years, no chukars were observed on these driving routes. This lack of observed chukars may be attributed to reduced mileage of the driving routes due to road closures occurring in 2007. An average of 7 chukar were observed on each route from 1998-2006.

Population status and trend analysis

In 2007, spring-summer was dry so chukar production should have been good. Spring-summer weather for 2008 has been variable with colder than normal temperatures but also lower than normal precipitation, which should provide good brood production.

Habitat condition and trend

Chukar habitat is relatively stable in Region 2 because of the precipitous habitat. However, development is increasing near some areas of chukar habitat (e.g. additional powerlines across Highway 97-A, Burch Mountain,), which could impact chukar populations.

Management conclusions

Chukar habitat appears stable. Populations and harvest of chukar will continue to fluctuate as a function of annual weather conditions and production.

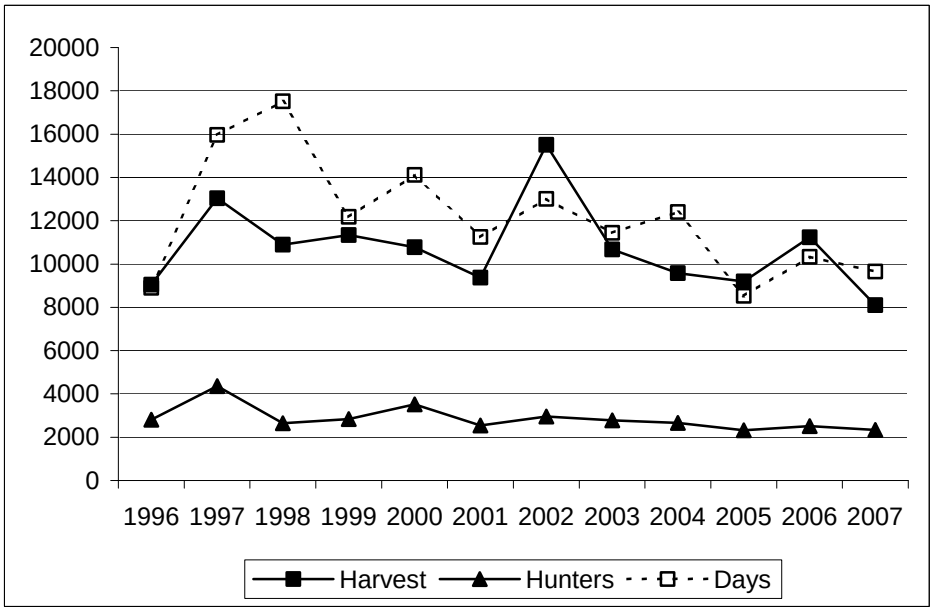


Figure 1. Region 2 chukar harvest and hunter effort from 1996-2007.

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 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 2007 harvest declined by 44% from 2006 and 48% from the 10-year mean. The number of hunters was 7% below 2006 and 19% below the 10-year mean (Fig. 1). Hunter success (birds/day/hunter) declined 17% from 2006 levels and 11% from the 10-year mean (Fig. 2).

Population status and trend analysis

Population surveys have not been conducted for 10 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 22-year averages. Both Chukar harvest and hunter numbers in 2007 were the lowest recorded in the 22-year monitoring period. These trends indicate the Chukar population in Region 3 continues to decline.

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 large decline in harvest from 1998 to 1999. Temperatures in Spring 2007 were normal, but precipitation was below average. Insect production was therefore likely reduced, which influenced poor chick survival in 2007.

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.

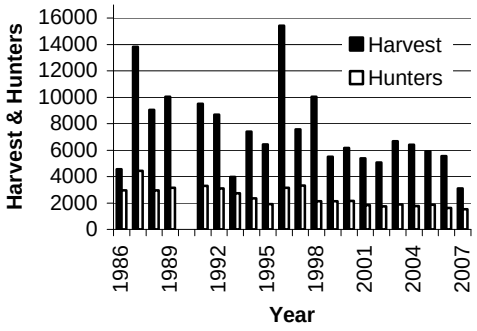


Figure 1. Chukars harvested and Chukar hunters during the period 1986-2007 in Region 3.

