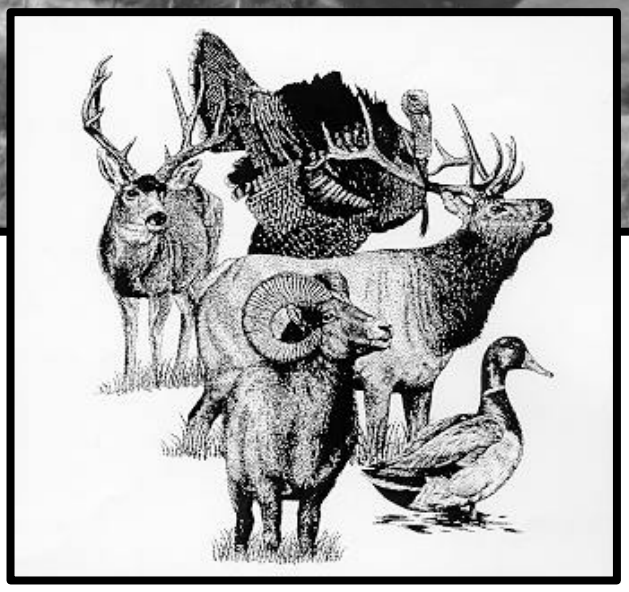
STATE OF WASHINGTON

2001 Game Status and Trend Report



Washington Department of FISH and WILDLIFE

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2001 Game Status and Trend Report

July 1, 2000 – June 30, 2001

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This Program Receives Federal Aid in Wildlife Restoration, Project W-97-R, Game Surveys.

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DEER STATUS AND TREND REPORT
Statewide

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Population Objectives and Guidelines

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. 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 post-hunt fawn:doe ratio objective 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 the fall of 2000 for the general season and special permit hunts combined was estimated at 40,976 (Figure 1, Table 1). This was the highest statewide deer harvest since 1994 (>45,000).

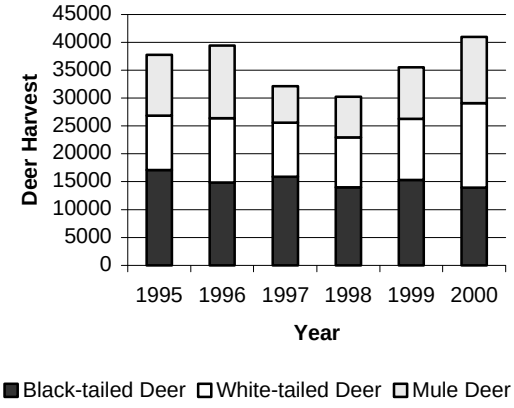

Figure 1. Estimated statewide deer harvest by species for 1995 to 2000 based on hunter report card percentages.

The estimated percentage of white-tailed deer from hunter report card information has remained at 37 % for the last 3 years. The estimated number of white-tailed deer harvested has increased. The estimated percentage of mule deer in the total harvest has increased each year for the last 3 years. The estimated number of mule deer in the harvest has increased. The estimated percentage of black-tailed deer in the total harvest declined each year for the last 3 years but the estimated number of black-tailed deer in the harvest has remained relatively stable.

Historically, Washington deer hunting was managed under an any legal buck hunting season 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 2000 general hunting season, modern firearm hunter success was 26 %. Muzzleloader hunter success was 18.5 % and archery hunter success was 19 % for the general hunting season.

Table 1. Estimated statewide deer harvest for general season and special permit season by weapon type and deer class for 2000.

General Season	Antlered	Antlerless	Total
Modern Firearm	29,343	3,295	32,638
Muzzleloader	856	522	1,378
Archery	1,941	1,454	3,395
Sub-Total	**32,140**	**5,271**	**37,411**
Special Permits	1,031	2,534	3,565
Grand Total	**33,171**	**7,805**	**40,976**

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 harvest report cards 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 are recovering from the most recent severe winter of 1996-97. 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. Mule deer in Okanogan County continued to do well during the time period of this report. Mule deer numbers in Chelan and Douglas Counties also improved during this time period.

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. Hair loss syndrome is not fully understood at this time. The commonalities for most afflicted deer seem to be the presence of 2 parasites, an internal lungworm and an external louse. 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 the larval lungworms. 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. Despite all of these negative impacts on black-tailed deer, the estimated number of animals harvested for the last six years has been relatively stable (Figure 1).

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 conducting a cooperative mule deer research project in central and eastern Washington 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.

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 2-point or better bucks or any bucks where appropriate without negatively impacting the population's health and viability. 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. Sever winters result in high winter die-offs. Several years are then required for deer populations to rebound from those depressed levels. Currently the mule deer and white-tailed deer populations in eastern and central Washington are in this rebound mode. Both species will probably continue to do well until the next climatic event that depresses populations to some lower level.

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

Literature Cited

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

DEER STATUS AND TREND REPORT: REGION 1
PMU 11 – GMU 101
PMU 13 - GMUs 105, 109, 113, 117, 121, 124

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Population objectives and guidelines

White-tailed deer (*Odocoileus virginianus*) are the most abundant deer in northeast Washington. Mule deer (*O. hemionus*) are present, especially in the higher elevations and most substantially in Ferry County, but their numbers are low compared to white-tailed deer.

The white-tailed deer harvest management objective is to provide abundant hunting opportunity while not exceeding 75% buck mortality rates. Pre-season surveys should equal or exceed about 30 (27-33) bucks per 100 does. Antlerless harvest goals vary greatly with winter severity and deer population levels. Antlerless hunting opportunity is appropriate when fall fawn:doe ratios are >45:100 and post-winter fawn:adult ratios exceed 20:100. Antlerless hunting is an important recreational opportunity and a significant factor in maintaining herd health, and addressing problem wildlife issues.

The management goal for mule deer is to provide conservative hunting opportunity, improve buck ratios and increase productivity and population levels. Washington Department of Fish and Wildlife (WDFW) has just begun a long-term mule deer study in Ferry County and adjacent areas. Harvest management will likely remain conservative in these locations until research results are available.

Hunting seasons and harvest trends

Figure 1 depicts the trend in total estimated deer harvested by hunters within Game Management Units (GMUs) 101 - 124 from 1994 through 2000. Since the last severe winter of 1996-1997 the annual hunter harvest of deer has steadily increased to a level similar to 1994. Hunter pressure and success for the opening weekend of modern firearm season appeared down in 2000 from previous years based upon data collected at the Deer Park Check Station (Table 1). Judging by the data collected at our check stations during late buck white-tailed deer season, however, it appears that although the early general season was a poor producer, the late buck season in GMUs 105-124 more than made up for the slow start.

Mule deer bucks legal for harvest have been limited to a three-point minimum for all weapons since 1997. There were no mule deer antlerless opportunities for any weapon users in GMUs 101-124, in 2000. The modern firearm season was consistent with the statewide, nine-day season. The mule deer buck harvest made a good recovery from a year ago increasing 80% (162 report cards in 2000 vs. 90 in 1999) in northeast Washington. This included an 81% increase in Ferry County. The report cards for whitetail bucks increased slightly in Ferry County (GMU 101) but the harvest improved significantly (20%) in GMUs 105-124.

We have no antler restrictions on whitetail bucks in GMUs 101-124. We offer Youth, Senior, and Disabled (Y/S/D) hunts for whitetails of either sex in GMUs 101-124 during the early general hunt. Archers and muzzleloaders (GMUs 109, 117, 124) are allowed

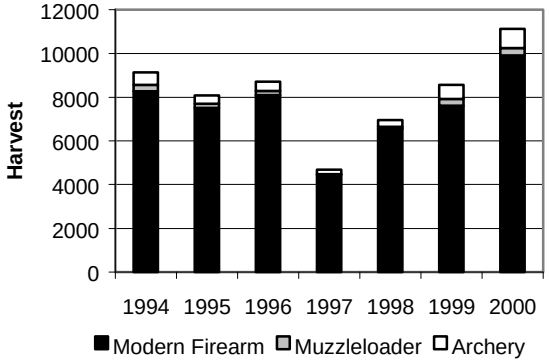

Figure 1. Trend in total deer harvest, GMUs 101-124, 1994-2000.

Table 1. Opening Sunday Deer Park check station, 1994-2000.

					% Success	
Year	Hunters	Bucks	Antlerless	Total	Bucks	Total
1994	644	73	8	81	11%	13%
1995	625	37	14	53	6%	9%
1996	650	62	21	83	10%	13%
1997	503	42	10	52	9%	10%
1998	551	59	25	86	11%	16%
1999	506	51	53	104	10%	21%
2000	401	34	23	57	8%	14%

to hunt any whitetail during their early hunts too. Modern firearm antlerless permits were reduced 34% in 2000 primarily due to losses of deer in the fall of 1999 due to Epizootic Hemorrhagic Disease (EHD) in various agricultural habitats in Stevens County. The fawn:doe ratio in late summer of 1999 was also relatively low at 49 fawns:100 does.

Hunter pressure for all weapons combined over the entire deer season has recovered since the low in 1997 and appears to have stabilized near 40,000 hunters (Figure 2). There was a slight decline in success on bucks at the opening weekend check station (Table 1). The over-all success of all hunters for all seasons in just Population Management Unit (PMU) 11 (GMU 101) took a big jump from 13% in 1999 to 21% in 2000. In PMU 13 (GMUs 105-124) there was a significant increase in success from 22% to 29%; this due primarily to the increased whitetail buck harvest.

We issued 1675 antlerless white-tailed deer permits for GMUs 101-124 in 2000. Questionnaires were returned by 76% of the permittees. Of those, 13% did not hunt. Of those that hunted, 50% (vs. 68% in 99) were successful, taking 557 deer, but 151 (27%) of the deer they took were antlered bucks during the general season. Therefore we can confirm only 406 antlerless deer harvested which is only 24% of the 1675 total permits issued. Such poor performance continues to confirm that antlerless or "either-sex" permits are a relatively inefficient means of harvesting whitetail does. The antlerless whitetail permit provides extra opportunity but raises questions about expense and bureaucracy. As a consequence, "any white-tailed deer" opportunities have been created for archers, muzzle loaders, modern firearm youth, senior, and disabled hunters. These hunts account for 85% of the antlerless harvest in northeastern Washington (Table 2). The popular Youth/Senior/Disabled "any whitetail" accounts for 67% of the antlerless harvest alone.

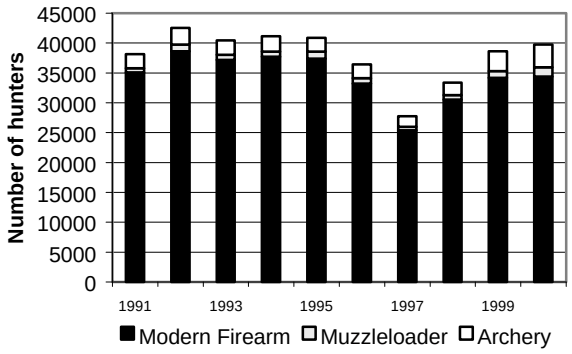

Figure 2. Trend in the number of deer hunters, GMUs 101-124, 1991-2000.

Surveys

Whitetail buck:doe ratios for summer 2001 are similar to 2000, although there does appear to be some year-to-year variability in both PMUs (Table 3). The fawn ratios are relatively low at 57 in our major whitetail units. The percentage of yearling whitetail bucks observed declined from 70% in 1999 to 62% in 2000 and down to 53% in 2001.

We classified 286 mule deer during pre-season surveys in 2001 for a buck:doe:fawn ratio of 42:100:46 vs. 49:100:43 in 2000. These are low fawn ratios even though they are primarily from deer observed in the only mule deer habitats that offer alfalfa fields for supplemental forage. Fawn ratios from the same areas have been consistently low for several years now. Fawn:doe ratios at 40:100 would generally be expected to do little more than maintain the deer population.

Table 2. Questionnaire harvest estimates for antlered and antlerless white-tailed deer, PMUs 11 and 13, 2000.

		Antlerless						Antlerless per
PMU	GMU	Archery	Permit	Y/S/D	Muzzleloader	Total	Antlered	100 Antlered
11	101	97	39	383	0	519	619	84
13	105	4	29	120		160	381	42
13	109	29	76	243	43	367	832	44
13	113	0	8	42	0	70	385	18
13	117	59	19	220	71	422	1241	34
13	121	59	70	577		709	2146	33
13	124	84	165	272	37	528	2227	24
Total		332	406	1857	162	2757	7831	279

Y/S/D = Youth/Senior/Disabled Hunters

Table 3. White-tailed deer pre-season composition surveys and buck:100 doe and fawn:100 doe ratios by PMU.

		August		September		B:D	F:D
PMU	Year	Bucks	Does	Does	Fawns	Ratio	Ratio
11	1998	43	69	50	41	62	82
13	1998	304	936	721	547	32	76
11	1999	69	151	156	76	46	49
13	1999	181	580	509	247	31	49
11	2000	57	150	57	42	38	74
13	2000	239	794	487	316	30	65
11	2001	50	191	226	85	35	50
13	2001	269	916	458	262	29	57

Post-winter "green-up" surveys for deer provide fawn per adult ratios and give an index to realized recruitment for the year. The 2001 "green-up" surveys conducted post-winter in western Ferry County yielded 65 mule deer fawns per 100 adults. Post-winter mule deer ratios in northern Stevens County were improved over past years at 37 fawns per 100 adults, but the total mule deer observed was down at only 41. We cannot explain why mule deer fawn:adult ratios in late winter on "green-up" are consistently high compared to late summer fawn:doe ratios. A number of possible explanations include differential sightability between classes, differential mortality between classes, differential sightability between seasons, just to name a few. We believe that these data at least provide an indication of the recruitment trends for these mule deer populations.

Post-winter whitetails surveyed over wide areas from GMUs 101-121 yielded a fawn:adult ratio of 50:100 (n = 762), which is down from 55:100 a year ago, and somewhat below the historical average ratio.

We collect age, antler, and sex ratio data from harvested deer for monitoring deer populations and developing season recommendations. Yearling bucks and buck antler points are monitored to track long-term trends in harvest mortality rates (Table 4). We are currently considering the early season percentage of yearlings as the estimate of the buck mortality rate. This is the rate we use (â = 63% 1998-2000) to reference the harvest mortality objective noted earlier (not to exceed 75%). We feel that the early checks bias toward yearlings and may bias toward conservative population estimates. When all early and late checks are combined we recommend the percentage of yearlings should not exceed 55% over a 3-6 year average. The white-tailed deer harvest for PMU 13 is below that threshold as well, at 51% for the 1998-2000 average (Table 4).

Recommendations for antlerless whitetail hunting opportunity are an important task each year (mule deer antlerless hunting is currently closed in northeast Washington). Establishing and achieving an antlerless harvest objective is as much art as science. Factors to consider are herd productivity, winter severity, and impact of various hunting regulations on the antlerless harvest. Recommendations for adjustments in antlerless hunting opportunity are made depending on the direction of the population trend. We experienced significant whitetail losses from epizootic hemorrhagic disease (EHD) in many of the agricultural low elevation habitats in GMUs 117 and 121. Consequently, modern firearm antlerless permits were reduced over 60% for these units in 2000. The resulting 2000 harvest was a 21% increase in the overall whitetail buck kill for PMU 13 while the antlerless kill dropped by 16% giving us a ratio of 44 does:100 bucks killed; down from 62:100 in 1999 (Table 5). Losses to EHD in Ferry County were minimal to non-existent. There was a high harvest on both bucks and does and increased the harvest ratio from 75 does:100 bucks killed to 85 does:100 bucks killed.

Population status and trend analysis

Post-winter mule deer fawn:adult ratios improved for March 2001 which is encouraging, especially in the Curlew area where there were 65 fawns:100 adults. The September mule deer fawn ratios are low (43:100

Table 4. Whitetail buck age trends from field checks and report card returns, GMUs 105-124.

	Early Checks		Late Checks		All Checks		Rprt Cards
Year	Sample	%Yrlg	Sample	%Yrlg	%Yrlg	%5pt+	%5pt+
1990	84	62	66	33	52	19	13
1991	62	61	106	29	41	24	15
1992	88	68	34	37	52	16	17
1993	21	52	44	27	31	28	16
1994	50	46	61	23	35	20	18
1995	29	83	0	---	---	---	16
1996	53	64	0	---	---	---	16
1997	40	65	63	30	39	22	12
1998	51	72	92	47	58	9	13
1999	57	68	77	42	53	16	12
2000	30	50	88	40	42	17	11

Table 5. Whitetail report card data for antlerless harvest recommendations, 1999 - 2000.

		Total		% WT		WT		D:B
PMU	Year	Bucks	Does	Buck	Doe	Bucks	Does	Ratio
11	1999	244	140	77	100	187	140	75D:100B
13	1999	1791	1105	98	100	1758	1105	62D:100B
11	2000	305	172	66	100	202	172	85D:100B
13	2000	2167	928	97	100	2108	928	44D:100B

does in 2000, 46:100 in 2001) but the ratios post-winter are comparatively high. If we consider the summer September ratios as being more accurate, then production is relatively poor and not at a level where increasing populations would be expected given the current level of mortality for all age and sex classes.

White-tailed deer populations are influenced significantly by winter severity in northeast Washington. Populations build rapidly during mild winters and experience major declines in severe winters. This past winter proved to be of average severity; it was long and cool but did not have exceptional snow or cold events (Figure 3). Survival over winter was good but our late summer fawn ratios are relatively poor (54:100 in GMUs 101-121) so maybe the long winter and dry summer stressed whitetail does more than expected. Whitetail pre-season buck ratios appear similar to 1998-2000 for PMU 13 at 29B:100D, but there hasn't been an improvement (Table 3, PMU 13) and this is near our suggested minimum management objective of 27-33. The whitetail buck harvest objectives are within management guidelines at 63% yearlings for the 1998-2000 three-year average (objective is not to exceed 75%). Our primary concern continues to be the low number of mature bucks showing up in the harvest relative to harvests prior to 1996. The percentage of 5 year or older bucks in the adult category (yearlings excluded) improved from 7% to 11% from 1999 to 2000 but still lags well behind the historical average of 21% (1987-95) (Figure 4). Based on report card returns, our percentage of five point or better bucks (11% in 2000, 1997-1999 average - 12%) did not improve and is well below the long-term average of 15% since 1988 (Figure 5).

Disease

While 2001 has been an exceptionally dry year we have had no confirmed reports of deer lost to Epizootic Hemorrhagic Disease. This year we are expanding a sampling protocol for Chronic Wasting Disease.

Habitat condition and trend

The human population continues to build rapidly in northeast Washington with associated losses of winter ranges and other critical habitat to development. White-tailed deer typically co-exist well with a high degree of human development. Ultimately, however, the amount of land converted to buildings, roads, or impacted by dogs, snowmobiles, and ATVs reduces the deer carrying capacity. There have been tremendous changes in much of the whitetail habitat in the forested hills and mountains due to forest practices. These

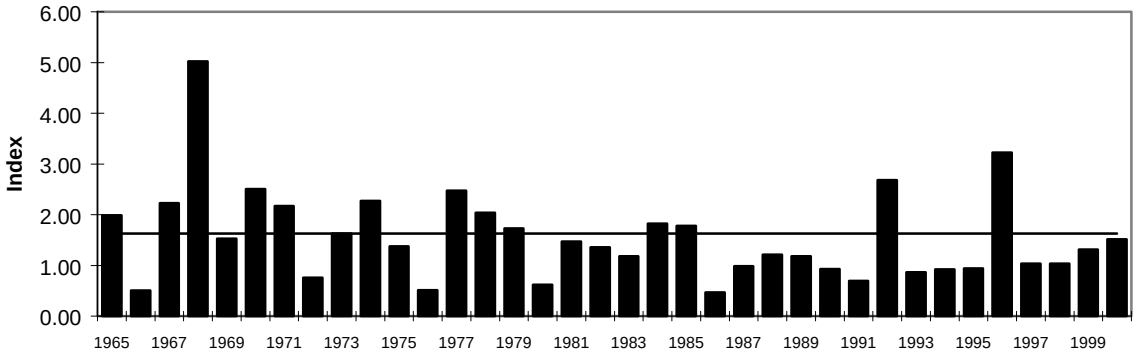

Figure 3. Chewelah winter severity index, based on mean temperature and total snowfall, 1965-2000.

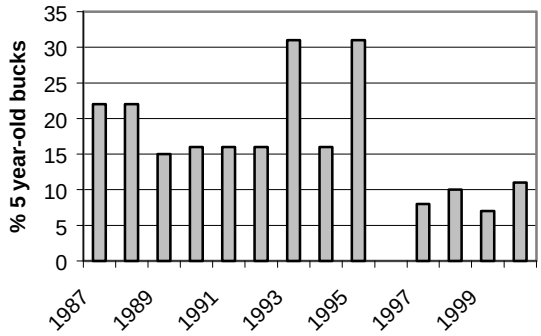

Figure 4. Percent of white-tailed deer bucks 5 years-o or greater from check stations, 1987-2000.

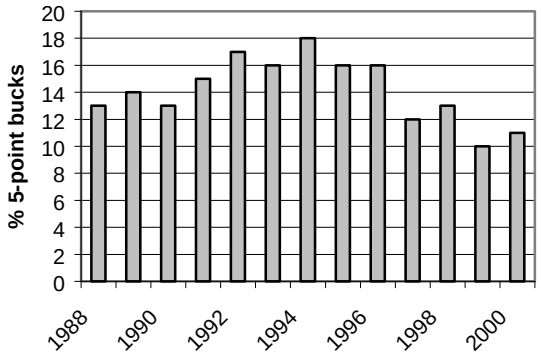

Figure 5. Percent 5-point or better white-tailed bucks from report cards, 1988-2000.

combined with the human impacts to the winter ranges that the deer depend on may be contributing to the general impression that the mountain deer populations have declined.

More significant to hunters is that with additional land subdivision and commensurate human development much of the land becomes off limits to public hunting. Generally, however, the whitetail population continues to thrive with the most notable population changes caused by winter weather rather than by local habitat alterations.

Mule deer populations on the other hand seem to be suffering long-term declines that most likely can be attributed to changes and fragmentation of the habitat. Land managers, especially the USFS, have begun an aggressive program to restore the historic park-land forest environment that mule deer likely prefer, relative to decades of fire protection and cutting large diameter trees that has led to dense, young stands of fir and pine. Maintaining adequate winter and spring concentration acreage may be challenging though, as humans move farther up the slopes.

Wildlife damage

Damage by whitetails to growing alfalfa is the primary economic loss. Antlerless permits and either-sex hunting opportunity by youth, senior, or disabled are part of the management strategy to stabilize populations, and control excessive deer damage. 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 whitetails on specific farms outside of general hunting seasons. This small-scale program shows considerable promise in being able to focus extra doe harvests onto the localized areas that need it to control damage rather than reduce doe populations beyond population management goals over an entire GMU.

Management conclusions

Our white-tailed deer buck management objectives are being met, but the buck:doe ratio is near the minimum limit for PMU 13. The lower than average percentage of 5-point or better, and 5 year or greater bucks in the harvest continues to concern us. We manage for high recreational hunting opportunity but we want to be assured that the deer population also has a reasonable number of bucks representing all age classes from yearling to at least prime. The current 3-year season package is in place and will assure closure of the late hunt prior to the peak of the rut in most years, closing November 19 each year. We will continue to monitor age and sex ratios to evaluate the harvest impact for the next three years.

Harvest of whitetail does did not keep pace with the buck harvest in 2000 so the ratio of hunter harvested does per 100 bucks dropped considerably. Permit levels were increased for 2001 but opportunities for antlerless hunting may need to be expanded and a means of improving success on “doe permits” will be explored.

Agency data needs for white-tailed deer are being met in most cases. We will continue operating check stations and conduct field checks to get an estimate of buck mortality (percent yearling males in the harvest), but a tooth envelope mailing system coupled with existing doe permits will be considered to estimate doe mortality rates. Some funds for 2001 have been earmarked for aging of teeth we collect in the field. These data will provide accurate age information on a limited number of bucks and does.

Pre-hunt composition surveys for white-tailed deer are adequate at this time. A reasonable sample of post-winter whitetails will continue to be gathered to monitor spring fawn:adult ratios. For mule deer we

will continue our spring trend counts and summer ratio surveys. Post-season data may be obtained from the surveys done in conjunction with the mule deer research project in GMUs 101 and 105.

Another issue that seems to be on the horizon at this time is the impact of increasing road closures to white-tailed deer hunters. Recent changes in forest road management for stream protection prompted state and industrial forest landowners to close many more roads to public automobiles and other vehicles. While this likely has a positive effect on deer populations, such road closures severely limit hunter access and distribution. Currently, private landowners are at or above tolerance levels for deer hunting activity. Greater access limitations on areas previously open to deer hunters may shift more hunter pressure to private lands and exceed the tolerance levels of private landowners. There are also considerable implications to managing whitetail populations if large land areas are not being hunted for antlerless animals while other areas are heavily hunted due to better access. Working with industrial and public land managers to develop some reasonable level of hunter access may be an important white-tailed deer management strategy in the near future.

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

DINAH J. DEMERS, Regional Wildlife Program Manager

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 landowners 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 state guidelines for buck escapement (at least15 bucks per100 does post-season) and to maintain healthy buck:doe:fawn ratios in areas which experience agricultural damage from deer.

Hunting seasons and harvest trends

Both species are responding very well to current management strategies. Over the past three years, WDFW offered a short nine-day modern firearm season with a three point minimum regulation for both deer species, plus a late whitetail buck hunt, which is also restricted to 3-point minimum. Archery mule deer seasons were 3-point minimum September 1-15 in GMU 127, and in GMUs 130-142 the season was three-point minimum September 1-5, and 3-point minimum or antlerless from September 6-15. For whitetail, the season was extended to September 6-30, for three point minimum or antler less. Late archery was limited to GMUs 127, 130, and 133, and hunters could take mule deer, whitetail 3-point buck or antlerless deer.

The Game Management Units (GMUs) numbered 127 through 142 make up the Population Management Units (PMUs) 14 and 15. These PMUs provide quality recreation in a relatively open habitat. Many large bucks have been taken in recent years as a result of the 3-point minimum regulation in conjunction with the short mule deer buck season.

Harvest of whitetail bucks has increased since 1997 due to implementation of the late buck hunt in November. This trend has continued. Harvest figures (Tables 1-3) indicate a trend of increased hunter take.

Table 1. Antlerless harvest per 100 bucks.

Year	PMU	Harvest/100 bucks
1995	15	86.3
1996	15	42.8
1997	15	20.1
1998	15	17.6
1999	15	14.5
2000	15	29.6
1995	14	125.3
1996	14	47.4
1997	14	23.4
1998	14	25.5
1999	14	28.2
2000	14	45.3

Estimated buck harvest in 2000 was greater than the previous 3 years for both whitetail and mule deer. However, hunter success is declining in units 127 thru 136, probably because of increasing numbers of hunters (Tables 2 and 4). Proximity to Spokane and the late buck season in these areas contribute to high hunter density. In 2000, the late whitetail buck season was shortened to help reduce buck harvest and hunter density.

Current habitat conditions will support increased population growth until a severe winter or a significant drought. The possibility of an outbreak of EHD in whitetail is a real threat in those GMU's with a high whitetail component when drought conditions reduce standing water levels.

We are using youth/senior/disabled hunts to manage antlerless white-tailed deer. As mule deer populations continue to rise in some areas WDFW will consider additional antlerless mule deer harvest to help

Table 2. Comparison of hunters and days of effort (*General season days/kill).

	1995		1996		1997		1998		1999		2000	
Unit	Hunters	Days/kill	Hunters	Days/kill	Hunters	Days/kill	Hunters	Days/kill*	Hunters	Days/kill*	Hunters	Days/kill*
127	1483	34	1696	29	2202	22	1693	31	2337	36	2234	17
130	1691	23	1864	15	2531	20	2727	30	2664	35	3189	25
133	2491	23	3614	11	3593	21	3093	19	3460	25	3290	15
136	1392	13	1804	16	2376	15	2412	23	2670	33	2272	21
139	2377	15	3470	16	3645	15	2598	20	2671	21	3146	11
142	1702	9	2718	12	2537	9	1860	14	2064	13	2227	8

Table 3. Buck by PMU, 1995-2000.

PMU 14	Buck Harvest
1995	591
1996	1,098
1998	962
1999	1,228
2000	1,561
PMU 15	
1995	731
1996	1,162
1998	1,048
1999	1,432
2000	1,774

Table 4. Percent hunter success by GMU.

GMU	1995	1996	1997	1998	1999	2000
127	12	15	23	17	18	29
130	15	21	21	13	17	18
133	26	27	21	17	20	24
136	23	20	20	14	14	15
139	21	20	29	18	24	31
142	33	22	39	22	30	36

alleviate agricultural damage.

Surveys

Deer populations in the Central District have been surveyed by ground methods. The post-hunt ratios more accurately reflect composition and performance of these herds, than the pre-hunt survey figures. However, whitetail bucks are often difficult to survey because of nocturnal behavior and the hunting pressure of the late whitetail buck season. As a result, the whitetail post-season buck:doe ratio figure is probably a conservative measure of composition.

Whitetail ratios in 1999 averaged 44 bucks: 100 does: 87 fawns pre-season, and 16 bucks: 100 does: 122 fawns post-season. Mule deer ratios in 1999 averaged 65 bucks: 100 does: 83 fawns pre-season, and 36 bucks: 100 does: 124 fawns post-season (Tables 5 and 6).

Pre- and post-hunt survey data is not available for 2000. Post-hunt aerial surveys are planned and will be implemented during the winter of 2001-2002. Pre-season surveys will resume during August and September 2002.

Population status and trend analysis

Although whitetail post-season buck ratios are probably underestimated by surveys, ratios for both whitetail and mule deer exceed guidelines (15 bucks per 100 does) for post-season herd composition. in the past (Tables 5 and 6). Doe:fawn ratios, overall, remain high in most units and indicate range and weather conditions are good to very good especially for whitetail. These GMUs are largely private lands, and though WDFW has little control of management practices on private lands, the recent weather and general fertile nature of these soils have helped produce healthy populations of both deer species.

We are managing mule deer very conservatively in the Central District resulting in a buck:doe ratio of 37 bucks post-season. Favorable weather has resulted in excellent recruitment.

Table 5. Deer survey, Central District.

		Pre-season			Post-season		
Species	Year	Buck	Doe	Fawn	Buck	Doe	Fawn
Mule	1996	32	80	56	90	398	330
Deer	1997	67	199	139	96	389	467
	1998	45	104	90	55	357	325
	1999	45	69	57	33	90	112
White-tailed	1996	9	119	88	24	117	127
Deer	1997	26	113	87	64	219	231
	1998	58	175	147	30	160	219
	1999	28	63	55	21	133	162

Management conclusions

Deer populations in the Central District are productive and increasingly abundant in recent years. Current season structures are addressing management issues. White-tailed deer are frequently still a social problem especially in Whitman County near Colfax and some other urban centers. It may be necessary to increase the harvest of antlerless component of both deer species in the Central District to control herd levels in the Central District.

It seems that with 3-point regulations, WDFW can not only continue to emphasize white-tailed deer harvest in the Central District, but may be able to increase hunter effort and recreational opportunity for harvest of these bucks by using permit only opportunity during the late season. Those units near urban centers will need to be closely watched to avoid over harvest.

Thus far, we have not experienced too many urban deer problems in Spokane. 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 the hunters with the landowner. This seems to be the most successful tool to help control damage and to provide recreational

Table 6. Deer composition ratios for 1999.

Species	Pre-season (buck:doe:fawn)	Post-season (Buck:doe:fawn)
Mule deer	65:100:83	37:100:124
White-tailed deer	44:100:87	16:100:122

opportunity.

Elk are found in most of the deer habitats in the Central District. Deer management in the Central District is often closely tied to elk management. When both deer and elk numbers are high, habitat can suffer and winter mortality can be significant.

Because of the EHD outbreak in 1998 and 1999 in the Central District, it will be necessary to monitor the white-tailed deer populations in this area carefully with extra effort during the post-season herd composition surveys in Spokane, Whitman and Lincoln counties. Because of landowner requests and the health of this herd, WDFW will continue to offer antlerless hunts by modern firearm permit, and general whitetail antlerless opportunity for archery, muzzleloader, youth, senior, and persons of disability seasons in units near the urban area of Spokane for white-tailed deer.

The mule deer population along the Snake River breaks in GMU 142 of Whitman County is higher than desired. We anticipate recommending increased mule deer antlerless harvest in this unit.

DEER STATUS AND TREND REPORT: REGION 1
PMU 16 - GMUs 145, 149, 154, 178, 181
PMU 17 - GMUs 162, 163, 166, 169, 172, 175, 186

PAT FOWLER, District Wildlife Biologist

Population objectives and guidelines

Mule deer (*Odocoileus hemionus*) populations are at management objective along the breaks of the Snake River and in the foothills areas of the Blue Mountains. Mule deer populations in the mountains are depressed, but are slowly recovering. White-tailed deer (*O. virginianus*) populations declined significantly in GMUs 145 and 149 due to an outbreak of epizootic hemorrhagic disease (EHD) in September of 1998. Four years of mild winters and minimal drought has maintained a good level of fawn production and survival.

Hunting seasons and harvest trends

In 1990, the nine-day season was combined with a three-point regulation for mule deer. The regulation was expanded to include white-tailed deer in 1991. The objective of this regulation was to improve buck survival and increase the post-season buck to doe ratio, which was well below management objective. Buck survival and post-season buck ratios for both mule deer and white-tailed deer have improved since 1990.

The district buck harvest declined when the three-point regulation was implemented, which was expected. The buck harvest averaged 2,214 bucks/year between 1994 and 1999, and compares favorably with the 1985-89 (pre three-point) district average of 2,340 bucks. The 2000 harvest was 24% above the 1994-99 average at 2750 bucks (Table 1).

Table 1. All deer harvest summary, 1990-2000, Blue Mtns., WA.

Year	Antlered	Antlerless	Total	Mule deer bucks > 4 point	Antlerless deer:100 Antlered
1990	1209	771	1980	34%	64
1991	1317	1088	2405	38%	64
1992	1588	875	2463	47%	55
1993	2012	766	2778	50%	38
1994	2231	1252	3483	46%	56
1995	1451	930	2381	43%	64
1996	2332	816	3148	52%	35
1997	2418	768	3186	51%	32
1998	2366	591	2957	54%	25
1999	2484	791	3275	53%	32
2000	2750	827	3577	50%	30

Prior to the three-point regulation, only 10-15% of the mule deer buck harvest consisted of bucks with four or more antler points. Antler point trends in the 2000 buck harvest appear stable with 50% of the mule deer bucks carrying 4 or more points (Table 1). Thirty-two percent of the whitetail bucks carried 5 points or more (Table 2), 74 % had 4 or more points. The 1992-99 average for mule deer with 4 or more points is 49.5%, and 70% for whitetail bucks. We are not seeing a decline in antler point trends in the buck harvest.

The 2000 buck harvest consisted of 59% mule deer and 41% white-tailed deer, which is comparable to the long term trend of 60% mule deer and 40% white-tailed deer. However, whitetail bucks are represented at a higher level in the harvest than they occur in the population due to two factors. One, approximately twice as many yearling whitetail bucks are legal under the three-point regulation, compared to yearling mule deer bucks. Two, the permit controlled, late Blue Mountain Foothills whitetail hunts add approximately 7% to the whitetail harvest.

The Blue Mountains Foothills late whitetail permit rifle hunts produced a harvest of 66 bucks and 12 does for a hunter success rate of 75% (Table 5). The quality of the bucks harvested is comparable to the long-term average with 32% having five or more antler points, compared to the 1993-99 average of 33%.

The antlerless deer harvest fluctuates according to

Table 2. Late Whitetail Permit Hunt Summary, Modern Weapon and Muzzleloader, Blue Mtns., WA.

	No.				Hunter	Bucks	
Year	Permits	Bucks	Does	Total	Succ.	≥5 pt.	Obs./Htr.
1990	50	16	4	20	54%	50%	4.0
1991	120	48	22	70	68%	56%	4.7
1992	140	62	24	86	58%	42%	6.5
1993	140	66	22	88	69%	31%	6.2
1994	200	68	49	117	69%	26%	5.8
1995	200	74	18	92	56%	24%	6.5
1996	200	74	14	88	56%	38%	7.3
1997	220	79	17	96	66%	32%	10.9
1998	175	57	14	71	63%	46%	9.8
1999	175	62	10	72	59%	26%	10.8
2000*	260	82	26	108	68%	32%	na

* Late ML whitetail permit data included.

permit levels, and hunter success rates. The antlerless deer harvest averaged 871 per year over the five-year period between 1994 and 1998. For 2000, permits were increased to 2410; 1825 antlerless only (600 whitetail only), and 585 3-point or antlerless (260 whitetail only), producing a harvest of 827 antlerless deer. Does were harvested at a rate of 30 does per 100 bucks. The success rate for general antlerless permits remained high at 74%. The average success rate for hunters with whitetail antlerless permits increased from 43% to 58%.

Surveys

Deer surveys are conducted to determine pre-hunt and post-hunt herd composition. Pre-hunt deer surveys for 2000 were very limited due to workload conflicts (Table 3).

Aerial post-hunt surveys were not completed due to new work assignments in December of 2000 (sub-basin planning), and only a small sample size was obtained during other activities (Tables 4 and 5).

Population Status And Trend Analysis

Mule deer populations along the Snake River and in the foothills of the Blue Mountains are at management objective. Mule deer populations south of Clarkston in GMU 181 and in the mountains are improving slowly.

The white-tailed deer population in units 145-Mayview and 149-Prescott suffered significant losses due to a severe outbreak of EHD in September 1998. Ground surveys in habitat units along the Snake River revealed as many as 20-30 dead white-tailed deer in a single 40-60 acre plot. White-tailed deer losses were confirmed as far upriver as Lower Granite Dam on the Snake River, Highway 12 on the Tucannon River, Prescott on the Touchet River, and Bennington Lake on the Walla Walla River. White-tailed deer numbers are recovering in the area impacted by the EHD outbreak.

Table 3. Pre-hunt mule deer surveys 1989-00, Blue Mtns., Washington.

	Bucks					Per 100 Does
Year	Ad.	Yearl.	Doe	Fawn	Total	F:100:B
1989			256	120	449	47:100:29
1990			302	140	548	46:100:35
1991			637	396	1333	62:100:47
1992			503	227	1027	45:100:59
1993			384	234	931	61:100:84
1994	90	196	624	404	1267	65:100:46
1995	28	49	226	108	411	48:100:34
1996	28	45	214	142	429	66:100:34
1997	42	108	254	160	564	63:100:56
1998	61	76	238	169	544	71:100:58
1999	41	54	306	187	588	61:100:31
2000	9	15	33	13	70	39:100:73

Table 4. Post-hunt mule deer surveys by class for year 2000, Blue Mtns., WA.

	Bucks					
GMU	Ad.	Yearl.	Doe	Fawn	Total	F:100D:B
162		1	7	7	15	—
172	2	4	22	11	39	—
181	5	12	54	28	99	52:100:31
186	1	3	15	6	25	—
Total	8	20	98	52	178	53:100:29

Good forage conditions for the last four years, followed by mild winters resulted in minimal over-winter mortality and excellent fawn production and survival. In 2000, only 70 mule deer were classified during pre-season surveys. This low sample size is not representative of actual pre-season herd composition. Other work duties precluded obtaining an adequate sample size for pre-season surveys.

No post-season deer surveys were conducted in 2000 due to extra work assignments (Figures 1 and 2). A small number were classified during bighorn sheep surveys.

The shorter, nine-day hunting season was implemented for three years (1987-89) prior to the three-point regulation with no improvement in post-season buck survival. Between 1990-99, private land enrolled in the WDFW hunter access program increased from 150,000 acres to over 400,000 acres, much of it Conservation Reserve Program (CRP) lands. Private land access increased 166%, which should have reduced buck survival, but did not. Other factors that may not be measurable, such as, the time it takes hunters to document three points allows better escapement, CRP lands provide much better security cover than existed prior to the three point regulation, and bucks two years and older probably have better hunter avoidance skills, which increases survival. Regardless of the influencing factors, post-season adult mule deer buck survival did not increase significantly until ***after*** the three-point regulation was combined with the short, nine-day season. It is difficult to obtain an adequate sample of white-tailed deer in post-season surveys due to lack of time and personnel.

Habitat Condition And Trend

Deer populations in the Snake River breaks and foothills of the Blue Mountains have increased since the advent of the CRP. This program provides thousands of acres of deer habitat in traditional agricultural croplands. Agricultural producers in the four counties in southeast Washington have enrolled a

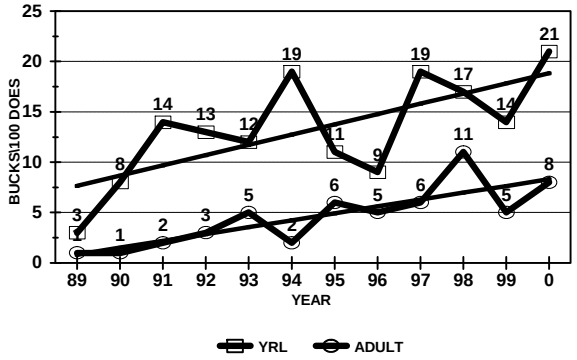

Figure 1. Post-season Buck Ratio Trend, Blue Mtns. 1989 – 2000.

large amount of their acreage in the program. The level of enrollment in CRP acreage remained the same from last year: Walla Walla county 161,400 acres, Columbia county 48,200 acres, Garfield county 58,300 acres, and Asotin county with 40,100 acres, district total of 308,000 acres (T. Johnson. pers. com.). These large areas of continuous habitat provide excellent forage and fawning areas where little existed prior to the CRP. As a result, deer populations in the farmland areas of southeast Washington should remain at good levels into the foreseeable future, if weather conditions are normal; mild winters, and no drought.

Yellow-star thistle is a major problem in the foothills and along the breaks of the Snake River above Asotin. This may be one reason mule deer populations along the Snake River breaks in portions of GMU 181 have not increased, compared to other deer populations along the lower Snake River.

Habitat conditions on National Forest lands have declined due to roads, logging, and fire suppression.

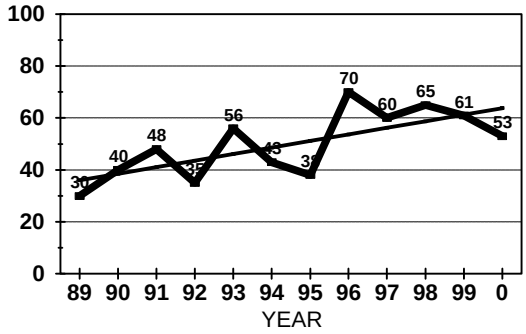

Figure 2. Winter mule deer Fawn Ratio Trend, Blue Mtns. 1989-2000.

However, the Pomeroy Ranger District is in the process of re-evaluating the Travel-Access Management Plan, which will, hopefully, close more roads. A new Fire Management Plan is being implemented that will allow the use of naturally occurring and prescribed fires for improving habitat conditions, this policy will also apply to the Wenaha-Tucannon Wilderness area.

Augmentation/Habitat Enhancement

Landowners enrolled in the CRP program will be required to re-plant approximately 50% of their existing CRP acres with new wildlife mixtures, including sagebrush. The remaining 50% of current CRP planting will be burned to re-establish healthy stands of grasses and forbs. This will greatly enhance the value of the CRP habitat for deer and other wildlife.

Wildlife Damage

Damage complaints attributed to deer have been minimal in southeast Washington over the last two years, compared to deer densities. Vineyard development is increasing at an alarming rate in GMUs 149 and 154, and could pose a serious deer damage problem in the future.

Management Conclusions

Mule deer populations along the Snake River breaks and in the foothills of the Blue Mountains are at management objective. Mule deer populations in the mountains are improving slowly.

The white-tailed deer population along the lower Snake River and its tributaries is recovering from heavy mortality suffered from an EHD outbreak in September of 1998. Whitetail populations in the foothills are high.

The three-point regulation has accomplished the goal of producing post-season buck survival rates that

Table 5. Post-hunt mule deer surveys 1989-00, Blue Mtns., Washington.

	Bucks					Per 100 Does
Year	Ad.	Yearl.	Doe	Fawn	Total	F:100:B
1989	6	23	790	234	1053	30:100:4
1990	15	111	1358	544	2028	40:100:9
1991	17	133	943	455	1548	48:100:16
1992	40	153	1231	431	1868	35:100:17
1993	45	119	995	559	1718	56:100:17
1994	20	163	879	381	1443	43:100:21
1995	43	69	693	264	1069	38:100:16
1996	51	85	993	697	1826	70:100:14
1997	47	157	822	489	1515	60:100:25
1998	81	117	705	460	1363	65:100:28
1999	72	180	1316	796	2364	61:100:19
2000	8	20	98	52	178	53:100:29

meet the management objective of 15 bucks:100 does, for both whitetails and mule deer. However, post-season buck ratios should not be used as a benchmark under a three-point regulation, because the ratio is naturally high due to the number of yearling bucks (sub-legal) in the post-season population. An adequate number of adult bucks post-season should be used to judge whether or not the program is meeting objectives.

The quality of the bucks harvested under the three-point program has improved without a decline in the number of bucks harvested. In addition, public acceptance of the three-point regulation is excellent due to the quality of the bucks harvested, and good hunter success rates. The three-point buck regulation should be maintained in the Blue Mountains until a better system for improving buck survival is implemented.

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*). The post-season sex ratio target is a minimum of 15 bucks per 100 does. Data on buck:doe ratios, fawn production, and fawn recruitment are collected during field surveys to assess success in achieving management objectives.

Hunting seasons and harvest trends

The 2000 hunting regulations retained the nine-day modern firearm season and the three-point minimum for mule deer implemented in 1997 for all user groups. The moratorium on antlerless mule deer hunting remained, as the population continued to recover from heavy winter mortality in the early and mid 1990s.

Hunter numbers in the Okanogan District appear to be leveling off at about half of what they were five years ago (Figure 1). Hunter numbers may expand somewhat with increased youth opportunity in 2001. Hunter days declined significantly, likely a product of increasing success (Figure 2).

Hunters enjoyed generally favorable weather conditions and good access, however, dry conditions made stalking difficult. The mild weather during the general season meant that deer were still well distributed at this time. Significant seasonal migration had not yet begun and hunters had to search widely to locate animals.

Even so, hunter success increased dramatically, and effort (number of hunter days per kill) fell sharply, as compared to 1999 levels in the Okanogan District (Figure 3). Harvest increased about 30% in PMU22 and nearly doubled in PMU 21 over last year (Figure 4).

Similarly, the Chewuch check station saw significantly more activity. WDFW personnel checked 72 deer in two weekends as compared to 53 in 1999 (Table 1). Checked deer included only three 3-pt yearlings. The check station recorded a decrease in hunter numbers and hunter days of 5 percent and 32 percent respectively, correlating nicely with total PMU data.

Despite sharply increased harvest, post-hunt buck:doe ratios climbed slightly in PMU 21, remaining well above escapement targets (Table 2). The percentage of post-hunt bucks with $\geq$ 3 antler points ended up almost unchanged at 32 %.

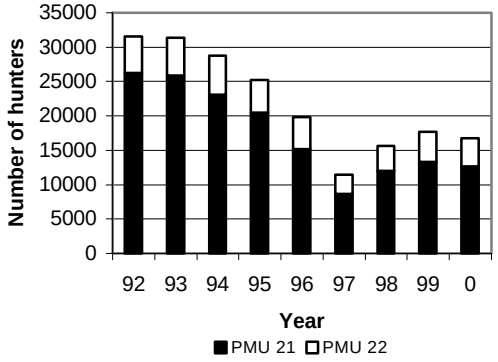

Figure 1. Trend in total hunters, PMUs 21 and 22, 1992-2000.

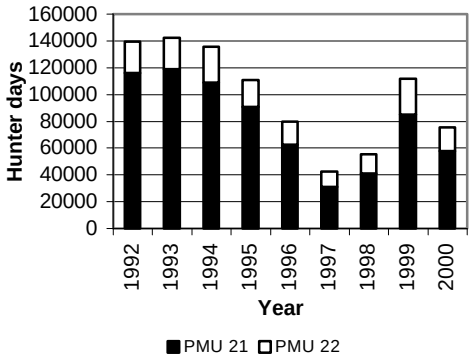

Figure 2. Trend in hunter-days, PMUs 21-22, 1992-2000.

Tribal input

Year 2000 data from the Colville Confederated Tribes (CCT) had not been received at the time of this report. In 1999, Tribal harvest decreased 18%, returning to the historical norm of about one third of the total PMU 22 harvest (Figure 5). Tribal interest in deer hunting is expected to remain high as long as deer are

readily available. As a result, Tribal officials share WDFW interest in the status and trend of mule deer herds in Eastern Washington, particularly immediately north of the reservation. The CCT continue to be active partners in an ongoing mule deer research project in North Central Washington, contributing staff time and financial resources.

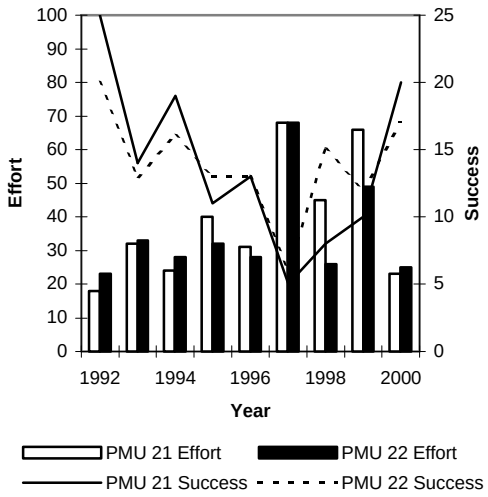

Figure 3. Trend in effort and success, PMUs 21 1992-2000.

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 early November / late December when most hunting seasons have ended, most bucks have not dropped antlers, and 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.

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. As with the post-season surveys, this effort is restricted to mule deer in PMU 21, due to sample size shortcomings and limited resources.

Biologists classified a total of 3,133 mule deer during helicopter surveys in PMU 21 in late November 2000 (Table 2). The counts yielded overall buck:doe and fawn:doe ratios of 27:100 and 93:100 respectively. Both ratios showed small increases over last year and represent values well above management objectives (Table 3).

During hiking surveys in late March and early April 2000, biologists classified 2,300 mule deer in PMU 21 (Table 4). Data analysis produced an overall fawn:adult ratio of 44:100, down noticeably from the previous two year, but still indicating good over-winter recruitment (Table 5).

Table 1. Chewuch Check Station Results.

	Deer Age Class			%		
Year	Adult	Yearl.	Total	Yearl.	Hunters	Success
1991	70	81	151	54	--	--
1992	92	105	197	54	2,256	0.09
1993	48	99	147	68	2,410	0.06
1994	--	--	160	--	1,994	0.08
1995	--	--	36	--	1,388	0.03
1996	24	51	75	68	1,247	0.06
1997	3	2	5	40	729	0.01
1998	30	3	33	9	980	0.03
1999	48	5	53	9	1,414	0.04
2000	69	3	72	4	1,250	0.06

Population status and trend analysis

Helicopter quadrant censuses conducted during a research project in PMU 21 in the mid 1980's produced a mule deer population estimate of approximately 25,000 animals. No recent reliable population estimates have been calculated. Our intention is to generate estimates using population reconstruction models, and efforts are underway to obtain reliable pre-season fawn:doe ratios. Unfortunately, necessary check station data on buck mortality and age structure are unobtainable under the three-point harvest restriction. Without this information, population models are ineffective. Current herd management does not rely on population estimates, and is based on demographic parameters generated from spring and post-season surveys. Even so, crude estimates and harvest data suggest the current herd size is comparable to that of the mid 1980's.

Throughout much of this century, the mule deer population in Okanogan County has fluctuated widely, largely in response to shifts in winter weather patterns. Even so, an overall gradual decline in mule deer numbers is evident. For roughly the last 15 years, harvest data indicated that even during periods of mild winter weather, the population is not rebounding to the historic highs of the 1950s and 60s.

Loss of winter range, due to increased human population and associated development is likely a major contributor to reduced herd size. This has been true district-wide, but is most pronounced in PMU 21. These development trends are continuing, and in fact are accelerating, especially the Methow Valley, where the largest concentration of wintering mule deer occurs. This is being mitigated somewhat by WDFW's aggressive land acquisition efforts in the Methow, that have targeted mule deer winter range and migration corridors.

Table 2. Post-season population composition counts from 2000, by area. F:100:B is fawns and bucks per 100 does.

		Buck Antler Class						
Area	Unit(s)	≥3 pt	< 3 pt	Subtotal	Does	Fawns	Total	F:100:B
Methow	218-231, 239,242	123	264	387	1425	1321	3133	93:100:27
Okanogan	209, 215, 233, 239	--	--	--	--	--	--	--
Total		123	264	387	1425	1321	3133	93:100:27

Table 3. Post-season mule deer population composition counts from PMU 21. F:100:B is fawns and bucks per 100 does.

	Buck Antler Class						
Year	≥3 pt +	< 3 pt pt	Total	Does	Fawns	Total	F:100:B
1991	--	--	--	--	--	905	63:100:13
1992	--	--	72	1191	864	2127	73:100:6
1993	--	--	103	1209	984	2296	81:100:9
1994	--	--	67	1012	719	1798	71:100:7
1995	--	--	69	608	456	1133	75:100:11
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

Table 4. Spring population composition counts from 2001, by area for PMU 21. F:100:B is fawns and bucks per 100 does.

Area	Unit(s)	Adult	Fawn	Total	F:100
Methow	218-231, 239, 242	1299	579	1878	45:100
Oka	209, 215, 233	294	128	422	44:100
Total		1593	707	2300	44:100

Table 5. Spring mule deer population composition counts from PMU 21. F:100 is fawns per 100 adults.

Year	Adults	Fawns	Total	F:100:A
1993	707	137	844	20:100
1994	507	257	764	51:100
1995	965	243	1208	25:100
1996	948	384	1332	41:100
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

High harvest of does may also contribute to population decline. Past harvest strategies have been based on the assumption that hunting mortality is compensatory. Current research in other states, suggests that hunting mortality may be more additive for mule deer. Ongoing research in Washington will address the effects of hunting mortality. In the interim, more conservative hunting regulations have been adopted, and guidelines for antlerless harvest have been developed using an additive mortality model. It is hoped the combination of habitat acquisition and conservative harvest will slow, and perhaps even halt, the decline over the long-term.

In recent years, qualitative observations from land managers, biologists, and long time residents, as well as harvest figures, suggest that by 1997 the population may have fallen to half or less of what it was in the mid 1980s and early 1990s. Severe winter weather contributed most to this short-term decline.

Fortunately, the last four winters have been mild, and deer populations have rebounded strongly. Production is high, and has been aided by greater buck:doe ratios and the elimination of mule deer antlerless hunting. Survey data in the spring of 2001 indicated less recruitment than expected. The herd is still growing steadily, but the rate of growth is slowing somewhat, suggesting forage resources are beginning to be stressed. Antlerless harvest may be necessary to reduce competition and maintain maximum rates of production.

Unlike mule deer, whitetail deer have increased in the district over the long-term. Many of the same habitat alterations that have excluded mule deer, 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 were never seen historically. Relatively flat harvest figures suggest the whitetail population may be stabilizing. Whitetail have also sustained significant

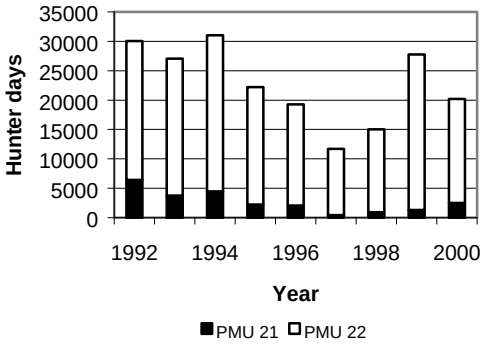

Figure 4. Trend in hunter-days, PMUs 21-22, 1992-2000.

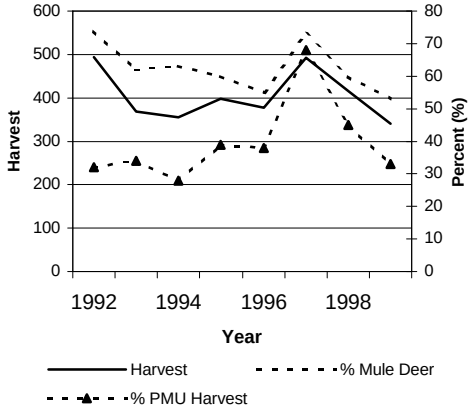

Figure 5. CCT harvest statistics.

winter losses in recent years, but in general, have been more resilient than mule deer.

Unlike population size, herd composition is tied to harvest rather than habitat. Heavy hunting pressure on antlered mule deer had caused the buck:doe ratio to hover at or below the historical minimum threshold of 10:100. Recent implementation of more restrictive seasons and a minimum management objective of 15 bucks per 100 does, have improved post-season sex ratios. This in turn should help insure higher pregnancy rates and more synchronous breeding, improving overall herd demographics.

Habitat condition and trend

Deer enjoyed easy access to available natural forage during last year's mild winter. Deer remained well distributed on traditional winter range, and were even able to utilize range farther north and west than in most winters.

Winter range continues to be lost on an annual basis throughout the Okanogan District. In PMU 21, conversion of land to agricultural and urban encroachment are responsible for most losses in the Okanogan Valley. Winter range and migration corridors in the Methow Valley are being lost to subdivision, and residential construction associated with a booming recreation industry. These development pressures are likely to continue and even accelerate, particularly in the Methow Valley.

WDFW continues to pursue the opportunity and resources to purchase land and/or easements in the most critical habitat at risk in the Methow. Over $19 million has been spent by WDFW to acquire 9,000 acres of important winter range and migration corridors since 1992, and additional purchases are expected over the next three years. The Methow Watershed Acquisition project scored well during the recent IAC project funding evaluation, and may receive as much as $6.7 million for additional land purchases and conservation easements during the 2002-03 biennium, depending on the outcome of the current state budget crunch. It is hoped that this program will continue in the future; however, land prices and competition for acquisition funds are both increasing. Additional acquisition funding sources are being pursued.

Seasonal ranges are poorly defined in PMU 22. Changes to the landscape are occurring more slowly here than they are in the adjacent unit to the west. Even so, some habitat is being lost on an annual basis to human development. This is probably most evident for mule deer winter range being converted to agriculture and residences near the Okanogan River. Many deer utilize mid-elevation mature forest as winter range in the eastern portion of this unit. Much of the forest is under harvest management. Ongoing research will help define seasonal ranges in PMU 22, and these results will help guide more focused deer habitat management.

Summer forage quantity and quality are important for fawn production and recruitment. In PMU 21, potential shortfalls during drought are mitigated by the availability of many acres of irrigated pasture, and by high elevation meadows that remain green even during dry years. Recent water use restrictions associated with salmonid recovery could potentially eliminate much irrigated acreage. This could significantly reduce available deer forage at lower elevations, and negatively affect deer production. This impact could be exacerbated by the effects of grazing. Much of Okanogan County is intensively grazed. In some areas, livestock already compete with mule deer for grasses and forbs. Livestock affects are most pronounced during dry years, like the two seasons just experienced.

In addition, heavy livestock grazing accelerates the spread of noxious weeds that aggressively displace many deer food species. Throughout the district, noxious weed invasion continues to be a major concern. Both agencies and private land owners are developing more aggressive integrated weed management programs.

PMU 21 has an abundance of noxious weeds, particularly on dry land range at lower elevations, an area where forage is already limited during the critical winter-spring season. In most of PMU 22, weeds are not as significant a problem; however, most of the unit is intensively grazed, and the potential for noxious weed invasion is high. In general, the low to mid elevation range in this area is wetter during the growing season than in PMU 21. It is hoped that this will slow weed invasion to a manageable level.

Land managers are concerned that much of the bitterbrush on winter range in PMU 21 and portions of PMU 22 is very old and not very productive, due to long-term fire suppression. Some low intensity prescribed burns are being conducted in an attempt to revitalize some of these areas. Early results are encouraging; however, the long-term effectiveness of these measures will not be known for several years.

Large areas of the Sinlahekin Wildlife Area are becoming less productive winter range due to increasing tree cover, again due largely to fire suppression. Recently, the proceeds from a local estate were dedicated to the cause of enhancing mule deer habitat in Okanogan County. These funds paid for a prescribed burn on the Sinlahekin winter range to stimulate regeneration of ceanothus and other browse species. Additional forest thinning and prescribed burning is planned for the Sinlahekin.

Road management is also receiving increased attention from public land managers. Many non-essential roads are being evaluated for seasonal or permanent closure, in an effort to provide greater wildlife security and reduce illegal harvest. This will benefit deer herds in both the short and long term.

Management conclusions

Mule deer populations had bottomed out after a series of severe winters, but are now rebounding nicely, fueled by high productivity and recruitment, and aided by conservative hunting seasons. Even so, a gradual long-term population decline will likely continue, if reductions in habitat quantity and quality are not curbed. Buck:doe ratios have improved in response to stricter hunting regulations, but the buck cohort is being shifted toward immature animals as a result of the three point restriction.

Whitetail deer numbers have also dipped during harsh winters in recent years, but are likely also rebounding strongly. In the face of increasing human development, the long-term prognosis for expanding whitetail distribution and abundance is more favorable than for mule deer expansion. This is a function of the whitetail's ability to better handle habitat changes associated with human development, and the difficulties in achieving adequate harvest on private lands, where whitetail tend to concentrate.

The following recommendations are strategies for expanding the deer population and improving herd vitality, while maximizing recreational opportunities to the extent they are compatible with sound biological management.

1. *Recommendation*. Delay deer hunting until after Labor Day.

Rationale. A post-Labor Day start date would reduce conflicts with non-consumptive users and anti-hunting members of the public. This is especially true in the public lands adjacent to the Methow Valley, where hunting pressure is highest, and heavy recreational pressure continues well into autumn.

2. *Recommendation*. After the general season, hunt mule deer by permit only.

Rationale. This would allow for the fine tuning of the harvest to the available surplus, and would mitigate for unanticipated increases in harvest vulnerability due to early season snowfall.

3. *Recommendation*. Drop the three-point antler restriction in all units during all seasons.

Rationale. Buck:doe ratios are well above management objectives, and buck numbers can be maintained by retaining the short nine day season in mid October, and by adopting permit only hunting after the general seasons for all user groups. In addition, a three point restriction may not be desirable. First, more bucks are being killed and left in the field due to misidentification of two points as three points. Second, a selection pressure may be exerted favoring individuals with lesser and/or slower antler development; these animals may represent a less desirable portion of the gene pool.

4. *Recommendation*. Continue youth/disabled antlerless harvest opportunities implemented in 2001. Decide on a general season vs permit format pending the 2001 harvest results and the severity of the 2001-02 winter.

Rationale. Production is likely to start falling as the growing population begins to stress forage resources. Managing population size will be necessary to maximize herd health and harvest opportunities.

5. *Recommendation*. Continue to vigorously pursue public acquisition of mule deer winter range in PMU 21.

Rationale. Mule deer carrying capacity in this unit is at least partially a function of available winter range and winter weather conditions. Winter range is rapidly being developed in the Methow and Okanogan Valleys.

6. *Recommendation*. Reduce livestock grazing from dry land winter range on wildlife area lands through lessee attrition, unless a clear benefit for wildlife can be demonstrated, and the threat of noxious weed expansion is insignificant. Encourage adjacent public land managers to reduce stocking rates and eliminate season-long grazing of dry land winter range.

Rationale. Noxious weed invasion is at epidemic levels throughout much of PMU 21. The threat of continued weed expansion may outweigh the potential benefits of improving deer forage shrub production by reducing grass cover. Similar results might be achieved with low intensity burning. In addition, livestock compete for forage with deer on many low and mid elevation ranges. During dry years, livestock often also consume browse needed for winter deer forage. This competition will become more critical as less irrigated land is available during summer.

7. *Recommendation*. Retain water rights on WDFW land to provide green summer forage and combat noxious weeds.

Rationale. Green summer forage is critical for mule deer production, and water restrictions, particularly in the Methow, are likely to significantly reduce the amount of irrigated pasture available to deer. Also, water is needed to help restore weed infested pasture to healthy range.

8. *Recommendation*. Lobby for the funds necessary to fence existing unprotected orchards and haystacks in deer winter range over the next five years. Phase out damage compensation over the same time period.

Rationale. Limited agency funds and staff time should be redirected towards more critical issues. Lack of a compensation program may discourage conversion of existing winter range to agricultural uses.

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

TOM McCALL, Wildlife Biologist

Population objectives and guidelines

Management objectives for PMU 23, Douglas, are to maintain the current mule deer (*Odocoileus hemionus*) population and the post-hunting season buck objective of 15 bucks:100 does. Management objectives for PMU 26, Chelan, are to increase deer populations as habitat recovers from fire, and maintain the post-season objective of 15 bucks:100 does. Post-season surveys and hunter harvest will be used to monitor population progress toward objectives.

Hunting seasons and harvest trends

Current hunting seasons are conservative compared to those prior to 1997, due to depressed deer populations in portions of north-central Washington. Deer season begins with early archery, which runs through the first two weeks of September. The modern firearm high buck season runs from September 15-25 in a portion of GMU 243 and in GMUs 244 and 249. Early- muzzleloader season is open in three units for five days in early-October. The early-modern firearm season is open for nine days in mid-October.

Limited permit hunting is offered for modern-firearm and muzzleloader hunters in late-November. Last year's post-season buck ratios were sufficient to allow offering five permits in most units in Chelan following the general buck season in 2000. Fifteen buck permits will be recommended per unit for the late season in 2001. The number of buck permits for late season should be increased as the deer population continues to recover.

The deer population in Chelan is migratory and is widely dispersed during the modern firearm season in mid-October. Because they are not concentrated at this time, only a small portion of the bucks are harvested. For example, 46 % of the bucks during post-hunt surveys in 2000 were mature bucks, suggesting few of the older bucks are harvested. Extending the deer season in Chelan for an additional week would mean more deer would be at lower elevation, which potentially could increase harvest.

As the deer population increases, there has been a corresponding increase in damage to agricultural areas. In 2000, there were 125 modern firearm permits for antlerless deer in Douglas to reduce damage. Increased permit levels will be recommended in 2001. A hunt for youth and disabled hunters will be offered in a portion of Douglas in 2001, to reduce damages and promote hunting. In 2001, a limited number of permits will also be offered in the Mission unit (GMU 251) in Chelan to reduce damage to orchards. Late-archery season was open in two units from November 24 through December 8, 2000.

The majority of our deer in the District are mule deer, although there are a few whitetails. Most hunters, regardless of weapon, are restricted to 3-point or greater bucks.

Buck harvest for the Wenatchee District in 1997 was the lowest ever recorded (Fig. 1). The reduction in harvest was caused by the following factors: severe winter of 1996, Tyee and Dinkelman fires (affected PMU 34), short modern-firearm hunting season, and 3-point minimum regulation.

The Douglas PMU's buck harvest decreased from 1997 to 1998 (985-368) following the winter of 1996-97 but has been stable ($\underline{r}$ = 0.49, $\underline{P}$ = 0.67, n = 3) from 1998 to 2000 (Fig. 1). The Douglas buck harvest in 2000 (660) nearly doubled from the low point seen in 1997 (368).

The Chelan PMU's buck harvest continues to grow. From 1997 to 2000, the Chelan buck kill increased 53% (246-523) ($\underline{r}$ = 0.94, $\underline{P}$ = 0.058, n = 4).

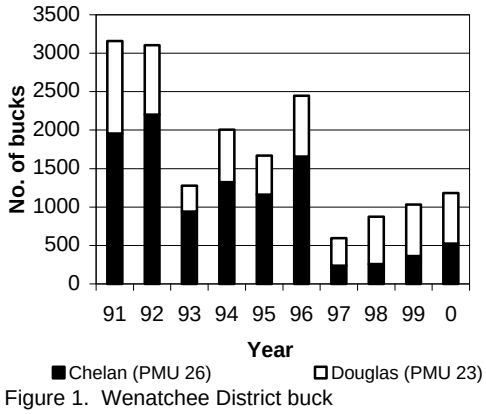

Figure 1. Wenatchee District buck harvest

Chelan's buck harvest in 2000 (523) increased 45 % from 1999 (361), but it is still down 76 % from the harvest of 2,206 bucks in 1992. The high harvest in 1992, may not be achievable again with the 3-point restriction.

In Douglas and Chelan PMUs, there has been little harvest of antlerless animals from 1997 to 2000 (range 0-40). The average yearly antlerless harvest from 1992 to 1996, in Douglas was 233 and 441 in Chelan.

Vehicles kill a large number of deer each year in the Wenatchee District, based on data collected by the Department of Transportation. Form 1997 to 1999, over twice as many deer were killed on state highways, on average, in Chelan County ($\underline{x}$ = 157, range 91-281) compared to Douglas County ($\underline{x}$ = 71, range 49-95) (Table 1).

Table 1. Number of deer killed on state highways in Douglas and Chelan, 1997-1999.

Year	PMU 23 Douglas	PMU 26 Chelan
1997	95	281
1998	49	99
1999	69	91

More deer are killed in Chelan County because the mountainous terrain forces deer to lower elevations in the winter to avoid deep snow. The number of deer killed was greatest in 1997, when the severe winter conditions forced deer on to roadways in both counties.

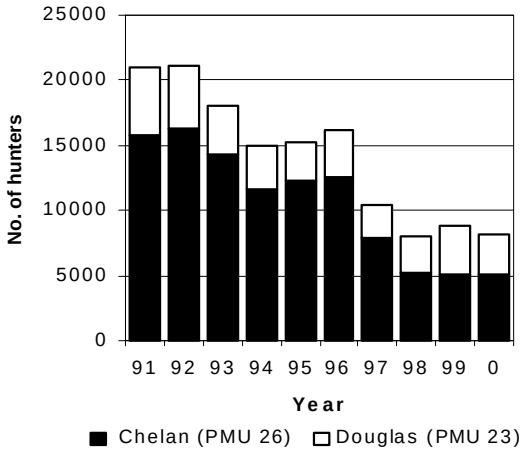

Figure 2. Number of Wenatchee District deer hunters.

The number of deer hunters in the Wenatchee District was at a low point in 1998 (8,079 hunters). The number of deer hunters in Douglas has been stable ($\underline{r}$ = 0.11, $\underline{P}$ = 0.830, n = 6) during 1995-2000. The majority of the land in Douglas is private, and most landowners allow similar hunter numbers annually. On the other hand, in Chelan the number of deer hunters has declined 59 % , from 12,247 to 5,019 ($\underline{r}$ = -0.92, $\underline{P}$ = 0.010, n = 6) from 1995 to 2000. In 2000, only about one-third as many deer hunters chose to hunt in Chelan compared to pre-Tyee fire years (Fig. 2).

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 antlers are dropped. These surveys are used to monitor post-hunt buck and fawn ratios.

In the Douglas PMU, December 2000, ratios were good, 21 bucks and 92 fawns per 100 does (n=648). In the Chelan PMU, December ratios were 24 bucks and 78 fawns per 100 does (n=1,088). Adult bucks made up 17 % of Douglas bucks and 46 % of Chelan bucks. Mild winter weather and low deer density resulted in excellent winter survival again this year.

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 from 1998 to 2000, and the population has fully recovered. In addition, there have been significant habitat enhancements associated with the Conservation Reserve Program that have been particularly beneficial for deer. These areas have been planted to a mixture of native vegetation or crested wheatgrass.

The Chelan PMU was severely impacted by the Tyee fire, which occurred in 1994. This fire removed much of the winter 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 now appears to be increasing rapidly based on the increase in the number of bucks harvested. During winter deer are beginning to use shrub communities that have grown up since the 1994 fire. And deer are using traditional winter range less because most of the bitterbrush on these areas was lost due to the fire. Continued mild winter conditions and

refraining from antlerless harvest will allow this population to rebuild.

Habitat condition and trend

Wildfire will have short-term impacts on deer winter range in Chelan County, but over the long-term deer should benefit from fire due to increased quantity and quality of forage. The Douglas population is more dependent upon agricultural crops (especially alfalfa and wheat) during winter than the Chelan population. Annual precipitation, especially rain that occurs during the spring, summer, and fall, can have a significant affect on deer populations in both PMUs.

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.

Management conclusions

There are concerns with the current 3-point regulation in Chelan PMU. We can meet buck escapement goals in Chelan without the 3-point regulation because most of the bucks do not move down to lower elevations where they are vulnerable to harvest until after the hunting season. Also, the 3-point regulation focuses mortality on the mature bucks that managers want to increase.

With the more open habitat conditions in Douglas, the 3-point regulation is working well and has increased the number of branch-antlered bucks harvested. Prior to the implementation of the 3-point restriction in Douglas, buck escapement was low, estimated between 6-10 bucks:100 does.

In 1999, a deer research project was initiated in Chelan County. The research is focusing on mortality, movements, and nutrition, of mule deer on both recently burned and unburned areas. This work should allow us to more intensively manage deer within the District.

DEER STATUS AND TREND REPORT: REGION 2
PMU 24 – GMUs 272, 278, 290, and PLWMA 201
PMU 25 – GMU 284

JIM TABOR, District Wildlife Biologist

Population objectives and guidelines

In 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 at least 15:100. Part of GMU 272 contains PLWMA 201, which has special population objectives formulated by PLWMA management in conjunction with WDFW.

In GMU 278 we strive to maintain a herd size well below 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 high buck:doe ratio of at least 30:100 post-hunt and maintain a high percentage of adult bucks (50 % of the total buck population). This GMU was established for the primary purpose of providing a "quality" mule deer (*Odocoileus hemionus*) buck hunting opportunity through "permit only" deer hunting.

Hunting seasons and harvest trends

GMUs 272, 278, and 284 had a 30-day early archery season in 2000 (Sept. 1-15, 3-point buck minimum and Sept. 15-30, 3-point buck minimum or antlerless for mule deer and any deer for white-tailed deer [*O. virginianus*]). In addition, GMU 272 had an either sex late archery season for mule deer (Nov. 22-Dec. 8). GMU 290 had an any deer, permit archery season with 35 permits (Sept. 16-Oct. 6).

All units except 290 had a nine-day general modern firearm buck season in 2000 (Oct. 14-22). In GMU 290, 15 permits were issued for a 15-day modern firearm any deer hunt (Nov. 1-15).

In 2000, a legal buck in all GMUs except 290 had to have a minimum of three antler points on one side.

The only muzzleloader seasons in the Columbia Basin units reported here were two general seasons in GMU 284 and a permit season for three hunters in GMU 290(Oct. 23-29). The general seasons in GMU 284 were Oct. 7-11 (whitetail, any deer and mule deer, 3-point minimum) and Nov. 22- Dec. 8 (whitetail or mule deer 3-point minimum or anterless). Antlerless permits were issued for two GMUs in 2000. GMU 272 had 300 permits and GMU 284 had 100 permits for the Oct. 14-22 season.

Special seasons and regulations were in effect in PLWMA 201 (contained in GMU 272). The deer hunting season was Sept. 15-Dec. 31. Hunting was by permit only.

In the 2000 season,, 13,676 hunter-days were expended by 4,329 deer hunters who hunted in the four GMUs (Table 1). This represented 16 % of Region 2 hunters and 12 % of Region 2 hunter-days. Hunting pressure, as measured by hunter-days, in the four GMUs combined decreased 18 % in 2000 compared to 1999.

Hunting conditions during the 2000 seasons were good to excellent in all units. Weather was cool and moist during most of the general buck season.

Overall hunter success (all weapons) in the four GMUs combined was 25 % and was slightly higher than that of 1999 and the eight-year mean of 1992-1999 (Table 1). Highest success (48 %) was in GMU 290.

Buck harvest in the four units combined was 831 in 2000 and increased 35 % from that of 1999 (616 bucks) and was 60 % over the 1992-1999 mean of 521 bucks (Table 1). Fifty percent of the buck harvest in the four units was from GMU 272, 43 % from GMU 284, 5 % from GMU 278, and 2 % from GMU 290.

In GMU 290, all 15 modern firearm any deer permittees hunted and harvested 14 bucks and 1 doe. The three-muzzleloader hunters did not harvest a deer. Fifteen of the 35 archery permittees hunted in the area and harvested one anterless deer. Thirty-five of 50 anterless permittees hunted to harvest 8 deer.

Antlerless harvest in the four units has fluctuated annually. The number of antlerless deer harvested is closely related to the number of permits issued. GMU 272 had antlerless permits in all years from 1992-97 and in 1999 and 2000 (the number varied from 50 to 300 annually). GMU 278 has had no antlerless permits in the past nine years. GMU 284 had no antlerless permits in 1994-1997 but had 150 permits in 1992 and

1993 and 100 permits each year in 1999 and 2000. None of the four GMUs had antlerless permits in 1998.The mean nine- year harvest of antlerless deer in the four units combined was 164 (range, 42 to 241).

Harvest of deer by archers and muzzleloaders in the four units is small, accounting for a small part of the total harvest in the past nine years. In 2000, archery and muzzleloader hunters harvested 13 % of the deer in the four GMUs (archery 4.5% and muzzleloader 8.5%).

The four Columbia Basin GMUs produced 18 % of the buck harvest in Region 2 in 2000. Hunter success in the four Columbia Basin GMUs was 25 % compared to 18 % 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, PLWMA 201 (contained in GMU 272), GMU 290, and GMU 284. No surveys have been conducted in GMU 278.

Post-hunt herd composition surveys have been done annually (except no survey in 1994) in GMU 272 including areas outside PLWMA 201. Surveys have been made from a helicopter or from the ground in late November or early December. In PLWMA 201 (an intensively managed cooperative of approximately 44,000 acres), pre-and post-hunt "total" counts were made annually through 1999. Counts were made from a helicopter in late August or early September (pre-season) and late November or early December (post-hunt). In 2000, only the post-hunt count was made. An attempt is made to count and classify all deer within the PLWMA during surveys. Because of excellent observation conditions due to "open" terrain and thorough coverage, it is estimated that > 90 % of the deer are counted.

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 2000, the post-hunt survey was made from the ground by volunteers and WDFW personnel. In 2000, the post-hunt survey was made from the ground by 21 volunteers and 11 WDFW personnel. A post-hunt herd composition survey of GMU 284 in 2000 was made from a helicopter.

The post-hunt herd composition survey in GMU 284 was made on Dec. 19 and 20, 2000. A total of 331 mule deer were classified. The buck:doe:fawn ratio was 26:100:72 and 42% of the bucks were adults.

From late Oct. through late Nov. 2000, 405 deer were classified in that part of GMU 272 outside PLWMA 201 (Table 2). Post-hunt ratios were 19 bucks and 83 fawns/100 does. Approximately 29 % of the bucks were judged to be adults. The buck:doe ratio and the percent of adult bucks declined from that of 1999 but the fawn:doe ratio was unchanged from that of 1999. Surveys in 1993 and 1995 produced sample sizes too low to provide confidence in observed buck:doe and fawn:doe ratios and percent bucks. The survey in 1992 provided a sample size of 212 deer and a reliable estimate of seven bucks and 60 fawns per 100 does.

In PLWMA 201, the post-hunt survey conducted 21 November 2000 indicated a slight decrease in the "wintering" or "migrant" herd size on the PLWMA compared to 1999 (Table 3). The "total" count of 1305 deer represented a 5% decrease from 1999.

During the December 2000 post-hunt herd composition survey, 346 deer were classified in GMU 290 with 42 bucks and 67 fawns per 100 does (Table 4). Foggy conditions during the primary day of the survey reduced sample size. The 1995 estimate of herd size within the 250 square mile GMU 290, based on a helicopter survey and intensive ground count, was 264 (170 deer seen during the survey) deer with a composition of 54 bucks, 95 does, and 115 fawns. Based on incidental observations in the past 18 years, herd size appears to be increasing and distribution within the area is expanding.

Population status and trend analysis

A total post-hunt sub-population size estimate was made only for PLWMA 201 in 2000. The post-hunt (migrant+resident) wintering herd size was 1,305 mule deer in late November 2000.

Little data other than estimates of harvest are available for use to evaluate long term trends of deer herd size in most of the Columbia Basin GMUs. Based on annual buck harvest since 1980, it appears that deer numbers in GMU 272 increased substantially through 2000. The 1980 harvest was 112 bucks compared to the 2000 harvest of 416 bucks. In GMU 284, a trend similar to that of GMU 272 shows an increase in herd size. The 1980 harvest was 76 bucks compared to 322 in 1997, 297 in 1998, 206 in 1999, and 356 in 2000. Buck harvest since 1980 in GMU 278 has been erratic and rather small but indicates herd size has increased in the last five years above that of the early 1980's. The 1980 harvest was 10 bucks compared to 45 bucks in 2000.

Post-hunt buck ratio in GMU 272 in 2000 was 19 bucks per 100 does and was above the objective of

15:100. Post-hunt buck ratio in GMU 290 in 2000 was 42 bucks per100 does and was well above the management goal of 30 bucks per 100 does.

Deer damage claims/complaints in the winter of 2000-01 were few in number in all GMUs due to the relatively mild winter weather.

Habitat condition and trend

The winter of 2000-01 was moderate but rather long in duration in all GMUs and provided no major disadvantage for deer.

Winter food for most deer in GMU 272 and 284 is winter wheat and the new growth of forbs. During the winter of 2000-01, these low-growing foods were available to deer most of the winter because of reduced snow cover. Wintering herds were spread widely throughout GMUs. Winter mortality was likely more than that of 1999-00 but less than that of harsh winters.

Three major changes in habitat have occurred in the Columbia Basin in recent years that appear to have affected deer significantly. Several thousand acres of primarily dryland wheat ground was put in the Conservation Reserve Program. Conversion of wheat to grass added permanent cover and some useful forage in the form of forbs, but in some areas removed a vital winter food resource (i.e., winter wheat).

Major habitat development on PLWMA 201 has provided high quality habitat for deer in GMU 272 and adjacent GMUs. Radio telemetry has shown that deer from as far as northern Douglas County and northeastern Lincoln County migrate to PLWMA 201 to winter.

The spread of Russian olive in GMU 278 and 290 has been 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 orchards, alfalfa haystacks, alfalfa fields, various row crops, and ornamental trees and shrubs.

Orchard tree damage and damage to alfalfa haystacks are the most serious damages to private property, and elicit the most 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 severe.

Many deer feed in alfalfa fields and various row crops during the growing season in most GMUs but claims/complaints for this damage are minimal. During the winter of 2000-01, few claims/complaints were made for deer damage.

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.

Population data for deer herds in the Columbia Basin GMUs are minimal at present. Post-hunt herd composition estimates are often made from sample sizes too small to be reliable. If the number of helicopter hours of survey time cannot be increased, post-hunt composition surveys should be conducted in GMUs 272 and 284 on alternate years in an effort to obtain reliable data for each unit. Helicopter surveys should also be supplemented with counts from the ground if manpower is available.

Evaluation should continue to determine the influence of PLWMA 201 on adjacent GMUs.

Table 1. Mule deer harvest in GMUs 272[a], 278, 284, and 290 from 1992 - 2000.

	Harvest				Hunter		Days/
Year	Buck	Doe	Total	Success	Number	Days	Kill
1992	460	194	654	0.25	2,581	8,344	13
1993	373	169	542	0.23	2,389	5,443	10
1994	455	134	589	0.21	2,774	8,213	14
1995	296	114	410	0.19	2,173	5,816	14
1996	745	172	917	0.27	3,403	8,102	9
1997	629	189	818	0.24	3,477	9,884	12
1998	594	42	636	0.24	3,477	7,941	12
1999	616	219	835	0.24	3,965	16,715	20
2000	831	241	1,072	0.25	4,329	13,676	13

[a] Does not include PLWMA 201

Table 2. Post-hunt mule deer herd composition in GMU 272 from 1992-2000.

				Total	Adult	Per 100 Does	
Year	Bucks	Does	Fawns	deer	Bucks (%)	Bucks	Fawns
1992	9	127	76	212	44	7	60
1993	8	45	38	91	75	18	84
1994	--	--	--	--	--	--	--
1995	3	27	46	76	33	11	170
1996	47	223	187	457	23	21	84
1997	29	213	133	370	31	14	68
1998	64	181	157	402	44	35	72
1999	50	213	176	439	48	24	83
2000	38	201	166	405	29	19	83

Table 3. Post-hunt mule deer surveys in PLWMA 201, 1988 and 1990-2000.

					Total	Adult	Per 100 Does	
Year	Bucks	Does	Fawns	Unid.	deer	Bucks (%)	Bucks	Fawns
1988	45	185	141	23	394	--	24	76
1990	90	390	362		842	--	23	93
1991	134	342	264	209	949	--	39	77
1992	145	550	446		1141	48	26	81
1993	159	565	474		1198	59	28	84
1994	166	480	453		1099	52	35	94
1995	185	517	534		1236	49	36	103
1996	255	593	580		1428	50	43	98
1997	182	520	411		1177	57	35	79
1998	229	613	514	7	1363	54	37	84
1999	217	615	522	17	1371	46	35	85
2000	219	594	492		1305	48	37	83

Table 4. Post-hunt mule deer surveys in GMU 290, 1995- 2000.

				Total	Adult	per 100 Does	
Year	Bucks	Does	Fawns	deer	bucks (%)	Bucks	Fawns
1995	35	61	74	170	57	57	121
1996	22	72	76	170	46	31	106
1997	2	55	28	85	50	3	51
1998	76	151	110	337	61	50	73
1999	77	180	124	407	51	43	69
2000	70	165	111	376	46	42	67

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

JEFFERY A. BERNATOWICZ, District Wildlife Biologist

Population objectives and guidelines

The management goals for deer in the majority of Region 3 are to increase mule deer (*Odocoileus hemionus*) populations while maintaining recreational opportunity while minimizing damage complaints. Escapement and recruitment objectives are ≥15 bucks and 45 fawns per 100 does post-hunting season.

Hunting seasons and harvest trends

Game Management Units (GMUs) 329, 342, 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, north portion 360, 364, and 368. Only GMUs 336, 352 and 360 are open for muzzleloader.

Deer hunter numbers in Region 3 in 1998 were at an all time low, increased in 1999 and 2000, but are 50% below the 1986-96 average (Table 1). The winter of 1996-97 reduced deer numbers. The 3-point restriction and subsequent low success rate further deflated hunter interest. The deer populations are rebounding, but hunters are slow to return to the region. In 2000, hunter numbers for modern firearm, muzzleloader, and archery were 51%, 77% and 36% below the ten year average prior to 3-point restriction.

Harvest has increased since 1997, but remains well below average (Table 2). Total buck harvest was 52% below the 1991-96 (pre-3 point minimum) average in 2000. Hunter success was average in 2000.

Modern firearm, muzzleloader, and archery special-permit hunters averaged 85%, 41% and 14% success. Special-permit hunters accounted for 16% of the regional harvest.

Surveys

Historically, deer have been surveyed with a mix of ground/aerial surveys in Region 3 (Table 3). In December of 2000, the Yakima Training Center (YTC) portion of GMU 371 was stratified by deer density and surveyed by air to estimate the population. An attempt was made to collect 2000 composition data in other GMUs, using volunteers, but the data were unusable.

The survey of YTC yielded an estimate of 829 ± 144 deer. The ratios per 100 does were 56±11 fawns and 33±8 bucks. Twenty of the 33 bucks were classified as ≥ 3 years of age.

Population status and trend analysis

The only population estimate in the Region is for YTC. No other deer population models have been developed in Region 3. Harvest is not an accurate indicator of population levels, but is the only long-term index available. 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 probably below the

Table 1. Number of deer hunters and success rate in Region 3, 1986-2000.

Year	Modern Firearm	Muzzle-loader	Archery	Total	Success rate (%)
1986	22,448	0	4,607	27,055	6
1987	23,164	204	4,761	28,130	7
1988	23,256	170	5,114	28,542	10
1989	23,623	254	4,693	28,575	12
1990	--	--	--	--	--
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
Mean	23,836	638	5,666	30,149	9

long term average. Harvest peaked in the early 1990s after 7 relatively mild winters. December fawn ratios were in the 50-70 range in all PMUs during 1990 and 1991. Severe winters in 1992-93 and 1996-97 caused the population to fall dramatically. The lack of harvest and mild winters since 1996-97 has resulted in a rebound in deer numbers.

Habitat condition and trend

There is little data on the historic or current condition of the deer range. Many believe winter range was negatively impacted by drought, cold winters, grasshoppers and fires during the 1980s. Moisture conditions had improved until a drought the last few years.

Management conclusions

The current hunting season structure has helped increase buck ratios above the stated objective, but decreased the number of deer hunters participating. The permit opportunities are providing a quality hunting experience with high success rates. The deer population on the YTC was estimated. Survey efforts will be directed to other GMUs with a focus on buck ratios and age structure. More antlerless hunting should be considered as the population increases.

Table 3. Deer survey data PMU in Region 3.

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
1996	33	863	58	2
1997	33	427	37	8
1998	33	645	75	11
1999	33	609	44	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
1996	36	659	55	3
1997	36	6	25	25
1998	36	21	52	11

Table 2. Deer harvest by PMU in Region 3, 1970-2000.

	PMU 32		PMU 33		PMU 34		PMU 35		PMU 36		Region	Total
Year	Buck	Doe	Buck	Doe	Buck	Doe	Buck	Doe	Buck	Doe	Buck	Doe
1970-79	990	183	529	152	95	0	316	67	324	86	2,254	488
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
Mean	1,108	162	998	119	162	10	427	85	287	79	2,892	455

DEER STATUS AND TREND REPORT: REGION 4
PMU 41 – GMU 410
PMU 43 – GMU 407
PMU 45 – GMU 418, 426, 437
PMU 46 – GMU 450

MIKE DAVISON, District 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 the available habitat base, provide recreational opportunity, and minimize damage complaints. The population objective is to maintain a post-hunt buck:doe ratio of 15 bucks:100 does when possible.

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 and northern location with lower human population densities than the more urbanized island and coastal regions. Historical harvest data indicates that mainland GMUs at more southerly latitudes exhibit higher deer harvest success. It has been speculated that lower temperatures resulting from cold air intrusion from the Frazier River basin lower carrying capacity for deer in affected units.

GMUs 426 and 450 are high elevation areas situated well into the Cascade Mountain Range. Extremely low human populations, limited road access, and severe geography characterize these units. These eastern-most units differ from other areas in that; the deer populations in high elevation habitats support predominately mule deer (*O. hemionus hemionus*) or mule/blacktail hybrid populations, as opposed to black-tailed deer only in lower elevation units.

Harvest and recreational opportunity profiles for GMUs 407-450.

The statewide total for deer hunters during the 2000 season was 149,971. This is comparable to the 152,842 hunters documented for the 1999 season in Washington State. The number of deer hunters in Region four was significantly lower from the previous season with only 9,566 hunters in 2000 as compared to 15,962 hunters in 1999. This represents a 40.1% decrease in the number of hunters in the 2000 season.

Region 4 deer harvest for the 2000 season was 1,504 animals. This represents a 39.1% decrease as compared to the previous years harvest of 2,470 deer in Region four.

Modern firearm hunters accounted for approximately 74 % of the deer harvest in GMU's 407-450 (1,111deer). Archery hunters accounted for approximately 21 % (324 deer) with muzzeloaders representing only 5 % (69 deer) of the harvest in GMUs 407-450 during the 2000 season.

Archery accounted for 56 % (170 deer) of the antlerless deer harvest in Region 4 during the 2000 season (total 303 animals). Modern firearms and muzzleloaders accounted for 34 % (103 deer) and 10 % (30 deer) of the antlerless harvest in Region 4, respectively.

Reported tribal harvest in GMU's 407-450 for the 2000 season totaled 68 animals (40 antlered and 28 antlerless). GMU 418 (Nooksack) accounted for approximately 78% of the total tribal deer harvest reported in GMU's 407-450 during the 2000 season.

Surveys

Herd composition surveys were conducted by D.N.R., U.S.F.S., National Parks Service, State Parks, and WDFW personnel on a voluntary basis (June - December, 2000). A total of 122 deer were classified throughout Whatcom and Skagit Counties (18 bucks/75 does/29 fawns). This represents a fawn/doe ratio of 39 fawns per 100 does. A total of 27 deer (adult and sub-adult) were observed with significant hair loss associated with hair loss syndrome). Driven survey routes were repeated on Lopez and Orcas Islands (GMU 410) during April, 2000. Of the 227 deer observed, none exhibited hair loss of any kind. However, a single deer observed on Cypress Island in

Skagit County (GMU 407) at approximately the same time, did show substantial hair loss over half of the body. Although hair loss syndrome is prevalent throughout mainland deer populations in Skagit and Whatcom counties, it has not been documented on any island habitats until now. Cypress Island is located in Skagit and is situated approximately 2.25 miles from the mainland.

Population status and trend analysis

The only evidence of population status and/or trends 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 4. No damage payments were made in this general area in 2000. However, the damage problems and associated public safety issues have increased significantly in the San Juan Islands portion of GMU 410 (Islands). Deer harvest in San Juan County has declined an estimated 65 % from harvest levels in the early 1980's as a result of a ordinance limiting hunting access to private property passed in 1987. During the same time period, county residences have increased an estimated 480 % while deer population densities have remained high. WDFW is not actively involved in deer/crop and private property conflicts in San Juan County as a result of the restrictive hunting ordinance but does consult with county officials on public safety concerns. According to the San Juan County Sheriff ‘s Office approximately 35-50 vehicle accidents involving deer strikes occur annually on road systems considered low density as compared to mainland road networks. Near misses and actual deer/plane collisions are also increasing as public safety issues.

Habitat condition and trend

No recent habitat analysis or formulated population surveys have been conducted to quantitatively define current habitat condition or population 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 timberlands 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 4 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. Confirm the absence of Chronic Wasting Disease in Whatcom, Skagit, and San Juan deer populations. Collect brain tissue samples for laboratory analysis from a minimum of 20 deer per district.
4. Continue monitoring local deer populations for presence /absence, distribution, and severity of hair loss syndrome.