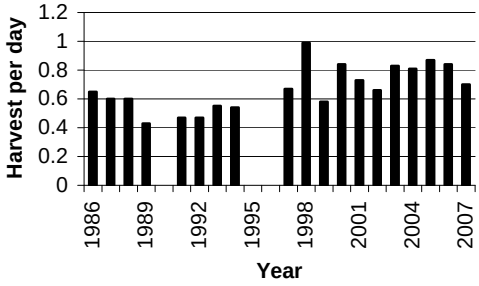


Figure 2. Hunter success measured as number harvested per hunter day during the period 1986-2007 in Region 3.

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.

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

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Quail

QUAIL STATUS AND TREND REPORT: REGION 1
Snake River Basin

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 2007-2008 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 34,591, a 62% 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 2007 decreased to 26,902 from 30,957 in 2006. Twenty-five percent lower than the 2000 to 2006 average of 35,689 birds, and 13% lower than the 2006 quail harvest.

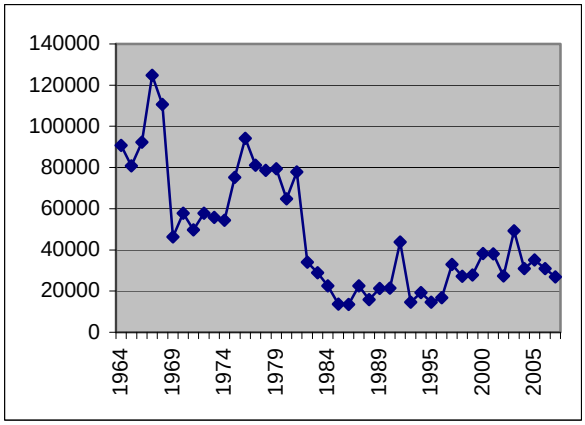

Figure 1. California and Northern bobwhite quail harvest history in Region 1.

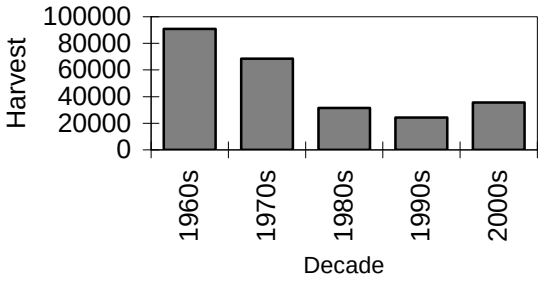

Figure 2. Mean annual quail harvest by decade, Region 1.

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 1984 to 1996 level (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.

Quail production data has not been gathered for approximately 12 years, primarily due to the relatively low priority of establishing new survey routes. However, incidental observations indicate that quail production in 2004 and 2005 were above the previous few years, perhaps due to favorable weather conditions during the nesting season. Observation data from 2006 – 2007 is 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 during the winter of 2007-2008.

Unfortunately, birds captured from southwestern Oregon during the winter of 2006/2007 all died in captivity in a holding facility in south-central Washington. 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 quail were either heard or observed during both surveys. Another supplemental release may occur during the spring of 2009, 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 over 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 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 (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 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. In 2006 and 2007 there has been a youth hunting season during the third weekend of September.

Region 2 is one of the state's most popular quail hunting regions. In 2007, there were 6,685 quail hunters (representing 42% of statewide quail hunters), hunting in Region 2 (Table 1). This was 7% more than that of 2006 and was 18% higher than the long-term average (1995-2006) of 5,684 quail hunters.

Table 1. Number of quail hunters per county in Region 2, Washington, 1995-2006.

Year	Adams	Douglas	Chelan	Grant	Okanogan	Total
1995	556	838	654	1,256	761	3,391
1996	487	823	1,144	1,279	957	4,312
1997	887	1,542	1,736	2,063	1,043	7,271
1998	663	995	1,015	1,537	741	4,291
1999	665	1,092	1,152	1,568	781	4,454
2000	664	1,539	1,313	2,416	1,427	5,914
2001	675	1,028	1,320	1,869	1,099	5,295
2002	524	1,037	1,472	2,303	1,251	6,587
2003	566	1,346	1,383	2,496	1,575	6,580
2004	598	1,696	1,347	2,680	1,214	7,535
2005	722	1,185	1,559	2,540	1,246	6,324
2006	542	1,045	1,238	2,703	1,309	6,253
2007	606	1,049	1,407	2,501	1,122	6,685

During the 2007 season, 45% of the statewide quail harvest occurred in Region 2. Number of quail harvested in Region 2 during the last 13 years ranged from a high of 75,272 in 2003 to a low of 20,663 in 1995 (Table 2). The 2007 harvest of 57,354 was 5% below that of 2006 and 15% above the long-term average (1995-2006) of 48,787 birds. Chelan Co. has yielded the largest harvest during most years and Adams County the smallest.