DEER STATUS AND TREND REPORT: REGION 4
PMU 44 – GMU 454
PMU 48 – GMU 466
PMU 67 – GMU 653

ROCKY SPENCER, District Wildlife Biologist

Population objectives and guidelines

Population goals are to maintain healthy population levels of black-tailed deer (*Odocoileus hemionus columbianus*), to provide recreational use, and ensure long-term population persistence within the available habitat.

Precise population estimates for GMUs 454, 466, and 653 are unavailable. We are now working to input data into POPII modeling effort to estimate population and trends.

Deer in GMU 454 have shown little fluctuation based on harvest estimates despite human population growth and development (Figure 1). Deer may be declining in GMU 466 and 653 because of decline in habitat quality and potentially extended deer hunting seasons (Figures 2 and 3). It is largely unknown if hair loss syndrome, which appeared in black-tailed deer populations throughout western Washington in 1996 may be influencing these deer populations.

Hunting seasons and harvest trends

Management strategies are similar for these three deer herds. All have a general 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. All have an archery season, from September 1-30, and extended, any-deer late archery season from November 22 though December 31 in GMU 454 and November 22 to December 15 in GMU 466. GMU 454 also has a muzzleloader season for any deer from Oct 7-11. GMU 454's more liberal seasons are designed to maintain the population at a level that 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. In general, male and female harvest in GMU 454 has been stable, with yearly fluctuations since 1991. However, data indicates a general and surprising increase in harvest from 1997-2000 and in 1999 and 2000 buck harvest increased by about 82% compared to 1998 (Figure 1). Buck harvest in both GMU 466 and 472 have declined about 50% from levels observed between 1991 and 1993 (Figure 2 and 3). Anterless harvest has been generally stable in 454 since 1997. GMU 466 antlerless harvest has shown considerable variation with yearly fluctuations most likely affected by dry early fall weather and late winter snowfall, both influencing hunter success. GMU 653 antlerless harvest is minimal.

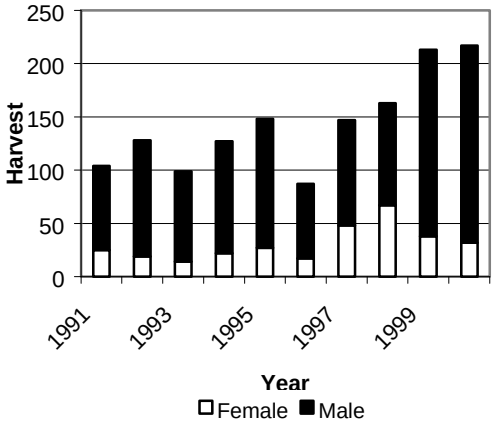

Figure 1. Deer harvest in GMU 454, 1991-2000.

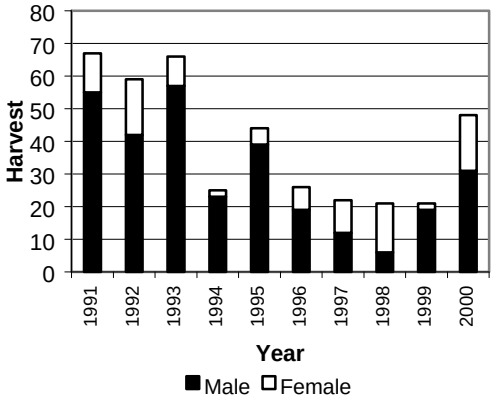

Figure 2. Deer harvest in GMU 466,

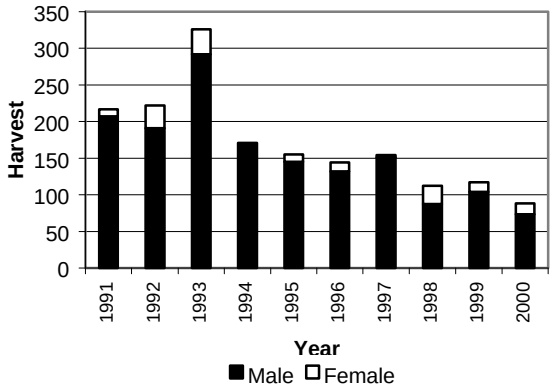

Figure 3. Deer harvest GMU 653, 1991-2000.

Surveys

There are currently no surveys conducted in GMU 454, 466, or GMU 653 because of limited funds.

Population trend and analysis

Based on limited, primarily anecdotal information, deer in GMU 454 have exhibited little change, while declines in deer numbers in GMU 466 and 653 appear more evident based on the downturn in hunter harvest over the last several years.

It is possible that the deer hair loss syndrome initially observed in western Washington herds since about 1996 could also be negatively influencing these populations. It is unknown if deer seasons established by Native American Tribes are influencing populations in GMU 466 and 472. Declines in habitat quality are also a concern.

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 2-10 acre tracts that are cleared and homes built. 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.

Deer habitat trends in GMU 466 and 653 are most dependent on timber management and subsequent seral stage develop which determines forage availability. There are several thousand acres of timberlands managed primarily for wood fiber production, with considerations for recreation, fish, and wildlife. Openings created by timber management that may have provided quality deer forage between 1991 and 1995 have likely declined, consistent with progressing forest seral stages to a closed canopy. As the number and total acres of these openings declines, so does available forage, which may influence deer populations and harvest (Figures 2 and 3).

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 damage to ornamental shrubs and gardens.

There are no damage complaints for deer in GMUs 466 or 653.

Management conclusions

Deer 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.

Developing an accurate assessment of the population size and composition is the most important concern in GMU 466 and 653. This information into management and habitat protection and enhancement efforts to maintain and potentially expand herd size and recreational hunting and viewing opportunity.

DEER STATUS AND TREND REPORT: REGION 4
PMU 47 – GMU 460

ROCKY SPENCER, District Wildlife Biologist

Population objectives and guidelines

Very little is known about many of the population dynamics aspects of black-tailed deer (*Odocoileus hemionous columbianus*) in the western Washington Cascade Mountains. This is primarily due to the secretive life history strategy of blacktails and the dense habitat they occupy in the western Washington Cascade Mountains. Herd composition counts are one of the more common methods used to obtain direct measures of deer herd composition that assess herd population status.

Population objectives for this herd are to maximize harvest opportunity and maintain the post-hunt buck composition ratio at a minimum 15:100 does. Recent post-hunt composition ratios fell below the desired 15:100 ratio. This coupled with high yearling mortality based on check station data prompted closure of this unit to late buck hunting. Data collected from 1984 to 1996 showed an average of 46 % (range 35-57 %) of the yearling harvest occurred during the four-day November late season.

Hunting seasons, harvest trends, and surveys

This deer unit has been managed under an 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 (Figure 1). 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% (range 24-52 %) of the total harvest. Harvest declined again in 1999 and 2000 to 205 and 202 deer respectively (Figure 1).

Data collected from check stations 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 to doe ratios for these years are below recommended level of 15:100 (WDFW Draft Deer Management Plan). 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, which historically accounts for >40% of the total harvest in this GMU. 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).

We have implemented a 3-year buck mortality study in this GMU to determine mortality sources. Preliminary data showed yearly survival rates (Sept 1999-Sept 2000) were 0.385, with predation the leading proximate cause of mortality. However, malnutrition may have predisposed 3 deer to predation. The next leading cause of mortality was hunter harvest.

Hunting seasons and guidelines, regulations and hunter pressure

Hunting seasons have remained basically unchanged over the last 10 years; season changes are generally reflected in simple calendar date adjustments. The most significant change was to eliminate the traditional four-day late buck season in November of 1998. While this appeared to have minimal effect to overall hunter numbers in 1998 compared to 1997 (Figure 2), it did reduce overall harvest, and this was expected. However, the overall trend in hunter numbers

Table 1. Preseason Deer Composition Survey Results from Helicopter

Year	Fawn	Spike	Branch Buck	Total Buck	Total
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

Table 2. Postseason Deer Composition Survey Results from Helicopter

Year	Fawn	Spike	Branch Buck	Total Buck	Total
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	33

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

for the years 1993-2000 shows a general and continued decline (Figure 2). The 3-year average for 1993-1995 period was 3,905 hunters compared to 2,116 for the period 1996-00. This reflects a notable decline of about 46% percent. Hunter numbers declined again in 2000 to 1,529 a decline of about 40% from 1998.

The closure of the late buck season in 1998 appeared effective in increasing postseason buck escapement and increasing late buck season ratios. Cooler weather characterized the modern firearm hunting season opener and the days following also provided good weather to hunt blacktails. Hunting conditions were good during the late archery season.. Deer harvest and hunter participation is presented in Figures 1 and 2.

Population status and trends

Beginning in 1996, black-tailed field surveys documented a hair loss syndrome affecting deer during the late winter and early spring surveys. It appears this has negatively influenced deer survival and recruitment, particularly fawns. Over 70% of fawns observed in May 2000 were affected, which may be contributing to low recruitment rates and potentially population concerns.

Habitat condition and trend

The significant majority of this GMU is managed for timber production. This creates a continuing mosaic of seral stages that can be beneficial to deer, provided amble created opening of 1 to about 10 years exist as part of this mosaic of habitat to provide a good forage base. The change of management along stream corridors to permit development to older timber seral stages should provide increased habitat diversity and snow intercept capability. During harsh winters this may benefit deer access to forage in these sites and as travel corridors.

Management conclusions

Continue the late buck season closure in the 2000 season and measure response by monitoring post-hunt buck:doe ratios. If ratios exceed the recommended levels of 15:100 bucks consider a limited entry late buck hunt in 2001.

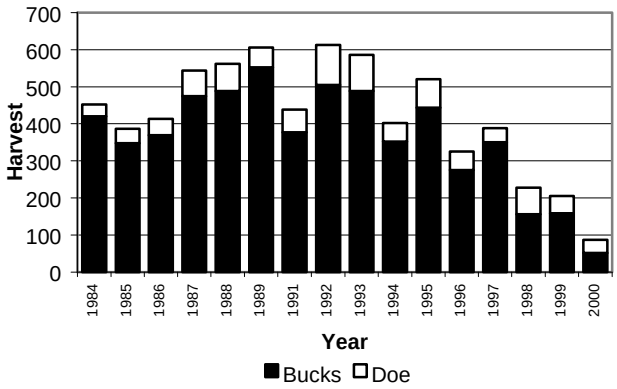

Figure 1. Annual deer harvest, GMU 460, 1984-2000.

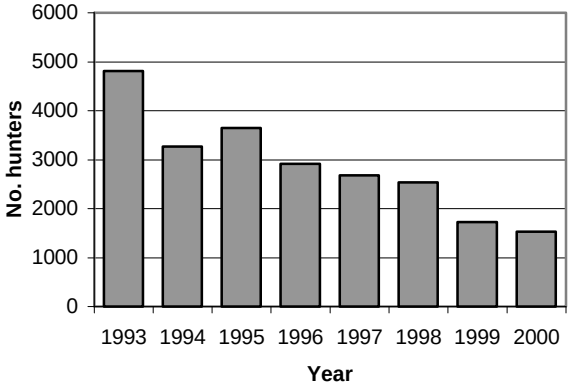

Figure 2. Number of deer hunters, GMU 460, 1993-2000.

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

RUTH MILNER, District Wildlife Biologist

Population objectives and guidelines

Population goals are to maintain healthy population levels of black-tailed deer (*Odocoileus hemionus columbianus*), to provide high quality recreational use, and ensure long-term population stability within the available habitat.

Hunting seasons and harvest trends

GMU 448 (Stillaguamish) was open to early archery hunters for any deer from September 1 through September 30, to muzzleloader hunters for any buck from October 6 through October 10, and to modern firearm hunters for any buck from October 13-31, 2000.

Access to private and state lands in Snohomish County continues to be somewhat limited due to gates and restrictions to non-motorized vehicles only. In most cases, these areas can be accessed on foot, mountain bike, or horseback, but restrictions on vehicles effectively eliminate access for many hunters.

Much of the hunting in GMU 448 takes place on U.S. Forest Service lands. Many traditional access roads have been decommissioned in recent years; so motorized vehicle access has been reduced on federal lands, compared to a decade ago.

Figures 1 and 2 express deer harvest, total hunters, and days per deer kill for the unit from 1988 to 2000. Fewer people hunted in GMU 448 in 2000 compared to the early part of the decade. Fewer hunters harvested more deer in 2000 compared to 1999 (Figure 1). Hunter effort expended per deer killed, measured in number of days/kill, decreased in 2000 compared to 1999. Hunter effort expended per deer killed in 1999 was considerably higher than the average from the previous decade (Figure 2).

Looking at harvest numbers over that last 12 years, the mean number of hunters in GMU 448 between 1988 and 1994 was 4,461 (SD = 494). For the last 6 years, from 1995-2000, the mean number of hunters declined by approximately 50% to 2,152 (SD = 485). Mean deer harvest from 1988-1994 was 408 (SD = 132). Mean deer harvest from 1995 to 2000 was 156 (SD = 56). The 2000 harvest was 152 animals, which is consistent with the 6-year average for the latter part of the 12-year period.

The Swinomish**,** Sauk Suiattle, Stillaguamish and Tulalip tribes are the resident tribes in Snohomish

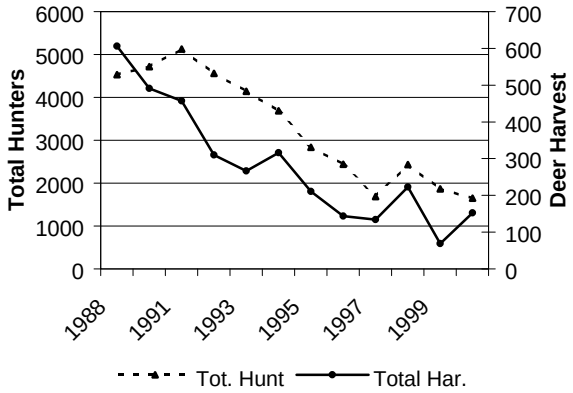

Figure 1. Trend in number of deer hunters and deer harvest. GMU 448. 1988-2000.

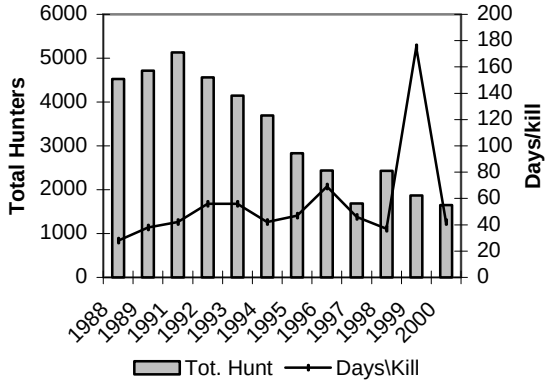

Figure 2. Trend in total number of deer hunters and days/kill, GMU 448, 1988-2000.

County. Several other non-resident tribes also hunt GMU 448. Harvest data submitted by the Northwest Indian Fish Commission indicate 1-buck deer harvested in GMU 448 during the 1999-2000 tribal hunting seasons.

Surveys

In October 2000, pre-hunting season helicopter flights in the southern half of GMU 448 resulted in excellent buck:doe ratios of 46:100. Of the total bucks classified, twice as many branch-antlered animals were seen compared to spikes. However, fawn:doe ratios were low at 46:100.

Population status and trend analysis

Hunter harvest report cards continue to be the best tool for understanding trends in GMU 448, however as indicated above, aerial surveys should improve the amount and variety of data available for future analysis.

Black-tailed deer populations in western Washington have been affected by hair loss syndrome, which may either weaken or kill deer affected by the disease. This may account for poor fawn recruitment and possibly reduced adult female survival. Estimates of deer mortality resulting from hair loss syndrome disease are not available for GMU 448 at this time.

Habitat condition and trend

Urbanization and suburbanization continues to increase in the western half of GMU 448. Continued loss of habitat over the next decade, and beyond, is expected as more people move into the greater Puget Sound area.

The majority of habitat containing a mosaic of recent clear cuts adjacent to older timber is on state and privately owned lands. Private industrial timberland owners appear to be accelerating harvest in many of their holdings. This has resulted in an increased number of clear-cut areas that may enhance foraging habitat for deer in the short-term.

The majority of the Mt. Baker Snoqualmie National Forest, which includes much of GMU 448, is designated as late successional reserve (LSR), so virtually no clear cutting is occurring on federal lands within the GMU. Much of GMU 448 forests are in the 10 to 50 year age class, where forage and cover may be limited. Extensive clear cutting seen from the late 1940's through the 1980's may account for the higher deer harvest numbers in the early part of the 12-year period discussed above. The decreased deer harvest we now see may be a result of these cut areas closing in, and fewer replacement cuts opening the landscape.

Management conclusions

Continued human development in GMU 448 will further reduce the habitat available to black-tailed deer. We expect to see continued gating of many forest tracts as well as continued road decommissioning on federal lands. As the human population within Snohomish County continues to increase, we expect to see more land posted Ano trespassing@ and more demand for areas which are closed to the discharge of firearms.

These trends will likely result in a reduction of land-base from which to hunt, but may result in a higher quality hunt for those hunters able to access gated areas on foot or other non-mechanized means.

DEER STATUS AND TREND REPORT: REGION 5
PMU 51 – GMUs 578, 588
PMU 52 – GMUs 564, 568, 574
PMU 53 – GMUs 524, 554, 556, 558
PMU 54 – GMU 516, 560, 572
PMU 55 – GMU 510, 513
PMU 56 – GMU 505, 520, 550
PMU 57 – GMUs 501, 504, 506, 530

MIN T. HUANG, Wildlife Biologist
PATRICK J. MILLER, District Wildlife Biologist

Population objectives and guidelines

Black-tailed deer (*Odocoileus hemionus columbianus*) 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 current population levels and a minimum buck escapement of 15 bucks per 100 does.

Hunting seasons and harvest trends

Information on black-tailed deer harvest and hunter effort is obtained annually from the WDFW hunter questionnaire and mandatory hunter report cards issued with each deer license. Estimates of total harvest, hunter pressure, and hunter success are based upon the sample of questionnaires and report cards returned. Biological sampling stations in Region 5 provide biological data (sex and age) on deer harvested.

Black-tailed deer 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. Season length and timing are determined by 3-year hunting packages, the latest of which covered 2000-02.

Several harvest strategies are employed in Region 5. During the general gun season, the majority of Game Management Units (GMUs) are managed under an any-buck strategy, where any buck with visible antlers is legal to harvest. Selected GMU=s (558, 574, 578, and 588) are managed under a 2-pt. or better harvest regime. Starting in 1998, GMU 582 became GMU 382 and is now managed as a mule deer unit, with a 3-pt. minimum. Muzzleloader harvest is primarily restricted to any buck, except for those seasons which occur in the branched antler GMU=s above. Archery hunters are allowed any deer, except in GMU=s 558, 574, 578, and 588; where there is a 2-pt minimum restriction on bucks. Harvest of antlerless deer during archery is legal in these GMU=s. Apart from the archery harvest, antlerless permits are allocated based on the damage history and minimum estimated population of selected GMU=s.

In 2000, an estimated 34,672 hunters spent a total of 226,550 days deer hunting in Region 5 (Table 1). Estimated hunter participation in 2000 was 78% of the long-term mean of 44,684"2,537 hunters. Total deer hunter numbers since 1992, however, has remained fairly constant in Region 5 (r = 0.01, P = 0.75). The estimated number of hunting days has been increasing over the same time period. The days required (range 28.5-35.1) to harvest an animal during the general hunting seasons has been constant (r = 0.54, P = 0.14).

Current regulations are designed to result in relatively stable harvest trends in Region 5. We do experience annual variation in harvest and success rates in some GMU=s. In those units west of I-5 (Lincoln Creek GMU 501, Stella GMU 504, Willapa Hills GMU 506, and Ryderwood GMU 530) we have seen a 4-year decline in buck harvest. This is also the case in the

Table 1. Hunter statistics for Region 5, 1992-2000.

Year	Hunters	Days	Harvest	Success (%)
1992	44,148	265,889	9,325	0.21
1993	46,616	271,233	7,154	0.15
1994	45,122	297,383	9,678	0.21
1995	43,244	293,616	7,333	0.17
1996	42,122	257,288	6,725	0.16
1997	41,776	281,458	7,501	0.18
1998	62,908	253,517	7,208	0.11
1999	41,551	388,082	6,948	0.16
2000	34,672	226,550	6,454	0.18

lowland east PMU 56 (Mossyrock GMU 505, Winston GMU 520, and Coweeman GMU 550). We are also seeing a longer-term decline in deer numbers in some of the Cascade units (Packwood GMU 516, Lewis River GMU 560, and Siouxon GMU 572).

Hunting conditions during the 2000 general firearm deer season were dry and warm. Dry conditions on the westside make stalking difficult. Cooler weather, low elevation rain, and higher elevation snow made for good hunting conditions during the late buck season.

Overall hunter success in 2000 was 18%. Much of this figure, however, was a result of high deer harvest and success rates in the West Klickitat (GMU 578) and Grayback (GMU 588) areas. This PMU accounted for 29% of the Regional harvest and success rates were 24%. Success rates have shown a slight, statistically non-significant decline since estimated success rates of 21% in the early and mid 1990's.

Surveys

Region 5 black-tailed deer demographics are collected from three annual surveys. Surveys include; (1) annual biological sampling stations, (2) annual summer productivity surveys, and (3) annual spring counts of the Klickitat deer herd. Survey data are used as inputs into the Sex-Age-Kill (SAK) population reconstruction model.

Sampling stations designed to collect deer biological data were established in 1993. Five voluntary deer sampling stations were staffed in Region 5 during the opening weekend of the general firearm deer season, 14-15 October 2000. Biological sampling stations were located in Cougar, Randle, Toutle, Chehalis, and Longview. Stations were strategically placed near major routes of travel from popular hunting areas to maximize the number of deer checked. The spatial arrangement of sampling stations is intended to allow for coverage of the entire westside of the Region.

Deer brought to sampling stations were examined by WDFW personnel and/or qualified volunteers. Age, sex, number of antler points, and GMU of harvest were taken from each checked deer. Age was determined by tooth wear and replacement into either annual age-classes or one of three discrete categories (fawn, yearling, adult) at the discretion of the examiner.

Data are used to determine the percentage of yearling bucks in the total buck harvest (≤1.5 years old). In an age stable population, this percentage is assumed to be equal to the overall buck mortality rate. It is also assumed that yearlings are as vulnerable to harvest as are adult bucks.

Summer deer productivity surveys were first established in 1994. In 2000, deer observations were conducted throughout the Region from August 15th to September 30th. Deer group sizes and composition were determined. Personnel from the Wildlife Management, Habitat Management, Fisheries Management, and Enforcement Programs of the WDFW, along with volunteers from other State and Federal Agencies, recorded observation data for all deer encountered during field activities. All deer were classified as bucks, does, fawns, or unknowns.

A fawn:doe ratio was determined from survey results. Ninety-percent confidence intervals about the mean were constructed following Czaplewski et al. (1984). Mean annual fawn:doe ratios were compared via overlapping confidence intervals to test the hypothesis of no differences in fawn:doe ratios between months ($P = 0.10$).

For spring counts, four permanent survey routes centered on the Klickitat Wildlife Area, Goldendale, WA, were censused on 20-21 March 2001. Transects were driven on the evening of the 20th and morning of the 21st. Deer group sizes and composition were determined. All deer were classified as fawn, adult, or unknown. A fawn:adult ratio was determined. Historic fawn:adult ratios were correlated to buck deer harvest using Pearson product-moment correlation.

A total of 41 deer were checked at the biological sampling stations on 14-15 October 2000. Small sample size precluded any meaningful interpretation of the data gathered. Previously, in 1999, the annual yearling buck percentage (AYBP) from any-buck GMUs was 0.588. In 1998 the percentage was 0.582. These are a significant departure from the 5-yr mean ($Z = 1.75$, $P < 0.05$.) Annual buck mortality rates in the range of 40%-50% are indicative of a lightly exploited population. The 2-year increase in estimated buck mortality rates may be indicative of increases in non-hunting related mortality (See Population Status and Trend below). The long-term estimate of doe annual mortality rates in the Region is 22.2%. An effort to characterize doe mortality rates is currently underway. Tooth envelopes and an explanatory letter were sent to all hunters possessing an antlerless permit in Region 5. Preliminary results indicate current doe mortality rates of 20-30%.

In recent years, biological sampling stations have not been providing the necessary sample size and harvest distribution to provide any meaningful inference about vital population demographics. Much of this is likely due to the voluntary nature of the stations. Options such as mandatory checks, meat locker queries, and extensive tooth collections are being evaluated.

Deer composition counts were conducted August-September 2000. A total of 520 deer were observed, with 479 of these animals classified. Different from past years, fawn:doe ratios declined as summer progressed (Table 2). The mean value of 0.463 fawns/doe represents a downward departure from the past 5 years (Z = 3.24, P < 0.05), is well below historical productivity data (~0.750) for the Region, and represents average-to-poor productivity when compared to values in the literature. The 2000 productivity estimates continue the downward trend since 1998. We do, however, sample after the peak of neo-natal mortality, so these values are closer representatives of ultimate recruitment than fecundity.

A total of 764 deer were classified during the March 2001 Klickitat deer survey (Table 3). The resulting fawn:adult ratio of 0.54"0.09 is indicative of excellent over-winter survival. The long-term mean (1985-1999) ratio for this area is 0.41.

Long-term correlations (1985-1999) between the spring fawn:adult ratio and the overall buck harvest in GMU 588 the following fall are significant (r = 0.71, P < 0.05). These analyses indicate that spring surveys are a good predictor of eastside fall hunting success.

The biological significance of this relationship is straightforward. First, since fawns are generally more vulnerable to resource shortages and other environmental stress, low fawn:adult ratios indicate tougher over-wintering conditions and likely lower overall survival of deer. High winter mortality across all age classes will result in lower fall harvests.

Table 2. Productivity survey results, Region 5, 2000.

Month	Buck	Doe	Fawn	Unk	F:D	Total
August	25	101	52	14	0.51	192
Sept.	62	167	72	27	0.43	328
Total	87	268	124	41	0.46	520

Table 3. Historic fawn:adult ratios for the Klickitat deer survey, 1990-2001.

Year	Total	Fawn:Adult
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
1993	522	0.13
1992	420	0.42
1991	465	0.65
1990	590	0.59

Secondly, biological sampling station data indicate that many yearling bucks branch and thus become vulnerable to fall harvest. Depressed fawn:adult ratios mean fewer yearling bucks will be available in the fall; hence, a lower total buck harvest.

The long-term mean fawn:adult ratio is 0.41, and is an indicator of average conditions. Using the long-term mean ratio as a benchmark, ratios above 0.50 are indicative of better-than-average hunting conditions, whereas ratios below 0.40 predict poor fall hunting in Klickitat County.

Population status and trend

We are starting to see some troubling trends in several areas of the Region. Overall, buck harvest has been declining throughout the Region. Total harvest, however, can fluctuate due to many factors. So, a 3 or 4-year decline in harvest, in and of itself, may not be a great indicator of a problem. In the Willapa Hills (PMU 57), Lowland I-5 (PMU 56), and Cascades (PMU's 54 and 55), however, many of the other indices we monitor are also indicating a widespread decline in deer numbers. We have seen a several year increase in estimated buck mortality rates (2000 data not included due to small sample sizes), a 3-4 year decline in estimated productivity, and particularly in the Cascades, a longer, statistically significant, downward trend in both buck harvest and in harvest per unit effort. Population estimates also indicate a longer-term decline in these PMU's.

During the period of 1997 to 2000, we have seen the overall Region-wide buck harvest decline from an estimate of 6,733 to 5,546 in 2000. This decline in buck harvest is more pronounced when the harvest from West Klickitat and Grayback is excluded. These 2 units have seen an increase in buck harvest from 841 in 1997 to 1,691 in 2000. The corrected buck harvest decline from 5,892 in 1997 to 3,855 in 2000 becomes more dramatic. Hunter numbers (range 34,672-62,908) have been relatively constant during this time frame (P = 0.6) and in Region 5 there is no relationship between the number of hunters and the estimated buck harvest (r = 0.14, P = 0.74). Thus, harvest rate on the westside has not increased during the period in which we are seeing the increase in buck mortality rates.

Buck mortality rates are a reflection of both harvest mortality and natural mortality. Currently, biological sampling station sample sizes are too small to statistically detect year to year changes in estimated buck mortality rates west of the Crest that are less than 15%. An increase of even 10% should be construed as being biologically significant. The estimated mortality rates collected in 1998 and 1999 (~0.58) are marginally non-significant from those sampled for the 1997

estimate of 0.449 ($Z = 1.68$, $P = 0.07$). If, however, the analysis is conducted against the 5 year mean (1993-1997) of 0.458, the difference is significant ($Z = 1.875$, $P < 0.05$). Despite chronically low sample sizes, estimated mortality rates within PMU's indicate an increase in those areas where hair loss syndrome has been reported, particularly the Willapa Hills. An increase in buck mortality rates suggests increased harvest mortality, increased non-hunting mortality, or a combination of both.

In the Cascades the effort required to harvest a buck, measured in days/kill, has been significantly increasing ($P = 0.10$). This is also the case in the Willapa Hills ($P = 0.01$) and in the Lowland I-5 east units ($P = 0.01$). Further evidence of decline can be inferred through an analysis of antlerless permit hunting activity. In PMU 57 antlerless permit hunt success rates have declined from 45% in 1997 to 30% in 2000. Over this same period the effort required to fill an antlerless tag has increased from 9 days to 16. A similar trend can be detected in PMU 56 where effort to harvest a doe has increased from 7 days to 16. Success rates have also gone down from 59% to 33%.

In the past 2 years we have also seen a substantial decline in observed productivity rates west of the Crest. In 1999 the estimate was 51 fawns:100 does. In 2000 observed productivity was 46:100. In both 1999 and 2000, our estimates during elk surveys from the helicopter were lower, but not statistically different from our ground counts. A helicopter survey specifically for deer of the Coweeman unit in 2000 produced an estimate of 47 fawns:100 does.

In the Cascades the downward trend we are seeing in the deer population is a long-term trend and likely the result of habitat condition and to some extent, winter conditions. We know that carrying capacity in those lands in USFS ownership is likely to decline by approximately 40% (See Habitat Condition below). We are likely starting to see some of the effects of the cessation of timber harvest. With declining habitat quality we are likely to see declines in productivity, and in bad winters, higher winter mortality of all age cohorts. In 1998 USFS personnel did see evidence of substantial winter kill of deer along the Cispus River. Poorer quality habitat will also result in a longer recovery of the deer population from a tough winter, even though deer density may be low after such an event.

In PMU 57 the trend we are seeing cannot be attributed to habitat changes brought about by less logging activity. Ownership in much of this PMU is industrial timber and the Dept. of Natural Resources. Logging has been relatively constant in this PMU. The case in PMU 56 is similar. One potential cause of the decline is hair loss syndrome. Reports of the problem began in PMU's 56 and 57 during 1996-97. Since that time, numerous reports of the problem, mostly from the GMU 504, 506, and 530 areas have been received. The Coweeman and Winston have also had a fair amount of reports.

The declines in harvest, success rates and increases in buck mortality rates coincide with the onset of the hair loss syndrome. Since no hard data on affliction rates or mortality rates of the syndrome exists, one can only speculate as to the cumulative effects on the deer population. Anecdotal reports indicate that deer are now absent from areas where just 2 or 3 years ago they were present in high numbers. Other factors, however, such as increased predation, poaching, or unknown environmental changes could also be responsible for the apparent declines in deer.

Deer east of the Cascades continue to rebound after the severe winter of 1996. Over-winter survival has been high the past three years and subsequent buck harvests have been very good, with harvest in 2000 one of the highest of the decade. The increase in winter survival has led to some problems with deer damage, which, in turn, has led to an increase in issuance of landowner permits and more liberal antlerless permit allocations.

Habitat condition and trend

At this time there are no known climatic factors directly affecting deer populations in Region 5. In localized areas, extreme winters can result in large winter-kills, the winter of 1996 being an example. Weather, however, is not limiting deer in Region 5. Indirectly, however, weather factors may be exerting some pressure on deer in the Region. Severe winter conditions often result in lower yearling recruitment.

Increasing urbanization in several GMU's (504, western portion of 550, 554, and 564) is resulting in a loss of quality deer habitat and an increase in deer/human conflicts. A cooperative project with Clark County to investigate urban deer movements was initiated to provide some insight to deer ecology in the urban environment. A total of 18 deer have been monitored over a 2-year span. Initial analyses indicate that does have fairly tight home-ranges, while bucks have been traveling linear distances of 4-5 miles, predominantly during the rut.

An increase in residential development along the Lewis River drainage may be negatively impacting the quality of black-tailed deer winter range. This winter range loss is being addressed in both the WDFW's Integrated Land Management (ILM) program for the Lewis River watershed, and in mitigation agreements concerning the three major hydroelectric projects

(Merwin, Yale, and Swift reservoirs) on the Lewis River.

Additionally, the establishment of large blocks of Late Successional Reserve (LSR) in the Gifford-Pinchot National Forest (GPNF), particularly in the Upper Lewis River watershed, will eventually result in loss of quality deer winter habitat in the Region. Of the approximately 49,000 acres of designated deer/elk winter range on GPNF lands in the Upper Lewis watershed, 80% is now in LSR. This will ultimately result in a 40% reduction in carrying capacity in this area (R. Scharpf, GPNF, unpub. data).

Management conclusions

In several areas of the Region deer populations seem to be declining. Initial steps have been taken to determine the cause of this apparent decline. Methods of increasing the amount and quality of biological data that are collected during the hunting seasons are being considered. These demographic data are extremely important for management and present sample sizes are not sufficient. A hair loss syndrome study has been initiated in Region 5. Results of the study will hopefully provide needed information on affliction rates, survival rates, and possible causes of the condition. A buck mortality study will begin in 2002. This study will provide information on causes for the observed increases in buck mortality rates that are currently estimated through biological sampling stations. Determination of adult female mortality rates is underway. Current age structure of the female segment of the population and an estimate of mortality rates will assist us in determining whether poor productivity is the only driving force for our declines, or whether adult mortality rates due to causes other than hunting are also helping to drive our deer population down. Increased adult mortality rates, with stable to decreasing harvest rates, would point to other sources of mortality that are not quantified at this time. Age structure of the females may affect how productive the population is, however there is no scientific evidence at this time that wild, black-tailed deer females live long enough to exhibit reproductive senescence. The next step needed is to measure physical condition and fecundity of the female segment of the deer population. We need to know whether fawns are being dropped and not making it to the age of recruitment, or whether they are not being produced at all. If fecundity is being compromised, nutrition may be the problem. If adult deer are in poor condition, they may be predisposed to higher predation rates, lower fecundity rates, hair loss syndrome, or other additional pathogens. Those factors contributing to the decline need to be identified.

Deer populations east of the Cascade Crest have rebounded from the effects of the harsh winter of 1996. Historically, eastside populations exhibit a two to three year recovery period after stochastic, additive events. Following severe winters in 1985 and 1992, eastside harvest did not approach pre-winter kill numbers for two years. The potential to increase antlerless hunting opportunity should be evaluated on an annual basis, especially if increases in buck harvest are concomitant with increases in deer damage complaints.

No specific habitat enhancements for black-tailed deer are planned in Region 5. Both the Klickitat (Klickitat County) and Cowlitz (Lewis County) Wildlife Areas have on-going, long-term management practices designed to benefit black-tail habitat.

Literature cited

Czaplewski, R. L., D. M. Crowe, and L. L. McDonald. 1983. Sample sizes and confidence intervals for wildlife population ratios. Wildl. Soc. Bull. 11:121-128.

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

BRYAN MURPHIE, Wildlife Biologist
GREG SCHIRATO, District Wildlife Biologist

Population objectives and guidelines

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

There has been considerable public concern about the loss of deer due to the hair loss syndrome. This was examined more closely with a new study as well as a continuation of a mortality source study in Region 6.

Hunting seasons and harvest trends

Based on the analysis of the Game Harvest Questionnaire, number of hunters increased in 2000. The average number of days required per kill for all hunters dropped back down to 34 days (Table 1). Success rate increased from .11 to .19, based on the three-wave questionnaire

Estimates of total annual mortality rates (i.e. from all sources) vary depending on the data source. However, recent findings from the ongoing buck mortality study have shown that the percent yearlings in the harvest as measured by tooth eruption at check stations accurately estimates annual mortality rates. For GMUs without check stations, the analysis of harvest report card data looking at antler size (spike vs. branch antlered) adjusted for older spikes and yearling 2 points determined a regional buck mortality rate from .28 to .50 for various Population Management Units (PMUs). Work in 1998 showed that there is a small under estimation of buck mortality rate from report cards due to bias in under reporting harvest of spikes. An analysis of 348 antlered deer at the Vail check station showed that 47 % were yearlings. A sampling of adult (yearling and older) antlerless harvest in GMU 667 resulted in an estimate of an average annual mortality rate of 15 % (n = 44). In general, the hunting regulations continue to be conservative with doe harvest targeted at 20 % of buck harvest.

Table 1. Summary of four harvest parameters for Region 6, 1991-2000.

Year	Hunters	Hunter days	Success	Days per kill
1991	29,033	161,413	0.22	25
1992	30,571	167,713	0.23	24
1993	30,474	170,865	0.17	32
1994	31,632	193,324	0.22	27
1995	31,449	192,221	0.19	31
1996	27,733	162,717	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	47
2000	38,239	172,331	0.14	33

Little tribal input on deer management has been received. Tribal harvest and interest is focused more on elk. Reported tribal harvest is increasing and is approximately 16 % of the Olympic Peninsula harvest.

Surveys

A pre-hunt and post-hunt helicopter survey was conducted in GMU 667 (Skookumchuck) and GMU 651(Satsop). In GMU 651, a total of 56 deer were classified. The ratios of fawns and bucks per 100 does were 53 and 30 respectively. The pre-hunt survey in GMU 667 classified 115 deer the ratio of fawns and bucks to does was 94 and 26 per 100 does. The post-hunt survey in GMU 651 observed 110 deer. The ratios of fawns and bucks were 44 and 3: 100 does. In GMU 667, 167 deer were examined for a fawn and buck ratio of 57 and 1: 100 does. GMU 651 showed a increase in overall winter survival of fawns compared to other units and studies

In the post season surveys hair slip syndrome was assessed in GMU 667: 48 % of fawns and 20 % of does and GMU 651: 17 % of fawns and 10 % of does had hair slip. This is an increase in the rate of hair slip observed in GMU 667. Based on the first year of the hair loss study there does not appear to be population level response to the hair loss.

Deer check stations were run at Vail on 4 weekends in 2000 with the help of the Eyes in the Woods volunteers (Table 2).

Population status and trend analysis

A Sex-Age-Kill Ratio (SAK) model was used to generate deer population estimates by PMU. Population parameters were estimated from Vail check station data, tooth envelopes from GMU 667 as well as aerial surveys conducted in the Skookumchuck and Satsop Unit (Table 3). The recovery rate was reduced to .75 to more closely reflect the data from the mortality study. In addition, overwinter mortality was incorporated in to the fawn recruitment estimate. The model is most sensitive to the female survival estimate. Therefore, the lower doe mortality of .15 generates large deer populations.

Table 3. SAK population estimate by PMU.

PMU	Estimated Population
66	5,578
65	3,953
64	12,203
63	14,502
62	28,673
61	15,401

Table 2. Vail check station results 1998.

Weekend	Hunters	Deer Checked
Opening	1,939	130
Second	1,309	78
Third	1,113	126
Late buck	1,226	68

Harvest data from 1991-2000, was plotted and reviewed for trends. Data from harvest reports were corrected for the separation of permit data from general harvest data from 1997-2000. Permit deer harvest and days of effort were added to the questionnaire estimates. All hunting methods were combined. SPSS (10.0) was used to test data for trends using the least squares method.

Effort and Success

The number of hunters in Region 6 from 1991-2000 has increased (P = 0.016, R^2 = 0.535), averaging 32063 +/- 3335 (standard deviation) (Table 2), while success rates, averaging 0.18 +/- 0.04, have declined (P=0.002, R^2=0.705). Hunter days averaged 17,2612 +/- 2,6131. Days per kill have increased (P= 0.038, R^2= 0.436), averaging 31 +/- 6.

Deer Harvested

Total deer harvested has declined since 1991 (P=0.021; R^2=0.509), ranging from 4,554-7,063 and averaging 5,743 +/- 814 (Figure 1). Buck harvest ranged from 3,818-5,952, with an average of 4,945 +/- 652. Antlerless harvest ranged from 533-1,111 and averaged 892 +/- 210. Harvest of antlerless deer, as a percent of buck harvest, was conservative, averaging 18 +/- 4% of buck harvest.

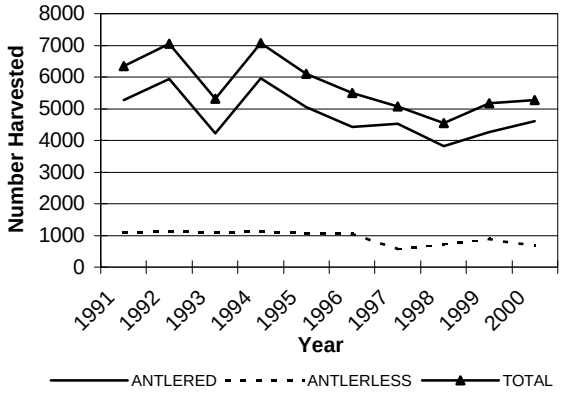

Figure 1. Total deer harvest, Region 6, 1991-2000.

Harvest trends by PMU

PMU 61

Effort and Success

Number of hunters increased (P=0.010, R^2=0.585), averaging of 8,209 +/- 545 per year (Table 3). Hunter days averaged 40,102 +/- 7591 per year. Hunter success rates did not decline (P=0.21, R^2=0.508), averaging 0.15 +/- 0.03, while days per kill increased (P= 0.002, R^2= 0.722), averaging 33 +/- 6.

Deer Harvested

Total deer harvested ranged from 828-1,715 and averaged 1,235 +/- 234(Figure 10). Buck harvest ranged from 670-1,503. Antlerless harvest ranged from 158-213. The plotted data suggest a decline in total deer harvested and bucks harvested after the 1994 season, however these declines were not significant (P>0.05). Harvest of antlerless deer, as a percent of buck harvest, was conservative, averaging 16% +/- 4% of buck harvest.

PMU 62

Effort and Success

Number of hunters averaged 6,503 +/- 602 per year (Table 4). Hunter days increased slightly over the period (P=0.041, R^2=0.425), averaging 29,175 +/- 4,174 per year. Hunter success rates averaged 0.19 +/- 0.02. Days/kill averaged 24 +/- 2.

Deer Harvested

Total deer harvested increased (P=0.008, R^2=0.602), ranging from 1,043-1,461 and averaging 1,218 +/- 138 per year (Figure 3). Buck harvest increased (P = 0.010, R^2= 0.589), ranging from 845-1,290. Antlerless harvest ranged from 163-257.

Harvest of antlerless deer, as a percent of buck harvest, was conservative, averaging 20 +/- 3% of buck harvest.

PMU 63

Effort and Success

Number of hunters averaged 6,244 +/- 737 per year (Table5). Hunter days averaged 30,853 +/- 8,203 per year. Hunter success rates averaged 0.16 +/- 0.02. Days/kill averaged 32 +/- 7.

Deer Harvested

Total deer harvested ranged from 616-1,246 and averaged 977 +/- 174 per year (Figure 4). Buck harvest ranged from 464-1,079. Antlerless harvest ranged from 78-193. Regression was not significant for these parameters (P > 0.05). Harvest of antlerless deer, as a percent of buck harvest, was conservative, averaging 18 +/- 7% of buck harvest.

PMU 64

Effort and Success

Number of hunters averaged 6,928 +/- 1,225 per year (Table 6), a slight decreasing trend (P=0.021, R^2=0.506). Hunter days averaged 36,048 +/- 8,496 per year. Average hunter success rate was 0.17 +/- 0.04. The plotted data suggest a declining trend in success rates for this PMU, however regression for this parameter was not significant (P>0.05). Days per kill averaged 35 +/- 16. The plotted data suggest a slight increasing trend in days per kill for this PMU, however this increase was not significant (P>0.05).

Deer Harvested

There was a significant decline in deer harvested for this PMU (total deer: P=0.000, R^2=0.818; bucks: P=0.001, R^2=0.744; antlerless: P=0.000, R^2=0.811). Total deer harvested ranged from 635-1,522 and averaged 1,129 +/- 285 per year (Figure 5). Buck harvest ranged from 505-1,263. Antlerless harvest ranged from 112-277. Harvest of antlerless deer, as a percent of buck harvest, for this PMU averaged 23 +/- 4% of buck harvest.

PMU 65

Effort and Success

Number of hunters declined over the period (P=0.000, R^2=0.835), averaging of 4,614 +/- 1109 per year (Table 7). Hunter days also declined (P=0.003, R^2=0.701), averaging 19,393 +/- 4646 per year. Hunter success rates did not significantly decline (P=0.31, R^2=0.461), averaging 0.11 +/- 0.03. There was an increase in days/kill (P = 0.024, R^2 = 0.489). Days per kill averaged 42 +/- 14.

Deer Harvested

There was a decline in deer harvested for this PMU (total deer: P=0.001, R^2=0.785; bucks: P=0.003, R^2=0.689; antlerless: P=0.001, R^2=0.795). Total deer harvested ranged from 232- 910 and averaged 514 +/- 222 per year (Figure 6). Buck harvest ranged from 226-805. Antlerless harvest ranged from 6-154. Harvest of antlerless deer, as a percent of buck harvest, was conservative, averaging 18 +/- 10% of buck harvest.

PMU 66

Effort and Success

Number of hunters averaged 3,457 +/- 585 per year (Table 8). Hunter days averaged 15,799 +/- 3,588 per year. Hunter success rates declined over the period (P=0.15, R^2=0.545), averaging 0.19 +/- 0.05. Averaging 26 +/- 8, there was an increase in days/kill (P=0.037, R^2= 0.440).

Deer Harvested

There was a decline in deer harvested for this PMU (total deer: P=0.000, R^2=0.818; bucks: P=0.001, R^2=0.792; antlerless: P=0.002, R^2=0.702). Total deer harvested ranged from 412 to 982 and averaged 648 +/- 197 per year (Figure 7). Buck harvest ranged from 291-785. Antlerless harvest ranged from 86-197. Harvest of antlerless deer, as a percent of buck harvest was high, averaging 30 +/- 8% of buck harvest. This reflects a targeted effort to harvest more does in the Pysht GMU on private timberland.

Management conclusions

The deer hair loss syndrome has been observed throughout Region 6. Even though mortalities had been observed, no indications of population level declines since incidence of hair loss has been documented. The reduction of antlerless permits in some instances to adjust for perceived over winter mortality does not appear to be warranted. 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 were there is little timber harvest and a push for older stand age classes. In addition, declines are occurring were canopy closure is occurring over large expanses of even aged timber management, (GMU 627). While increases are occurring where these even age stands are being harvested again (GMU 667, 663).

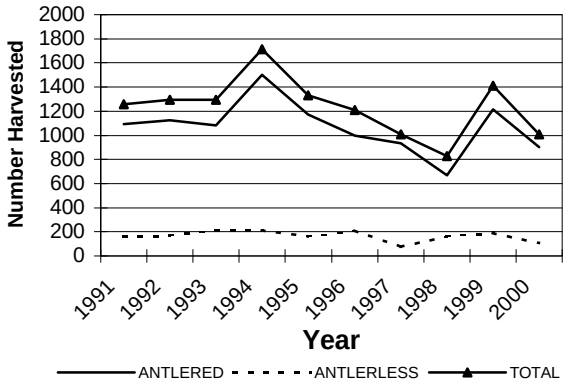

Figure 2. Total deer harvest in PMU 61, 1991-2000.

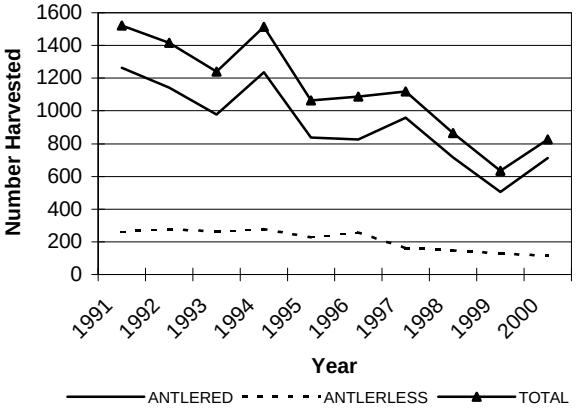

Figure 5. Total deer harvest in PMU 64, 1991-2000.

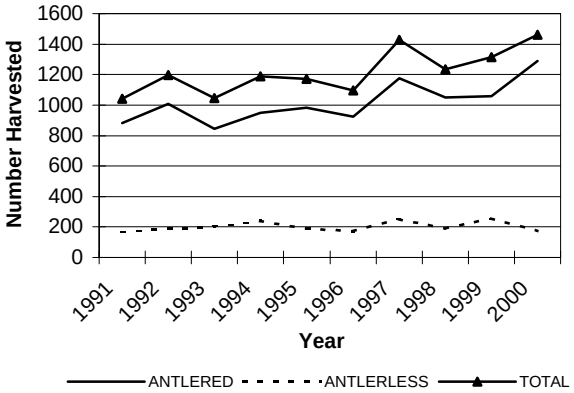

Figure 3. Total deer harvest PMU 62, 1991-2000.

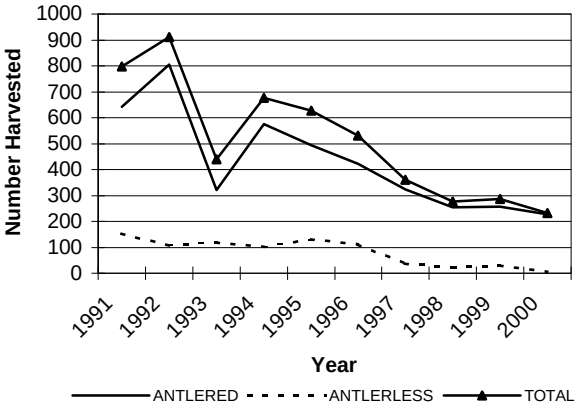

Figure 6. Total deer harvest in PMU 65, 1991-2000.

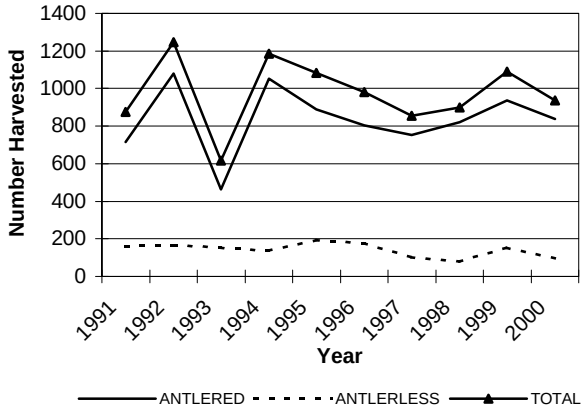

Figure 4. Total deer harvest, PMU 63, 1991-2000.

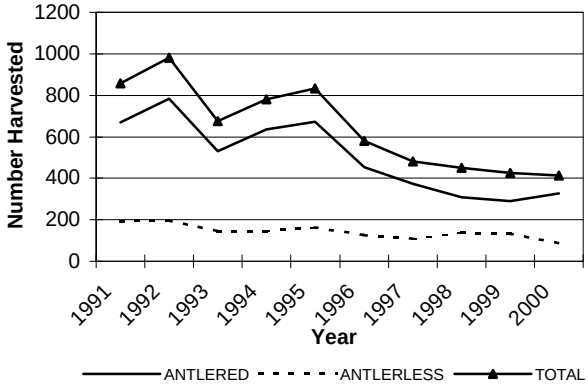

Figure 7. Total deer harvest in PMU 66, 1991-2000.

Table 3. Summary of Four Harvest Parameters for PMU 61, 1991-2000.

Year	Hunters	Hunter days	Success	Days per kill
1991	7,263	32,420	0.17	26
1992	7,441	37,517	0.17	29
1993	8,095	36,842	0.16	29
1994	8,529	43,810	0.20	26
1995	8,386	43,669	0.16	33
1996	8,268	41,978	0.15	35
1997	7,781	33,010	0.14	30
1998	8,630	33,861	0.10	41
1999	8,121	59,537	0.15	42
2000	8,580	38,374	0.12	38

Table 4. Summary of Four Harvest Parameters in PMU 62, 1991-2000.

Year	Hunters	Hunter days	Success	Days per kill
1991	5,547	22,660	0.19	22
1992	6,527	28,877	0.18	24
1993	6,583	28,247	0.16	27
1994	6,444	27,773	0.18	23
1995	6,787	31,780	0.17	27
1996	6,212	26,800	0.18	24
1997	6,365	28,327	0.22	20
1998	6,417	26,007	0.19	21
1999	6,113	32,314	0.21	25
2000	8,036	38,966	0.18	27

Table 5. Summary of Four Harvest Parameters in PMU 63, 1991-2000.

Year	Hunters	Hunter days	Success	Days per kill
1991	5,391	25,077	0.16	29
1992	6,192	28,487	0.20	23
1993	5,632	24,290	0.11	39
1994	6,790	34,098	0.17	29
1995	6,188	32,903	0.17	30
1996	6,029	27,151	0.16	28
1997	5,243	22,721	0.16	27
1998	6,989	30,566	0.13	34
1999	7,798	53,117	0.14	49
2000	6,192	30,120	0.15	32

Table 6. Summary of Four Harvest Parameters in PMU 64, 1991-2000.

Year	Hunters	Hunter days	Success	Days per kill
1991	8,065	37,766	0.19	25
1992	7,787	35,308	0.18	25
1993	8,122	41,884	0.15	34
1994	8,061	41,958	0.19	28
1995	7,627	39,593	0.14	37
1996	6,974	41,318	0.16	38
1997	4,343	21,244	0.26	19
1998	5,401	23,983	0.16	28
1999	6,845	49,437	0.09	78
2000	6,059	27,984	0.14	34

Table 7. Summary of Four Harvest Parameters in PMU 65, 1991-2000.

Year	Hunters	Hunter days	Success	Days per kill
1991	6,013	25,198	0.13	32
1992	5,840	22,698	0.16	25
1993	5,209	22,567	0.08	51
1994	5,718	24,207	0.12	36
1995	5,603	24,740	0.11	39
1996	3,942	14,525	0.13	27
1997	3,315	14,216	0.11	39
1998	4,012	15,702	0.06	57
1999	3,370	16,948	0.09	59
2000	3,118	13,128	0.07	57

Table 8. Summary of Four Harvest Parameters in PMU 66, 1991-2000.

Year	Hunter	Hunter days	Success	Days per kill
1991	4,080	18,292	0.21	21
1992	3,615	14,826	0.27	15
1993	3,718	17,035	0.18	25
1994	3,928	21,477	0.20	27
1995	3,970	19,535	0.21	23
1996	2,563	10,944	0.23	19
1997	2,355	10,882	0.20	23
1998	3,884	15,404	0.12	34
1999	3,515	18,258	0.12	43
2000	2,946	11,338	0.14	28

ELK STATUS AND TREND REPORT
Statewide

JERRY NELSON, Deer and Elk Section Manager

Population Objectives and Guidelines

The goal set by Washington Department of Fish and Wildlife 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 12:100 with a total bull mortality rate of 50 % or less. Some limited-entry Game Management Units (GMUs) are being managed for 15 to 25 bulls per 100 cows in the post-hunt composition counts.

There are 10 recognized elk herds in Washington: Blue Mountains, Selkirk, Colockum, Yakima, North Cascades, North Rainier, South Rainier, Mount St. Helens, Olympic, and the Willapa Hills. The population objective for the Blue Mountains elk herd is 5,600. Population objectives for the remaining 9 herds have not been finalized in elk herd management plans and should be considered flexible. Tentative population objectives for Washington elk herds allow for substantial population increases in the Blue Mountains, North Cascades, North Rainier, South Rainier, Willapa Hills, Mount St. Helens, and the Olympic Peninsula (Table 1). Although some herds may be below management objective, a re-distribution of current elk populations may still be required to alleviate elk damage complaints (Blue Mountains, Willapa Hills, Colockum, Yakima).

Some herds can support an 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 and Colockum herds seem to be very near the targeted population objective, but site-specific damage complaints still need to be addressed.

Table 1. Current status of Washington elk populations.

Elk Herd	Population	Objective
Blue Mountains	4,400	5,600
Selkirk	1,200	1,200
Colockum	4,500	5,000
Yakima	10, 500	10,000 to 11,000
North Cascades	250	1,250
North Rainier	1,800	2,800
South Rainier	2,100	3,000
Mt. St. Helens	13,400	15,000
Olympic	10,000	11,000
Willapa Hills	4,200	8,000

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 harvest management objectives are to allow at least 12 bulls per 100 cows in post-hunt surveys and maintain total bull mortality at or below 50 %.

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 has declined since the early 1980s. Eastern Washington bull harvest has increased slightly in the past 2 years (Table 2). The estimated bull harvest for the 2000 general season in eastern Washington was 2,033. The western general season bull harvest has also declined since the early 1980s. Western bull harvest has increased slightly in the past 2 years. The estimate for the bull elk harvest for the 2000 general season was 2,486. These estimates do not incorporate male calves killed under antlerless, special permit regulations. The general season total elk harvest was nearly equally divided between western Washington 3,367 elk (49.7 %) and eastern Washington 3,412 elk (50.3 %).

The estimated statewide elk harvest for both the

general season and special permits combined in 2000 was 8,278 elk (Table 3).

Both antlered and antlerless harvest increased in 2000 over 1999. The general season elk hunter success rate for all weapon types in 2000 was 7.9 %. General season success rates by weapon type were 6.7 % for modern firearm, 9.3 % for archery, and 12.8 % for muzzleloader.

Table 2. 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

Surveys

Table 3. Statewide elk harvest for the past 10 years by antlered and antlerless class.

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

WDFW conducts surveys on all 10 elk herds. On the westside the Department surveys 10-20 % of the elk units. In the Colockum and Yakima areas we survey about 75 % of the elk winter range. 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. The population estimate for the Blue Mountains elk herd was 4,399 ± 389. The post-hunt bull:cow ratio was 10 bulls:100 cows for the Blue Mountains in 2000. Paint ball mark-resight estimators have been used to cross check the efficacy of the visibility bias model. Preliminary estimates suggest that survey methodology provides relatively precise and accurate estimates. Paint ball mark-resight estimators have also been used with success on sub-herds on the Olympic Peninsula, North Rainier and North Cascades. Composition counts are conducted by WDFW and Tribal co-managers in the North Cascades and North Rainier.

Most elk surveys conducted in western Washington are completed prior to the modern firearm hunting seasons. The rationale for mid-September surveys is less segregation between age and sex classes during the rut. Therefore observations at this time tend to be least biased in terms of accurate bull:cow:calf ratios.

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 (Blue Mountains) to 57 bulls:100 cows in some southwest Washington GMUs. Calf:cow ratios also vary markedly in pre-hunt surveys from the mid 20s to the high 50s depending on the unit surveyed.

Population Status and Trend Analysis

Statewide elk populations are virtually impossible to estimate but are probably somewhere between 52,000 and 58,000.

Elk populations in the Blue Mountains continue to perform poorly due to low calf survival. Summer calf ratios seem to have improved over rates in the 1980s, but calf survival is still not up to desired levels. Current elk populations are estimated at approximately 4,400, about 1,200 below population objectives. The spike bull general season was initiated in the Blue Mountains in 1989. Bull harvest has declined markedly in the Blue Mountains since 1985. Calf survival and recruitment is less than desired with the calf to cow ratios transitioning between the summer of 2000 and March of 2001, declined from 54 to 21 calves per 100 cows. The post-hunt Blue Mountain bull ratio combining all GMUs surveyed was 10 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 was near population

objective with the most recent population estimate approximately 10,500. The spike-only general season with branch-antlered bulls available by limited permit has been in place for the Yakima herd for 7 years. Post-hunt bull ratios were meeting objective for the second year in a row. Winter calf ratios were near or above the level required for population maintenance. Site-specific damage problems exist for the Yakima herd and some lethal removals are required to address those cases.

The Colockum population has declined recently, possibly as much as 20 %, and totals about 4,500 elk. Post-hunt bull escapement objectives are not being met. The post-hunt bull ratio for the Colockum herd for all GMUs surveyed was 8 bulls per 100 cows in February of 2001. Calf recruitment has dropped in recent years and was 21 per 100 cows for the second year in a row. The Colockum herd also creates localized damage problems. Some of the damage complaints involve mature bulls. This presents an additional management challenge because the total population is below objective and the post-hunt bull ratios are below objective.

Both North and South Rainier elk herds have declined outside Mount Rainier National Park in the past few years. The North Rainier Herd has declined to about 1,800 and the South Rainier Herd now numbers close to 2,100.

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 has declined from 1,200 to 250 elk in the last 15 years. An unexplained reduction in recruitment is one cause for the decline. Increased vulnerability due to road access as well as undocumented harvest are also thought to be contributing factors in this population decline.

The Willapa Hills herd is below population objective and in addition some refinement is necessary in terms of redistribution of elk to address damage complaints. The Mount St. Helens herd is below objective. These herds 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 and changes in forest management.

Augmentations

No augmentation or translocation projects were conducted for this period. In March 2000, 157 elk were captured and relocated from Arid Lands Ecology Reserve (ALE), near Hanford. Seventy-five of those elk were released in the Blue Mountains and 82 were released in northeastern Washington. Of those 82 animals, 13 were fitted with radio-collars. Volunteers from the Pend Oreille County Sportsmen's Club relocated the radio-collared elk a minimum of twice per month since release. To date, 5 mortalities of radio-marked elk have been documented; 3 from predation, 1 from unknown causes, and 1 that was legally harvested in Stevens County during the 2001 season. Only 1 of the 13 radio-marked Hanford elk has left the Selkirk Mountains.

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 will greatly diminish 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 and it's availability.

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

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 Rocky Mountain Elk Foundation have improved habitat for elk. These projects have involved burning, fertilization and road management. Other cooperative projects involved RMEF and Olympic, Gifford Pinchot, Wenatchee, 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, Ferry, and Stevens County (north of Kettle Falls discourage elk west of the Columbia River; south of Kettle Falls discourage elk west of Highway 395) and from dispersing into northern Chelan and Okanogan counties.

WDFW is attempting to reduce elk 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

Management plans for all 10 elk herds are being developed. To date, the management plan for the Blue Mountains elk herd has been completed.

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 3-point minimum restrictions 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. WDFW bull escapement goals are at least 12 bulls per 100 cows in post-hunt surveys and total, annual bull mortality 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 non-tribal 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.

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ELK STATUS AND TREND REPORT: REGION 1
PMU 11 – GMUs 127, 130, 133, 136, 139
PMU 13 – GMU 142

GEORGE TSUKAMOTO, Staff Wildlife Biologist

Population objectives and guidelines

The population goal for this elk (*Cervus elaphus*) herd is to manage the elk population for a sustained yield, a variety of recreational, educational and aesthetic purposes including hunting, and to preserve, protect, manage and enhance elk and their habitats. It is also important to intensively manage this elk population at levels compatible with agriculture production and within tolerance levels of landowners occupying the rural-urban interface.

Hunting seasons and harvest trends

The 2000 general elk hunting seasons for GMU 127-142 was as follows:

- Archery - Sept. 1-14, Any elk
- Late Archery (GMU 127) - Nov.22-Dec. 8, Any elk
- Muzzleloader - Oct. 7-13, Any elk
- Late Muzzleloader - Nov. 22-Dec. 8, Any elk
- Modern Firearm - Oct. 28-Nov. 5, Any elk
- AHE only - Dec. 9-31, Any elk

The harvest strategies in place are directed to control populations where agricultural damage and nuisance problems have persisted and increased. The major area of crop damage occurs in GMU 130 in proximity to the Turnbull National Wildlife Refuge. Over time elk have learned that the Turnbull is safe harbor for this elk herd. A more recent turn of events is the recognition by many smaller landowners the economic benefits to providing fee access for elk hunting, thus increasing hunter access resulting in increased harvest.

The hunting seasons structured in 2000 allowed the harvest of any elk combined with late seasons has definitely increased the harvest of elk (Table 1). An all time record harvest of 244 elk consisting of 75 bulls and 169 antlerless is the second straight year of high harvest.

Muzzleloader hunters were the most successful with a reported harvest of 45 bull elk and 81 antlerless elk. The modern firearm hunters had a relatively short season, but managed to harvest a total of 103 elk consisting of 18 bulls and 85 antlerless. Archery take totaled 9 elk, 6 bulls and 3 antlerless. Muzzleloader hunters harvested 54 %, modern firearm hunters 42 %, and archery hunters 4 % of the reported take.

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

Year	Antlered	Antlerless	Total	Hunters	Hunter
1991	76	82	158	1330	
1992	24	40	64	461	
1993	6	19	25	582	
1994	40	67	107	1016	
1995	32	28	60	1107	
1996	29	106	135	1305	
1997	25	45	70	735	
1998	2	19	21	254	
1999	101	103	204	2473	
2000	75	169	244	2966	

Since 1991 the number of hunters reported hunting elk in GMUs 127-142 has more than doubled. In 1999 the number of hunters almost doubled the number reported in 1991. In 2000, the number of hunters approached 3,000 for an all time high. Hunter days of effort expended by hunters exceed 10,000 in 2000.

Surveys

Ground and aerial surveys are used to gather population and herd composition estimates for GMUs 127 and 130. In 1998 a mark-resight study was conducted in this area resulting in a minimum estimate of 179 elk. Aerial surveys have not been conducted since 1998.

Population status and trend analysis

August ground surveys have been conducted since 1995 (Table 2). However, no surveys were conducted in 2000. The sample size has remained small and so variable from one year to the next that it is difficult to make any management conclusions with confidence.

The number of elk utilizing the Turnbull National Wildlife Refuge area has been monitored between 1994 -1998 (Table 3). There has been a significant increasing trend in the utilization of this area by elk that has been caused by the increase in population, but also because the area acts as a sanctuary during the hunting

seasons.

Habitat condition and trend

The greatest concern for the habitat is related to agriculture crop damage in the area. With increasing elk numbers there has been a parallel increase in damage complaints as well as nuisance problems. Habitat degradation is accelerating with urban expansion, increased roads and human disturbance.

Elk Damage

Elk damage continues to be a problem in GMUs 127 and 130. Hotspot and landowner antlerless permits are effective tools for targeting offending elk. However, the number of permits issued, and the conditions and procedures under which these permits are issued must be carefully coordinated.

While the core herd area is in GMUs 127 and 130 there are increasing numbers of elk in GMUs 133, 139, 142 and 284. These scattered groups are occupying habitats wherever they can find relative seclusion and safety.

Management conclusions

The higher level of harvest occurring in this area is a direct result of the harvest strategies developed in the past two years (1999-2000) hunting seasons and regulations. It is imperative that consistent annual surveys are conducted to monitor elk productivity, distribution and population numbers. Continued protection of elk in large areas such as the Turnbull National Wildlife Refuge and some large privately owned tracts may create difficulties in managing elk numbers in damage problem areas.

Table 2 GMU 127 and 130 Elk Herd Composition Surveys.

Year	Bulls	Cows	Calves	Total	Bull:100cow:Calf Ratio
1995	6	103	57	166	6/100/56
1996	17	92	48	157	19/100/52
1997	12	41	26	79	29/100/63
1998	7	100	31	138	7/100/31
1999	7	24	10	41	29/100/42
2000	7	78	51	136	9/100/65
2001	No Data				

Table 3 Number of elk observed in the Turnbull National Wildlife Refuge.

Year	Number of elk
1994	25
1995	84
1996	73
1997	94
1998	138
1999	
2000	
2001	

ELK STATUS AND TREND REPORT: REGION 1
Selkirk Herd
PMU 11 – GMUs 101, 105, 109, 113, 117, 121, 124

STEVE ZENDER, District Wildlife Biologist
DANA L. BASE, Associate Wildlife Biologist

Population objectives and guidelines

The elk (*Cervus elaphus*) harvest management objective in the eastern portion of the Pend Oreille Population Management Unit (PMU) is to maintain the annual overall bull mortality rate at less than 50%. A post hunting season bull to cow ratio of at least 12:100 will be maintained (WDFW, 2001). Antlerless hunting opportunity here is by permit only, except that bow hunters may hunt any elk.

Elk population growth and distribution is discouraged in Ferry, western Stevens and Spokane Counties, consequently general "any elk" seasons are offered in specified Game Management Units (GMU).

Hunting seasons and harvest trends

Elk are widely scattered throughout the densely forested region of northeastern Washington and as a consequence are exceptionally difficult for hunters to harvest. While we have very limited population data, there is currently no indication that bull:cow ratios are a problem. Therefore, there are no antler point restrictions and any antlered bull is legal.

Due to the elk transplant efforts in Selkirk, GMU 113 and 49 Degrees North, GMU 117 all elk hunting in those units was bull only. Otherwise bow hunters had the early general season, which was consistent with the rest of the state, and five units open for a late hunt along with their late white-tailed deer hunts. Muzzleloaders had a general early October bull hunt in GMU 109, also over-lapping a whitetail hunt, and could apply for antlerless permits along with the modern firearm hunters. The modern firearm general bull hunt was consistent with the rest of eastern Washington. Antlerless permits were issued only for Threeforks, GMU 109 and Mount Spokane, GMU 124. The focus of significant permit levels in the Mount Spokane unit is to address increasing damage problems with elk there. Hunters could take any elk in GMU's: 101 - Sherman, 105-Kelly Hill, 121-Huckleberry, and west of Highway 395 in 124-Mount Spokane.

The trend in hunter numbers continued to increase in 2000 (Figure 1). Anecdotal information indicates that the lack of antler restrictions in this area is attracting hunters from other more restrictive elk regions in eastern Washington.

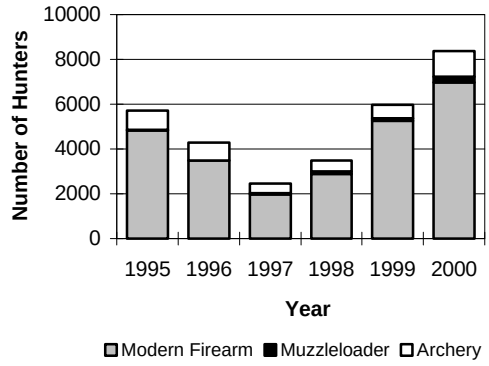

Figure 2. Trend elk hunters by weapon type.

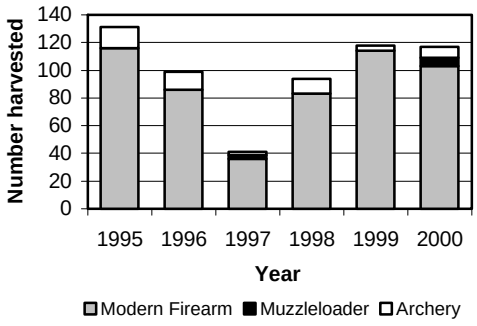

Figure 1. Trend in elk harvested by weapon

The estimated elk harvest appears to have leveled off since recovering from the low following the severe 1996-97 winter (Figure 2). Absolute harvest levels and hunter numbers are suspect, however, as the sample size is small and the return rate of harvest report cards from hunters is poor. Therefore these figures best represent the trends rather than the actual numbers of hunters afield and elk harvested.

A special survey of all permit holders (Rieck, 2001) revealed that success by "any elk" permit holders was only 15 percent. The 70 total permits issued (only 53 reported they hunted) resulted in a take of 3 bulls and 5 cows taken in GMU's 109 (3) and 124

(5).

Hunter interest appears to be increasing in the "elk control" units (GMUs 101, 105, 121, and western 124). Several small scattered elk groups are present in these units but they remain elusive as elk anywhere in the Selkirk Mountains and harvest remains low even with the option of taking antlerless animals. Hunter report card returns show higher bull than cow harvests in these units. It appears that those hunters finding elk are able to select for bulls.

Surveys

Harvest rates have generally been relatively low for the northern Selkirk Herd compared with other regions of Washington State. Consequently, devoting substantial time to surveying bull to cow ratios has not been a high priority. For management decisions we currently rely on trends in bull mortality rates based upon age estimates from antler point data obtained by hunter reports and field checks (Table 1). Hunter reporting rates are low, however, which compounds the limitations already faced from having a small sample size.

Table 1. Report card and field check antler point data, GMUs 101-124.

Year	1-2 points	3-5 points	6+ points	Total
1994	9 (35%)	6 (23%)	11 (42%)	26
1995	18 (46%)	12 (31%)	9 (23%)	39
1996	21 (46%	12 (27%)	12 (27%)	45
1997	11 (52%	4 (19%)	6 (29%)	21
1998	7 (44%)	5 (31%)	4 (25%)	16
1999	17 (61%)	6 (21%)	5 (18%)	28
2000	23 (56%)	11 (27%)	7 (17%)	41

We conduct moose composition flights over some elk range and classify elk when encountered. While the sample is low these are the only post-hunting season data we currently have. During our December 2000 moose survey flights we observed 32 elk in GMU's 101-117 for a ratio of 15 bulls:100 cows and 45 calves:100 cows. The bull:cow ratio is above the minimum goal of 12 and the calf ratio is near the upper average calf ratio for other state herds, WDFW (1996).

The statewide elk survey protocol recommends September helicopter flights to obtain unbiased composition ratios. We experimented with this on October 4-5, 2000 in northern Pend Oreille County. We had poor success in finding elk and the resulting sample was too low to provide meaningful composition estimates (4 bulls and 7 cows). The cost was about $4,000. While we would likely improve efficiency in the future, the cost per animal ratio is problematic.

Our best opportunity to observe elk is from mid-March to mid-April. We have continued our program of involving volunteers to classify elk groups. Observations during early mornings or late evenings are made of elk that concentrate on "green-up" fields or forest openings.

The calf:cow ratio is the only reliable information gathered on post-winter surveys. This year's survey efforts yielded a ratio of 47 calves per 100 cows. This ratio generally implies good calf survival and is consistent with ratios from the last two years (Table 2). While most bulls, especially mature bulls are not as likely to frequent the fields near human activity, our classified ratio of bulls was 13:100 (n=15 bulls).

Table 2. Post-winter elk composition surveys, Pend Oreille Sub-herd.

	Ratios		Classified
Year	Bull:Cow	Calf:Cow	Sample
2001	13:100	47:100	183
2000	2:100	43:100	118
1999	5:100	42:100	141
1998	12:100	62:100	165

Population status and trend analysis

General observations and anecdotal information indicate that elk populations may be on an increasing trend, primarily by expansion of their range. The excellent calf ratios and the apparent stable to increasing harvest trend support these observations.

Augmentation

In February and March of 2000, 82 elk were captured on the Hanford Arid Lands Ecological Reserve and relocated to the Selkirk Mountains of northeastern Washington.

Of those 82 animals, there were 13 radio-transmittered elk released in northeastern Washington. These animals have been relocated by volunteers from the Pend Oreille County Sportsmen's Club, from the ground at least a couple times per month since release. Through November 1, 2001 we have documented 5 mortalities of radio-marked elk; 3 apparently from predation, one from unknown causes, and one that had moved to south Stevens County was legally harvested during the 2001 season. Only 1 of the 13 radio-marked Hanford elk has left the Selkirk Mountains to date.

Habitat condition and trend

Habitat conditions for elk in the Pend Oreille sub-herd appear to be favorable for the foreseeable future.

Road closure policy by federal and private land managers has been aggressive in recent years. Logging is increasing on USFS lands and continues intensively on private lands. The forage from the high rate of logging during the 1980s in central Pend Oreille County should be reaching a stage where elk can thrive. Size of mature timber cover areas are getting smaller, however, and thus the quality of cover may be more of a problem than we are aware of at this time.

Wildlife damage

We continue to experience only a few formal damage complaints in northeastern Washington annually regarding elk. Instances of elk frequenting agricultural areas as they continue to expand into western Stevens and northwestern Spokane Counties are passing the novelty stage and are beginning to generate more concern. There were several instances in the past year where 15-25 elk foraged on young hay crops or invaded barns with stored hay. In these cases WDFW Officers worked with landowners and sportsmen to haze elk out and avoid monetary damage claims.

Habitat enhancement

Cooperative projects to enhance habitat, primarily through seeding grass forage, browse burns, and road closures are an ongoing endeavor. Most projects have involved the Rocky Mountain Elk Foundation (RMEF) and the Colville National Forest. State agencies, private timberland corporations, and the Kalispel Tribes have been involved on several projects as well. From 1989 through 1999 the RMEF and partners (primarily USFS-Colville NF) spent $590,869 on habitat improvement projects for the benefit of elk in northeastern Washington (McGowan, J. 2000).

Management conclusions

We will continue the March/April counts on green-up. These surveys give us good information on recruitment in the herd. The elk appear to use the same fields each year so the next step is to standardize the effort in some way so that trends in elk numbers can be obtained as well as the composition data.

We will shift our elk flight money to December/January survey period where we can combine efforts with our moose composition flights. This is a continued effort to experiment with effective ways to obtain sex/age composition data on the northern Selkirk elk herd.

Mandatory reporting by all elk hunters will begin for the fall hunt of 2001. Harvest data is currently the most important information we collect for management of the elk in northeast Washington. Mandatory reporting should provide a significant improvement in our ability to develop harvest management recommendations.

While composition surveys may be necessary for hunting season recommendations, there is a need for more detailed information on elk distribution, numbers, and habitat use. Many management decisions depend upon having adequate knowledge of elk distribution and preferred habitats. Managers consistently emphasize coordinating habitat enhancement efforts. These efforts should take place within key portions of elk range. Our knowledge, however, of where these key places are is limited. Finding out more about what core areas and habitat types that elk use during each season of the year should be part of the ongoing effort to enhance elk habitat in general.

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ELK STATUS AND TREND REPORT: REGION 1
PMU 13 – GMUs 145, 149, 154, 162, 163, 166, 169, 172, 175, 178, 181, 186
PMU 14 – GMU 157

PAT FOWLER, District Wildlife Biologist

Population objectives and guidelines

Elk (*Cervus elaphus*) populations in the Blue Mountains have declined by approximately 1500-2000 animals since 1985. The current post-season elk population is estimated at 4,399 elk (± 378, 90 % CI). Sub-populations in GMU 169 Wenaha, GMU 175 Lick Creek, the eastern portion of GMU 166 Tucannon, and GMU 172 Mt. View are below population management objectives by approximately 1,200 elk. The goal is to increase elk populations that are below management objective in units containing primarily public land, with an overall population management objective of 5,600 elk.

Hunting seasons and harvest trends

The spike-only management program for bull elk was implemented in 1989 after research determined cow elk pregnancy rates were lower than normal (65%), and post-season bull to cow ratios were 2 to 5 bulls:100 cows, with few adult bulls in the population. The program was designed to improve breeding efficiency by increasing the number of adult bulls in the post-hunt population.

The bull harvest has declined approximately 67 % since 1985. Hunters harvested 831 bull elk in 1985, compared to a five-year average bull harvest of 243 since 1995 (Table 1). The reduction in the bull harvest is due to a marked decline in elk populations in GMUs 166, 169, 172, and 175, and poor calf survival for the entire Blue Mountains elk herd.

The 2000 yearling bull harvest increased from 169 to 231, up 37 %. Yearling bull report card returns increased 58 %, from 64 to 101.

Table 1. Blue Mountains Elk Harvest (PMUs 13 &14), 1992-00.

	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

Controlled hunt permits for "any bull" were implemented in 1991 after post-hunt bull ratios reached management objective. Any-bull permit holders can still look forward to a very high quality hunt (Table 2). Permit holders in 2000 averaged 55 % success; modern firearm had 76 %, muzzleloader had 50 %, and archery had a 27 % success rate. The quality of bulls harvested is exceptional with 83 % having six or more antler points.

Hunters in the Mill Creek Watershed (GMU 157) experienced fair hunting conditions, and the area remained accessible throughout the hunting season. Forty permits were issued for the Watershed in 2000. Hunters harvested 12 bulls for a success rate of 30 %. The quality of bulls harvested was excellent, with 75 % being six point or larger.

The cow elk harvest varies from year to year based on damage complaints and the level of hotspot hunting. General season cow permits were eliminated in all units from 1994-2000, and only late ML permits were issued in damage units to control isolated sub-populations that cause conflicts with landowners. The hunting season harvest of cow elk declined to 25 in 2000, compared to 57, 61, 28 and in 1997, 1998, and 1999 respectively. Permits issued for damage control (hotspot / landowner) in 2000 resulted in a harvest of 12 cow elk, 11 in the west Blue Mountains (WBM) and 1 in the east Blue Mountains (EBM). The combined harvest (hunter / damage) totaled 29 cow elk in the WBM, compared to 11 (Peola, Couse ML) in the EBM.

General season antlerless permits were issued in GMU-154 and 162 for the 2001 season in response to agricultural damage complaints. The elk population in

Table 2. Permit Controlled Bull Elk Harvest - All Weapons, 1992-00, Blue Mtns. WA. (excludes GMU-157 Watershed).

	Bull		Hunter	Percent	Bulls Obs.
Year	Permits	Harvest	Success	6 Point+	Per Hunter
1992	131	53	44%	64%	4.7
1993	132	53	41%	66%	3.1
1994	122	42	37%	66%	3.4
1995	122	45	41%	72%	4.9
1996	139	49	42%	68%	5.5
1997	110	54	51%	79%	6.7
1998	62	31	55%	73%	6.8
1999	67	29	51%	85%	9.1
2000	63	30	55%	83%	na

these units has reached management objective, and antlerless permits are being used to stabilize the population and control damage levels.

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.

Post-season surveys are conducted to determine population trend and herd composition in late winter. The annual post-season survey was conducted during mid March 2001. The survey followed the protocol for the Idaho Elk Sightability Model using the Hiller 12-E helicopter. A total of 23 of 38 zones were surveyed in seven GMU's; high density 17/19, medium density 4/7, low density 2/12. The Wenaha unit (GMU 169)was surveyed by ODFW biologists in early April.

Population status and trend analysis

Post-hunt surveys in March 2001 produced a count of 3,837 elk, compared to 3,628 elk in 2000. The population estimate for the Blue Mountains elk herd was 4,399 elk (Figure 2), using the Idaho Sightability Model, which is 1,200 elk below management objective. Elk population status varies between sub-herds. Sub-herds in the west Blue Mountains are stable to increasing slightly, while the Wenaha herd continues to decline. The North Wenaha herd contained approximately 2,200-2,500 elk in the late 1980's, but has declined to 400-500 elk. At the current recruitment rate, the Wenaha herd will continue to decline. Sub-herds in GMU 166 east, 172, and 175 have stabilized, but are still slightly below management objective.

Summer calf ratios have improved to historical levels (Table 4). However, annual calf survival continues to be a major problem. Late winter calf ratios have remained at low levels for the last ten years (Figure 1). Calf mortality from predation during summer and winter months continues to take a heavy toll on calves. Calf to cow ratios declined 61 % between the summer of 2000 and March 2001, from 54 calves:100 cows to 21 calves:100 cows.

The factors responsible for low calf survival generate considerable debate. Some suggest density dependent factors are at work, but no data has been produced to support this hypothesis. Results from the calf mortality study show a minimum of 58 % of the calf crop is lost each year, with a minimum of 78 % due to predation. Of the 113 calf mortalities recorded during the study, not a single mortality was documented to starvation or other sources that would suggest density dependent factors are involved.

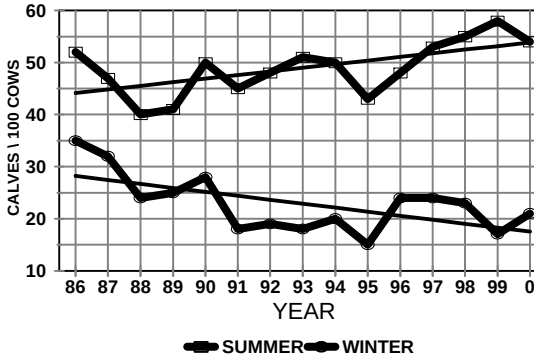

Figure 1. Summer and Winter Calf Ratio Trend, Blue Mountains 1986 - 2000.

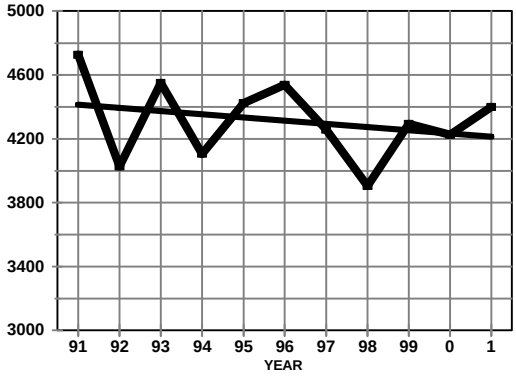

Figure 2. Trend in total elk population size.

Along with the density dependent hypothesis, some suggest that cow elk are in poor physical condition, resulting in under weight calves. Calves in poor condition would be more vulnerable to predation and have a poorer chance of over winter survival.

Table 4. Pre-hunt elk survey summary, Blue Mtns. Wa.

	Bulls						Per 100 Cows	
Year	Adult	Yearling	Total	Cow	Calves	Total	Bu.	Ca
1990	29	41	70	466	232	768	15	50
1991	68	131	199	1014	454	1667	20	45
1992	77	53	130	530	253	913	25	48
1993	86	69	155	875	445	1475	18	51
1994	25	72	97	538	270	905	18	50
1995	28	48	76	684	276	1036	11	40
1996	65	68	133	1037	500	1670	13	48
1997[a]	67	30	97	716	376	1189	14	53
1998	28	53	81	498	316	976	14	55
1999	15	19	34	224	132	390	15	59
2000	20	47	67	460	248	775	15	54

[a] Aerial survey conducted in late June

Again, no data has been produced to document poor herd health, or under weight calves.

When you look at calf weights, July-August calf ratios, and antler development in bull elk, there is no indication of poor herd health, quite the contrary. Calf weights at the time of capture in late May and early June ranged from 26 to 98 pounds, and averaged 54 lbs. for females and 57 lbs. for males. July calf ratios run 55 to 60+ calves:100 cows indicating excellent productivity. Antler development in bull elk rivals the best herds in the western United States, with adult bulls producing antlers that score 320-400+ BC on a regular basis. Antlers of this caliber are not produced on poor habitat, or in herds with poor health.

The impact of predation on big game recruitment has been documented many times in large ungulate research, and should be acknowledged when data indicates it is contributing to the recruitment problem.

The number of yearling bulls counted in spike-only units varies from year to year, and is influenced by several factors: calf production and survival previous year, and yearling bull mortality. The number of yearling bulls counted in spike-only units between 1993-99 ranged from 65 to 107, and averaged 82. Post-hunt surveys in March 2001 produced a count of 81 yearling bulls, which is consistent with the long-term average.

The post-season bull ratio in spike-only units averaged 15.5 bulls:100 cows between 1991-99, but declined to 10 bulls:100 cows in 2000. Post-hunt bull ratios ranged from a low of 3 bulls:100 cows in GMU 175, to a high of 21 bulls:100 cows in GMU 169 Wenaha. The decline in observed bull ratios during surveys may be a function of two factors; increased disturbance due to shed antler hunters, and higher than anticipated adult bull mortality (poaching and tribal harvest). Increased shed antler hunting activity appears to make adult bulls more reclusive, breaks up bachelor groups, and results in adult bulls spending more time in the timber, which reduces sightability during surveys. Adult bull mortality appears to be increasing due to higher levels of poaching and tribal harvest.

Bull permit levels must remain conservative, because recruitment of yearling bulls into the adult bull population will remain low due to poor calf survival, spike-only hunting, and increasing losses of adult bulls. Maintaining good age structure and numbers in the adult bull population may become a significant challenge.

It will be extremely difficult to increase elk populations in GMUs 166, 169, 172, and 175 unless the major problems impacting these sub-populations are addressed; habitat effectiveness, calf survival, agricultural damage control, and the level of cow elk mortality.

Habitat condition and trend

Habitat conditions on National Forest land should be improving due to increased levels of controlled burning and the expansion of road closures. The Pomeroy District is in the process of re-evaluating the Access-Travel Management Plan. Increasing road closures on the Pomeroy District would greatly improve habitat effectiveness for elk in GMUs 166 and 175. The road closure program on the Walla Walla Ranger District is completed.

Augmentation and habitat enhancement

Habitat preservation and enhancement projects continue on the Wooten and Asotin Wildlife Areas, mostly in the form of weed control of yellow-star thistle and knapweed. It is becoming more difficult each year to find money for matching Blue Mountains Elk Initiative and Rocky Mountain Elk Foundation projects. One forage enhancement project was initiated in 2000 on Ables' Ridge (Wooten Widlife Area). The project was seeded in the spring of 2001, but drought may hinder growth the first year.

Elk damage

Elk damage continues to be a major problem in GMUs 154 and 162. Damage complaints peaked in 2000, and major claims were filed by landowners.

Hotspot and landowner antlerless permits are excellent tools for targeting offending elk. However, the number of permits issued, and the conditions and procedures under which these permits are issued must be carefully coordinated in order to maintain elk management objectives, and accomplish damage goals without jeopardizing these important damage control tools.

Management conclusions

The spike-only management program has improved the age class structure of the adult bull population resulting in a significant improvement in breeding efficiency; more intense rutting activity, smaller harems, high percentage of conception during the first estrous, and earlier breeding. Another positive effect is the dramatic increase in the quality of adult bulls available for harvest (Table 2).

The Blue Mountains elk herd continues to suffer from low calf survival, which has a negative impact on the elk population, and reduces the number of yearling bulls available for harvest under the spike-only program. Elk populations on the westside of the Blue Mountains are relatively stable and at management objective, with the exception of GMU 166 (Tucannon) east of the Tucannon River. Elk populations on the

eastside of the Blues, and in Unit 169 Wenaha are below management objective by approximately 1,200 elk.

The Blue Mountains elk population will not increase significantly until several factors that are negatively impacting this elk herd are brought under control. First, calf elk survival must improve dramatically. Second, habitat values that have declined due to roads, logging, noxious weeds, and fire suppression must be reversed in order for elk to fully utilize the available habitat on public land. Third, the Blue Mountains Elk Control Plan has been very effective by improving landowner / WDF&W relations, but, new and innovative techniques and options must be developed and financed in order to reduce damage and increase landowner tolerance of elk on private land. And fourth, work with the treaty tribes to achieve better harvest control and monitoring. The Blue Mountains elk population will not increase in the near future unless we reverse and\or control the negative factors impacting this elk herd.

ELK STATUS AND TREND REPORT: REGION 3
PMU 32 – GMUs 328, 329, 335
PMU 33 – GMUs 336, 340, 342, 346,
PMU 34 – GMUs 372, 382
PMU 35 – GMUs 352, 356, 360
PMU 36 – GMUs 364, 368

JEFFREY A. BERNATOWICZ, District Wildlife Biologist

Population objectives and guidelines

The population objectives for Yakima and Colockum elk (*Cervus elaphus*) herds have not been solidified. Herd plans are currently being written. The **draft** plan for Yakima recommends reducing the postseason herd to 10,000 elk. A tentative goal of 300-400 animals has been set for the Rattlesnake Hills sub-herd. The postseason bull ratio goal is $\geq$12 bulls per 100 cows.

Hunting seasons and harvest trends

Historically, the Colockum units opened earlier than Yakima units and any bull was legal. In 1994, all branched antler bull hunting became permit only. Archers and muzzleloaders may take antlerless animals in some areas. Hunting seasons were changed to a standard opening date in 1997. In 2000, hunters were able to hunt any area in eastern Washington under one tag. The PMU 34 portion of the Yakima herd has been managed as a damage area with a wide array of liberal seasons allowing the harvest of antlerless and any bull.

Agency policy generally prohibits hunting during the peak of the rut (mid-late September). Early archery seasons runs September 1-14. Early Muzzleloader season is 7 days and usually starts the first Saturday in October. General modern firearm season starts in late October and runs 9 days. Late muzzleloader is 5 days in mid-November. Late archery starts the day before Thanksgiving and continues into early December. There are also various damage control seasons for muzzleloader that start as early as August 15th and end as late as December 15th.

In 2000, the reported number of elk hunters in Region 3 decreased slightly and was near the 10-year average (Table 1). All user groups decreased in 2000. The recorded decline may have been a result of the expanded tag area and a change in the way hunter numbers are estimated.

Hunter success was up from 1999 and above the 10-year average (Table 1). All user groups had increased success, with muzzleloader hunters doubling the 10-year average and modern firearm success rate.

Bull and cow harvest in the Colockum were comparable to 1999 and harvest was 39% below the 10-year average (Table 1). Yakima bull and cow harvest increased 27 % and 46 %, and total harvest was 40 % above the 10-year average (Table 1).

Surveys

Post-hunt aerial surveys were conducted in February 2001. Survey units were stratified and randomly selected. We covered 70%(n=21) and 69%(n=27) of the Colockum and Yakima survey units. Feedlots for the Yakima herd were ground surveyed. PMU 34 is not included in the flights or data summaries.

Calf recruitment in the Colockum remained at the lowest levels since aerial surveys began in 1990 (Table 2). Bull ratios in the Colockum remained below the goal of 12 bulls:100 cows. Calf recruitment in the Yakima herd rebounded after a 3-year decline (Table 3). The bull ratio in the Yakima herd is well above the goal of 12 bulls per 100 cows.

Population status and trend analysis

In February 2001, the Colockum and Yakima herds were estimated at 4,453$\pm$329 and 10,460$\pm$503 (Tables 2 and 3). It is difficult to determine trends for either population. Aerial surveys of the Colockum have been conducted using methods that were generally consistent with protocols used for estimating population since 1995. Formal protocols were implemented in 1999. Prior to 1999, quadrats were not randomly selected and quadrat boundaries were not strictly observed. In years with a low sampling rate (i.e. 1999), there is a high variance and the population was probably overestimated. In light snow years, the population was likely underestimated. Preliminary analysis of the historic data indicates no strong trend in the overall population since 1995. The data indicate a decline in calf recruitment.