Table 2. Number of quail harvested in Region 2, Washington, 1995-2006.

Year	Adams	Douglas	Chelan	Grant	Okanogan	Total
1995	1,261	4,025	4,433	4,359	6,585	20,663
1996	2,261	4,784	8,682	4,558	8,334	28,619
1997	2,285	7,353	13,872	4,603	8,297	41,706
1998	2,005	6,990	7,009	8,564	4,797	29,365
1999	2,542	5,685	12,632	6,190	8,538	35,587
2000	2,902	12,822	10,860	10,677	11,882	49,143
2001	3,771	9,881	15,940	7,421	13,479	50,492
2002	1,948	15,269	16,125	9,535	14,431	57,308
2003	2,567	16,724	14,078	15,677	26,226	75,272
2004	3,907	20,365	19,630	16,019	12,722	72,633
2005	4,583	13,615	15,939	15,071	15,345	64,533
2006	3,670	13,856	12,699	14,570	15,328	60,123
2007	3,886	12,540	13,545	15,667	11,716	57,354

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 has increased over the long-term (1995-present) but has declined in recent years. Although other factors may have contributed to increased harvest, it is likely related to an increase in the quail population. In Region 2, past objective data and recent year's 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 2006-07 was moderate in most parts of Region 2. Mild temperature and a moderate quantity and duration of snow cover were likely conducive to good over-winter survival. The adult quail population in summer of 2007 should have been relatively large. In addition, incidental observations during the 2007 breeding season indicated good production, albeit late due to a cool spring,

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. 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

The Private Lands Program and Wildlife Area personnel often trap and transplant quail within Region 2, however, no quail were trapped in 2007. 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 and often include development of water sources, including guzzlers.

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 will 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 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 22-23 September and the regular season was 6 October 2007, to 21 January 2008. Quail harvest declined 24% from 2006 and was 15% below the 10-year average. Effort (total hunter days) declined 25% from 2006 levels (Figure 1). Hunter success, measured as birds per hunter-day, increased 2% from 2006, and was 15% above the 10-year average (Figure 2).

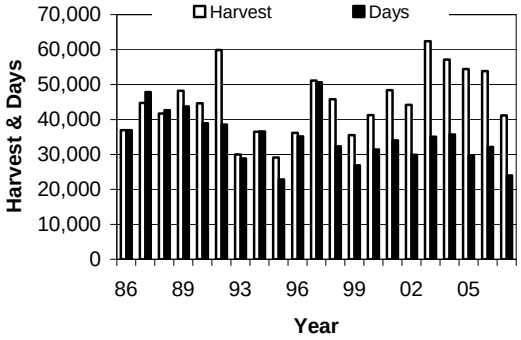

Figure 1. Quail harvest and hunter days for the period 1986-2007 in Region 3.

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 2007 was a below average year for quail production in Region 3. Total harvest was the third lowest in the last 10 years (Figure 1). Temperatures in Spring 2007 were normal, but precipitation was below average. Insect production was therefore likely reduced, which influenced poor chick survival in 2007. Hunter success (1.7 birds) remained above average (1.3 birds) for the 7th 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.

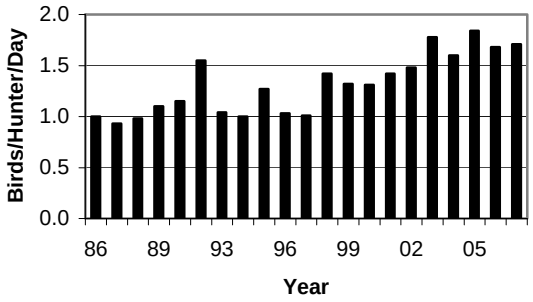

Figure 2. Quail hunter success during the period 1986-2007 in Region 3.