Harvest data from the Colockum herd (Table 1) suggests a population decline since the late 1980's. However, the low harvest may be a result of poor calf recruitment. There have been few antlerless or branched antler bull permits in the Colockum in the last 5 years.

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
1986	715	437	754	516	24,265	1,346	3,440	29,501	9	13	5	8
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	32,946	9	18	12	11
Mean[a]	526	515	1,058	1,080	22,933	4,953	5,287	33,173	9	9	8	9

[a] Mean calculated from 1990s data only

The first Yakima herd survey with population estimation as a main objective was in 1999. The 1999 survey covered 30% of the units and was heavily weighted toward high-density units. Elk in 1999 were also leaving the Yakima feedlots, resulting in an extremely high density of elk on a few of the survey units. When the small sample was extrapolated to the remaining area, an overestimate of the population resulted.

The Yakima elk population was possibly underestimated in 2001. Some elk may not have been on winter range because of a light snow pack. The random selection also missed the highest density units. However, the population likely decreased from 2000 to 2001. The estimated legal harvest exceeded estimated February recruitment by 471 elk. Including poaching, crippling loss, and natural mortality, it is possible the population declined by as much as 1,000elk.

The PMU 34 population grew from less than 100 elk in the early 1980's to approximately 1,000 (~840 in Rattlesnake Hills) in 1999. An aggressive hunting program and a trapping effort has reduced the herd to about 600 (~520 in Rattlesnake Hills). A fire in 2000 displaced elk from a refuge (ALE), which increased harvest. The herd will likely rebound quickly without hunting or trapping on ALE.

Habitat condition and trend

The overall summer range for the Colockum herd is improving due to timber harvest. However, a large portion of the herd concentrates around the Coffin Reserve. The area in and around the reserve is heavily impacted by both elk and domestic cattle and appears to be in poor condition.

Colockum winter range forage quality is likely decreasing. Nearly all the winter wheat fields have been converted to CRP**.** The older CRP is in crested wheat grass, which is undesirable elk forage in this area.

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 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 accumulative ungulate grazing that is occurring on summer range used by elk.

In PMU 34, the major change to habitat was a fire that consumed 95% of the 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.

Wildlife 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.

Most of the Colockum herd is not fenced. Damage is being managed by early and late muzzleloader hunts. The boundaries of the muzzleloader hunt are drawn depending on where damage is occurring. The program has been fairly successful. Additional problem elk are being managed through hot spot and landowner preference hunts. The goal is to eliminate/displace the elk that have developed a preference for agricultural crops.

Cattle ranchers in the Yakima area are complaining of competition between elk and cattle. In 2001, a bill was passed allowing ranchers to claim damage on rangeland. The impacts of the bill will not be known until 2002.

The PMU 34 herd has the potential to cause the most significant annual damage. In 2001, damage payments to wheat farmers exceeded $200,000. The total for the entire region from1991-2000 was $37,777. The proximity of PMU 34 elk to valuable tree crops further increases the risk. Controlling the herd size is problematic as the core use area is on ALE, where hunting is prohibited.

Management conclusions

Table 2. Colockum elk winter composition 1990-99.

	Antlerless		Bulls		Total	Ratios (per 100 cows)	
Year	Cow	Calves	Spike	Branched	Elk	Calves	Bulls
1990	918	336		21	1,275	37	2
1991	559	213		23	795	38	4
1992	NO	DATA					
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	3,159 ± 570[b]	21	7
2001[a]	3,464	719	100	170	4,453 ± 329[b]	21	8

[a] 1999-2001 data based on visibilty model

[b] Population estimate ± 90% C.I.

Table 3. Yakima elk winter composition 1990-99.

	Antlerless		Bulls		Total	Ratios (per 100 cows)	
Year	Cow	Calves	Spike	Branched	Elk	Calves	Bulls
1990	929	371		28	1,328	40	
1991	432	195		28	655	45	7
1992	NO	DATA					
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	16,786 + 4,334 [b]	33	11
2000 [a]	8,125	2,528	421	703	11,848 + 753 [b]	31	14
2001 [a]	6,896	2,652	464	698	10,460 + 503 [b]	38	17

[a] 1999-2001 data based on visibilty model

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

Based on the limited information available, the Colockum herd appears to be stable or declining. Bull recruitment remains low and the goal of 12:100 cows is not likely to be reached under current circumstances. Calf recruitment has been poor in recent years. The overall summer range may be improving, but animals are concentrated in a small area for an extended period in late summer and fall. Winter range quality has probably deteriorated. Ideally, the condition of the animals would be measured on various ranges and seasons in hopes of identifying nutritional bottlenecks. If funding is not available for radio collaring, then an effort should be made to measure condition of animals harvested by hunters.

The Yakima herd appears healthy. In the short term, hunter opportunity and harvest will remain high. There is a perception by some of the constituency that the Yakima elk herd is too large and should be reduced to prevent range damage. Information needs to be collected on range condition and forage utilization to better respond to those concerns.

The PMU 34 herd is above the goal of 300-400 elk, and is expected to continue to grow. Damage payments in 2000 emphasize the need to reduce the PMU 34 elk population. Hunting is not expected to control herd growth under the current harvest strategies available to WDFW. Direct management access to elk on the Arid Land Ecological Reserve (ALE) is required to effectively manage the number of elk in this sub-herd.

ELK STATUS AND TREND REPORT: REGION 4
PMU 44 – GMU 454
PMU 47 – GMU 460

ROCKY SPENCER, District 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. We believe there are 200-250 elk in GMU 454 and 175-225 elk in GMU 460. 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. Elk are tolerated by many citizens that perceive them as a "quality of life" indicator. Other citizens do not support the presence of elk because of damage to ornamental plants and gardens.

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 40 elk. Occurrence varies on the extremes, with elk found in isolated wilderness areas, managed timber lands, and rural and even some thriving urban populations near the cities of North Bend and Snoqualmie.

Hunting seasons and harvest trends

Management strategies vary for these two elk herds. GMU 454 has liberal seasons, including extended antlerless seasons, designed to maintain the population at a level that keeps damage complaints at an acceptable level.

In GMU 460, there has been limited antlerless harvest and a 3-point or better restriction on bull harvest, designed to allow the population to grow at a slow rate and expand their range. Antlerless harvest was eliminated for the 2000 season to enhance herd growth. This GMU has good elk habitat, primarily on managed forest lands, and the potential to support about 450-550 elk without damage concerns. Harvest for years 1993-2000 in GMU 460 and 454 is presented in Figures 1 and 2, respectively.

Surveys

There are currently no surveys conducted in GMU 454 or 460 because of limited funds.

Population status and trend analysis

Based on limited, primarily anecdotal information, the elk population in GMU 454 is stable or declining slightly. The elk population in GMU 460 is increasing slowly.

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.

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 and nuisance are limited in scope, yet can be a notable problem. Elk damage has been a problem primarily to some golf courses and Christmas tree farms.

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 population enhancement.

Several small sub-herds occur within and immediately adjacent to the urban/suburban 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, 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 these data into city planning efforts to direct development, protect open space, establish parks, and other preservation efforts. Encounters of elk and humans along the urban interface present an opportunity for building and expanding public interest in wildlife conservation.

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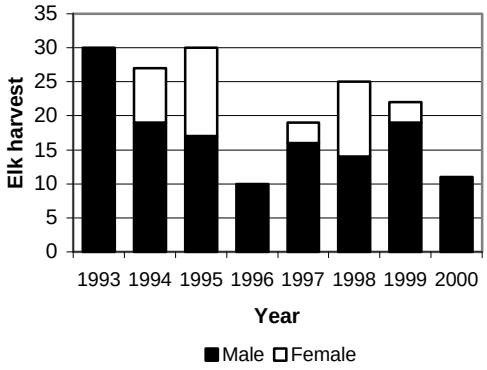

Figure 1. Trend in elk harvest, GMU 460, 1993-2000.

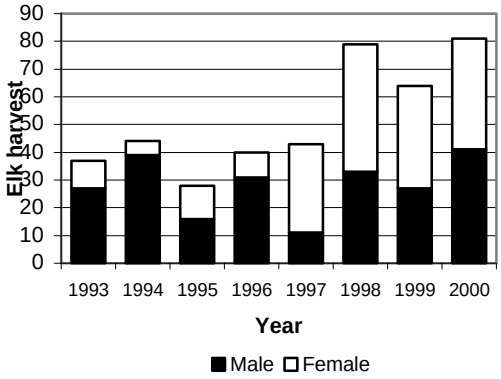

Figure 2. Trend in elk harvest, GMU 454, 1993-2000.

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

MIKE DAVISON, District Wildlife Biologist

Population objectives and guidelines

The long-term management objectives for the Nooksack elk (*Cervus elaphus*) herd are:

1) Stabilize and/or reverse the downward population trend in the Nooksack herd.
2) Reverse the pattern of outward migration of elk from the central portion of the range to peripheral (agricultural damage) areas.
3) Maintain the number of elk occupying lowland agricultural habitats at or below current levels.
4) Increase population numbers to a minimum of 750 animals on primary elk range.

More specific objectives and strategies for management of the Nooksack elk herd include:

1) Increasing the scientific database by expanding the level of herd composition surveys (pre- and post-hunt) necessary to complete population reconstruction and/or modeling techniques;
2) Increase precision and accuracy of tribal and recreational harvest reports;
3) Monitor elk numbers and distribution in agricultural damage areas;
4) Increase elk population numbers in GMU 418 to a minimum of 750 animals by maintaining a conservation closure, enhancing road management, and habitat enhancement projects;
5) Promote expansion of the Nooksack elk herd into newly designated elk range south of the Skagit River (GMU 437 Sauk) by maintaining a conservation closure in GMU 437, maintaining hunting pressure on elk utilizing agricultural lands in order to encourage depredating animals to migrate into GMU 437, and potentially by re-introduction (transplants) of elk into newly designated range;
6) Manage the Nooksack elk herd for a minimum five percent annual growth rate by maintaining post-hunt bull ratios of 12 or more branched antlered bulls per 100 cows and an average of 30-45 calves per 100 cows;
7) Reduce damage caused by elk through the use of special hunting formats (hot-spot hunts, landowner damage hunts and landowner preference permits),
8) Increasing forage enhancement projects on public and private lands adjacent to damage areas.
9) Implement augmentation projects in GMU 418 and newly designated elk range areas south of the Skagit River in GMU's 437 and 450.

Hunting season and harvest trends

Conservation closures were established in both GMUs 418 and 437 in 1997 as outlined in the management strategies for the Nooksack elk herd (Draft Nooksack Elk Herd Plan, 1997). Tribal hunting pressure is less significant on an individual tribe basis than from a cumulative impacts perspective. Of the 11 tribal signatories associated with the Point Elliott Treaty (ratified March 8, 1859), seven have been documented hunting the Nooksack elk herd. To date, it has been assumed that all seven active tribes have voluntarily complied with the Conservation Closures. Non-tribal harvest for 2000 was 6 animals harvested within established muzzeloader seasons (damage units). Reported tribal harvest for 2000 totaled 2 elk (1 bull and 1 cow) in GMU 437.

Surveys

Herd composition surveys were conducted on 8/28/2000. A total of 136 elk were classified (21 bulls /68 cows/47 calves). This represents a bull ratio of 30.9 bulls per 100 cows and a calf ratio of 69 calves per 100 cows. Approximately 71% of the bulls (15 out of 21) were branched antlered animals.

Sixteen elk (15 cows, 1 bull) were captured on March 27-28, 2000. All animals were fitted with radio collars and subsequently monitored on a bi-weekly basis by WDFW field personnel. Monitoring efforts were transferred to RMEF volunteers beginning in June, 2000. The primary objective of the monitoring project is to evaluate elk movement and habitat utilization patterns with specific emphasis on potential use of lowland agricultural lands. This work is anticipated to answer questions regarding the feasibility of elk augmentation in the future.

On March 22-23, 2001, 14 of the original 15 radio collared elk were re-captured. Blood samples as well as fecal samples were collected as part of a body condition and parasite analysis. Total fat levels were determined utilizing ultrasonography and a body condition scoring system. Pregnancy rates were also evaluated via ultrasonography. Preliminary data analysis indicates that total body fat levels of Nooksack

elk averaged 5.6% which was significantly greater than 2 other western Washington and 1 western Oregon population (which averaged 3.8 - 4.8% body fat; L. Bender and J. Cook, personal communication). Parasite levels were very low as compared to other western populations. Pregnancy rates were also very high with 15 of 17 cows (88%) verified as pregnant (L. Bender, personal communication).

Preliminary analysis of movement data (radio telemetry) indicates that radio-collared cows are staying in the forested habitats and not moving into agricultural areas during the winter.

Population status and trends

The Nooksack Elk Herd Plan (Draft 1997) identifies the development of a statistically valid population model as the highest research priority for this herd. Current population estimates for the Nooksack Herd based upon field observations, is between 250 and 300 animals. Elk numbers and distribution within the central range do not appear to have changed from previous low levels. Decreased numbers and distribution of elk in the peripheral lowland habitats, generally associated with elk crop depredation problems, have resulted in damage claims for both Whatcom and Skagit Counties.

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 research priority and will require relatively little effort beyond purchase of current (Year 2000) Landsat flight data. 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 forest lands to agricultural and/or industrial use is accelerating and poses the greatest threat to elk habitat in the future.

Wildlife damage

Estimates of elk numbers occupying agricultural damage areas had decreased from 150-200 animals in 1997, to 75-100 by the end of 1998. The Wildlife Enforcement Division reports a continued decrease in the number and distribution of elk related damage complaints received during the 2000 season.

Augmentation and habitat enhancement

Considerable work has begun to accomplish augmentation in the North Cascades Elk Range. An augmentation Plan (Draft) has been completed and distributed to all appropriate landowners, sports groups, and tribal representatives. The NEPA review process has been initiated by the U.S.F.S. as required for potential elk releases on federal lands. Internal (WDFW) planning for augmentation has begun with a potential target date(s) for release of spring or late summer (2002).

Management conclusions

Management recommendations for the Nooksack Elk Herd and associated habitat include the following:

- Continue efforts to establish a statistically valid population estimate via population modeling.
- Shift the survey time period for aerial herd composition surveys to late July and early August, in an effort to increase elk classification sample size.
- Continue road closure agreement with DNR and Crown Pacific, Inc. in primary winter range areas.
- Evaluate the potential for a paint-ball marking research project in the Nooksack.
- 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 (75-100 animals).
- Evaluate the potential for a transplant project in GMU 418 (Nooksack) and 437 (Sauk).
- Conduct a genetics study designed to evaluate whether the remaining elk are Roosevelt, Rocky Mountain or a mixed breed.
- Conduct a Nutritional Ecology Study designed to evaluate elk nutritional levels on a seasonal basis.
- Complete a Habitat Landscape Evaluation for GMU 437 (Sauk).
- Place radio collars on 30 elk to evaluate migration patterns, habitat use, mortality and habitat description of elk range in GMU 418 (Nooksack).
- Revise (update) the Management Plan for the Nooksack Elk herd.

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Personal Communication; Dr John Cook, Wildlife Research Biologist; Nat. Council for Air and Stream Improvement

ELK STATUS AND TREND REPORT: REGION 4
PMU 48 – GMU 485

ROCKY SPENCER, District Wildlife Biologist

Population objectives and guidelines

The Green River elk (*Cervus elaphus*) herd is a relatively small and compact population that continues to decline. Elk historically occurred in the Green River, 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. The 1997 late spring, early winter population estimate was 227 elk (range 177 to 277). The current elk population estimate is about 170 animals and continues to decline (Spencer unpubl. data 2001).

Because the majority of this herd resides within the boundaries of a municipal watershed, public access has been restricted and hunting has always been limited. Historically however, hunters would ignore this restriction and risk a potential trespass fine for the opportunity to kill a trophy bull. This unregulated access created potential water quality problems and in 1984 the City of Tacoma and the Washington Department of Fish and Wildlife (then Department of Game) cooperated to create a unique game management unit (GMU 485) for a limited entry elk permit hunt. Unauthorized trespass and hunting closed season violations are effective deterrents, virtually eliminating unrestricted access. In addition this created the cooperative management opportunity for mature quality bulls and highly successful antlerless hunting.

Our management objective for this herd since 1984 has been to maintain and enhance the opportunity for both trophy bull hunting and maintain high success rates for antlerless elk hunting. Despite its small size this herd has a reputation for meeting management objectives, providing a high hunter success rate, including trophy bulls and has been one of the most popular permit hunts in Washington State.

Hunting seasons and harvest trends

Hunters may enter and exit this GMU at one of two specified gates, providing the opportunity to check every harvested elk. 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. Subsequently, permit allocation has changed to include the Tribe: 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 in 1997-2000.

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 (Figure 1). These are seemingly minor increases and changes in harvest and yet are an important consideration for this particular herd.

Prior to 1992 these regulations met our management objectives. The increase in harvest from 1992-1996 may have adversely affected the population. There were no permits in 1997 or 1998.

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 (Figure 2).

The Muckleshoot Tribe collects age and

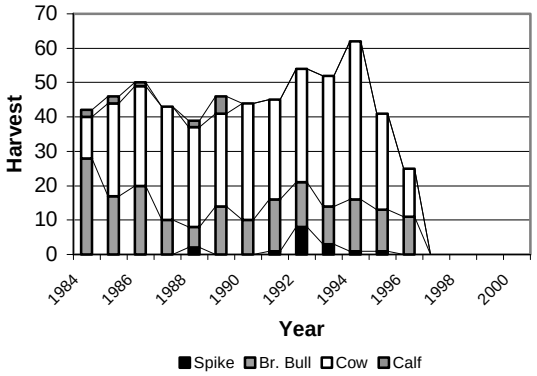

Figure 1. Trend in elk harvest, GMU 485, 1984-2000.

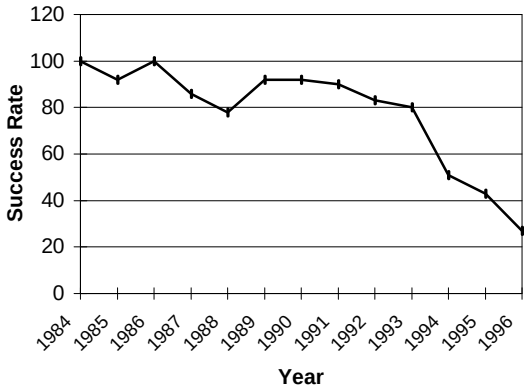

Figure 2. Trend in hunter success, GMU 485, 1984-1996.

reproductive data during their established hunt. The tribe also contributes by providing flight dollars for composition flights. Permit levels and allocation result from yearly meetings between the Tribe, State, and Tacoma Public Utilities.

Surveys

Prior to 1986 elk composition was primarily from the ground by foot or vehicle; standardized helicopter surveys are now the primary method, supplemented with ground surveys.

Pre-hunt (September) bull:cow:calf ratios from 1984 - 1998 are presented in Table 1. One notable point for discussion is the extremely low calf survival rates. The pre-hunt composition shows a general decline in calf:cow ratios since 1984. These rates are below the average for other western Washington herds. Beginning in 1996, flights in June, July, and August were conducted to better assess calf production and to document and compare recruitment with traditional September composition surveys. Calf:cow ratios averaged 40:100 for June-August and declined to 26:100 by September. Inadequate funding caused this survey to be in scaled back in 1997. In 1998 no pre-hunt flights were conducted because of population declines.

Our pre-hunt, branch-antlered bull ratios have generally increased since 1984 and stabilized at about 29:100 cows. Pre-hunt, branch-antlered bull survey data remained stable for the 1994-1997 period. No data were collected in 1998-2000.

Post-hunt (March) composition counts since 1985 have shown a general decline in calf recruitment (Table 2). Branch-antlered bull composition increased until 1991, stabilized from 1992-1994 at about 21:100 cows and dropped in 1995, 1996, rose slightly in 1997 and declined again in 1998. The low spike recruitment in 1993 through 1996 could account for the subsequent decline in branch-antlered bull ratios. These data should be viewed with caution because post-season branch-antlered bull counts may under represent bulls.

Population status and trend analysis

In 1994, 156 elk were marked with paintballs fired from CO2 rifle using a Bell 206B helicopter. Three re-sight flights were flown with 1,206 total elk observed and 202 marked elk seen. An average of 56% of the total marked elk were seen for the three flights combined (range 55.7-79.5 %). The population estimate was 612 elk (± 68, 95% CI) including 460 cows, 50 calves, 85 branch-antlered bulls, and 16 spikes. This type of mark-recapture estimate has been successful in Washington for estimating elk

Table 1. GMU 485 Pre-hunt elk herd composition 1984-1997 (all ratios per 100 cows) no flights in 1998,1999, and 2000.

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.

Table 2. GMU 485 Post-hunt elk herd composition 1984-1999 (all ratios per 100 cows).

Year	Spike	Br. Bull	Total Bull	Calves
1984	5.5	3	9	21
1985	6	4	10	30
1986	4	9	13	23
1987	5	5	10	15
1988	8	11	19	22
1989	6	12	18	21
1990	7.5	19.5	27	15
1991	7.4	23	30	14
1992	9.3	11	20	21
1993	3.4	18.5	22	12
1994	3.7	16	20	13
1995	4.3	9.2	13.5	10
1996	2.3	6	8.4	11.5
1997[a]	3.4	23.5	27	7
1998	1.8	12.7	14.5	6.4
1999[a]	3	18	21	9
2000	.08	16.4	17.0	19

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

populations.

There are no historic population estimates for comparison, but our long history and experience with this elk herd from field observations and sub-herd location suggests this herd has declined from about 1992 to the present. Also, the total number of elk counted during post-hunt helicopter composition flights in March has shown a decline from 1992 thru 2000. This suggests a decline in the population and generally supports our field observations (Figure 3).

Our 1994 population estimate indicated only 50 elk calves were recruited to the population. This coupled with the decline and low recruitment indicated from post-hunt composition counts since 1985 suggested a declining population. Increased harvest in declining populations can compound the problem by increasing the rate of decline. Other 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. This GMU is closed to harvest of bear and mountain lion and these predators are likely at maximum densities relative to prey availability. Analysis of mountain lion elk kills (n=28) found highly significant statistical selection for elk < 1 year old. Certainly a combination of these variables should be considered.

In March and April 1997, we conducted another paintball mark-recapture estimate. This was the first opportunity to assess population changes since 1994. We 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). Please see

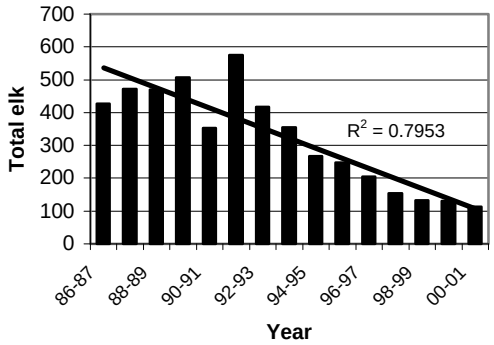

Figure 3. Total elk counts from helicopter, 1986-2001.

GMU 485 Mark-Recapture Population Estimate- Final Report 1997 for results and discussion. We again repeated the paintball mark-recapture estimate in March and April of 2001. The estimate was 170 elk (range 145-192) (Spencer unpubl. data 2001).

The winter total trend count in 1998, 1999, and 2000 was 133, 130, 114 elk respectively, again documenting a decline in the population (Figure 3).

In addition, mortality data from radio equipped adult cows is currently about 27 % per year (D. Vales pers. comm. 1999). This far exceeds recruitment rates and forecasts a continued population decline.

Calf mortality study

The WDFW initiated calf mortality study in May of 1997, again in June 1998, and the continued by the Muckleshoot Tribe in cooperation with WDFW in 1999, to determine the sources of elk calf mortality. This was a cooperative study that included the Muckleshoot Indian Tribe, City of Tacoma, Public Utilities, Weyerhaueser and Plum Creek Timber Companies, and the Army Corp of Engineers. Preliminary results suggest that predation, predominantly mountain lion is the primary source of death to radio equipped calves. However, based on preliminary data, the nutritional status of radio equipped adult cows, many of which are associated with these calves is poor, and this also may be affecting calf survival and their vulnerability to predation. The study may continue in 2001, more comprehensive preliminary data will be available in September 2003.

Habitat condition and trend

The area has intermingled ownership of private, state, and federal timber lands. Most of the timber lands are intensively managed and create a mosaic of seral stages. Average rotation between successive harvests is about 60 years on private and state lands. These managed lands are interspersed with 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 essentially tracks forest seral stages and quantifies the change in the amount determined as forage and elk numbers for each seral stage over time. This could be affecting elk recruitment as discussed earlier.

Wildlife damage to private property and nuisance problems

Elk in this GMU are not a problem to private property and we have no nuisance problems.

Habitat enhancement activities

We are currently working cooperatively with the U.S. Army Corp of Engineers, Tacoma Public Utilities, and the Muckleshoot Tribe to create open meadow grass habitat plots for elk. These are mitigation measures 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 we completed a 250 acre forage enhancement project with the RMEF, City of Tacoma-Public Utilities, and the Bonneville Power Administration. The project was highly successful and involved spraying and mowing of scotch broom along powerline corridors to stimulate elk forage.

Management conclusions

Low calf recruitment rates are a concern for this elk herd. Continued low recruitment and the antlerless harvest rate up to 1996 were incompatible. The low post-hunt spike ratios from 1993 through 2000 (1.8:100 cows) are a concern. Our management goal is to increase the population to a minimum 550 elk and maintain high bull to cow ratios and ensure a majority of bulls reach the prime age class (5-10 years).

This permit hunt is one of Washington's most popular because of the opportunity to harvest and view quality bulls and the high success rates. We did not issue elk permits for the 1997 to 2000 hunting seasons because of the continued population decline. No permits will be issued in 2001.

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ELK STATUS AND TREND REPORT: REGION 5
PMU 51 – GMUs 578, 588
PMU 52 – GMUs 564, 568, 574
PMU 53 – GMUs 522, 524, 554, 556, 558
PMU 54 – GMUs 516, 560, 572
PMU 55 – GMUs 510, 513
PMU 56 – GMUs 505, 520, 550
PMU 57 – GMUs 501, 504, 506, 530

MIN T. HUANG, Wildlife Biologist
PATRICK MILLER, District Wildlife Biologist

Population objectives and guidelines

The Washington Department of Fish and Wildlife's (WDFW) long-term population goal for elk (*Cervus elaphus*) in all Game Management Units (GMUs) of Region 5 is to maintain current population and harvest levels (WDFW 1996). Specific Region 5 objectives include, (1) manage general hunting GMUs to achieve post-hunt bull elk escapement objectives of 12 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 with liberal regulations to reduce damage. In general, herd productivity is managed to equal or exceed the previous 5-years mean. (WDFW 1996).

Hunting seasons and harvest trends

Data on elk harvest, hunter success, and hunter effort are obtained annually through the WDFW hunter questionnaire and mandatory hunter report cards issued with each elk permit.

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 the chance of over-exploitation and to provide equal opportunity. Season length and timing are determined by 3-year hunting packages, the latest of which covered 2000-02.

As previously mentioned, in 2000 elk were managed under three 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, 382, and 588), 3-pt minimum (any bull with 3 or more points is legal) GMUs (501, 504, 505, 506, 510, 513, 520, 530, 550, 554, 558, 560, and 572), and permit only (limited entry, hunting by permit draw only) GMUs (524 and 556). Concern over the level of antlerless harvest in GMU's 506, 520, and 530 led to a reduction in modern firearm permits and a restriction of late archery season cow harvest. Antlerless harvest was curtailed for all user groups entirely in GMUs 510, 513, and 516. In all other units, apart from the any-elk GMUs and GMU 501, antlerless harvest was allowed during archery seasons and by permit during general firearms and muzzleloader seasons.

Since 1992, hunter pressure in Region 5 has been increasing (r = 0.65, P = 0.05), with a mean of 27,059 hunters (SE = 1,233). Days spent afield have remained stable over this same period, however, (r = 0.51, P = 0.16), with a mean of 165,489 days (SE = 10,675).

Elk populations in many of the Region's 3-pt GMUs are not meeting WDFW post-hunt escapement objectives of 12 bulls per 100 cows. Estimates from population model simulations indicate that post-hunt bull:cow ratios range from 9-17:100 throughout the Region.

Hunting conditions were average during the 2000 elk season. Typical warm, dry weather during September and early October made early archery and muzzleloading hunting challenging. Fire danger during the early archery season resulted in the closure of all private timberlands during the first week of September. Fall and early winter precipitation and cooler temperatures prevailed during the general firearm and late seasons.

A total of 28,622 elk hunters spent 172,588 days afield in 2000. Region 5 harvest was 2,865 elk. Overall hunter success during the general season was 9%. The general season success rates have been stable over the past 8 years (r = 0.26, P = 0.15). Permit hunt success rates in the Region, however, continue to be high, with reported success rates of 49% for the 28 permit hunts that were offered in 2000.

The estimated 2000 elk harvest of 2,865 was the highest of the decade. Report card returns in 2000 were high. The estimated harvest relies upon the volume of

hunter report card returns and takes into account the assumption of constant reporting rates over time. Thus, high volumes of report card returns will result in high estimated harvests. Estimated harvest in 1999 was also very high. The 2000 elk surveys indicated that bull mortality rates in the open-entry units did increase from 1998, indicating that the 1999 harvest likely was high. Our 2001 surveys will shed more light on the estimated 2000 harvest.

The estimated harvest, the estimated harvest per hunter-effort expended, and population model simulations all indicate a general decline in elk populations in Region 5. Increasing effort to harvest elk can be one indicator of an overall decline in the population. Lower harvests in units that historically have had consistent regulations and consistent population modeling results also indicate a likely decline.

Antlerless harvest levels in some of the lowland elk units is a concern. Recent cow harvest in several units has greatly exceeded the target of no greater than a 5% antlerless harvest rate. Regulation changes in GMU's 506, 520, and 530 specifically aimed at reducing antlerless harvest did result in a 45% reduction in cow harvest from the 3-year mean. Continued lowered cow harvest, in conjunction with continued high productivity (see Surveys below) should result in increased population levels.

Increased cow mortality in the Packwood area has also been a concern. The South Rainier elk herd has been declining for several years, although the number of resident elk in the Cowlitz River valley has been increasing over the same time period. Due to the decline in the South Rainier herd, no antlerless elk hunting was allowed in the three GMUs that encompass the Cascade sub-herd area. Earlier work had suggested that the timing of tribal harvest in this area took both migratory and resident elk. Surveys in Mount Rainier National Park in 1999, however, indicated an increase in the Mount Rainier South elk herd. These survey results suggest that resident elk herds may be receiving the majority of the harvest pressure, rather than the Park herd. A current joint study between WDFW and the Medicine Creek Indian Tribes is meant to better ascertain mortality rates and movement of these elk.

Surveys

Until 1995, spring and fall elk composition counts were used to determine the sex and age structure of the Region 5 elk population. Since, only 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) as input into the elk reconstruction model (Bender and Spencer 1999).

Fall composition counts are used to generate cow:calf, bull:cow, and bull age structure ratios. Fall cow:calf ratios are an index of population productivity. Since bulls, cows, and calves freely intermix during and immediately after the rut, fall composition counts provide the most un-biased bull:cow ratios. 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.

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 2000, fall surveys were conducted from 15 September to 11 October.

Observed elk were classified as calf, cow, or bull. Bull elk were further classified by number of antler points to determine the percentage of prime (heavily beamed, five or more antler points per side) bulls present in the herds.

Data were used to generate estimates of calf:cow and bull:cow ratios, expressed as the number of bulls and the number of calves per 100 cows. Ninety percent confidence intervals were constructed about the ratio estimates following Czaplewski et al. (1983).

A total of 1,284 elk was classified during the 2000 surveys (Table 1). Despite our desire to improve both coverage and sample size, survey coverage in 2000 was similar to that of 1999 (Figure 1). Due to weather and scheduling problems, both Lewis River (GMU 560) and Souixon (GMU 572) were not covered. Coverage of Marble (GMU 558) was sparse. Overall, weather conditions during the surveys that were conducted were variable, with some days good, others with bright sun and temperatures in excess of 65E F. Wind was not much of a factor during most flights. Coverage of the units that were surveyed, apart from Marble and Stella (GMU 504), was excellent. Scheduling and weather conditions resulted in separate survey flights of some of the bigger units (506, 520, 530, and 550. This resulted in much better overall coverage of these units, providing a very

Table 1. Raw data from elk surveys in Region 5, Sept-Oct 2000.

GMU	Spike	Raghorn	Mature	Cow	Calf	Total
504	0	1	0	4	2	7
506	20	9	2	82	41	154
520	23	12	3	76	37	151
524	39	55	13	189	85	381
530	30	12	0	67	36	145
550	20	11	0	73	36	140
556	17	27	4	140	73	261
558	2	2	0	29	12	45

Table 2. Composition ratios with 90 % confidence intervals from elk surveys, Sept-Oct 2000.

GMU (PMU)	Bull:Cow	Calf:Cow
520, 550 (PMU 56)	46±9:100	49±10:100
504, 506, 530 (PMU 57)	48±9:100	52±10:100
558	14±10:100	41±22:100
524	57±5:100	45±4:100
556	34±7:100	52±10:100

good representative sample of our elk. Special care was made to avoid the possibility of double counting groups by cutting off the units at well-defined breaks.

Composition ratio estimates are presented in Table 2. Despite reasonable sample sizes in most units, 90 % confidence intervals continue to be 20-30% of the given observed parameter. It will likely require more effort than is practical to reduce these confidence intervals to desirable levels. Increasing the number of units surveyed on an annual basis, however, can mitigate this shortcoming.

Permit units

Total bull mortality and composition ratios for bulls and calves in both Margaret (GMU 524) and Toutle (GMU 556) were consistent with the previous 6-year average (Table 3). Bull mortality rates in both units were ~35% with Toutle showing more variability, which is right where they were prior to the onset of tribal harvest in 1997. The return to lower observed mortality rates was a result of decreased harvest and a mild winter. Bull ratios in both units were also good. The previous 2-year decline in observed productivity also improved in 2000. Whether the 2000 productivity estimates are a one-year event or the start of an increasing trend remains to be seen.

The age distribution of bulls in both these units is still younger than desired for our quality units (Table 4). The mature bull component of the population in Margaret has declined from ~30% in 1996 to 12% in 2000. In Toutle, the mature bull component has gone from ~23% to 8% over the same time period. Prior to the 2 years of tribal harvest, over-harvest of bulls, particularly in the Margaret, likely occurred. Thus, permit allocation was reduced from 50 bull tags to 30. With the onset of tribal hunting, permits were further reduced to the present allocation of 18. Thirty bulls is a sustainable harvest that will likely still result in an older standing bull population. Given the fairly constant raghorn bull percentages in these two units, and with better control over harvest now, the mature bull component should increase over the next couple of years.

Both the Margaret and Toutle seem to be recovering from several years of higher than average mortality, that affected all age and sex classes, albeit some harder than others (i.e. calves). We are meeting our escapement objectives in these 2 units. The continued decline in the mature bull component of the populations is of concern, but should slowly rebound.

Table 3. Historic demographic data from Margaret (524) and Toutle (556) GMUs, 1994-2000.

Year	GMU	B:C ratio	C:C ratio	Bull Mortality	n
2000	524	57±5	45±4	36%	381
	556	34±7	52±10	35%	261
1999	524	43±8	31±6	21%	252
	556	33±10	35±11	18%	141
1998	524	49±6	36±5	40%	358
	556	35±7	33±7	52%	266
1997	524	48±5	48±5	35%	410
	556	35±7	49±10	39%	237
1996	524	54±6	45±5	38%	332
	556	44±9	49±9	37%	230
1995	524	57±9	55±9	34%	271
	556	43±11	51±13	45%	179
1994	524	66±9	43±7	38%	298
	556	42±22	63±31	20%	49

Open entry units

Productivity for the second straight year was very high throughout the Region (Tables 5, 6, and 7). Bull ratios were also very high, a reflection of the previous year's productivity and a mild winter. Spikes, however, made up the majority of bulls. The presence of mature bulls was lacking throughout the open-entry units. Mature bulls only comprised 3% of the sampled bull population. Prior to 3-pt. minimum regulations, we observed 8% mature bulls in the total bull sub-population in these units. Raghorn percentages were ~30-33% for 2000 in these units.

Surveys continue to indicate that the 3-pt minimum is not resulting in achievement of bull mortality rate objectives. In the Winston and Coweeman, pooled data indicate mortality rates of ~62%. Output from population models predicted ~60-65% in 1998, so 2 years of 3-pt regulations in these 2 units have resulted in overall bull mortality rates in the low to mid 60's. This is a lower rate than the historic 70% when these units were any bull, but still well above our goal of #50% annual mortality. Branched bull survival rates continue to be low in these units. If productivity continues to be high (>40:100), we will likely reach post-season escapement goals, but will have bull populations highly skewed towards animals <2.5 years old.

Observed bull mortality rates were even higher in PMU 57 than in PMU 56 (Table 7). Harvest estimates

Table 4. Historic survey data from 524 and 556, 1995-2000.

Year	GMU	Spikes	Raghorn	Mature	Bulls	Cow	Calf	Total
2000	524	39	55	13	107	189	85	381
	556	17	27	4	48	140	73	261
1999	524	13	39	11	63	145	44	252
	556	5	20	3	28	84	29	141
1998	524	38	37	20	95	193	70	358
	556	29	20	7	56	158	52	266
1997	524	35	39	26	100	210	100	410
	556	18	17	11	46	131	64	241
1996	524	34	29	27	90	167	75	332
	556	25	27	16	68	109	53	230
1995	524	25	28	20	73	128	70	271
	556	18	13	9	40	92	47	179

Table 5. Historic pooled survey data from 520 and 550, 1995-2000.

Year	Spikes	Raghorn	Mature	Bulls	Cow	Calf	Total
2000	43	23	3	69	149	73	291
1999	9	12	3	24	79	40	143
1998	40	9	10	59	156	52	267
1997	34	9	3	46	176	74	296
1996	16	5	2	23	90	38	151
1995	32	5	2	39	165	89	293

for 1999 in both Ryderwood and Willapa Hills were very high. The paucity of older bulls in the surveys suggested that, indeed, bull harvest was heavy. Since the initiation of the early muzzleloader bull hunt in Ryderwood, we have seen an increase in observed bull mortality rates from 50% to 71%. This is not too surprising, since we had a similar season in Willapa Hills during 1995 and had bull mortality rates ~63%. With increasing bull mortality rates and continued reports of spike bull kill we are not going to meet escapement ratio goals in this PMU. Continued high productivity, however, will help us, although we will continue to have few older bulls.

The 2000 survey results from PMUs 56 and 57 underscore the importance of comprehensive annual surveys. Lack of current information in many of the Cascade elk units (GMUs 516, 560, and 572) renders evaluation of the 3-pt minimum regulation incomplete. Differences exist in habitat, climate, and access between the Cascades and the lowland areas. We need to determine whether the 3-pt minimum will achieve our bull mortality and escapement objectives in the Cascades, where elk have greater cover and access is tougher. Presently, survey data and modeling suggests that the 3-pt minimum, at least in the lowland areas does not appear to result in significantly lowered bull mortality rates. There was little difference in demographic parameters among the lowland units. If we take out Ryderwood and the higher mortality rates presumably associated with the early muzzleloader season; Winston, Coweeman, and Willapa Hills all exhibited similar demographics-bull mortality rates in the mid 60% range.

Table 6. Historic pooled demographic parameters from 520, and 550, 1995-2000.

Year	B:C ratio	C:C ratio	Bull Mortality	n
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

Both Region 5 permit areas looked good in 2000. Productivity in these units increased. Declining mature bull percentages remain a concern.

Population status and trend

Population modeling, in conjunction with other indices, indicate a general decline in elk populations in much of Region 5. Increasing hunter pressure, loss of both quality and quantity of habitat, declining productivity in some areas, and climate are possible causes.

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 and hunter success. The severe winter kill of 1998-99 in the Toutle river valley

was largely due, to the poor quality of wintering ground and high elk numbers, than a catastrophic winter event.

Table 7. Historic demographic parameters from GMU 530, 1995-2000 (PMU 57 for 2000 in bold).

Year	B:C ratio	C:C ratio	Bull Mortality	n
2000	48±9	52±10	68%	306
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±613	64%	122
1996	21±8	39±12	56%	135
1995	39±12	47±14	50%	134

East of the Cascade crest climate will periodically result in significant winter-kill of elk. The last significant winter kill occurred during the winter of 1991-1992. The winter of 2000-01 was relatively mild at the lower elevations, with very little snowfall. A small fraction of Region 5 elk occur east of the Crest. On a Regional basis, only during extreme winters will weather significantly influence elk population numbers.

Region 5 faces significant loss of elk habitat through a number of different avenues: (1) establishment of extensive Late Successional Reserve (LSR) areas will result in loss of both summering and wintering habitat on US Forest Service (USFS) lands, (2) increased residential development along the three hydroelectric reservoirs (Merwin, Swift, and Yale Reservoirs), whose creation had already resulted in loss of significant amounts of historic winter range, will result in additional loss of winter range along the Lewis River watershed, and (3) general increases in development and human encroachment throughout the Region, which is resulting in a lower tolerance by landowners to the presence of elk.

Loss of elk habitat due to LSR establishment is expected to approach 41% in certain areas (R. Scharpf, GPNF, unpub. data). Efforts to minimize this impact, including manipulation of Managed Late Successional Areas (MLSA=s) to provide elk forage, are currently being evaluated by the USFS and WDFW. These losses of habitat directly affect the South Rainier herd and parts of the St Helens herd.

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 negotiations are ongoing over Yale Reservoir; negotiations over Swift Reservoir began prior to the expiration of Pacificorp=s license in 2000.

Degradation of wintering habitat is occurring along the North Fork of the Toutle River, specifically along the mudflow within the St. Helens Wildlife Area. The dire condition of the habitat was evident in the winter of 1998-99. Declines in habitat quality are a result of (1) shifts in plant composition away from nutritious forages, (2) invasion of exotics such as Scotch broom, and (3) continued erosion of stream-side vegetation. The quality of the surrounding slopes continues to decline, as the canopy closes.

Table 8. Results of spring elk survey, May 1999.

GMU	Fall 1998 calf:adult	n	Spring 1999 calf:adult	n
550	41±16:100	45	38±15:100	77
556	24±7:100*	266	34±15:100	52
554	Not conducted		18±15:100	40
558	Not conducted		24±16:100	52

Augmentation and habitat enhancement

Steps continue to be taken to enhance forage quality on the Toutle mudflow through plantings and fertilization. With the cooperation of the Rocky Mountain Elk Foundation, Mt St. Helens Preservation Society and other volunteers, two hundred and sixty-eight acres were seeded in 2000. Additionally, two hundred and twenty-three acres of existing forage were fertilized and forty-one acres of scotch broom were eradicated. Stabilization of the mudflow itself through tree planting is also being attempted.

A cooperative habitat enhancement project to benefit the South Rainier herd continues to be developed. With the cooperation of the Rocky Mountain Elk Foundation and Rayonier Timberlands, an initial step was undertaken with the fertilization of ninety acres of winter range just outside of the town of Packwood.

Management Conclusions

Elk populations in the Region seem to be in a general decline. Steps to address these declines were initiated during formulation of the 2000-02 hunt package. Allocation of antlerless permits has been reduced in several of the areas of concern. Following the regulation changes, a 45% decrease in antlerless harvest occurred in those areas. Conservative cow harvest will continue in these areas until populations are back at management goal levels. Increases in the amount of elk damage occurring within localized areas of the Region and political pressure complicate the reduction of antlerless opportunity.

Bull escapement continues to be of concern in the Region as well. Analysis indicates that objectives are not being met in many of the open-entry units. After 3 years of implementation, reduction in the general firearm season from 12 to 9 days has not yet resulted in achievement of post-season objectives. The current 3-

year package continues the 9-day season. We will continue to monitor the efficacy of this strategy.

Prior to 2000, the level of population survey in Region 5 was inadequate to determine the effects of both winter severity on calf survival and various harvest regimes on our elk. The utility of spring surveys to determine over-winter calf survival was illustrated in the early 1999 survey (Table 8). Although not suitable for adult sex ratios due to biased samples, spring surveys do provide good indications of calf survival and ultimate recruitment to the population.

The current intensity and coverage of Region 5 fall surveys needs to be continued. Recent survey coverage has been just adequate to provide representative sampling of the entire Region. Population modeling is dependent on good data input. Due to the variability in our elk units, representative survey data must be collected annually. Current pre-season survey intensity needs to remain high, in order to increase sample sizes, reduce confidence intervals, and provide the best model inputs.

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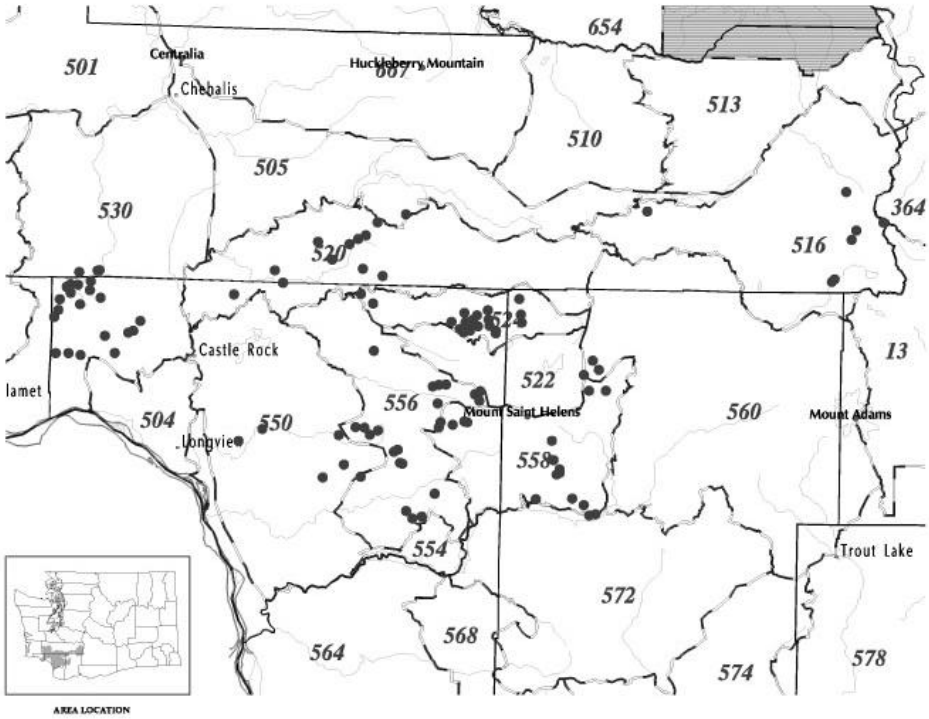

Figure 1. Elk locations during 2000 elk survey.

ELK STATUS AND TREND REPORT: REGION 1
PMUs 61-66, GMUs 601-684

H. M. ZAHN, District Wildlife Biologist

Population objectives and guidelines

The year 2000 hunting season was the first of the 200-2002 three-year season package. Specifically, goals are to increase elk (*Cervus elaphus*) population in suitable habitat while addressing elk damage complaints. On the Olympic Peninsula 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 2000 hunting season the three-point minimum requirement for antlered elk was retained region-wide. A total of 240 either sex or antlerless-only permits were issued to all user groups including Advanced Hunter Education graduates and Persons of Disability. Only 9 of these permits (antlerless-only) were issued on the Olympia Peninsula (Dungeness Damage Area). Based on the state-wide hunter questionnaire the estimate of total region-wide elk harvest was up by 56 percent above that for the previous year. The estimate of the number of elk hunters hunting in Region 6 increased by 43 percent for the same period. Harvest estimates of antlered elk by Population Management Units (PMU) are listed in Table 1. Hunting conditions were typical for the area and season with no unusual dry or inclement weather recorded. All harvest estimates are for state hunting seasons only and do not include harvest by treaty tribes.

During the 2000-2001 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 have taken place with representatives of the Point No Point Treaty Council (Skokomish, Port Gamble S'Klallam, Jamestown S'Klamma, Lower Elwha Klallam), Quinault, Hoh, Quileute and Makah Tribes.

Surveys

During the period of September 21 through October 18, 2000 pre-hunt helicopter elk surveys were conducted in a number of Game Management Units (GMUs). During these surveys elk are classified as cows, calves, yearling bulls (spikes) and branch-antlered bulls (2.5 years old and older). Table 2 summarizes the results of these surveys by GMU.

During the period of March 19-30, 2001, post-hunt helicopter surveys were conducted (Table 3). Post-season surveys have some 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 population of yearling males among antlered elk surveyed in pre-season surveys. Since this method during fall flights is often ends up being a worst case estimator of bull elk mortality. In Region 6 this estimator varies yearly but tends to fall between 50-60 percent total annual mortality rate for antlered elk.

Region-wide the harvest of antlered elk increased to 571 bulls in 2000. This represents an increase of 51 percent over the previous year. The addition of two GMUs in Pierce County account for only 15 percent of this increase. Significant harvest estimate increases again occurred in GMUs in Pacific County.

Population status and trend analysis

During the 2000-2001 time period the elk mortality study in GMU #615 (Clearwater) was continued. The purpose of the study is to assess mortality rates from various sources and focuses on elk at least 1 year old. The results of two years worth of data are presented in Table 4 and represent average annual mortality rates of bulls and cows over a 2-year period. The sample sizes from which these mortality estimates were derived were 40 bulls and 48 cows.

There are some indications that the decline in elk numbers over the level of the 1980's in prime elk habitat on the Olympia Peninsula has stabilized. However, we have not been able to document significant increases. This issue continues to be the focus of much of the technical discussions of the cooperative elk management group (WDFW and Olympic Tribes). The state has continued the moratorium on antlerless harvest on the Olympic Peninsula for the 2000 season. The cooperative elk management group continues to support the cow harvest recommendations presented in Table 5.

Habitat condition and trend

Habitat conditions on managed forest lands continue to be generally favorable for elk, although high road densities are detrimental if open to vehicular traffic. Units that sustained heavy large scale timber harvest during the 1970s (portions of Pacific County) now have large stands of second growth, but we have not documented nutritional stress (due to lack of forage) in those populations. 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 2000 elk season. These include a 3-point antler minimum for legal bulls, conservative cow harvest, where possible, and no 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 1. Antlered elk harvest for the 2000 general elk seasons by PMU.

PMU	Antlered harvest	% change from 1999
61	265	+31
62	88	+252
63	54	-27
64	0	0
65	52	-2
66	57	+8
67	55	-44

Table 5. Maximum cow harvest levels recommended to tribal policy planners in 2000.

GMU	Max cow harvest
601	6
602	22
603	2
607	15
612	7
615	26
618	11
621	12
Total	101

Table 2. Results of pre-season elk surveys by GMU (Fall 2000).

		Antlerless		Antlered		Ratios per 100 cows		
GMU	*n*	Cows	Calves	Spikes	Branch	Calves	Spikes	Branch
602	169	121	30	10	8	25	8	7
612	137	86	31	16	4	36	19	5
615	228	127	73	14	14	57	11	11
648	83	49	23	8	3	47	16	6
658	157	100	41	9	7	41	9	7
673	176	105	45	16	10	43	15	10

Table 3. Results of post-season elk surveys by GMU (Spring 2001).

		Antlerless		Antlered		Ratios per 100 cows		
GMU	*n*	Cows	Calves	Spikes	Branch	Calves	Spikes	Branch
615	133	85	43	5	0	51	6	0
648	319	217	72	28	2	33	13	1
673	245	159	63	21	2	40	13	1
681	72	40	15	15	2	38	38	5

Table 4. The number and associated average annual mortality rates of adult elk in the Clearwater unit by mortality source (July 1, 1999 – June 30, 2001).

Sex	Hunting mortality		Tribal mortality		Unknown mortality		Natural mortality		Total mortality	
	n	rate	n	rate	n	rate	n	rate	n	rate
Bulls	5	0.124	5	0.124	2	0.048	3	0.074	15	0.370
Cows	0	0.000	0	0.000	2	0.035	5	0.089	7	0.124

ESTIMATE OF NON-REPORTED HARVEST OF ELK: REGION 6 PMU 65 – GMU 615

WARREN A. MICHAELIS, District Wildlife Biologist
JACK L. SMITH, Regional Program Manager

Introduction

Recent declines of elk (*Cervus elaphus*) numbers and state harvest within the Clearwater Game Management Unit (GMU 615) prompted region six staff to investigate parameters that might be affecting this population. The main objective was to estimate mortality rates and sources.

In July of 1999, an effort using both regional staff and volunteers from the Kitsap Bowhunters (KBH) was initiated to radio instrument a representative sample of adult elk within the Clearwater GMU 615. Groups of elk targeted included herds that we felt were more vulnerable to human induced mortality sources. These included herds occupying the western half of the GMU where elk are more accessible by road.

During the spring of 2000 a springtime population estimate was achieved. We used this estimate to compare with a previous population estimate in 1995 as a gauge to compare population response to management changes. We have completed two years of survival monitoring and plan to initiate a capture in June for spikes. This will give us three years of data for spikes and four years of data for branch bulls and cows.

Methods

Estimates on the number of adult elk taken by hunters (both state and recognized tribal) are generated through a confirmed and most likely method. Frequent fixed-wing flights are conducted for monitoring of radio equipped elk mortality signals (Smith et. al. 1994). Mortality sources are the determined through ground investigations and survival rates are determined using the Kaplan Meier method adjusted for the staggered entry design (Pollock et al. 1989). For the purposes of this report the following mortality classifications are used:

***State Take*.** Radio equipped 3pt bull taken within either the archery seasons or modern firearm season.

Tribal Take. Radio equipped elk including branch-antlered bull, spike, or cow. Elk determined to be Tribal Takes for the following reasons: 1) During recognized tribal season accompanied with either a strong first-hand report by a witness or tribal member directly turning in radio transmitter. Entire remains of elk taken from kill site: i.e. one spike that was killed in late November with all remains harvested (classified as Tribal Take) vs. a spike killed in mid-February with only a few choice parts taken (classified Poached).

Human unknown. Radio equipped elk that upon investigation had evidence to suggest it was killed by a human. They are also mortalities that occur during a time of tribal hunting activity. Two examples are: 1) A branch bull that was wounded by a modern firearm in late December and not recovered either by the shooter (most likely it was a tribal wounding loss or not recovered by a poacher) and 2) A collar from a cow that was cut-off by a human and pitched into the Hoh River. This occurred during a time when the tribes were actively hunting.

Natural. Radio equipped elk determined to die of either malnutrition or predation.

Poached. Elk taken outside recognized season (cow during modern firearm) or elk regardless of sex/age outside of state and recognized tribal seasons.

Population estimate

Population estimate was generated using a special paint marking – re-sight technique which compares number of marked to unmarked elk present in the population during subsequent re-survey flights. A springtime population for the Clearwater Game Management Unit was achieved in 2000 (WDFW unpublished report).

An estimate of the population in the fall was determined by combining three years of fall composition data and adding to it the average fall calf ratio that would enter the population after July 1. Annually, 32 % of the population in the fall are calves. Source-specific mortality telemetry data were then used to determine the number of elk lost to each documented mortality source.

Tribal harvest of branch bulls was derived for a second estimate by using the annual estimated state harvest of branch bulls in relation to the annual Tribal mortality rate. Two years of harvest estimate data from 1999 and 2000 were used for the estimate.

Results

A total number of 36 cows, 18 branch-antlered bulls, and 14 spikes were marked from July 1999 through August 2000. Four of the 18 total branch-antlered bulls survived from a previous study and were included in the initial sample. From these, a total of 11 branch-antlered bulls, 4 spikes, and 7 cow mortalities were documented

and used to estimate the annual source-specific mortality rate (Table 1).

The spring population estimate was 1,470 " 289. The fall calf population was generated by multiplying the average percentage of calves present in fall flights times the spring estimate (1,470 × 0.32 = 470 calves) which was then added to the spring estimate for a total fall population estimate. The total of 1,940 was then apportioned by fall composition data to estimate the number of adult elk in the population. Mortality rates were then used to estimate the number of elk harvested by each hunting mortality source within GMU 615 (Table 2).

The most likely (ML) estimate of tribal cow harvest is 19 cow elk. In addition, a second estimate for tribal harvest within the Game Management unit was accomplished by using the source-specific tribal rate as a function of state estimated harvest for the unit (Table 3).

Management conclusions

Historically, the Department of Fish and Wildlife has used both fall and springtime composition surveys to determine survival and recruitment rates on elk populations. These methods are however not without problems. Visibility biases especially in areas typical of the Olympic Peninsula present inherent difficulties in achieving a sample size large enough to accurately represent the population under study (Caughly, 1977).

In addition, the use of radio telemetry and the development of more sophisticated analytical methods allows wildlife managers access to information which might not otherwise be available (White and Garrot, 1990, Heisey and Fuller, 1985).

Estimates of tribal harvest differ markedly from those reported for the Clearwater GMU by the Northwest Indian Fisheries Commission annual game harvest report (NWIFC report 1999, 2000). Our estimate of 20- 52 elk (Table 2), taken by tribal hunters within the unit is considerably higher than reported harvest of three elk for 1999 and 8 elk for 2000. This could be the result from either non-reporting by an individual tribe or under-reporting by several tribes hunting GMU 615. The average annual state harvest estimate derived from mortality sources of 28 branch-antlered bull elk compares favorably with the 1999, 2000 average state harvest estimate (Table 3).

We feel we are now accurately accounting for the amount of non-reported harvest, which occurs within this individual Game Management Unit.

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Table 1. Annual source-specific mortality rates derived from radio equipped elk within the Clearwater GMU 615.

	Branch		Spike		Cow	
Source [a]	Conf.	ML	Conf.	ML	Conf.	ML
Tribal	0.35	0.45	0.17	0.17	0.00	0.13
State	0.47	0.47	0.00	0.00	0.00	0.00
Hum. unk.	0.10	0.00	0.00	0.00	0.25	0.13
Natural	0.08	0.08	0.67	0.67	0.75	0.75
Poach	0.00	0.00	0.17	0.17	0.00	0.00
Ann. Mortality rate	0.48	0.48	0.29	0.29	0.13	0.13

[a] Mortality sources presented either as confirmed reports or most likely cause of death

Table 2. Estimate on the number of adult elk lost annually to each hunting source present within the Clearwater GMU 615.

		Tribal		State [a]		Total elk loss	
Cohort	Est. Fall Pop.	Conf.	ML	Conf.	ML	Conf.	ML
Branch bulls	123	20	26	28	28	48	54
Spike bulls	143	7	7	0	0	7	7
Cows	1,204	0	19	0	0	0	19
Total [b]	1,470	27	52	28	28	55	80

[a] No state seasons for spikes or cows within the GMU

[b] Does not include estimated 470 calves present in the fall population

Table 3. Calculation of annual tribal harvest of Branch bulls using estimated state harvest report data within the Clearwater GMU 615.

	Antlered rate		Mean annual state	Est. number of branch bulls harvested [b]	
Source	Conf.	ML	harvest [a]	Conf.	ML
Tribal	0.35	0.45	21	16	20
State	0.47	0.47	21	21	21

[a] Annual published harvest report data

[b] TR/SR x ann. State harvest = estimate

MOUNTAIN GOAT STATUS AND TREND REPORT
Statewide

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

Population objectives and guidelines

Statewide mountain goat population objectives include restoring self-sustaining goat populations to historic ranges in Washington, monitoring individual goat herds so hunting opportunities can be maintained and monitored, and providing recreational viewing opportunities of selected goat herds. The individual herd productivity goal is 25 kids: 100 adults and harvest opportunity is only considered for populations exceeding 30 individuals. For goat populations meeting or exceeding these guidelines, harvested is limited to 4% of the total observed population.

Hunting seasons and harvest trends

Mountain goat hunting opportunity in Washington is limited by permit. Permit availability (and therefore hunter opportunity) has decreased dramatically over the last 10 years (Figure 1). Thirty-eight permits were available in 11 goat management units in 2000 and a total of 4,026 applicants entered the drawing. The 2000 mountain goat season provided 47 days of mountain goat hunting (September 15 to October 31). Hunters were able to use any legal weapon and may harvest any adult goat with horns greater than 4 inches.

Of the 38 permits available in 2000, 35 individuals actually reported that they hunted goats. A total of 30 goats were killed for a hunter success rate of 86%. This was a higher success rate than the previous 3 years.

Given the marginal status of mountain goats (see **Population status** section), only goat populations that are surveyed annually, and meet or exceed population guidelines described above will be considered for hunting in future years.

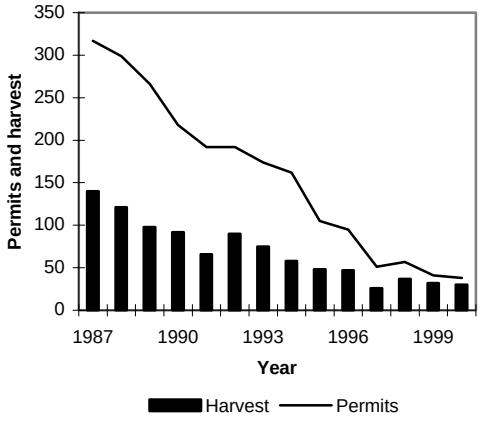

Figure 1. Mountain goat recreational hunting opportunity in Washington.

Surveys

For many years, funding limitations greatly reduced the Departments ability to conduct thorough and consistent surveys. However, during the last two years, funding from cooperative grant sources allowed volunteers and Department staff to survey all goat units during 2000 that were open to hunting. All surveys were conducted using a helicopter and generally occurred between July and September. Because the funding level wasn't enough to survey all goat units, (regardless if they're hunted or not) priority was given to hunted units. As such, no consistent survey effort has been accomplished during the last 3 years for most of the goat units closed to hunting. Those survey efforts in units closed to hunting have typically been funded and conducted via collaboration with land management agencies and tribes.

Darrington surveys

Recently, a partnership composed of the USDA Forest Service, Washington Department of Fish and Wildlife, USDI Park Service, the University of Washington, the Stillaguamish Tribe, and the Northwest Indian Fish Commission was brought together by the Sauk Suiattle Tribe to discuss declining numbers of mountain goats in the Darrington Ranger District, Snohomish County. Several strategies for developing and funding mountain goat research in the area have been discussed and it is likely that a project will be undertaken in the coming years.

A 2-hour helicopter survey was conducted by the Department of Fish and Wildlife on 7 July 2000. A total of 44 goats were counted, of which 20 were seen in the Gamma Ridge area of the Glacier Peak Wilderness. Of these 20 animals, 6 were nannies, 4 were kids, and 10 were unclassified adults. The remaining goats were counted within the Boulder River Wilderness (5 nannies, 6 kids, 5 sub adults, 6 unclassified adults) and on White Chuck Mountain (2 nannies).

North Cascade surveys

Mountain Goat surveys were conducted in north Region Four as part of an interagency cooperative project between the Washington State Department of

Fish & Wildlife, U.S. Forest service and the National Parks Service. The National Parks Service primarily provided funding for this round of surveys with a smaller contribution from U.S.F.S.

WDFW personnel participated in three days of surveys focused upon Mountain Goat populations in three areas; (1) Jack Mountain - GMU 4-9, (2) Mt. Baker - GMU's 4-2, 4-3, 4-4, 4-5, and 4-6 and (3) Nooksack - GMU 4-1 (Table 1).

Table 1. Survey results in North Cascades area.

Goat Unit	Goats Observed	
	Adults	Kids
Jack Mtn.	8	4
Mt. Baker	79	19
Nooksack	10	5

Population status and trend analysis

Mountain goat populations have been on the decline in Washington for many years. Historically, goat populations may have been as high as 10,000 animals. Today goats likely number fewer than 4,000. Hunting opportunity has decreased accordingly, and current permit levels are extremely conservative and represent 4% on the known population in herds that are stable to increasing. Despite continued reductions in hunting opportunity many local goat populations continue to decline. However, despite the overall declining trend in goat numbers and range, a few populations (those currently hunted) are doing well. Goat populations alone the lower Cascade crest and the north shore of Lake Chelan appear to be stable to slightly increasing.

Habitat condition and trend

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

Management conclusions

Mountain goat populations are declining rapidly in Washington State, and a consistent funding base for mountain goat management and research activities is the greatest obstacle for addressing the decline in the short-term. In addition, standardized mountain goat survey protocols are need to better reflect population trends and composition.

In the long-term, better information on current habitat quality and quantity is needed to guide future habitat management activities. Given the broad distribution of goats and the areas they inhabit, these management activities must be a collaborative effort with the Department, land management agencies, tribes, and local or private organizations.

MOUNTAIN GOAT STATUS AND TREND REPORT: REGION 1
Linton Mountain

DANA L. BASE, Associate Wildlife Biologist
STEVE ZENDER, District Wildlife Biologist

Population Objectives/Guidelines

The current population objective for the Linton Mountain Goat Herd is to maintain a viable population for public viewing. The Linton Mountain area received national recognition when the U.S. Forest Service recognized the Sullivan Lake District of the Colville National Forest with an award for developing a public mountain goat viewing area. The area was developed in partnership with the Washington Department of Fish and Wildlife, local industry, and the Inland Northwest Wildlife Council.

Hunting Seasons And Harvest Trends

Mountain goats at Linton Mountain were hunted from 1972–1976. The number of permits authorized annually ranged from 5 to 15 and animals harvested ranged from 4 to 11. Hunters took a total of 34 mountain goats over the 5-year period. As reported by Guenther (1972), mostly nannies were killed. Hunting has not resumed at Linton Mountain since 1976, as the goat population has not consistently met Department guidelines for recreation hunting.

Surveys

Surveys of the Linton Mountain Goat Herd are generally accomplished by ground-based counts. Excellent views of nearly the entire goat range are afforded by vantage points along Boundary Road near the town of Metaline Falls. Additional vantage points are on a primitive road that services a high voltage power line with a wide right-of-way clearing parallel to the goat cliffs. Surveys seem to be most productive when conducted either early or late in the day. In recent years the counts have been so low that multiple visits have become necessary to improve the likelihood of seeing any goats.

Personnel conducted three ground-based surveys in 2000, plus a helicopter survey of goat cliffs on October 04, 2000. The highest count was three adult mountain goats observed on April 26 and May 10, 2000. Only two goats were observed during the October surveys, which included the helicopter survey. Debbie MacArthur (pers. Comm. 2000), a WDFW volunteer who lives near goat cliffs, reported observing a nanny and one kid in late October, 2000. A ground-based survey will be completed during the fall of 2001; however, ad-hoc viewing opportunities by MacArthur have resulted in only 1 goat observation through summer, 2001.

Population Status And Trend Analysis

So far as we know, mountain goats did not occupy Linton Mountain since Euro-American settlement until 7 animals were released there by Washington Department of Game in 1965. The original herd came from Nason Ridge in Chelan County and consisted of 2 billies, 4 nannies, and 1 female kid. In 1981, 11 mountain goats from the Olympic Mountains were trans-located to Hooknose Mountain, which is roughly 5 miles north of Linton Mountain. At least 3 of these 11 new goats, 2 billies and 1 nanny, were subsequently found at Linton Mountain.

Until October of 2000, only one mountain goat kid had been identified since 1994. Prior to 1994, kids were observed every year in which adequate population surveys were carried out (Table 1). Adult goats surveyed from 1994 to the present may have included yearlings. The two age classes are often lumped due to difficulty distinguishing them at long viewing distances. The mountain goat population at Linton Mountain is perilously low and unproductive. Reasons may include poor habitat conditions, the recent severe winters of 1992-93 and 1996-97, and predation.

Habitat Condition And Trend

No recent comprehensive surveys of mountain goat habitat have been made at Linton Mountain. Both quantity and quality of forage along with predator escape terrain may be limiting factors to goat population growth. Controlled burns may be a strategy to enhancement goat habitats in the area. The Sullivan Lake Ranger District has developed a controlled burn plan but has not implemented it thus far. The long-term goal continues to be to improve foraging habitat on Linton Mountain but the few goats remaining there now are likely not limited by forage quantity.

Augmentation

There are no current plans for population augmentation. As the pool of breeding animals is dying out since the population peak ten years ago. A new introduction is likely necessary to keep the herd viable.

Management Conclusions

At present, there are too few goats remaining in the Linton Mountain Goat Herd to provide a reasonable viewing opportunity. The population is perilously near extinction. While opportunities for augmentation are not on the immediate horizon, augmentation will likely be needed to re-establish this goat-viewing site.

Personnel we will continue ground-based surveys to document how many animals are present. Since surveys are labor intensive, qualified survey volunteers who possess necessary optical equipment will be enlisted whenever possible.

Literature Cited

Guenther, S.E. 1972. Linton Mountain Goat Study. Unpublished report for the Washington Department of Game. Olympia, Washington, USA.

Table 1. Status of Linton Mtn. mountain goat herd, 1965-1999.

Year	Kids	Adults	Population Estimate	K:100
1965 [a]	1	6	7	17
1966	b	b	7	b
1967	b	b	9	b
1968	b	b	11	b
1969	b	b	14	b
1970	b	b	18	b
1971	8	b	23	b
1972 [c]	8	b	32	b
1973 [c]	b	b	32	b
1974 [c]	b	b	35	b
1975 [c]	b	b	33	b
1976 [c]	4	b	34	b
1977	b	b	b	b
1978	b	b	b	b
1979	b	b	b	b
1980	b	b	b	b
1981	b	b	b	b
1982 [d]	5	8	20	62
1983	3	12	25	25
1884	1	10	25	10
1985	6	12	25	50
1986	7	25	35	28
1987	6	21	35	29
1988	7	24	40	29
1989	6	20	40	30
1990	1	9	40	11
1991	1	13	25	8
1992	7	26	33+	27
1993	4	16	20+	25
1994	3	13	16+	23
1995	0	18	18+	0
1996	0	9	10-20	0
1997	1	9	10	11
1998	0	5	5+	0
1999	0	6	6	0

[a] Year that 7 Mountain Goats were translocated from Chelan County to Linton Mountain.

[b] No survey data available.

[c] Years that herd was hunted by special permit.

[d] Year that 3 marked Mountain Goats were identified at Linton Mountain that came from failed release of 11 animals at Hooknose Mountain in 1981.

MOUNTAIN GOAT STATUS AND TREND REPORT: REGION 2
Chelan County

TOM McCALL, Wildlife Biologist

Population objectives and guidelines

The management objective for Chelan County mountain goats is to provide recreation-hunting opportunity for goats while maintaining a healthy and sustainable population (Table 1). For goat herds of sufficient and stable size, harvest levels are managed at 4% of the total, estimated goat population.

Hunting Seasons and Harvest Trends

No goat harvest has occurred in Chelan County in over 20 years. The 2001 survey data indicated the six mountain goat units in Chelan County are below population objectives (Table 1). However, the goat population on the north shore of Lake Chelan is strong and exceeds the population threshold required for a conservative harvest. As such, harvest opportunity for 2 goats will be offered for this area in fall 2001.

Surveys

Three survey methods are used to monitor mountain goat populations in Chelan County. As part of a hydropower relicense 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).

Washington Department of Fish and Wildlife personnel accompany PUD personnel on one survey per year. For Lake Chelan, the total number of known goats is the result of comparing all surveys completed during each winter.

In other areas of Chelan County, a helicopter has been used in recent years to survey selected mountain goat areas. Incidental surveys are done in conjunction with other work to supplement survey efforts. Because of difficult terrain and low population densities, mountain goats are expensive to monitor. However, from 2000 to 2002, funding for mountain goat surveys has been acquired and one fall survey per year will be completed. We have set population objectives for each geographic mountain goat area within the Wenatchee District.

Population Status And Trend Analysis

Mountain goat populations in Chelan County are below historic levels found in the 1960s to 1980s. Except for the Lake Chelan population, mountain goats are not monitored closely enough in the Chelan County to precisely describe population trends. But, from 1996 to 2000, the estimated Chelan County goat population appears stable (Table 1). In 2000, based on our best available information, the Chelan County mountain goat population was estimated at 155 animals, the same as the average during 1996-1999. In 1998, the Cascade Mountains received more snow than any year since 1956. Some areas set all-time records for snow pack. These heavy snows probably increased mortality of goat populations. The winters of 1999 and 2000 were milder.

The current Lake Chelan goat population is considerably less than the estimated 500 goats found in the area in the 1960s. The Lake Chelan populations have been closely monitored for the past 15 years. The trend in the goat population for Lake Chelan from 1990 to 2000 is stable (Table 2). There has been no significant change (P = 0.92) in the number of kids produced for Lake Chelan during 1990-2000. There were 24 kids produced in 2000, compared to the average of 17 kids per year between 1990-1999.

In fall 2001, the Chiwawa and East Stevens areas

Table 1. Number of mountain goats surveyed in Chelan County, 1996-2001.

	Year						
Area [a]	1996	1997	1998	1999	2000	Survey objective	% from objective
N. Lake Chelan	42	80	64	58	68	100	-32
S. Lake Chelan	13	44	41	40	31	50	-38
Stehekin	4		5		6	25	-76
Chiwawa	14	15			12	30	-60
N. Wenatchee River	42	6	27	35		50	-30
E. Stevens	33	14	13		1	45	-98
Total	123	163	150	133	118	280	
Estimated population size	125	165	165	165	155		

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

were surveyed by helicopter. Twelve adult goats were observed in the Chiwawa area and 1 adult goat in the East Stevens area. The lack of kids in these areas in 2001 is of concern. The drought conditions in summer 2001 may have reduced the survival of kids because of lack of forage.

In fall 2000, the North Wenatchee River area was surveyed intensively by helicopter and from the ground. During the survey 35 goats (25 adults, 10 kids) were counted.

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 goat population will probably incur some mortality this winter, due to the lack of winter forage. By the following spring, however, the goat population should begin to benefit from the burn through enhanced quality and quantity of forage.

Habitat Condition And Trend

Fire suppression during the last 50 years has probably decreased forage for mountain goats. Most mountain goat habitat in Chelan County 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. The Rex Creek burn on the north shore of Lake Chelan in 2001 should enhance goat habitat in this area over the long-term.

Management Conclusions

Mountain goat populations in Chelan County are below historic and objective levels. All populations are expected to gradually increase to objective level. As populations reach objectives, WDFW consider conservative hunting opportunities.

Table 2. Mountain goat population composition for Lake Chelan, Chelan County, 1990-2000.

Year	No. kids	No. adults	Unk.	Population estimate	No. kids: 100 adults
1990	18	98		116	18
1991	27	155		185	17
1992	16	88		104	18
1993	13	92		105	14
1994	25	98		123	26
1995	12	109		121	11
1996	7	47		70	15
1997	18	105		124	17
1998	17	93		110	18
1999	19	79		98	24
2000	24	76	5	105	32

MOUNTAIN GOAT STATUS AND TREND REPORT: REGION 2
Methow and Mount Chopaka

SCOTT FITKIN, District 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. Incidental observations suggest goats are beginning to recolonize historical range along the "goat wall" west of Mazama. Animals in this portion of the unit are often viewed at a salt lick along the Hart's Pass Road, providing a favorite watchable wildlife opportunity. Unfortunately, productivity has been down the last two years, potentially the result of dry conditions. This may retard herd expansion.

The Chopaka goat herd is limited in size, and is likely in decline. This herd provides excellent viewing opportunities for the general public and is managed primarily as a watchable wildife resource. Harvest in this unit was suspended in 1999.

Hunting Seasons And Harvest Trends

Hunters enjoyed fair conditions; the high country remained accessible throughout the season, but the landscape was very dry and the weather quite mild. Five permits were issued for the Methow Unit (Table 1), and no permits were issued for the Mt. Chopaka Unit (Table 2). For 2001, WDFW issued only two permits in accordance with herd management guidelines.

During the 2000 season, hunters filled all five permits issued for the Methow Unit, and hunted for an average of 7 days. On average hunters saw more than 23 goats apiece, including several kids.

Table 1. Summary of harvest information for mountain goats in the Methow Unit.

Year	Permits	Hunters	Harvest	Success	Goats Seen/Hunter
1991	5	5	4	80%	--
1992	5	5	5	100%	21
1993	8	8	7	88%	31
1994	8	7	6	86%	26
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

Table 2. Summary of harvest information for mountain goats in the Mt. Chopaka Unit.

Year	Permits	Hunters	Harvest	Success	Goats Seen/Hunter
1991	2	2	2	100%	--
1992	2	2	2	100%	6
1993	2	2	1	50%	9
1994	1	1	1	100%	15
1995	1	1	0	0%	0
1996	1	1	1	100%	2
1997	1	1	1	100%	17
1998	1	1	1	100%	6
1999	0	0	0	---	---
2000	0	0	0	---	---

Surveys

Biologists conducted aerial surveys of both units in the Okanogan District in late June, 2001. WDFW has adopted a policy of not offering permits in any Units not adequately surveyed. Funding for the effort came from a co-op project utilizing private grant money from a variety of sources, as well as matching state dollars. Surveys located only 60 goats in the Methow Unit, despite a an intensive search effort. Only 2 adult goats were seen in the Chopaka Unit; however the survey was not comprehensive due to funding limitations. As a result no more than two permits are likely to be issued in the Methow Unit, and none in the Chopaka Unit for 2002.

Population Status And Trend Analysis

Several years of survey data from the Chopaka Mountain area indicate low productivity, and a herd likely in decline (Table 3). Goats appeared to flourish in the area after the last major fire in 1919; however, no major fires have occurred since. A reduction in habitat quality may be responsible for the downward trend. A paint ball marking effort in 1997 produced a population estimate of only 24 animals.

In the past, funding shortfalls have resulted in inconsistent data collection in the Methow Unit, and inferences about population levels and trends in this unit are rather speculative. Survey funding is hopefully becoming more secure. Recent data indicates productivity has declined in the short-term. This may be a result of reduced forage quantity and quality during two consecutive dry years. It could also be indicative of advancing plant succession since the 1985 fires, suggesting a long-term decline in forage

Table 3. Population composition counts from the Mt. Chopaka Unit. K:100 is kids per 100 adults.

Year	Kids	Adults	Population Estimate	K:100
1991	26	6	--	23:100
1992	4	28	--	14:100
1993	2	18	--	11:100
1994	3	9	--	33:100
1995	--	--	--	--
1996	4	16	--	25:100
1997	2	11	24	18:100
1998	--	--	--	--
1999	--	--	--	--
2000	2	10	--	20:100
2001	0	2	--	0:100

resources and a corresponding decline in goat productivity (Table 4). Up until now, herd demographics have been strongest in the Gardner Mountain portion of the unit, where recent fires have had favorable effects on goat habitat.

A small number of mountain goats are widely scattered throughout suitable goat habitat in the western portion of the Okanogan District outside of the established goat units. Little survey work has been done in these areas due to lack of resources. Population size or trend is unknown for these animals, although anecdotal information from outfitters suggests a growing population in the Amphitheater Mountain area of the Pasayten Wilderness, and more than a dozen animals in the Isabella Ridge area .

Habitat Condition And Trend

All goats in the Okanogan District enjoyed mild conditions last winter. Winter mortality should not have been a significant factor for either population.

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, in areas of recent fire activity, goats benefit from favorable foraging conditions. On the other hand, range quality in heavily forested areas suffers from fire suppression, and could benefit from some pro-active fire management.

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.

Management Conclusions

Through the years, both survey effort and results have been highly variable in this district, yet the management objective of harvesting no more than four percent of a herd hinges on reliable survey data. As a result, emphasis should be placed on providing the resources necessary for a consistent survey effort, and developing a more comprehensive, standardized, and reliable survey technique.

Goat populations in the Methow Unit are the most robust in the district, but require diligent scrutiny, due to falling productivity. Suitable goat habitat adjacent to this unit is sparsely populated at best, 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. If in practice, the Methow herd grows but exhibits little dispersal, animals could be actively relocated to other suitable areas in the district.

Productivity in the Mt. Chopaka Unit remains poor, and the population is likely in decline. As a result, harvest should remain suspended until reliable survey data over successive years indicates compliance with state-wide population and productivity thresholds. This herd is an important wildlife resource for both consumptive and non-consumptive recreation. Land managers should explore the feasibility of using prescribed burns to enhance existing goat habitat, and improve herd productivity.

Table 4. Population composition counts from the Methow Unit. K:100 is kids per 100 adults.

Year	Kids	Adults	Population Estimate	K:100
1994	6	25	--	24:100
1995	--	--	--	--
1996	16	41	--	39:100
1997	20	49	--	41:100
1998	--	--	--	44:100
1998	--	--	--	--
2000	11	36	--	31:100
2001	10	50	--	20:100

MOUNTAIN GOAT STATUS AND TREND REPORT: REGION 3
Naches Pass, Bumping River, Tieton River, Blazed Ridge, and Kachess Pass

JEFFREY A. BERNATOWICZ, District Wildlife Biologist

Population Objectives/guidelines

The objective is to maintain stable goat populations in all goat units for public viewing and hunting opportunities. 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 2000, there were 15 permits spread over the 5 units (Tables 1-5). Thirteen of 15 permit holders were successful.

Surveys

Personnel conducted surveys for all goat populations hunted in fall 2000 (Tables 1-5). Historically goat surveys were conducted in June 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 June surveys.

In 2001, helicopter surveys of all units open to hunting were conducted July 27 –August 25. Surveys were generally conducted from sunrise until 11 am. Goats seemed most active and visible during the early morning hours. The later morning flights (Blazed Ridge, Naches Pass) tended to yield low counts.

Population Status And Trend Analysis

The status of mountain goat populations is difficult to determine. Surveys techniques have not been tested for accuracy or precision. Historic survey timing and technique within the region has not been consistent enough to allow for meaningful trend analysis. The best we can do is guess at trends from the available data.

The Tieton River population appears to be stable or increasing. The 2001 survey documented a record number (113) of goats in the unit (Table 1). Historic harvest has averaged 3.1 (3% of maximum count) goats per year in the Tieton. However, Tieton and Goat Rocks are the same population of goats. Surveys in 2001 show the majority of goats in both units were within 2-3 miles of the dividing line. If Goat Rocks harvest and population are included, harvest has exceeded 4% in the last 10 years.

The status of the goats in the Bumping unit is unknown. The Bumping hunters in 1999 reported a record number (60 per hunter) of goats (Table 2) while surveys have not indicated any pattern (Table 7). The unit is difficult to survey because of abundant hiding cover. In 2001, the number of goats seen on surveys was similar to 1996 and 1997. Harvest in the early 1990s in Bumping averaged 10% of the highest count (78) while the kid:adult ratio averaged 18:100. This harvest may have been high enough to cause a population decline. Since 1995, harvest has averaged 3.6% of the peak count (61) while the kid ratio has averaged 31:100.

The number of goats seen on surveys in the Naches Pass unit has fluctuated between 118 ands 21 total goats (Table 3). There has been a downward trend in the number of adults seen since 1995. Only 21 goats were documented in 2001. The low number was probably the result of goats being in cover during a late morning survey. Hunter reports from the unit have been variable (Table 3). Harvest in the early 1990s average 6% of the high count while recruitment averaged 24 kids:100 adults. Harvest may have been excessive given recruitment.

Blazed ridge has only been surveyed and hunted 5 years (Tables 4). Results have been extremely variable with no distinct trend. Harvest has averaged 2.5% of the maximum count (139 in 1997) and kids per adult has consistently been >32:100. The large decline in goats seen since 1997 is a concern. Much of the area has been heavily logged in the past few years and winter range may have been lost.

Surveys in the Kachess Ridge unit also indicate a potential population decline (Table 5). Flights in 2001 only documented 28 goats. Most of the animals were in heavy timber and lower elevation than expected. Large number of animals could easily have been missed on the surveys. Annual harvest has only been 1 (2.7% of count in 2000).

Habitat Condition And Trend

The majority of goats in the Bumping, Tieton, and Naches Pass units are in Wilderness Areas where populations are probably more influenced by weather than changes in habitat. Snowfall in the high elevations had been above average over much of the 1990s. There is no comprehensive documentation of where the goats in these units winter.

The Blazed Ridge and Kachess Units are mostly outside of wilderness areas. Timber harvest has occurred in both units. The north portion of the Blazed ridge unit has been particularly heavily harvested. The timber cutting may have removed winter cover. Roads densities have also increased. There are often roads at the top and

bottom of every ridge. ORV use is heavy in the Blazed Ridge Unit.

Management Conclusions

Goat populations in Region 3 may be declining. Historical harvest probably exceeded our current goal of 4% of a healthy and stable population. Determining if 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. Ideally, goats should be radioed or winter surveys conducted to determine winter range. If heavy timber is important to goats, populations such as Blazed Ridge may be in trouble.

Table 1. Summary of harvest and survey information for Tieton goat Unit.

	Harvest Information				Survey Data			
Year	Permits	Hunters	Harvest	Goats Seen/Hunter	Kids	Adults	Total	K:100
1990	5	5	4	27				
1991	5	5	4	13	7	21	28	33
1992	5	5	3	22				
1993	5	2	2	24	11	39	50	28
1994	5	5	4	49	11	21	32	52
1995	3	3	3	53	9	72	81	13
1996	5	5	4	28	30	60	90	50
1997	1	1	1	46	17	73	90	23
1998	3	3	3	53				
1999	3	3	3	7				
2000	3	3	3	43	23	81	104	28
2001	3				29	84	113	25

Table 2. Summary of harvest and survey information for Bumping River goat unit.

	Harvest Information				Survey Data			
Year	Permits	Hunters	Harvest	Goats Seen/Hunter	Kids	Adults	Total	K:100
1990	15	14	11	14				
1991	10	9	7	17	5	12	17	42
1992	10	10	9	19	12	66	78	18
1993	6	6	5	17	7	43	50	16
1994	6	5	4	16	5	35	40	14
1995	2	2	2	49	3	30	35	17
1996	6	5	5	28	20	39	59	51
1997	1	1	1	15	12	49	61	25
1998	2	2	2	15				
1999	2	2	2	60				
2000	2	1	1	8	7	22	39	32
2001	2				14	46	60	30

Table 3. Summary of harvest and survey information for Naches Pass goat unit.

	Harvest Information				Survey Data			
Year	Permits	Hunters	Harvest	Goats Seen/Hunter	Kids	Adults	Total	K:100
1989					24	94	118	26
1990	8	7	7	65				
1991	8	5	4	25	10	42	52	24
1992	8	8	8	34	11	86	97	13
1993	10	9	9	26	5	18	23	28
1994	10	8	7	31	13	27	40	48
1995	1	1	1	40	9	78	87	12
1996	10	9	7	36	23	58	81	40
1997	1	1	1	15	10	55	65	18
1998	3	3	3	34				
1999	3	3	3	36				
2000	3	3	3	22	21	48	69	44
2001	2				3	18	21	17

Table 4. Summary of harvest and survey information for Blazed Ridge goat unit.

	Harvest Information				Survey Data			
Year	Permits	Hunters	Harvest	Goats Seen/Hunter	Kids	Adults	Total	K:100
1991					9	22	31	41
1992								
1993								
1994								
1995								
1996	3	2	1	31	27	57	79	47
1997	1	1	1	83	40	99	139	40
1998	6	6	6	20				
1999	6	6	6	27				
2000	6	6	5	49	18	43	61	42
2001	2				13	40	53	32

Table 5. Summary of harvest and survey information for Kachess Ridge goat unit.

	Harvest Information				Survey Data			
Year	Permits	Hunters	Harvest	Goats Seen/Hunter	Kids	Adults	Total	K:100
1991					21	39	60	54
1992					7	18	25	39
1993					14	44	58	32
1994								
1995								
1996	1	1	1	40	11	25	36	44
1997	1	1	1	20	1	5	6	20
1998	1	1	1	40				
1999	1	1	1	20				
2000	1	1	1	8	5	32	37	16
2001	1				6	22	28	27

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

MIN T. HUANG, 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). 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 objective 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 1999: Smith Creek, 3; Tatoosh, 5; and Goat Rocks, 7.

Hunting seasons in all three units have traditionally been the last two weeks of September and the entire month of October. In 2000 the season 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 mountain goat populations in the three units. Much variability exists, however, in the hunter survey data, and one must use caution in the interpretation of these data (Table 1). Aerial surveys conducted by WDFW and USFS indicate that mountain goat populations in the Goat Rocks Unit may be declining (Tables 2-3). 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.

Weather conditions in 2000 were variable 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. Both animals taken during 2000 were likely resident animals, as harvest occurred in the middle of September. Weather conditions moderated as September progressed, and cooler weather prevailed during most of October. Harvest in Smith Creek occurred during the first week of October. Harvest in Goat Rocks was distributed throughout the first month of the "any weapon" season.

Overall, hunter success in all goat units in 2000 was slightly down from the previous two years (Table 1). Historically, success rates in the Goat Rocks Unit approach 100%; this was the case in 2000. 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 are stable (P=0.84). The number of goats seen by hunters is also stable (r=0.32, P=0.45). The 2000 harvest consisted of 4 billies and 2 nannies.

Since 1993 success rates in Tatoosh have also been stable (r=0.86). Goat sightings per hunter were up (r=0.87, P=0.005), though many sightings are from areas north of the hunt unit boundary, in Mount Rainier National Park. In 2000, 2 billies were taken.

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 couple 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. Hunter success has been stable (r=0.39). The number of goats seen, however, has been declining (r=0.72, P=0.04). In 2000, hunters took 1 billy and 1 nanny.

Surveys

From 1993-97 surveys were concentrated in the Smith Creek Unit. A cooperative project between the Gifford Pinchot National Forest-Cowlitz River District and WDFW allowed for the use of helicopter surveys in Smith Creek. The results of those surveys indicated that the conservative permit allocations in the unit were sustainable. Despite the continued presence of factors that make this population susceptible to over-exploitation (easy access, limited quality habitat) goat populations in

Table 1. Hunter survey summary statistics for Region 5 mountain goat harvests, 1993-2000.

Unit	Year	Permits issued	Harvest	Number hunters	Success (%)	Mean goat Seen (+SE)	Adult:kid seen	Mean days Harvest goat
Smith	2000	3	2	2	67	16±4	60±23	14.5
Creek	1999	3	2	2	100	4±3	25±20	1.0
	1998	3	2	2	67	21±4	36±24	7.7
	1997	3	1	2	50	25	67	9.5
	1996	5	2	2	40	42±10	26±15	12.5
	1995	5	2	4	50	24±4	14±14	22.5
	1994	3	2	2	67	17±8	28±24	6.0
	1993	3	2	2	67	53±6	59±30	11.0
Goat	2000	7	6	6	100	55±30	28±6	3.2
Rocks	1999	7	7	7	100	52±22	20±13	2.7
	1998	7	7	7	100	32±12	43±19	3.2
	1997	10	9	9	100	19±4	30±20	2.8
	1996	10	6	9	67	55±9	36±17	5.8
	1995	10	10	10	100	40±7	42±23	2.2
	1994	10	10	10	100	46±8	39±19	2.3
	1993	10	10	10	100	37±7	39±21	1.9
Tatoosh	2000	5	2	2	40	14±4	40±10	10.0
	1999	5	2	3	67	22±12	35±25	18.0
	1998	5	2	4	50	15±7	54±28	7.5
	1997	5	1	1	20	9±3	16±16	8.0
	1996	5	1	3	33	9±7	37±32	35.0
	1995	5	3	4	75	7±3	28±22	6.0
	1994	5	2	2	40	3±1	33±33	15.0
	1993	5	2	2	40	3±2	15±15	12.5

Smith Creek continue to exhibit high overall productivity and relatively high numbers.

In 2000, cooperative funding from the USFS allowed for 2 aerial surveys, one conducted in late June, and the other in early August. Surveys concentrated on Smith Creek and Goat Rocks. In addition to WDFW surveys, USFS wilderness rangers were requested to note locations and composition of goats during the summer. All goats were classified as kid, adult, or yearling. A kid-to-adult ratio was calculated from survey results. Ninety-percent confidence intervals around the ratios were determined following Czaplewski et al. (1983).

Survey coverage of the Smith Creek Unit was very good on both flights. The early flight in Goat Rocks was more intensive than the late flight. This was due to certain stipulations placedupon the use of the funding. There was little variation in the total number of goats observed between the 2 flights (Tables 2 and 3). There was a difference in the Smith Creek Unit in the kid:adult ratio between the 2 surveys. Both surveys in the Goat Rocks resulted in similar productivity estimates, although the early survey was conducted too early to capture all of the productivity. All kids observed in June were very small, so we likely missed some nannies with new kids.

The kid:adult ratios from the late survey were 24"7:100 in the Goat Rocks and 43"8:100 in Smith Creek. The observed productivity in Goat Rocks continues to be low. The results of the survey tend to substantiate concerns over lower productivity in the Goat Rocks.

A question arises from these aerial count results. What is the level of sightability bias associated with the surveys? Previous studies have attributed estimates of bias ranging from 59% (Brent 1960) to 75% (Adams and Bailey 1982) of the total population. Houston et al. (1986) determined bias estimates of 0.66 for helicopter surveys in the Olympic National Park. In open habitats, such as Goat Rocks, aerial surveys are likely capturing upwards of 60% of the total population. In more timbered areas, such as Smith Creek, the percentage is likely lower than that reported by Brent (1960).

Another confounding factor, at least in the Goat Rocks, is the amount of mixing that occurs across the administrative boundary of the Goat Rocks and Tieton hunt units. The boundary is the Cascade Crest Trail. Most goats observed in the Goat Rocks, at least, are found within 5 miles of the Crest. Recently, concern has been voiced about the possibility of ›double-counting: animals in the surveys which take place in each unit. Since the flights are not coordinated, goats observed on the Goat Rocks side in one survey may be on the other side of the administrative boundary when the Tieton survey is conducted. Thus, population estimates for each unit may be exaggerated. A joint survey of the Tieton and Goat Rocks will take place in 2001. This should provide needed information on just how many animals are in each unit.