Habitat condition and trend

Similar to other agriculturally associated wildlife, quail habitat quantity and quality has declined for decades. The main culprit 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 severe winter conditions 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

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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. The daily bag limit of 3 of any of the 3 species has not changed since 1952. Estimated hunter numbers and harvest have declined from the historic highs of the 1970's (Figures 1 and 2). Hunter harvest was down 9% from 2006. Harvest estimates continue to be closely tied to hunter participation (Figures 1 and 2). Increased restrictions in motorized travel, particularly in private industrial timberlands, may reduce hunter participation as well as grouse harvest.

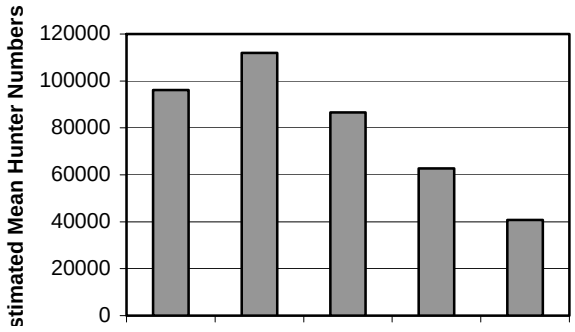

Figure 1. Long-term trend in grouse hunter numbers, 1963-2006.

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 during recent years remains higher than the 1980s and early 1990s (Figure 3).

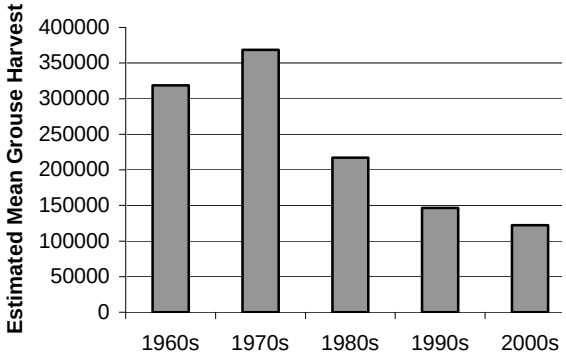

Figure 2. Long-term trend in grouse harvest, 1963-2006.

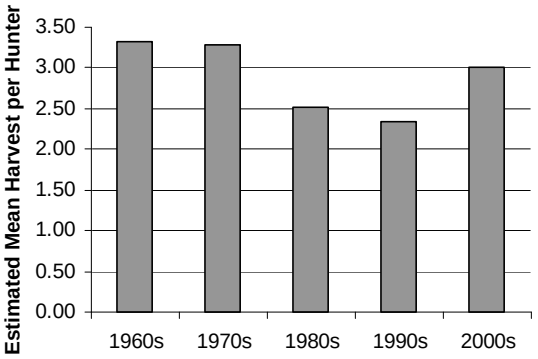

Figure 3. Estimated grouse harvested per hunter in WA. 1963-2006.

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 13,698 hunters in 2007. The estimated annual harvest of all three forest grouse species combined within Region One has ranged from approximately 28,000 to 65,000 since 1991. In 2007, approximately 43,733 grouse were harvested (Table 1), which is down 22% from 2006. In addition, the estimated harvest per hunter declined approximately 20% from 2006 to 2007.

The cause of this decline is not definitively known, but a decline in hunter participation is a likely cause. Hunters spent approximately 18% fewer days hunting Region 1 in 2007 (84,528 vs. 102,616).

In the past the Hunter Questionnaire reported the estimated ruffed grouse harvest to be roughly three to four times higher than blue grouse each year. Spruce grouse harvest is consistently low as this species is the least common and most range-restricted forest grouse in Region 1.

Hunters harvested 22,523 forest grouse in Region 2 in 2007, which was a bit higher than the 2006 harvest of 21,702 (7% increase). Harvest was 2% higher than the average annual harvest from 2002 to 2006. Hunter numbers increased 9% from 8,314 in 2006 to 9,067 in 2007, and were 16% more than the 2002-2006 average. The average number of grouse harvested per day per hunter was 6% lower in 2007 (0.45) compared to 2006, and 21% lower than the average during 2002-2006. Despite an increase in harvest and participation over the last five years, hunter success has been decreasing.

In 2007, total grouse harvest in Region 3 (8919 birds) was 2% below the 5-year average and 6% above the 2006 harvest estimate. The number of grouse hunters remained unchanged from last year. Hunter success, as measured in grouse harvest per day, increased 24% 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 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 2007 was 1.5.

Table 1. Number of forest grouse hunters and reported harvest by Region for 2007.