Population Status And Trend Analysis

Goat populations in Tatoosh and Smith Creek seem to be stable. Present permit allocation is conservative enough that removal of nannies in Smith Creek and Tatoosh is not having a detrimental effect on productivity. Hunter success rates have also been stable in both of these units. Reliance solely upon hunter success rates, however, is impractical, due to small sample sizes. Changes or inferred stable trends can be biased merely by sampling error (Caughley 1977). The number of goats seen by hunters, however, has been declining in Smith Creek. Survey results in 2000, however, did not differ significantly from aerial survey efforts in 1997, indicating a high likelihood of overall population stability.

Table 2. Survey results of goat flight, June 27, 2000.

Location	Adult	Ylg	Kid	Total	Kid:Adult
Smith Creek Unit	21	0	2	23	10:100
South Point	12	0	0	12	
Stonewall Rdg	9	0	2	11	
Goat Rocks Unit	52	8	10	70	19:100
Lost Lake	5	1	0	6	
Chimney Rock	6	1	4	11	
Johnson Peak	31	5	6	42	
Goat Lake	10	1	0	11	

Table 3. Survey results of goat flight, August 15, 2000.

Location	Adult	Ylg	Kid	Total	Kid:Adult
Smith Creek Unit	23	0	10	33	43:100
Stonewall Rdg.	11	0	5	16	
South Ridge	8	0	4	12	
Smith Ridge	4	0	1	5	
Goat Rocks Unit	50	0	12	62	24:100
Jordan Cr.	6	0	2	8	
Goat Lake	24	0	2	26	
Cipus Pass	20	0	8	28	

Population status in the Goat Rocks, however, is unclear. Although success rates have typically been 100%, declining productivity and the residual effects of 2 consecutive heavy snowfall winters may be responsible for a decline in the population. Based upon studies conducted in other mountain goat habitats, we are observing between 59% and 75% of the total population in the August aerial surveys. Even if a low estimate of 50% sightability is applied to the 2000 survey effort, the total estimated population in the Goat Rocks is ~140 animals. The estimate in 1995 was 250-300. The movement of goats on either side of the Crest also needs to be determined.

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**). Sightings of ear-tagged Smith Creek transplants in the Mt. Adams Wilderness indicate that goats are likely expanding their range. Long-term changes in habitat, 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 (Table 4).

The documented loss of alpine meadow in the study area equals a 20.8% decrease. Of the 1,540 acres of alpine meadow present now in the study area, only 311 acres (20.2%) have low conifer intrusion. The remaining alpine meadows have—moderate (53.8%) and high (26.0%) levels of conifer intrusion. Meadows with high to moderate conifer intrusion can be expected to become un-suitable for goats within 35 years. Avalanche chutes comprise an additional 1,047 acres of marginal goat habitat.

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-

Table 4. Analysis of alpine meadow in the Smith Creek Goat Unit. (From T. Kogut, USFS).

Ridge system	Historic Meadows (ac.) (1959)	Recent Meadows (ac) (1990)	Difference (ac)
Stonewall	348	259	-89
South Point	749	529	-220
Smith	248	195	-53
Castle Butte	599	557	-42
Total	1944	1540	-404

specific competition that occurs in the alpine meadows will favor elk. Thus, the need for restoration and preservation of these areas is paramount to continued healthy goat populations.

Habitat Enhancement

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

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

Management Conclusions

All three mountain goat units in Region 5 are valued for both viewing and hunting opportunities. Consequently, harvest quotas are kept conservative to maximize both the consumptive and non-consumptive recreational attributes of these populations.

Research is needed to develop population estimates and models for the goat populations in Region 5. Marking of goats with highly visible, numbered ear tags, and colored collars, in conjunction with the use of an open population model such as the Jolly-Seber, or Pollack's robust design, could provide a useful population estimator and model. Both these methods provide estimates of survival, productivity, and total population size at each sampling interval. Re-marking could be achieved through ground surveys and hunter surveys. Due to relatively small population sizes, the initial marked sample sizes needed for acceptable precision and low variance of the estimate would not be excessive. Due to the openness of the habitat, a mark-resight study of goats may not experience the observational bias and lack of capture heterogeneity that often plague such studies (McCullough and Hirth 1988). Should acceptable variance and model outputs be obtained, accuracy and reliance upon current trend data could be evaluated. Smaller scale mark-resight efforts could be employed to develop an aerial survey sight bias model also.

The continuation of annual aerial surveys is needed. In the absence of an extensive mark-resight population estimate, however, sightability bias estimates must be developed in order to maximize the utility of on-going aerial survey efforts. Development of a sightability bias estimate may be less expensive than intensive mark-resight methods and would provide information applicable to most mountain goat range within Washington.

Without a decent 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 (Festa-Bianchet and Urquhart 1994), are highly susceptible to over-harvest. Presently, our information about goat population dynamics is limited. Although hunter report cards provide information on demographic parameters, these data are highly variable. Between year variation in hunter observed ratios within each goat unit is significant (B_c = -845.2, $P < 0.001$). This is further evidenced by the large confidence intervals around the estimates (Table 1). This is likely due to hunters observing and counting the same groups of goats repeatedly, variability of days spent hunting, some mis-classification, 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 un-suitable matrix lands. Potential corridors between such areas could then be managed for goats.

Based upon the results of the cooperative Cispus AMA study, alpine meadow restoration in the Smith Creek Unit is recommended. This will require USFS funding and environmental approvals.

Augmentation/translocation Recommendations

None are needed nor recommended.

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MOUNTAIN GOAT STATUS AND TREND REPORT: REGION 4
Foss River, Pratt River, Corral Pass

ROCKY SPENCER, District Wildlife Biologist

Population objectives and guidelines

Mountain goats (*Oreamnos americanus*) are important in Washington for recreational viewing and hunting opportunities. Conservative harvest management strategies have been implemented to accomplish both objectives. Despite these efforts many local and regional populations have declined. Harvest management objectives are established at 4% of the observed goat population.

WDFW currently lacks the baseline population information for many goat populations to consider implementing any harvest strategy. When coupled with limited survey dollars, habitat loss, road construction, and hunting, there is concern that population harvest quota objectives may have been exceeded in the past, possibly contributing to local and regional population declines.

Hunting seasons and harvest trends

Hunting has been by permit only and was open to hunters from September 15 (September 1 for archery hunters) to October 31. Between 1990-1996, WDFW issued a total 10 harvest permits each for Foss and Pratt Rivers. However, due to a decline in goats observed by hunters and during annual surveys, permits were scaled back to 5 for each unit in 1997 (Table 1). Goat populations have continued to decline in both areas. As such, only two permits were issued for Foss River in 1999 and no permits were issued in Pratt River. In 2000, Foss River also was closed to hunting. Goat hunting continued in Corral Pass with 2 permits annually (Table 2).

Since the circumstances surrounding mountain goat hunting can vary notably from year to year (because of snowfall, cloud cover, visibility, hunter skill and effort), yearly totals likely do not provide the best insight into goat population dynamics (Table 2). Nonetheless, Pratt River showed declines in all categories (except % kids) between the years specified (table 2), including an increase in days per kill. This trend continued in 1998, suggesting this population has declined since 1990.

Foss River averages show less dramatic and little change in success rate and goats seen, but a notable decline and increase in the percent kids, and days per kill respectively (table 2). From the 1998 and 1999 data, the major concern is the decline in the number of goats seen, which supports the average declines indicated for years specified in table 2.

Corral Pass also showed a decline the average number of goats seen in Table 2 and again in 1999 and 2000 (Table 1). This could indicate a decline in this population and should be watched closely. However, permit levels were reduced from five to two and our limited survey work suggests the population in stable. The 1998 and 1999 seasons were unusually warm and dry, which could have influenced all categories for specified areas in table 1 and to a lesser degree table 2.

Population trend and analysis

Currently there are no robust population estimates for mountain goat populations in the Pratt and Foss River, and Corral Pass areas. The comparative data for the 1991-94 and 1995-99 averages suggests a decline in these populations based on number of goats seen and to a lesser degree the percent kids. Days per kill may not be a good measure of population parameters.

Table 1. Averages for specified categories and years for Mt. Goat Hunts in Pratt River, Foss River, and Corral Pass.

Area	Year	Success Rate	Goats Killed	Goats Seen/Hunter	% Kids	Days/Kill
Pratt River[a]	91-94	51	4.5	59	18	6
	94-98	38	1.75	21	19	13
Foss River	91-94	25	1.8	23	24	7
	95-99	26	1.5	18	7	38
Corral Pass	91-94	63	1.8	105	24	10
	95-99	88	2.2	58	19	7

[a] Pratt River closed in 1999 due to population concerns

Table 2. Harvest and hunter effort summaries for Corral Pass in 1999 and 2000.

Year	No. of Permits	No. Goats Killed	Success Rate	Goats Seen/Hunter	% Kids	Days/Kill
1999	2	2	100	32	14	3
2000	2	2	100	22	30	5

Habitat condition and trend

We have no direct data on habitat conditions and trends. However, empirical evaluation of available information shows road access and logging of winter range has increased notably in the Foss and Pratt River Units, and cover adjacent to escape terrain has declined. Several authors have suggested these activities and conditions can be detrimental to goat populations (Chadwick 1973, Johnson 1983).

Management conclusions

It appears that mountain goat populations have declined from historic levels in at least the Foss and Pratt River Units**.** These units were closed to hunting in 2000. The priority is to monitor Corral Pass closely for continued indications of a population decline and the need to reduce permit levels. Future activities for goats in the area may include:

1) Design and conduct a pilot project using paintball mark-recapture technique on selected populations. Refine and evaluate this technique to estimate goat populations with statistical validity. Determine if this application could be applied to other populations.
2) Consider a long-term sightability study using brightly colored neck collars with radio transmitters, in conjunction with paintball mark-resight study to establish baseline population estimates.
3) Use the data collected from 2 and 3 above to establish, seek funding, and implement systematic survey routes to continue to provide baseline population estimates for all goat units. Once established, repeat routes biannually.

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BIGHORN SHEEP STATUS AND TREND REPORT
Statewide

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

Population objectives and guidelines

The management goal for bighorn sheep in Washington State is to establish self-sustaining Rocky Mountain and California bighorn sheep herds throughout all available sheep habitats within historic sheep range. Objectives and strategies to obtain this goal are described in the statewide Bighorn Sheep Management Plan and objectives specific to each herd are described within 14 individual bighorn sheep herd plans.

Hunting seasons and harvest trends

Bighorn sheep hunting opportunity in Washington was limited by permit-only hunting. Permit availability, and therefore hunter opportunity, has increased over the last 3 years as bighorn numbers increase (Figure 1). Fourteen general season permits, one auction permit, and 1 raffle permit were available in 7 different sheep management units for 2000 and a total of 14,380 applicants entered the drawing (excluding auction and raffle permits). The 2000 bighorn sheep general season provided 26 days (September 15 to October 10) of recreational hunting opportunity, and hunters had the choice of any legal weapon to harvest any bighorn ram (no curl restrictions).

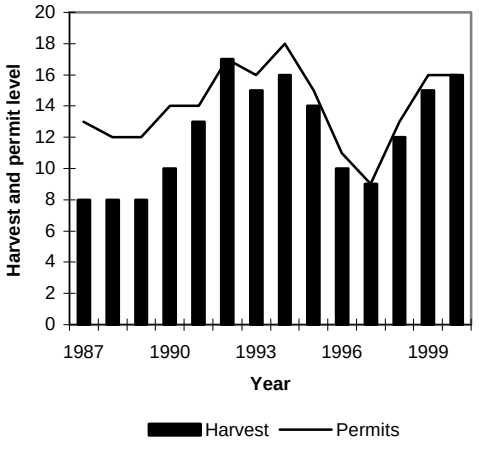

Figure 1. Trend in bighorn sheep recreational hunting opportunity in Washington.

The bighorn sheep hunting season in Washington occurred relatively early in the year, so weather wasn't much of a factor in hunter success. Of the 16 permits available in 2000, all 16 individuals reported that they hunted bighorn sheep. A total of 16 sheep were killed for a hunter success rate of 100% (excluding auction and raffle permits).

Surveys

All bighorn sheep units open to hunting in 2000 were surveyed (except Lincoln Cliffs). Surveys also were conducted in all non-hunted populations, including the 4 herds of the Blue Mountains. Survey efforts in this area continue to be a priority as we attempt to document population recovery from the 1995 *pasteurella* outbreak. Both ground counts and aerial surveys were used to survey and classify sheep as lambs, ewes, or rams. Rams were further classified as yearling, less than 3/4 curl, or greater than 3/4 curl. Surveys were conducted at differing times throughout the year, with a general pattern for most regions to survey lamb production in early summer and total herd composition in winter.

Population status and trend analysis

Rocky Mountain bighorns in the Blue Mountains continue to struggle as they recover from the 1995 *pasteurella* outbreak. Lamb mortality has remained high in 2000 and ewe survival has declined in several herds; however, the total sheep population has remained fairly stable at approximately 188 sheep (Table 1). California bighorn populations remained stable in most herds. The population of California bighorns now numbers approximately 721 sheep (Table 1).

Augmentations occurred in 3 herds during 2000; Tieton River, Lake Chelan, and Hall Mountain. Source sheep were obtained from Cleman Mountain, Lincoln Cliffs, and Condon (OR) herds.

Washington Department of Fish and Wildlife continued cooperative work with the Foundation for North American Wild Sheep, Idaho Department of Fish and Game, Oregon Department of Fish and Wildlife, U.S. Forest Service, and the Bureau of Land Management on restoration of bighorn sheep within Hells Canyon. Project activities included monitoring lamb production and mortality, sightability surveys, and disease investigations related to domestic-bighorn

Table 1. Population trend of bighorn sheep in Washington State, 1994-2001.

	Year								
Sheep Herd	1994	1995	1996	1997	1998	1999	2000	2001[a]	Comments
Rocky Mountain Bighorn Sheep									
Hall Mountain	33	30	32	27	25	29	26	--	Low lamb & ewe survival
Asotin Creek	15	12	13	13	30	34	38	40	Lamb survival 44%; rams intermix with Mt. View herd
Black Butte	215	50	45	54	64	60	60	60	High lamb mortality; domestic-bighorn sheep concern
Wenaha	110	90	50	69	55	60	60	60	Population stable; low lamb survival
Mt. View	60	45	18	23	23	32	27	28	Low lamb & ewe survival; range heavily grazed
Subspecies total	*433*	*227*	*158*	*186*	*197*	*215*	*211*	*188*	
California Bighorn Sheep									
Tucannon	50	45	50	50	42	30	27	18	Scabies severely impacting herd; herd near extinction
Vulcan	69	61	43	52	24	24	19	--	Herd appears limited by unknown parasite
Mt. Hull	--	55	50	60	--	70	62	65	Herd appears healthy and should begin to expand
Sinlahekin	--	--	37	32	32	32	25	32	Improving range condition is a top priority
Swakane	30	38	25	30	36	35	51	--	Interaction with domestics sheep is a threat
Quilomene	50	70	90	135	143	164	165	165	Herd stable and healthy
Umtanum	200	150	150	150	150	150	100	130	Herd stable and healthy
Selah Butte	17	32	43	58	43	47	73	60	Herd stable and healthy
Cleman	55	60	65	100	117	135	156	141	Herd stable and healthy
Lincoln Cliffs	35	45	65	90	102	88	95	--	Population currently at herd objectives
Lake Chelan	--	--	--	--	--	15	50	50	Herd stable; recent fire in portion of sheep habitat
Tieton	--	--	--	--	--	--	37	60	threat of interaction with domestics sheep
Subspecies total	*506*	*556*	*618*	*757*	*689*	*790*	*860*	*721*	
Total	939	783	776	943	886	1,005	1,071	909	

[a] 2001 population estimate for bighorn sheep not yet completed for all herds.

sheep.

Habitat condition and trend

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

Management conclusions

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

Disease outbreaks associated with domestic-bighorn interactions is the primary concern for several herds. Disease has decimated or threatens at least 6 bighorn sheep herds at present. For those herds, eliminating the risk of disease transmission between domestic and bighorn sheep is the priority.

Noxious weed control is important for maintaining quality forage habitat for sheep and aggressive programs aimed at eliminating invading species and restoring native grasses are essential. Noxious weed control can be accomplished only in conjunction with better overall range grazing practices. Where the potential exists for conflicts between bighorn sheep and domestic sheep, particularly on federal lands, we should seek cooperative agreements that place a priority on the restoration of native species (i.e., bighorn sheep).

Restoration and reintroduction of bighorn sheep should remain top priorities. Several herds may need augmentation if they are to rebound from apparent stagnation.

BIGHORN SHEEP STATUS AND TREND REPORT: REGION 1
Asotin

PAT FOWLER, District Wildlife Biologist

Population objectives and guidelines

The management objective for the Asotin Creek herd is to increase bighorn sheep numbers to a self-sustaining population capable of supporting both consumptive and non-consumptive recreation. It is estimated that the current herd range can support a population of approximately 75-100 bighorn sheep.

Surveys

Surveys conducted in March were done using protocol for the sightability model. The protocol does not differ significantly from the system we have used for many years.

Population status and trend analysis

Rocky Mountain bighorn sheep were re-introduced into the Asotin Creek drainage in 1991 with the release of six bighorns from the Hall Mountain herd in northeast Washington. Another supplemental release occurred in 1994 with the release of nine bighorn sheep from Hall Mountain. The population fluctuated between 10 and 15 animals, but failed to show significant growth, probably due to low lamb survival.

A supplemental release of 10 sheep from British Columbia occurred in January of 1998: 2 yearling rams, 7 ewes, and 1 female lamb. This release substantially increased the reproductive potential of this herd.

The survey in March 2001 produced a counted 34 bighorn sheep, approximately 85% of the estimated population: 8 rams, 23 ewes, and 3 lambs (Figure 1).

Surveys in June of 2000 produced a count of 15 ewes, and 9 lambs. Lamb mortality was high in 2000, with only 4 lambs surviving to the spring of 2001, 44% survival rate. Lamb survival at this level will not allow the herd to significantly increase in numbers.

Surveys in June of 2001 produced a count of 18 ewes with 11 lambs (61 lambs: 100 ewes), but 3 of the 9 collared ewes lost their lambs by July 3. In mid-July 14 ewes were counted with 10 lambs, and by September 13 ewes were counted with 9 lambs. If the population contains 23 ewes (Table 1), there should be approximately 13-14 lambs in the September population.

The rams continue to move back and forth between the Mt. View herd range on Lake Ridge and Asotin Creek. This movement has exposed the Asotin Creek herd to scabies and other diseases associated with the Mt. View herd. One ram was lost to a tribal hunter in 1999.

The eight rams observed during the 2001 survey consisted of; Class 1 - 1, Class 2 - 2, Class 3 - 3, Class 4 - 2.

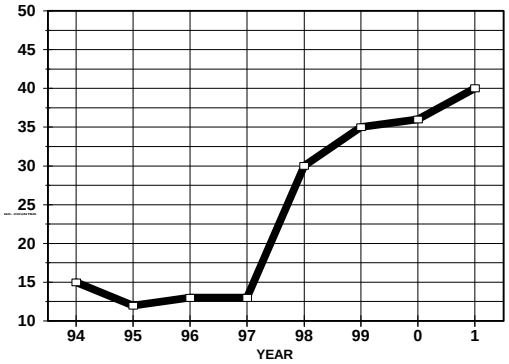

Figure 1. Bighorn sheep population trend, Asotin Creek herd, 1994-2001.

Habitat condition and trend

Habitat conditions within the range of the Asotin Creek herd are generally good. However, yellow-star thistle is invading the area and could cause significant habitat degradation if it is not controlled.

Augmentation and habitat enhancement

Weed control projects are being implemented within the herd range. Controlled burns are also in progress on an experimental basis to halt the expansion of yellow-star thistle

Aerial application of herbicides is also being used to control the spread of noxious weeds.

Disease and parasites

The Asotin Creek herd was not impacted by the *Pasteurella* die-off that occurred in 1995-96. However, the herd has contracted scabies from rams that mingle with the Mt. View herd. Scabies appeared to increase in severity in 2001.

In early July 2 yearling rams migrated into the suburbs of Asotin and mingled with domestic sheep and goats for two weeks. On July 14, the rams were immobilized and sent to Caldwell, Idaho for testing. Pharyngeal and nasal swabs, blood, and fecal samples

were collected at the time of capture. Both rams tested positive for *P. multocida* and *P. trehalosi*.

Management conclusions

The current population has increased to approximately 40 bighorn sheep. The management objective for the Asotin Creek herd is to increase the population to between 75-100 bighorn sheep.

Herd health and habitat condition will be monitored during this process to determine if the population can expand safely, or herd growth should be controlled. If herd growth needs to be controlled, options for controlling the population will be evaluated: trap and transplant, ewe seasons, etc.

Permit controlled hunting for rams will be implemented when the population meets specific criteria established in the Bighorn Sheep Management Plan.

Table 1. Population Trend and Herd Composition, Asotin Creek Herd, Blue Mtns. Washington.

			Rams				Count	Population	Per 100 Ewes
Year	Lambs	Ewes	Y1	<3\4	>3\4	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	4 (1)	5	11	13	100:100:11
1997	2	14	1	1	3 (1)	5	21	13	36:100:33
1998	7	13	3	2	2 (1)	7	27	30	54:100:54
1999	8	16	2	2	5 (2)	9	26	34	56:100:50
2000	7	18	4	2	3 (1)	9	34	38	50:100:39
2001	3	23	1	2	5 (2)	8	34	40	24:100:13

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

BIGHORN SHEEP STATUS AND TREND REPORT: REGION 1
Black Butte

PAT FOWLER, District Wildlife Biologist

Population objectives and guidelines

The Black Butte herd suffered a major *Pasteurella* die-off during the winter of 1995-96, reducing the population from approximately 220 bighorn sheep to 52. The long-term management objective will be to restore this bighorn sheep population to 150-200 animals.

Hunting seasons and harvest trends

Permit controlled hunting was terminated in both Washington and Oregon after the die-off. Permit controlled hunting will be recommended when this population meets criteria for establishing permits, as listed in the Bighorn Sheep Management Plan. Since the Black Butte herd is an inter-state herd, hunting seasons and permit levels will be developed in conjunction with the Oregon Department of Fish and Wildlife.

Surveys

Surveys conducted in December 2000 and March 2001 were conducted using the protocol for the sightability model developed in Idaho. The Idaho protocol does not differ significantly from the system we have used for many years, so the data should be comparable under normal survey conditions. The level of sightability is determined by the number of collared bighorns counted, compared to the total number of collars in the population. In December observers counted 9 of 10 collars, and in March 10 of 10 collars. Sightability in the terrain inhabited by bighorn sheep in southeast Washington generally produces high sightabiltiy if surveys are conducted under good conditions. Developing a sightability model for the Blue Mountains is very important, because habitat, terrain, and sightability may differ substantially from models developed in other areas. Applying models developed in specific habitat types and terrain may introduce a significant amount of error when using them to develop population estimates in areas with different habitat and terrain.

Population status and trend analysis

The sightability survey was conducted on December 1, 2000. Aerial surveys are also conducted in conjunction with post-season elk surveys in March. The Black Butte bighorn sheep population has fluctuated since the die-off of 1995-96, and continues to struggle. Herd composition surveys conducted at the low point of the population cycle (March) in 1998, 1999, 2000, and 2001 produced counts of 56, 56, 48, and 54 bighorn sheep, respectively (Table 1, Figure 1).

Due to high mortality of adult ewes in 2000, the ratio of rams to ewes is increasing (Table 1.). Adult ewe mortality in 2001 was minimal, with only two mortalities.

Lamb production and survival has been monitored closely. Lamb mortality due to pneumonia has taken a heavy toll of lambs shortly after birth and through the summer. Surveys of the Black Butte herd were conducted in June of 2000 and produced 33 ewes with 22 lambs. However, a survey in September produced a count of 16 ewes with 8 lambs, and surveys in March 2001 resulted in 25 ewes with 7 lambs, indicating lamb mortality was high.

Table 1. Black Butte Herd Composition Data 1989-01, Blue Mtns. Washington.

			Rams				Count	Population	Per 100 Ewes
Year	Lambs	Ewes	Y1	< 3\4	> 3\4	Total	Total	Estimate	R:100:L
1989	33	64	—	28	16 (8)	44	141	150	69:100:52
1990	16	46	—	14	21 (9)	35	97	120	76:100:35
1991	23	45	—	13	5 (2)	18	86	110	40:100:51
1992	31	55	—	10	12 (7)	22	108	130	40:100:56
1993	39	75	—	7	15 (7)	22	136	150	29:100:52
1994	51	93	—	13	26 (8)	39	183	215	42:100:55
1995	2	34	3	1	2 (1)	6	42	50	18:100: 6
1996	2	29	2	1	2	5	36	45	17:100: 7
1997	7	30	4	4	4 (2)	12	49	54	40:100:23
1998	11	31	4	5	5 (2)	14	56	64	36:100:35
1999	10	30	4	6	6 (1)	16	56	60	59:100:33
2000	7	25	3	7	6 (2)	16	48	60	60:100:28
2001	7	25	3	9	10 (2)	22	54	60	88:100:28

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

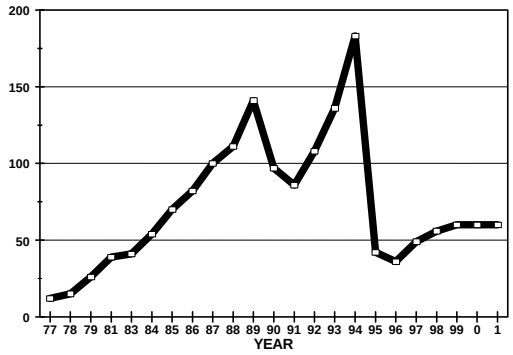

Figure 1. Bighorn sheep population trend, Black Butte, 1977-2001.

Surveys in 2001 indicate 21 lambs were produced, but only 7 survived to September, and none in the Washington segment of the population.

Low lamb survival for 2000 and 2001 will result in no herd growth this year, and most probably a decline in the overall population.

In January 2000, five rams were radio collared to determine ram mortality, movements, and habitat use. The ram population is recovering slowly, since it is highly dependent on annual lamb production and recruitment, which has been poor.

Habitat condition and trend

Yellow-star thistle continues to spread into the Black Butte-Grande Ronde drainage. Efforts to control the spread of yellow-star by using aerial application of herbicides have been fairly aggressive, but are failing to slow the advance of this invader.

Augmentation and habitat enhancement

Yellow-star thistle is the biggest threat to habitat in the range of the Black Butte herd. Efforts will continue to control and reverse the spread of this noxious weed. Combinations of herbicide, biological controls, and re-seeding may be tried in the future.

Disease and parasites

Scabies continues to be a problem, but Rocky Mountain bighorn sheep appear to deal with this nuisance fairly well. However, in some years, severe infestations can cause problems for lambs and reduce survival rates.

Lungworm loads appear to be holding at a low level based on analysis of fecal samples from radio-collared ewes and necropsied sheep, and is not a problem at this time.

Contact with domestic sheep is still considered the major threat facing this bighorn sheep population. A ranch adjacent to the Chief Joseph W.A. has approximately 250 domestic sheep that occasionally trespass onto WDFW land, and could come in contact with bighorn sheep. A barrier fence was constructed in the spring of 1999 in an effort to limit contact between domestic sheep and bighorns. However, the fence may not stop bighorn rams from investigating the domestic sheep at certain times of the year. This herd of domestic sheep may be constantly re-infecting the Black Butte herd and could be the reason this herd seems to have a continuous problem with pneumonia.

Negotiations are currently underway between the RMEF and Magnun Ranch to develop a conservation easement, which will include a clause requiring the ranch to remove and not replace any domestic sheep, goats, or other animals that may transmit disease to bighorn sheep.

Management conclusions

The Black Butte herd is struggling due to the *Pasteurella* die-off that occurred in 1995-96, and possible re-infection from domestic sheep on a neighboring ranch. The bighorn sheep population has fluctuated since the die-off from a low of 45 in 1996, to 60+ sheep in 1998, to approximately 50 in 2001. Due to constant mortality of adults and lambs the herd is not recovering and may decline slightly over the next year.

The long-term management objective for the Black Butte herd is to increase the population to approximately 150-200 sheep. Habitat and herd health will be assessed during this period to determine if the population should be allowed to increase beyond the recommended management objective, or management options implemented to stabilize population growth; trap transplant, ewe seasons.

BIGHORN SHEEP STATUS AND TREND REPORT: REGION 1
Hall Mountain

STEVE ZENDER, District Wildlife Biologist
DANA BASE, Associate Wildlife Biologist

Population objectives and guidelines

Rocky Mountain Bighorn Sheep were introduced to Hall Mountain from Alberta, Canada in 1972 (Johnson 1983). The Hall Mountain Bighorn Sheep Herd Plan calls for maintaining a population of 40–70 Rocky Mountain Bighorn Sheep within the Hall Mountain herd. Herd composition objectives stipulate a lamb to ewe ratio of at least 50:100. A ram to ewe ratio of at least 50:100 is also desired. The Hall Mountain herd is not currently hunted; however, this population has been used as a primary source for transplants of Rocky Mountain Bighorn Sheep to other parts of the state. In addition, the Hall Mountain herd has played a substantial role for a "Watchable Wildlife Area" where the general public can easily see bighorn sheep.

Surveys

As traditionally carried out since the early 1970s, ground surveys at the Noisy Creek winter feeding station were used in late 2000 and early 2001 to estimate the total number of sheep, sex ratio, and lamb production (Table 1). Similar efforts counting and classifying bighorn sheep in British Columbia, which occasionally mix with the Hall Mountain herd, were also carried out over the 2000-2001 winter. Count totals at a feeding station along Canada Highway 3 included 7 lambs, 10 ewes, and 7 rams for a lamb/ewe/ram ratio of 70 L: 100 E: 70 R.

The U.S. Forest Service (Sullivan Lake Ranger District, Colville National Forest) has monitored survival and movements of a number of Bighorn Sheep from the Hall Mountain herd by radio telemetry since 1995 (Baldwin 1999, Aluzas 1997, and Bertram 1996). This effort has been winding down due to a number of reasons. First, there was no annual capture of the bighorn sheep this last winter. Consequently radio collars with depleted batteries could not be replaced as well as new radio collars put on other animals. Meanwhile mortalities of radio-collared bighorns are occurring resulting in fewer animals to track (Table 2). Finally recent staff reductions and turnover along with shifts in program priorities have not allowed regular radio-telemetry monitoring of the remaining bighorn sheep.

As of February 2001, 2 rams and 4 ewes were detected by telemetry near the Noisy Creek feeder. Of the 21 total bighorn sheep that were fitted with radio transmitters beginning in December of 1995, there have been 10 confirmed mortalities through January of 2001. Half of these mortalities (5/10) have occurred since March of 2000. These mortalities include 5 rams and 5 ewes. Four other radio-collared sheep are of unknown status as radio contact has been lost since as recently as last year.

This herd of bighorn sheep tends to spend every winter from early December through February at or near the Noisy Creek feeder at the base of Hall Mountain. Occasionally individual radio-tagged or earmarked sheep go to the Canada Highway 3 feeder, which is within a few miles of the international border. In the early spring the sheep begin dispersing to high mountains and ridges north of and including Hall Mountain. By summer bighorn sheep are typically found on Sullivan Mountain, Salmo Mountain, Crowell Ridge, Gypsy Ridge, and the Watch Lake Basin. Radio-telemetry has determined that the sheep do not make just one annual round-trip migration between summer and winter ranges. Several sheep move between Hall Mountain and the high country north three or more times between the spring and fall. Some Hall Mountain bighorn sheep also summer in the vicinity of Kootenay Pass, Snowy Top Mountain, and other high mountains and ridges in British Columbia, Canada.

Population status and trend analysis

The Hall Mountain bighorn sheep herd has not recovered to its population level in 1993, the last year that animals were transplanted out of the herd (Table 1). From 1994 through 1997, lamb recruitment declined to less than the management objective ratio of 50 lambs per 100 ewes. In 1998 this ratio improved to 55 lambs per 100 ewes. This ratio fell back, however, in 1999 and 2000 to 43 and 31 lambs per 100 ewes, respectively. Encouragingly, the combined British Columbia - Washington herd had a lamb / ewe / ram ratio of 48 L: 100 E: 70 R in the 2000-2001 winter. In 2000-2001 the number of lambs at the Noisy Creek feeder (four) was down from the previous two winters at six lambs each.

Habitat condition and trend

This part of the state is heavily 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, Crowell Ridge, and Gypsy Ridge, non-forested escape terrain appears significantly limited and

Table 1. Population composition counts of Hall Mountain Bighorn Sheep since herd establishment in 1972 (Note that subsequent to the original release of 18 sheep in 1972, there has been only one release of two adult ewes which occurred in 1981. There have been 85 sheep translocated out of this population over nine separate years. In addition, a number of 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).

					Number Translocated			Ratio
Year	Lambs	Ewes	Rams	Count Total	Lambs	Ewes	Rams	Lambs : 100 Ewes : Rams
1972	0	13	5	18				0 : 100 : 38
1973	ND	ND	ND	ND				ND
1974	7	ND	ND	19				ND
1975	5	ND	ND	22				ND
1976	2	7	5	14	2	5	2	29 : 100 : 71
1977	ND	ND	ND	ND				ND
1978	5	10	6	21				50 : 100 : 60
1979	8	ND	ND	27				ND
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

ND = Insufficient data available.

fragmented. Sheep, and especially lambs, migrating between these and other peaks and ridges have to go through dense forest where they may be highly vulnerable to predators. In October of 2000, the U.S. Forest Service did a controlled burn on approximately 100 acres of shrub field habitat on the southwest slopes of Hall Mountain (Suarez 2001). The objectives for this burn are to rejuvenate decadent shrubs and reduce conifer encroachment, thus enhancing forage and travel opportunities for ungulates including bighorn sheep.

Wildlife damage

There have been no reported incidents of wildlife damage caused by the Hall Mountain bighorn sheep. As this population has traditionally been fed during the winter months at the Noisy Creek feeding station, the sheep tend to concentrate there and thus "stay out of trouble". Potentially, without supplemental winter-feeding, sheep could easily stray to human settlements for food.

Watchable wildlife area

The 2000-2001 winter was once again mild compared to most winters in northeastern Washington. Hence the Hall Mountain bighorn sheep availed themselves of less food at the Noisy Creek feeding station than over more severe winters. As usual, public visitation to the site peaked around the Christmas and New Years holidays. Sometime in January 2001 a cougar moved into the feeder area and preyed on at least one of the bighorn sheep, a radio-collared ewe. The cougar even denned in the hay storage barn. As a result feeding operations were suspended in late January to help reduce the potential of additional sheep mortalities as well as minimize risk to human visitors.

Augmentation and translocation

Trapping was not attempted last winter and no efforts were made to either supplement or translocate Hall Mountain bighorn sheep in 2001-2002. This herd of Rocky Mountain bighorn sheep has served as useful transplant stock for other areas in Washington.

Management conclusions

The Hall Mountain bighorn sheep will hopefully recover to population and lamb recruitment levels experienced in the 1980s. In the last four years, however, the herd appears to be doing little more than holding its

own in population. Lamb recruitment is low and adult mortality appears to be high. There are some encouraging signs, however, as lamb recruitment was up for the nearby B.C., Canada herd. We believe this emphasizes the importance of metapopulations of bighorn sheep in which adjacent populations can exchange genetically as well as replenish one another following a crash or decline.

To our knowledge, cougars have always been present in the Sullivan Lake area, especially in the winter. While we believe that cougars are the primary predator of Hall Mountain bighorn sheep, we have not observed significant losses of sheep at the Noisy Creek feeder in the long history of winter-feeding at that site. The cougar that took up residence underneath the barn is a somewhat extraordinary exception and efforts are underway to preclude cougars from "living that close" to the sheep feeder and the U.S. Forest Service campground. We believe that winter feeding needs to continue to prevent the bighorn sheep from straying towards year-round human habitations, maintain the public viewing opportunity (i.e. watchable wildlife area), and hopefully contribute toward recovering herd productivity.

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Table 2. Radio-telemetry tracking of Bighorn Sheep from Hall Mountain and their status as of the year 2001.

Ear Tag #	Mo/Yr Radio-Tagged	Sex	Capture Age	Status as of 2001
Orange 12	12/1995	M	10+	Mortality in July 1997
Yellow 28	12/1995	F	2.5	Observed at B.C. Hwy. 3 feeder on 01/24/2001
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 in January 2001 at feeder, killed by Cougar
Red 39	12/1996	F	4+	Mortality in August 1997
Scarlet 13	12/1996 & 01/2000	M	6+	Detected near Noisy Creek Feeder in February 2001
Yellow 29	12/1996	M	8.5	Mortality in August 1997
Scarlet 4	12/1996	F	2.5	Detected in the Gypsy Mountain area in August 2001
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	Unknown - last detected at Snowy Top Mtn. in B.C. in 2(
Lavender 51	01/1999	F	4+	Mortality in March 2000
Lavender 52	01/1999	F	4+	Detected in the Hall Mountain area in August 2001
Lavender 54	01/1999	F	6.5	Detected north of Salmo Mountain in August 2001
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	Detected near Noisy Creek Feeder in February 2001
Scarlet 11	01/2000	M	Subadult	Detected near Noisy Creek Feeder in February 2001

BIGHORN SHEEP STATUS AND TREND REPORT: REGION 1
Lincoln Cliffs

GEORGE TSUKAMOTO, Staff Wildlife Biologist

Population objectives and guidelines

The management objective for the Lincoln Cliffs herd is to increase bighorn sheep numbers to a self-sustaining population capable of supporting both consumptive and non-consumptive recreation. The objective is to reach a population size of 70 or more bighorn sheep.

Hunting seasons and harvest trends

Interest in bighorn sheep hunting in the Lincoln Cliffs area has increased since 1997 when 527 hunters applied for the single permit. In 2000 there were 1,078 applicants for the single permit.

The first hunting permit for this herd was issued for the 1997-hunting season. Since then one permit has been issued each year. Harvest success has remained high at 100% for the past 4 years. Hunters report observations of bighorn while hunting. On the average hunters have seen 49 sheep with approximately 6 mature rams with ¾ curl or larger. Hunters have spent an average of 6 days hunting (range 1-14).

Surveys

Aerial surveys have been conducted in conjunction with deer surveys whenever possible. For the most part these surveys have been inconsistent.

Ground surveys have been more consistent however there are limitations in this methodology as well. Some limited ground surveys were conducted during May and June to determine production, however these attempts were not successful because of the small number of observations.

The most successful ground surveys have been conducted in November and December during the rut when bighorns are keyed to the same general areas for the rut (Table 1). Surveys were not conducted in 2001 because of a change in personnel.

Table 1. Lincoln Cliffs Bighorn Sheep Fall Herd Composition Ground Surveys.

Year	Total sheep	Rams	Ewes	Lambs	Uncl.	R:100E:L ratio
1992	20	-	-	-	20	-
1993	26	6	13	7	0	45/100/57
1994	35	8	17	10	0	47/100/59
1995	45	11	21	11	1	52/100/52
1996	65	15	33	16	1	46/100/48
1997	90	23	42	25	0	55/100/60
1998	102	16	49	37	0	32/100/76
1999	88	25	44	18	1	56/100/41
2000	95	21	46	29	0	46/100/63
2001	-	-	-	-	-	-

Population status and trend analysis

This 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 the release of bighorn sheep into this area the population showed an increase each year and tripling numbers in 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 peaked at 102 animals counted during the 1998 fall ground survey.

In March 1999, 10 ewes and 1 ram lamb 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 Clemon Mountain area.

This population has maintained high productivity and has remained above the population objective level the past 5 years. Despite the removal of 28 ewes and 1 male lamb by trapping for transplant the past three years, the population continues to maintain about 90-100 sheep.

The bighorn distribution is centered on the original release site on the Lincoln Cliffs. Marked animals have been observed as far east as Porcupine Bay on the Spokane Arm of Roosevelt Lake and to the east side of Banks Lake in Grant County. Bighorns have not yet been observed north of the lake on the Colville Indian Reservation.

Habitat condition and trend

Habitat conditions within the range of the Lincoln Cliffs herd are in good condition. There is no competition with domestic livestock at the present time. A continuing threat is the increasing development of recreational housing in the area, but most of these are located at lower elevations.

Augmentation and habitat enhancement

No recent augmentations have been made to this herd. The last augmentation was of 5 sheep from

British Columbia in 1996.

Disease and parasites

During capture operations the past three years 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. Pregnancy tests conducted were positive for adult ewes

Management conclusions

The current population has increased to approximately 90-100 bighorn sheep. The management objective for the Lincoln Cliffs herd as stated in the Bighorn Sheep Herd Plan (1995) is to increase the population to 60-70 bighorn sheep. We have exceeded this level and the potential exists to further expand this herd.

Herd health and habitat condition will be monitored to determine if the population can expand safely, or herd growth be controlled. If herd growth needs to be controlled, options for controlling the population will be evaluated: trap and transplant, ewe seasons, etc.

Permit controlled hunting for rams will be continued as long as the population meets established harvest criteria.

BIGHORN SHEEP STATUS AND TREND REPORT: REGION 1
Mountain View

PAT FOWLER, District Wildlife Biologist

Population objectives and guidelines

The Mt. View herd suffered a major *Pasteurella* die-off during 1996, resulting in a 70% reduction in the population, from 60+ bighorn sheep to 18. The management objective will be to restore this herd to 60+ animals.

Hunting seasons and harvest trends

Permit controlled hunting was terminated in this population after the die-off. Hunting will not be implemented until the population meets criteria established in the Bighorn Sheep Management Plan.

Surveys

Aerial surveys are conducted using sightability protocol. A sightability model specific to the Hells Canyon area is being developed for bighorn sheep. Sightability in the Blue Mountains terrain is much higher than Idaho experienced during development of their sightability model for California bighorn sheep in the Owyhee.

Population status and trend analysis

Aerial surveys are conducted in March 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. The Mt. View herd is not growing. Surveys for 1998, 1999, 2000, and 2001 produced a population trend count of 21, 29, 27, 18 bighorn sheep, respectively (Table 1, Figure 1). Although the 2001 count declined, herd composition counts over time indicate the population is stable at approximately 28 bighorn sheep. The population is not increasing due to adult mortality and poor lamb survival.

Lamb survival has been relatively poor, following the normal mortality pattern after a *Pasteurella* die-off. Surveys conducted in the summer of 2000 showed poor lamb production and survival, with 12 ewes and only 4 lambs. Surveys in March of 2001 produced a count of 11 ewes with 3 lambs, indicating mortality from August to March was minimal. Overall, lamb mortality was very high in 2000.

Lamb production and survival improved in 2001 with counts producing 15 ewes and 12 lambs (80 lambs: 100 ewes). Mortality through September was minimal, with most lambs surviving.

Habitat condition and trend

Over grazing by domestic livestock is still the major habitat problem within the range of the Mt. View herd. Yellow-star thistle is advancing up the Grande Ronde River and could inundate this range within the next few years. The future for habitat in this area is uncertain at best. Land use practices will be difficult to change.

Disease and parasites

The pasteurellosis epizootic is running its course over time. It usually takes from 3-8 years for herds to completely recover, and for lamb production and survival to improve to pre-die off levels. An interesting phenomenon occurred in 2000, when sheep transplanted into Hells Canyon from Alberta wandered into the range of the Wenaha and Mt. View herds in August and September. All 3 radio collared

Table 1. Population Trend and Herd Composition, Mt. View Herd-Unit 8, Blue Mountains [( ) indicates number of Class-4 rams in > 3\4 segment].

				Rams			Count	Population	Per 100 Ewes
Year	Lambs	Ewes	Y1	< 3\4	> 3\4	Total	Total	Estimate	R:100:L
1989	6	16	—	5	4 (2)	9	31	31	56:100:38
1990	7	18	—	5	2 (1)	7	32	32	39:100:39
1991	8	15	—	8	6 (4)	14	37	37	93:100:53
1992	5	16	—	6	8 (4)	14	35	35	88:100:31
1993	18	23	—	10	8 (4)	18	59	65	78:100:78
1994	10	24	—	10	7 (4)	17	51	60	71:100:42
1995	6	28	1	1	5 (2)	7	41	45	25:100:21
1996	1	14	1	0	0	1	16	18	7:100:07
1997	3	14	1	1	2 (1)	3	21	23	29:100:21
1998	5	12	3	2	2 (1)	7	21	23	58:100:42
1999	10	14	3	1	1	5	29	32	36:100:71
2000	4	14	4	1	1	6	24	27	43:100:29
2001	3	11	1	2	1	4	21	28	35:100:27

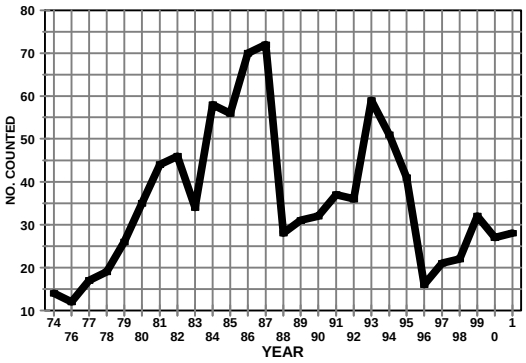

Figure 1. Bighorn sheep population trend, Mt. View herd, 1974-2001.

transplanted sheep that were known to have entered the "pasteurella zone" died. Necropsy results show the bighorns died from pneumonia. This indicates bighorn sheep that have never been exposed to pasteurellosis, will die if they come in contact with bighorns that have survived a *pasteurella* die-off, even several years after the event.

Scabies is a continuous problem, and appears to have a greater impact on this herd than others, with the exception of the Wenaha. A die-off that occurred in 1988 may have been induced by scabies, which resulted in high mortality due to pneumonia.

Management conclusions

From the time the Mt. View herd was established with California bighorns in 1974 until the first major die-off in 1988, the population stayed within a well-defined herd range in the Wenatchee and Cottonwood Creek drainages. Since that die-off, Rocky Mountain bighorn sheep have dominated the herd, with much interchange occurring between the Wenaha and Mt. View herds. It appears the Mt. View herd may have developed into a sub-population of the Wenaha herd.

The Mt. View herd is struggling due to the *Pasteurella* die-off that occurred in 1996. The population increased slightly after the die-off to approximately 30 bighorn sheep in 1999, but has remained fairly stable since. Poor lamb survival and adult mortality have resulted in no growth in this herd. The population is at a critical level were low productivity and adult mortality may prevent this herd from recovering for many years, unless lamb survival improves dramatically. The herd will not increase significantly until annual lamb survival reaches 30-40 lambs: 100 ewes over a period of several years.

Management direction will be to increase the Mt. View bighorn sheep population to 60+ animals. At that time, habitat and herd health will be assessed to determine if the population should be allowed to increase, or management options implemented to stabilize population growth.

BIGHORN SHEEP STATUS AND TREND REPORT: REGION 1
Tucannon

PAT FOWLER, District Wildlife Biologist

Population objectives and guidelines

The Tucannon herd is one of five bighorn sheep herds inhabiting the Blue Mountains. The Tucannon herd was established in the early 1960s with a release of California bighorns from the Sinlahekin Wildlife Area. The management objective for this herd is to increase the population to 60 animals.