Region	Est. No. of Hunters	Estimated Harvest
1	13,698	43,733
2	9,067	22,523
3	5,465	8,119
4	4,383	8,059
5	7,000	14,443
6	8,424	22,312
TOTAL:	42,012	119,189

Grouse harvest in Region 4 during the 2007 season was 8,059. This was a 12% decrease from the 2006 season harvest total of 9,157 and a 17% decrease from the previous five-year average of 9,766 (2002-2006) despite an overall increase in the number of hunters. 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 2007. The 2007 harvest in Region 4 represents 7% of the total 119,189 grouse harvested statewide. In Region 4, the greatest harvest occurred in the southernmost counties of King and Snohomish, which accounted for 61% of the total Region 4 grouse harvest for 2007. The 2007 grouse harvest in Skagit County was down 44% compared with the previous year. Grouse hunters report increased harvest success when hiking or mountain biking forest road systems behind locked gates.

In 2007, total grouse harvest (14,443) in Region 5 increased 14% from 2006, increasing for the second straight year. In addition, the number of hunters increased in 2007 by 7% from 2006 levels. Hunter numbers were 4% higher than the 5-year average. Hunter success, as measured in grouse harvested per day, 5% higher than 2006, but was 12% lower than the previous 5-year average. There have been no recent forest grouse surveys, but these hunter and harvest statistics do not indicate an increase or decrease in grouse populations in Region 5.

Combined forest grouse harvest (ruffed and blue grouse) for Region 6 was estimated at 22312 birds in 2007. This represents a 10% decline over the year 2006 season estimate and a 8% decline over the recent 5-year average (2002-2006). 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. There was no change in the reported number of grouse hunters over the 2006

season or over the previous 5-year average (2002-2006). This probably is due to the fact that a large portion of the grouse hunting effort in Region 6 occurs as part of other hunting activities. Estimated success rate (grouse per hunter-day) was 0.31 a 5% decline over 2006 and a 7% decline over the recent 5-year average. The three counties with the highest percentages of the Region 6 grouse harvest were: Grays Harbor (30%), Clallam (22%) and Jefferson (12%).

Region 1 typically has the highest number of both forest grouse hunters and birds harvested. While the percentage declined from 2006, the Region 1 grouse harvest was still the highest in 2007 with approximately 36% of the statewide grouse harvest (Table 1). Stevens County continues to have the highest grouse harvest of all Washington counties, followed by Okanogan and Pend Orielle counties. Grays Harbor County has the highest harvest of any western Washington county.

Surveys

Statewide population surveys for forest grouse were not conducted in 2007; 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 has shown harvest to be split between the three forest grouse species. In 2007, 63.5% of the overall harvest was blue grouse, 16.6% spruce grouse, and 19.9% ruffed grouse (Figure 4).

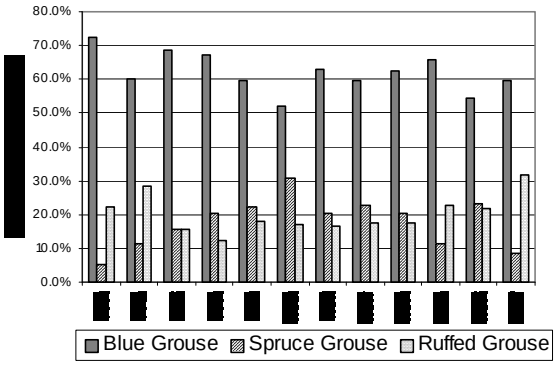

Figure 4. Forest grouse harvest species distribution in north-central Washington 1993-2007 (Schroeder, 2007).

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 2007, cooler temperatures and dry conditions should provide for good grouse production in Region 2. In fall 2006, several large fires in Chelan and Okanogan counties limited access by hunters, which likely reduced harvest. In 2007, fire conditions are normal and should not limit hunter access to habitat.

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.

The pace of timber harvest in western Washington during the 1980's has had a significant impact on forest grouse populations. Blue grouse tend to benefit in the first ten years and the greatest ruffed grouse benefits occur between 10 and 25 years after clear-cut timber harvest. Current conditions should result in higher blue grouse populations with an increase in ruffed grouse populations over the next ten to twenty years.

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.

Until monitoring of harvest can be refined and a better determination of proportion of the population harvested can be developed, no change in recreational opportunity appears necessary.