Hunting seasons and harvest trends

The last ram permit was issued in 1999. The hunter harvested a Class-4 ram that netted 180 4/8 B&C with horn length measurements of over 38" on both sides. The ram appeared to be a Rocky Mtn. bighorn. In contrast, all but two of the rams harvested in this unit since the 1960s have been California bighorns. The population is below management objective and does not meet established guidelines for issuing permits.

Surveys

Surveys conducted in March were done using sightability protocol. The protocol for this model does not differ significantly from the system we have used for many years. Surveys are conducted with a Hiller 12-E helicopter, which gives maximum visibility.

Population status and trend analysis

Aerial surveys are conducted in conjunction with post-season elk surveys in March, in order to determine population trend and herd composition at the low point of the annual population cycle. The 2001 survey produced a count of 18 bighorn sheep; 4 rams, 12 ewes, and 2 lambs. Ground counts are used to determine lamb production in early June and July, and again in November-December if time and work schedules allow.

The Tucannon herd peaked at approximately 60-70 bighorn sheep between 1992-94, and stabilized at 50-60 between 1995-1997. This herd was infected with scabies in 1998 and the results were predictable. Two factors, mountain lion predation and scabies are taking a toll on the herd and have resulted in a 70-80% decline in the population over the last four years. Since 1997, the herd has declined to approximately 15 animals.

Ground surveys in early July of 2000 produced a count of 6 rams, 13 ewes, and 7 lambs. One ewe was in extremely poor condition due to scabies and probably did not survive. Ground surveys in June of 2001 produced a count of 7 ewes with 4 lambs. The ewe population has declined 70%, from 27 ewes to between 7-10, which dramatically reduces the reproductive potential of this population.

Since 1994, the ram population has declined 78%, from 18 to 4. Rams observed during the 2001 survey consisted of 3 Class 3's rams, and 1 Class 4 ram. The oldest ram appears to be seven years old. No yearling or two-year-old rams (Class 1 & 2) were observed; indicating recruitment at this time is non-existent.

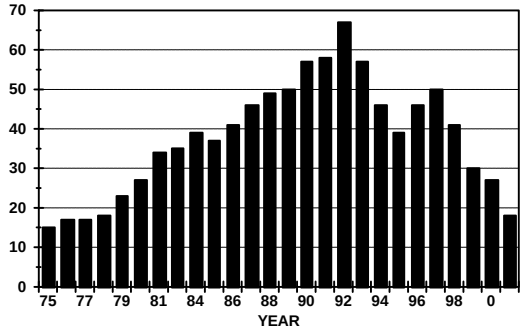

Figure 1. Bighorn sheep population trend, Tucannon herd, 1975-2001.

Habitat condition and trend

Habitat conditions on the Wooten Wildlife Area are excellent, but yellow-star thistle is moving into the area, and it is a constant battle to keep it from spreading.

Augmentation and habitat enhancement

Weed control is the major habitat improvement project at the present time.

Disease and parasites

The Tucannon herd was not exposed to the 1995-96 *Pasteurella* die-off that occurred in other bighorn sheep populations in southeast Washington. Domestic goats on private land near the Wooten WA could be a significant danger to this bighorn population.

Scabies has a terrible impact on California bighorn sheep. The 1987 scabies outbreak in the Mt. View herd decimated that population. It appears the Tucannon herd is suffering the same fate. This herd was scabies free until 1998-99. Symptoms of scabies was observed in this population during the March

Table 1. Population Trend and Herd Composition, Tucannon Bighorn Sheep, Blue Mtns. Washington.

				Rams			Count	Population	Per 100 Ewes
Year	Lambs	Ewes	Yl	<3/4	>3/4	Total	Total	Estimate	R:100:L
1989	9	23	---	10	8	18	50	55	78:100:39
1990	11	22	---	11	13 (5)	24	57	65	104:100:50
1991	12	23	---	10	13 (5)	23	58	65	100:100:52
1992	15	28	---	12	12 (4)	24	67	70	86:100:54
1993	12	24	---	13	8 (2)	21	57	60	89:100:50
1994	4	24	---	4	14 (2)	18	46	50	75:100:17
1995	2	24	1	4	7 (1)	12	39	45	50:100:08
1996	10	24	1	4	7 (2)	12	46	50	50:100:42
1997	10	27	1	3	6 (3)	10	47	50	37:100:37
1998	4	22	4	2	6 (2)	12	38	42	50:100:18
1999	2	17	2	2	3 (2)	7	26	30	41:100:12
2000	7	13	1	4	2 (1)	7	27	27	54:100:54
2001	2	12	0	0	4 (1)	4	18	18	33:100:25

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

survey in 1999, and confirmed from a dead ewe in September 1999. Scabies was probably transmitted to this herd by a wandering ram in November of 1998. Rocky Mountain bighorn sheep appear to handle scabies infections better than California bighorn sheep.

When both California bighorn herds (Mt. View & Tucannon) were infected with scabies, the impact was severe. Both populations crashed. Symptoms included blindness, ataxia, and severe hair loss.

One ewe was observed by hunters in the Tucannon in September of 1999 and appeared to be ataxic. The ewe was located the next day, but she had been killed by a mountain lion during the night. The carcass was taken to WSU for necropsy. Analysis showed the scabies infection in the inner ear was so severe that it entered the brain. Obviously, this would cause severe ataxia.

Management conclusions

The Tucannon herd has declined 75% over the last four years. This population has fluctuated in numbers over the last 25 years, mostly due to periods of low lamb survival. Predation appears to be the primary factor impacting lamb mortality, but a combination of scabies and predation may be the central factors in the current crisis.

The bighorn sheep population has declined below 20 animals. If this decline continues it will be difficult to recover this population to management objective. At the present time, the Tucannon herd may only contain 15 bighorn sheep; 4 rams, 7 ewes, 4 lambs.

BIGHORN SHEEP STATUS AND TREND REPORT: REGION 1
Vulcan Mountain

STEVE ZENDER, District Wildlife Biologist
DANA BASE, Associate Wildlife Biologist

Population objectives and guidelines

California Bighorn Sheep were introduced to the Vulcan Mountain area of northern Ferry County, Washington in 1971. Eight Bighorn Sheep (2 rams and 6 ewes) were translocated from the Colockum State Wildlife Area to U.S. Bureau of Land Management (BLM) land near Little Vulcan Mountain. Four more California bighorn sheep were translocated into the Vulcan area from John Day, Oregon in 1990. By 1991, the population had peaked above landowner tolerance levels, so three sheep were taken from the Vulcan Herd and moved to Lincoln Cliffs, and in 1993 eleven sheep were translocated from Vulcan to Quilomene Wildlife Area.

The population goal for the Vulcan Mountain herd is to maintain 80-110 animals on the available range. The sheep use private rangeland a considerable amount of time, which has been a contentious issue with ranchers in past years when the population was higher. The population has declined in recent years and currently is below the lower population goal for the herd. Sport hunting has been a traditional consumptive use for the herd and an activity that is co-managed with the Colville Confederated Tribes (CCT).

Hunting seasons and harvest trends

Since both state and tribal hunters hunt Vulcan Mountain, biologists confer prior to developing their respective permit recommendations. Due to the low herd population and recruitment levels hunting was discontinued in 2000 and no tags have been offered by WDFW or CCT in 2001.

Every year in late fall the herd is surveyed to determine population composition and trends. The survey is a standardized automobile route along the Kettle River and Customs County roads and private, primitive roads into Moran and Cummings Creek Meadows. Observations are accomplished by binoculars and spotting scope from points along the route. Given the timing, rams are generally in the rut and distributed in relatively observable areas with the ewes and lambs. The entire sheep range is surveyed, however, not every sheep is expected to be seen as their range is heavily timbered and rocky which impedes visibility. The 2000 survey resulted in 8 rams, 9 ewes, and 2 lambs (Table 2).

Population status and trend analysis

The Vulcan herd has declined dramatically from 1990 to 2000 (Table 2). The greatest losses occurred from 1994 through 1998. During this period adult mortality, due primarily to poor health (internal parasites, possibly disease, winter stress), road-kill, and likely cougar, was exceptionally high. At the same time lamb recruitment dropped to 0 (Figure 1). A few encouraging signs that the population may be starting to recover include the following: all sheep observed in the past 2 years appeared to be healthy; at least two lambs were recruited in 2000; and on June 22, 2001 an early season lamb survey yielded 11 ewes with 8 lambs.

Herd health and productivity

The primary cause of the sheep population decline since about 1995 is believed to be related to exceptionally high internal parasite loads over several years. Mortalities were highest in 1996 and 1997 while surviving animals in 1998 and 1999 were generally in poor physical condition (thin, gaunt body mass, signs of chronic scours, and unusually poor horn growth). Lamb production dropped to zero from 1998 through 1999 and only 2 lambs were produced in 2000. The good news is that by 2000 the surviving sheep appeared to be in good condition and by June of 2001

Table 1. Summary of harvest information for bighorn sheep in the Vulcan Mountain Unit.

Year	Org.	# Tags	Harvest	Avg. Age	Horn Length
1992[a]	State	3	3	6.3	32,33,29
1993	State	4	4	5.8	36,27,35,33
1994	State	4	4	6.3	32,33,33,31
1995	State	2	2	5.5	36,31
1995	CCT	2	1R	1.5	---
1996	State	2	2	6.6	33,33
1996	CCT	2	1R1E	1.5R	---
1997	State	1	1	6.0	30
1997	CCT	1	0	---	---
1998	State	1	1	5	27
1998	CCT	1	0	---	---
1999	State	1	1	10.5	30
1999	CCT	1	0	---	---
2000	State	0	0		
2000	CCT	0	0		

[a] In inches

Table 2. Fall population composition counts from Vulcan Mountain.

			Rams				Count	Ratio
Year	Lambs	Ewes	Yearling	<3/4	>3/4	Total	Total	Lambs : 100 Ewes : Rams
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	09:100:86
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

we confirmed exceptionally high lamb ratios (9 adult ewes with 8 one month old lambs).

To date we have not been able to obtain a definitive identification of the worm producing the high larvae loads in the fecal samples tested (Foreyt, 2000). We feel it is very important, not only for the Vulcan Mountain herd but for all sheep, to identify this parasite. To this end, along with the numerous fecal samples collected and analyzed (Foreyt, 1999 and 2000), we euthanized a ram in November 2000 and submitted it to the WSU Diagnostic Laboratory. While the animal was in good physical shape it did carry high nematode larvae judged to be, or similar in appearance to *Parelaphostrongylus;* a muscle worm (Murphy, 2000). Apparently the adult muscle worms are incredibly hard to locate and identify and at present other researchers question that it is *Parelaphostrongylus* (Hall, 2001). We will continue to pursue this in the next year.

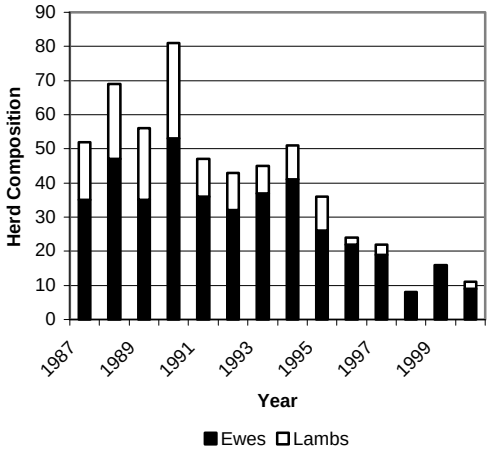

Figure 1. Vulcan Mtn. Bighorn sheep herd composition, 1997-2000.

WDFW and BLM biologists, in hopes of reducing the parasite loads, have distributed anthelmintic treatment blocks across the sheep range. At this point we are not sure if the improved condition and productivity of the sheep is the result of use of these blocks, less stress due to the low sheep numbers, or some survivor immunity. The use of the blocks appeared sporadic and limited but we may be able to improve interest in the blocks by timing placement later in winter.

Habitat enhancement

We estimate there were not more than 25 sheep on the range in 2000 so habitat enhancement was not as high a priority as when populations were higher. However, the BLM wildlife and range personnel have made significant range enhancements in the critical lambing habitat at Moran Meadow by installing temporary fencing to improve cattle grazing management.

Management conclusions

Not many sheep appear to have survived the die-off that has occurred over several years at Vulcan Mountain but the survivors appear in relatively good health as of the summer of 2001. Surveys and monitoring into fall and winter will provide better information on lamb survival. With cooler weather we plan to resume efforts to monitor the parasite loads and continue to pursue a definitive identification of the muscle worm that appears to be the problem. This may mean another animal will need to be sacrificed for lab work; unfortunate but essential considering the potential long-term implications of learning about a new threat to sheep throughout North America.

Augmentation to jumpstart the rebuilding process is an option and being discussed, but until we know more about the parasites in the existing herd we are reluctant to expose new sheep to the same fate. We are also interested in monitoring the health, productivity, and survival of the remaining “survivors”.

Habitat protection and improvement involving a collaborative effort of the private landowners, the federal (BLM and USFS) land managers, and our supporting organizations (FNAWS, SCI) continues to be a high priority for the long-term success of this herd. The population decline of this herd in recent years was likely not the result of one factor but a combination of factors that are all mitigated with improved habitat conditions.

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BIGHORN SHEEP STATUS AND TREND REPORT: REGION 1
Wenaha

PAT FOWLER, District Wildlife Biologist

Population objectives and guidelines

The Wenaha herd suffered a major *Pasteurella* die-off during the spring and summer of 1996, reducing the population from approximately 90 bighorn sheep to 49. The management objective is to restore this bighorn sheep population to 90+ animals.

Hunting seasons and harvest trends

Hunting was terminated in both Washington and Oregon after the die-off. Permit controlled hunting will be implemented when the population meets the criteria for establishing permits as listed in the Bighorn Sheep Management Plan. Since the Wenaha herd is an inter-state herd, hunting season recommendations will be developed in conjunction with the Oregon Department of Fish and Wildlife.

Surveys

Surveys were conducted in December and March using protocol for the bighorn sheep sightability model developed in Idaho. The survey protocol is very similar to the technique we have been using for many years, and the data should be comparable under normal conditions. During the survey in Decmber, 11 of 14 collars were observed and 14 of 14 were observed in March.

Population status and trend analysis

Aerial surveys are conducted annually in conjunction with post-season elk surveys in order to determine population trend and herd composition at the low point of the annual population cycle. The Wenaha herd has increased slightly after the die-off, but has declined slightly over the last two years. Surveys conducted in the spring and summer of 1999, 2000, and 2001 produced counts of 65, 54, and 50 bighorn sheep, respectively (Figure 1, Table 1).

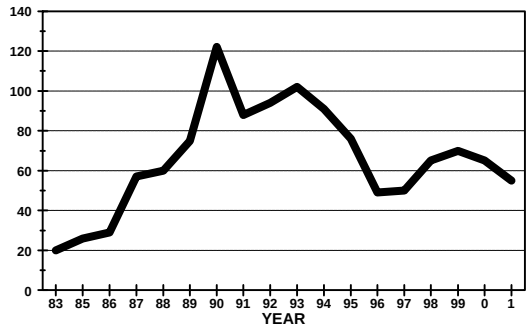

Figure 1. Bighorn sheep population trend, Wenaha herd, 1983-2001.

Lamb production and survival has been monitored closely since the die-off. Lamb mortality followed the usual pattern after a Pasteurella die-off; 3-5 years of poor lamb survival. Surveys conducted in mid June 2000 produced a count of 33 ewes and 22 lambs (67 lambs: 100 ewes), but only 28 ewes with 8 lambs were counted in March 2001 (29 lambs: 100 ewes).

Surveys in June of 2001 produced a count of 31 ewes with 14 lambs (45 lambs: 100 ewes), but by September, only three lambs remained. The high level of lamb mortality this herd is experiencing will result in a decline in the population if it does not improve.

Monitoring of collared rams shows they are re-

Table 1. Wenaha Herd Population Trend and Composition Counts, Blue Mtns. Washington.

			Rams					Population	Per 100 Ewes
Year	Lambs	Ewes	Y1	<3\4	>3\4	Total	Total count	Estimate	R:100:L
1989	12	36	—	15	12	27	75	100	75:100:33
1990	33	59	—	14	16 (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	13 (4)	19	76	90	40:100:19
1996	2	43	4	0	0	4	49	50	9:100:5
1997	4	50	1	7	4	12	62	69	24:100:8
1998	4	27	3	4	8 (1)	15	46	55	56:100:15
1999	12	27	2	4	0	6	45	60	22:100:44
2000	7	30	3	8	6(1)	17	54	60	57:100:23
2001	8	28	0	4	10	14	50	60	50:100:29

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

establishing old migratory patterns into Washington, moving into the higher elevations of the First and Second Creek drainages to spend the summer months. There was concern that this migratory pattern may have died when the majority of rams in the population perished during the Pasteurella die-off.

Habitat condition and trend

Habitat conditions on National Forest lands have changed since last year. Tussock moth infestations have killed trees over large acreages throughout the Wenaha-Tucannon wilderness. A lighting storm in the area could result in a major wildfire, which could reduce habitat quality over the short term. Yellow-star thistle could become a major problem within five years if the rate of spread is not controlled on the lower Grande Ronde River.

Augmentation and habitat enhancement

The U.S. Forest Service is proposing a series of controlled burns within the boundaries of the Wenaha-Tucannon Wilderness. This will improve habitat conditions for bighorn sheep.

Disease and parasites

The pneumonia-induced die-off appears to be running the usual course over time. Lamb survival continues to be poor. To date, we have not been able to isolate the specific pathogen responsible for lamb mortality. Scabies continues to be a problem, but Rocky Mountain bighorns appear to deal with this nuisance fairly well. However, in some years, severe infestations may cause problems for lambs and increase mortality. Lungworm loads appear to be holding at a low level based on analysis of fecal samples from radio-collared ewes and necropsied individuals, and is not a problem at this time.

Management conclusions

The Wenaha herd is struggling due to the Pasteurella die-off that occurred in 1996. The bighorn population has stabized at approximately 60 bighorn sheep, compared to 90 sheep prior to the die-off. The population will not increase until lamb survival improves. Management direction will be to increase the Wenaha bighorn sheep population to 90+ animals. Herd health and habitat conditions will be monitored during population growth to determine when growth should be stabilized.

BIGHORN SHEEP STATUS AND TREND REPORT: REGION 2
MT. Hall and Sinlahekin

SCOTT FITKIN, District Wildlife Biologist

Population objectives and guidelines

Both the Mt. Hull and Sinlahekin herds are being managed for steady population growth for as long as available resources will support increased numbers. A conservative, any ram permit harvest also is allowed to the extent it is compatible with population growth objectives.

Hunting seasons and harvest trends

WDFW issued no permits in 2000 or 2001 for the Mt Hull or Sinlahekin Units (Table 1). Ram age structure in the Mt Hull herd had still not recovered since the July 2000 fire. In Sinlahekin, all population parameters remained below harvestable levels.

Surveys

Biologists conducted helicopter surveys of both units in late June, 2001. Observers counted only 17 sheep in the Sinlahekin unit; however, additional ground observations produced a minimum count of 29 animals (Table 2). Several observations occurred outside of historic range. Bighorn sheep use of habitat to the northwest of the Sinlahekin Valley now seems well established. This is particularly true in the winter and spring.

Aerial surveys located and classified 35 sheep on Mt Hull. Supplemental ground surveys by Foundation for North American Wild Sheep (FNAWS) members augmented the aerial effort in the Mt Hull unit. The ground surveys documented a population of at least 59 animals, including four rams $\geq$ 3/4 curl (Table 3).

Table 1. Summary of harvest information for bighorn sheep in the Mt. Hull Unit.

Year	Permits	Harvest	CCT[a] Permits	CCT Harvest 1989
1990	0	0	0	--
1991	0	0	0	--
1992	2 ram	2 rams	0	--
1993	1 ram	1 ram	0	--
1994	1 ram	1 ram	0	--
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	0	?	?

[a] CCT=Colville Confederated Tribes

Population status and trend analysis

Observational data suggests that the Mt. Hull herd grew fairly steadily following reintroduction in 1970. Numbers were highest in the late 1980s and early 90s during a spell of mild winter weather, peaking in 1991 at 80-90 animals. The population declined slightly in the early 1990s, particularly following the severe winter of 1992-93. Herd numbers have slowly rebounded in recent years and are expected to climb back to historic highs. Much expansion beyond that level is unlikely, given the existing resource base. The population suffered a temporary setback during the fire of 2000. Most of the mature ram cohort disappeared. Incidental observations suggest some of the animals emigrated to Canada.

WDFW staff augmented this herd with 11 animals transplanted from Cleman Mountain in February of 2001. The primary purpose of the transplant is to improve genetic diversity. Documenting potential immigration and emigration routes is a secondary objective. All animals are radio marked and have stayed in the Mt Hull vicinity to the present time. Two potential mortalities will be followed-up on as soon as telemetry gear problems are ironed out.

The long-term outlook for the Sinlahekin herd may be improving, at least temporarily. 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. Herd demographics improved in 2000-01. This may be function of the herd expanding its range into previously unused habitat. Mature rams, however, are still largely absent. Productivity in the herd improved in early 2001, suggesting the chance for herd extirpation is reduced, at least in the short-term.

Habitat condition and trend

Over-winter survivorship for all sheep in the Okanogan District likely was high during the mild winter of 1999-00. Sheep appear to be establishing habitual use of new winter and spring ranges to the North and West of traditional range on the eastern side of the Sinlahekin Valley.

In recent years, winter range has likely been a limiting factor for the Sinlahekin herd. It may also be

Table 2. 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	--	46:100:46
1996	2	20	7	0	7	0	29	30-45	20:100:35
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

that year-round habitat quality on traditional range is significantly degraded. The amount of available sheep habitat in this area has remained relatively stable, yet the carrying capacity of the historical range seems to have declined significantly compared to years past. Intensive competition with livestock and corresponding invasion by noxious weeds, particularly diffuse knapweed, are probably major contributors to this trend.

Rams appear especially vulnerable to range condition, and appear to be in rather poor health overall. Five mature rams succumbed to severe winter weather in 1992-93, and skulls collected from carcasses suggest individuals may not develop much beyond a 3/4 curl before succumbing to old age.

Much of the sheep forage habitat for the Sinlahekin herd is not under WDFW control. Bighorn are poor competitors and can escape livestock competition only in the steepest areas where soils are thin and forage limited. The DNR maintains heavy cattle grazing on its permits in sheep range, and most of the adjacent private land is intensively grazed. These activities are likely to continue, maintaining competition and accelerating weed expansion. These conditions have been exacerbated by recent drought. Recent herd expansion into new habitat may mitigate for these problems initially. The long-term prognosis; however, is not promising, since the same concerns mentioned above exist in the newly utilized areas as well.

The best hope lies in range enhancement projects on state owned lands, particularly WDFW ground. An extensive prescribed fire program is planned for the Sinlahekin Wildlife Area, primarily to enhance deer winter range. This effort, combined with an aggressive weed control program should also improve forage conditions on some sheep range.

An additional threat to the Sinlahekin herd is a domestic sheep herd existing immediately adjacent to bighorn range at the northeast corner of Aeneas Mountain. Wild sheep are often in close proximity to this flock. Past research indicates a high endemic level of parasitism and disease in the Sinlahekin herd. Existing nutritional stress on the bighorns enhances vulnerability to pathogens, and the potential for chronic disease infection is high. A stochastic event such as the contraction of a highly virulent disease strain could eliminate the Sinlahekin population.

Table 3. Population composition counts from the Mt Hull 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	Total	Estimate	L:100:R
1990	--	--	--	--	--	--	80	--
1991	--	--	--	--	--	--	80-90	--
1992	0	26	1	7	8	34	80	0:100:31
1993	0	17	2	7	9	26	--	0:100:53
1994	5	28	2	8	10	53	--	18:100:36
1995	11	16	6	11	17	44	55	69:100:106
1996	0	5	10	6	16	21	40-60	0:100:320
1997	8	25	--	--	8	41	55-65	32:100:32
1998	--	--	--	--	--	--	--	--
1999	19	24	15	8	23	66	70	80:100:96
2000	21	30	9	0	9	60	60-65	70:100:30
2001	10	30	15	4	19	59	660-70	33:100:63

By contrast, the Mt. Hull range generally remained in good shape and the amount of available habitat was stable, before this summer's fires. Although the fire reduced forage availability during the 2000-01 winter, mild weather conditions and some supplemental feeding minimized adverse effects. Post-fire conditions appear to be rebounding quickly. Sheep foraged extensively within the fire perimeter this past season, taking advantage of early successional conditions.

Livestock competition and noxious weed invasion are generally less of a problem on Mt Hull than in the Sinlahekin. Even so, the fire could increase the likelihood of weed invasion, so programs such as the Forest Service's aggressive weed control effort, funded by FNAWS, are now even more important.

Management conclusions

Mt. Hull Herd. The Mt. Hull herd appears healthy. Good productivity and improving demographics should easily support the anticipated harvest of two rams annually in the long-term. In the short term, the herd will have to be monitored closely to ascertain the health of the ram cohort. The population should climb to the historic high, perhaps beyond, depending on the success of interagency habitat enhancement projects and fire recovery.

Sinlahekin Herd. Both bighorn sheep numbers and range quality on Aeneas Mountain area are likely in decline, and these trends are likely to continue without aggressive habitat enhancement efforts. Management should focus on reducing competition with livestock, reclaiming land colonized by noxious weeds, and reintroducing periodic fire into the landscape. Also, the incidence of disease in the herd should be closely monitored due to proximity of a domestic sheep herd.

If range condition and herd vitality do not improve soon, the long-term future of the Sinlahekin band looks bleak. In addition, the lack of genetic diversity also is a concern. Even so, any augmentation of the herd currently is inadvisable, since the available range appears to be poorly supporting the animals already present, and the proximity of domestic sheep would put introduced animals at grave risk. Areas immediately northwest of Aeneas Mountain are providing some opportunity for for range expansion. As sheep move north on Chopaka Mountain, competition with mountain goats may be a concern.

BIGHORN SHEEP STATUS AND TREND REPORT: REGION 2
Swakane Canyon and Lake Chelan

TOM MCCALL, Wildlife Biologist

Population objectives and guidelines

Within the Wenatchee District, California bighorn sheep have been reintroduced to Swakane Canyon and the north shore of Lake Chelan. There are also a few bighorns from the Quilomene herd that use the south part of the District in the Colockum Creek and Squilchuck Creek watersheds.

Management objectives for the Wenatchee District bighorns are to (1) increase the size and range of existing populations; (2) ensure genetic strength by augmenting existing populations with bighorn from other areas; (3) minimize risk of disease to bighorn by eliminating overlap with grazing allotments of domestic sheep on public land, and provide information to the public about the importance of keeping these species apart; and (4) reintroduce bighorn to historic but unoccupied habitat within the District.

There were an estimated 51 bighorns in the Swakane herd in 2001. Our population objective for Swakane is 50-60 adult sheep.

Between March 1999 through March 2001, 53 California bighorns from Washington and British Columbia were released on the north shore of Lake Chelan (Table 1). The population was estimated at 50 animals in 2001, and our population objective for the herd is 200 adult sheep.

Hunting seasons and harvest trends

In 1999, the first ram permit ever was offered for the Swakane herd, followed by one permit per year for 2000 and 2001. The hunting season was from September 15 to October 10. Each of the three hunters was successful at killing a ram. No hunting will occur in the Chelan herd until at least 8 or more adult rams is achieved.

Surveys

The Swakane area has much tree and shrub cover making aerial surveys ineffective. For Swakane, we rely on incidental reports from Washington Department of Fish and Wildlife personnel and the public as well as ground surveys with volunteers. Attaching radio-collars to a portion of the herd would help locate groups of sheep and improve the precision of surveys. No survey of Swakane sheep was performed in 2001. From July 2000 through June 2001, 18 reports of Swakane bighorn were received. The most useful information from these reports from along Highway 97-A include:

1) October 31, 2000, 13 ewes and lambs and 7 rams near pond on Hwy. 97-A.
2) January 16, 2001, 9 ewes, 6 lambs, 1 adult ram.
3) July 2001, group of sheep with 9 lambs near Boat Club.
4) August 24, 2001, 36-38 sheep seen in new alfalfa field in Swakane Canyon (9 lambs, 25-26 ewes, 2-3 yearling rams). This field attracted lambs and ewes and yielded the highest counts recorded for the herd.
5) September 15-October 6, 2001, permit hunter saw 39 sheep (3 lambs, 20 ewes, 6 rams <3/4 curl, 10 rams $\geq$3/4 curl).

On June 9, 2001 volunteers and WDFW staff surveyed the Lake Chelan herd and found 10 lambs and 22 ewes along Grade and Gold Creeks. An additional significant observation in August 2001 included 2 lambs, 7 ewes, and 2 rams north of Coyote Creek.

Population status and trend analysis

From 1992 to 2000, the Swakane bighorn population has slowly increased (Table 2). In 2001, the population was estimated at 51 sheep. The increased population size in 2001 was probably the result of the

Table 1. California bighorn sheep released on the north shore of Lake Chela, Chelan County, 1999-2001.

Release Date	Composition	Source
March 17, 1999	10 ewes, 1 male lamb	Lincoln Cliffs, WA
March 17, 1999	2 3-year old rams	Quilomene, WA
February 11, 2000	4 ewes, 2 lambs (1 male, 1 female)	Umtanum, WA
	4 ewes, 1 female lamb	Quilomene, WA
February 16, 2000	2 rams (1 2-year-old, 1 3-year-old)	Clemons Mtn., WA
March 18, 2000	15 ewes, 3 rams (2 2-year-olds, 1 3-year-old), 3 male lambs	Kamloops, B.C.
January 31, 2001	3 ewes (2 ad., 1-1 1/2 years old), 3 male lambs	Clemons Mtn., WA
Total	53 sheep	

Table 2. Estimated population composition of the Swakane bighorn sheep herd (yrl = yearling), Chelan County, 1992-2001.

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

new alfalfa field in Swakane, which attracted lambs and ewes to where they could be more accurately counted. Additionally, each succeeding permit hunter has used the knowledge of the previous hunters to help locate rams, which has enhanced our counts of rams. A record 9 lambs were counted in 2001, compared to the average of 3.9 lambs for 1992-2000.

In 2001, the Chelan bighorn population was stable at approximately 50 animals (Table 3). In 2001, at least 12 lambs were born. There was a 20% (1 of 5) mortality rate of adult bighorn ewes that had radios in 2000, and a 25% (6 of 24) rate in 2001. Most mortalities were probably due to cougar predation and one due possibly to a fall.

There are about 12 bighorns that use the Colockum and Squilchuck watersheds within the Wenatchee District. These sheep are part of the recently reestablished Quilomene herd.

Habitat condition and trend

Habitat conditions for both Swakane and Chelan bighorns are excellent, primarily because of 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 40,000 acres. But only a small portion of this burn was bighorn habitat. This fire should begin to prove advantageous to sheep by the following spring. The Wenatchee National Forest has also conducted controlled burns on several areas within the expected range of Chelan bighorn. The Dinkelman fire in the Swakane area, which burned in 1989, proved beneficial to the bighorns in this area.

Wildlife damage

We have not received damage complaints related to bighorns in the Wenatchee District. However, rams are frequently seen during winter and spring in the vicinity of Ohme Garden on the north side of Wenatchee. There is potential for damage if this use increases.

Augmentation and habitat enhancement

Augmentation of the Chelan bighorn herd is complete. For Swakane, augmentation is necessary to achieve the population objective for the herd, given the stagnate nature of the population. However, because Swakane bighorn sheep have a documented history of intermixing with domestic sheep from nearby grazing allotments, the risk of *Pasteurella* pneumonia for bighorns will likely increase as the herd increases in size.

The Mosses Coulee area in Douglas County may offer potential habitat for bighorn reintroduction. Most of the area is privately owned, but the proportion in public ownership has increased in recent years. A long-term agreement with landowners, that they would refrain from raising domestic sheep and that they would maintain bighorn habitat, would be required before we consider 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 bighorn in 2000. Bighorn rams were

Table 3. Estimated population composition of the Lake Chelan bighorn sheep herd, Chelan County, 1999-2001.

				Rams						
Year	Lambs	Ewes	Yrl	<3/4 curl	≥3/4 curl	Total rams	Total sheep	Population estimate	Lambs:100 ewes	Rams:100 ewes
1999	2	10	1	2		3	15	15	20	30
2000	6	33	5	6		11	50	50	18	33
2001	12	24	8	4		12	48	50	50	50

documented in domestic sheep allotments twice during 2000. Wenatchee National Forest is currently evaluating sheep allotments in the area. The WDFW and Wenatchee National Forest are currently revising their Memorandum of Understanding concerning bighorn management. These efforts are expected to reduce overlap and conflicts between domestic sheep and bighorn.

BIGHORN SHEEP STATUS AND TREND REPORT: REGION 3
Quilomene, Cleman Mountain, Umtanum, Selah Butte, and Tieton

JEFFREY BERNATOWICZ, District Wildlife Biologist

Population objectives and guidelines

The objective is to restore bighorn sheep to native ranges and allow for increases in their population size compatible with the carrying capacity of the habitat.

Hunting seasons and harvest trends

Region 3 supports five populations of California Bighorn: Quilomene, Cleman Mountain, Umtanum, Selah Butte, and Tieton. Hunting is by permit only for rams and occurs in all units except Tieton (Tables 1).

Surveys

Historically, surveys have been conducted from the ground and hiking routes were along ridgelines. Since 1993, most surveys were conducted using a helicopter during June; except Clemans Mountain was ground surveyed in June. Personnel also counted sheep at Clemans Mountain during winter on the feedlot. Additional observations of sheep in other units were obtained during surveys for other species. All available information was used to estimate total population size (Tables 2-5).

Population status and trend analysis

Bighorn sheep were native to areas within Region 3, but were 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 in Colockum Wildlife Area and Cleman Mountain.

The Colockum reintroduction was the first and most successful. The population was estimated at over 100 animals by the late 1960s. The population crashed in the early 1970s. The cause of the decline was not totally documented, but was either a result of *Pasteurella H.* pneumonia or winter mortality. Colockum bighorns were at very low numbers in the 1980s and reportly died out by 1990. Reintroduction was initiated just south of Colockum on Quilomene Wildlife Area in 1993. By 1996, 41 bighorns had been released in the area. The Quilomene population is now estimated at over 160 sheep (Table 5).

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

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

Area	Year	Permits	Harvest	Comments
Cleman Mtn.	1996	1	1	
Cleman Mtn.	1997	2	2	
Cleman Mtn.	1998	4		Harvest includes raffle and auction hunters
Cleman Mtn.	1999	3	2	One hunter became ill and could not hunt
Cleman Mtn.	2000	5	6	Harvest includes auction hunter
Umtanum	1990	5	3	
Umtanum	1991	3	3	
Umtanum	1992	3	3	
Umtanum	1993	3	3	
Umtanum	1994	3	3	
Umtanum	1995	3	3	
Umtanum	1996	3	3	
Umtanum	1997	2	2	
Umtanum	1998	2	2	
Umtanum	1999	3	3	
Umtanum	2000	1	2	Mt. Hull hunter allowed to hunt area
Selah Butte	1997	1	1	
Selah Butte	1998	2	2	
Selah Butte	1999	2	2	
Selah Butte	2000	2	2	
Quilomene	1998	1	0	
Quilomene	1999	3	6	Harvest includes auction, raffle, and 1 accidental
Quilomene	2000	3	4	Harvest includes raffle hunter

antibiotics in 1990. Augmentation has included: 4 in September 1989, 4 in January 1990, and 19 in 1996. Production and herd growth have increased after 1996 and exceeded to population goal of 150 animals in 2000 (Table 2). In January 2001, 11 ewes and 7 young rams were captured and moved to herds in Region 2.

The Umtanum herd was established in 1970 with the release of eight animals. Within 15 years the population grew to an estimated 200 animals. Population estimates have varied between 100 and 200 animals since 1989 (Table 3). Dispersal, winter mortality, and the removal of 52 sheep for augmenting other populations are suspected for causing the fluctuation. In 2001, 67 ewes were seen in June 2000, down from 102 in 1994 (Table 3). Capture efforts has caused the sheep to be helicopter shy, making animal detection difficult. There also is an obvious movement between Selah Butte and Umtanum units. The current Umtanum population is estimated at approximately 130 animals.

Sheep from the Umtanum herd crossed the Yakima River during the winter of 1992-93 and formed the Selah Butte sub-herd. The Selah Butte population has varied between 43 and 73 since 1996. The decrease in ewes seen in 2001 corresponded with an increase on the Umtanum side of the river (Table 4).

The Tieton River herd has been established with the release of 49 sheep from 1998-2001. Documented losses have included 8 ewes and 2 rams emigrating, 1 ram poached, 1 ewe predated (probable bear), and 3 road kills (2 ewes, 1 lamb). A total of 31 lambs have been produced in 4 years. The June 2001 population was estimated at 60 sheep.

Habitat condition and trend

Forage resources vary annually with moisture. The past 18 months have been drought conditions. Noxious weeds are present on all sheep ranges especially along roadways. It is important to continue management of these areas to prevent further invasion of noxious weeds. Small fires in the Yakima Canyon have reduced shade and escape cover in the primary lambing area, but the regenerated grasses are providing abundant food.

Augmentation and habitat enhancement

In the past 4 years, reintroduction and augmentation efforts have focused on the Tieton. Forty-nine animals have been released in the area. The source of the sheep has been Quilomene, Umtanum, Selah Butte, Lincoln Cliffs and John Day, Oregon. In 2001, 11 sheep from Lincoln Cliffs were released at the south end of the Yakima Canyon. Mineral blocks have been put out within the range of all 5 herds. Sheep at Clemans Mt. are feed during the winter.

Bighorn sheep population in Region 3 is healthy and growing. However, 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.* that is transmitted by domestic sheep. The probability of another disease outbreak is high. Domestic sheep have been documented either with, or within a few of wild sheep in every herd in the Region.

Table 2. Quilomene June Population Composition.

Year	Lambs	Ewes	Total Rams	Adult Rams	Total Count	Estimated 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

Table 3. Clemans Mt. June Population Composition.

Year	Lambs	Ewes	Total Rams	Adult Rams	Total Count	Estimated 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

Table 4. Umtanum June Population Composition.

Year	Lambs	Ewes	Total Rams	Adult Rams	Total Count	Estimated Population
1989						170
1990						180
1991						190
1992						190
1993	32	66	31		129	200
1994	20	102	29		151	200
1995	35	69	41		115	150
1996	26	47	42		115	150
1997	5	30	17	9	52	150
1998	23	27	18		68	150
1999	25	44	22		91	150
2000	19	26	28	23	73	100
2001	34	67	20	17	121	130

In addition, bighorns, particularly young rams, have been documented in or near domestic sheep grazing allotments. Private rangelands, which were idle or grazed by cattle, within or bordering areas frequented by bighorn sheep could be converted to domestic sheep in the future; this includes areas in Quilomene, Umtanum, Selah Butte, and Tieton.

The best long term insurance is to re-establish bighorn sheep in as many separate ranges as possible. If one population declines, other separate populations should be available as a source of clean stock for augmentation. The bighorn sheep population level versus risk of disease must be assessed. History has shown that bighorns can't be stockpiled. As the wild sheep population grows, the probability of a contacting disease increases. Removal for transplant has been used frequently in the past 5 years. Increasing the recreational harvest, including ewes, will probably be needed in the near future.

Table 5. Selah Butte June Population Composition.

Year	Lambs	Ewes	Total Rams	Adult Rams	Total Count	Estimated Population
1994					17	17
1995	6	14	12		32	32
1996	8	25	10		43	43
1997	8	31	19	2	58	58
1998	7	14	19	4	40	43
1999	1	24	22		47	47
2000	11	34	28	23	73	73
2001	8	15	20	14	53	60

MOOSE STATUS AND TREND REPORT: REGION 1
GMUs 101, 105, 109, 113, 117

STEVE ZENDER, District Wildlife Biologist
DANA L. BASE, Associate Wildlife Biologist

Population objectives and guidelines

Moose population management objectives in Washington are to maintain a healthy population and provide quality hunting opportunity through limited entry permits.

Hunting seasons and harvest trends

Moose hunting opportunity in Washington is limited by permit. Permit availability and therefore moose hunter opportunity in Washington has increased over the last 10 years (Figure 1.) Forty permits were available in the 4 moose management units in the Colville District (Kettle River, Threeforks, Selkirk, and 49 Degrees North) for 2000. One additional moose permit was available by raffle and 1 permit was available by auction; each for any open moose unit the hunter chose. General permit season dates remained October 1 - November 30. All moose units were open for the use of any legal weapon to provide eligibility to all hunters for all units and maintain hunter weapon choice. Moose hunters in the Colville District units were allowed to take one moose of either sex. If drawn, it is a once in a lifetime opportunity. There is a mandatory hunter report to be returned to WDFW.

A total of 38 moose were killed (37 bulls, 1 cow) in the Colville District units (Table 1). The hunter success rate (which includes the auction permit filled in 49 Degrees North) was 93%. Hunters averaged 7 days per moose harvested in 2000, which is less time spent than the previous several years. Hunter success was distributed throughout the two-month season with the only significant higher percentage occurring during the first week (38%), and a bit of an increase in harvest activity during the first 2 weeks of November (26%). Given the exceptionally high 93% success rate, and the lower number of days spent to take a moose; the 2000 moose hunt was a great success. It is significant that while the hunt is open to any moose we only had 1 cow taken. The hunting season is certainly not impacting the antlerless portion of the moose population; there may be some opportunity here to expand antlerless hunting and harvest.

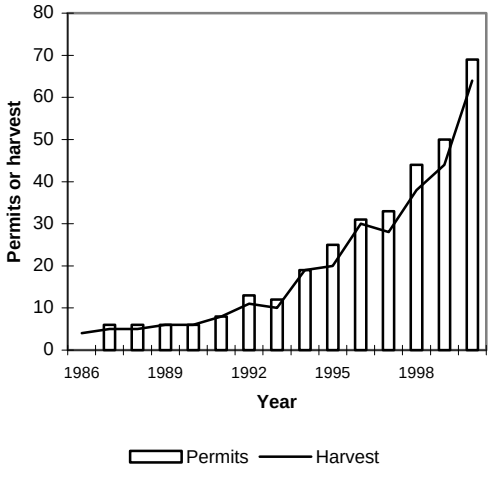

Figure 1. Statewide moose permit levels and harvest, 1986-2000.

Table 1. Colville District (Kettle River, Selkirk, Three Forks, 49 Degrees North) moose harvest and hunter effort.

Year	Permits	Success	Bull	Cow	Total	Total Days	Days /kill
2000	41	93%	37	1	38	285	7.0
1999	32	84%	25	2	27	231	8.6
1998	28	89%	24	1	25	211	8.4
1997	21	86%	17	1	18	248	13.8
1996	23	96%	19	3	22	115	5.2
1995	20	85%	10	5	17	152	8.9
1994	15	100%	14	1	15	98	6.5
1993	9	78%	6	1	7	113	16.1
1992	9	78%7	0	7	65	65	9.3

Surveys

The primary moose survey effort is an annual helicopter survey in early winter. The initiation of a moose raffle hunt has greatly enhanced our aerial survey abilities by providing dedicated moose management funds.

For the 2000-2001 winter the primary survey emphasis was in 49 Degrees North and Threeforks, with a first time reconnaissance survey in Kettle River (Table 2). The calf ratios in 49 Degrees North are down from last year (48 vs. 71) but still very good considering we were near or below 30 from 1994-1998. The bull ratios are a bit higher in 49 Degrees North (86 vs. 76). Of the 48 bulls we observed in 49 Degrees North only 13% were yearlings, while 47% were sub-

Table 2. Population composition counts of Moose for helicopter-surveyed areas in the 2000-2001 winter.

Area	GMU	Date	Bull	Cow	Calf	Total	B:100C:Ca	Hours	Moose/hour
49 Degrees North	117	12/18/2001	48	56	27	131	86:100:48	3.8	27
Threeforks	109	12/19/2001	6	2	1	9	300:100:50	1.0	12
Kettle River	101,105	12/19/2001	1	0	0	1		2.6	0.4

Table 3. Moose hunter observations and days per kill in the Colville District for the 2000 season.

Unit	Days per Kill	Moose/Day	Bulls/Cows/Calves	Total Moose	Ratio B/C/Ca
Kettle River	1	3.0	1/1/1	3	100:100:100
Threeforks	12.6	0.3	8/5/3	16	160:100:60
Selkirk	8.5	0.3	14/15/7	36	93:100:47
49 Degrees N	5.7	2.1	70/128/34	232	55:100:27

adults, and 40% mature bulls.

Only an hour of flight time was spent in Threeforks where moose are much harder to locate than in 49 Degrees North so the sample was low. We need to gain more experience in flying this unit and direct more flight time here to provide the data necessary to evaluate population trends and permit levels.

We found moose likewise difficult to locate in the Kettle River unit. The primary survey areas, the Sherman Creek and Sheep Creek drainages are 50 miles apart, which costs a lot in flight time for minimal results. We may not be able to justify dedicated moose surveys in these GMUs very often but we hope to glean information on moose from the increased flight surveys in relation to the mule deer and cougar research projects in progress in these areas.

Moose hunters provide their observations with the mandatory report. Hunters reported observing 287 moose during the season which yielded a calf:cow ratio of 30:100. This ratio is lower than our observed ratios from the post-season (early winter) helicopter flights, but is consistent with the flight data in being lower (30 vs. 44) than the ratios from last year (Figure 2, Tables 2 and 3). Hunting is definitely more difficult in the Selkirk and Threeforks units than the 49 Degrees North Unit (Table 3). The Selkirk and Threeforks units have a higher degree of dense or selectively harvested forests than the heavily clear-cut forests of 49 Degrees North. Road closures for grizzly bear habitat protection have occurred within a substantial amount of moose range within the north part of the Selkirk Unit. This action has put much of the preferred moose hunting area out of reach for many hunters.

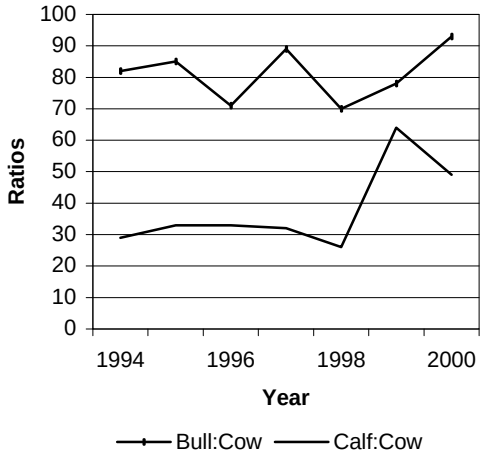

Figure 2. Composition of moose herds (survey areas vary annually).

Population status and trend analysis

Early winter composition survey flights have been accomplished each year for the last 6 years (Figure 2). Bull ratios remain high at near 93 bulls: 100 cows. Even in the 49 Degrees North Unit where harvests have been highest and our survey data the best we observed 86 bulls: 100 cows. Consequently hunter harvest does not appear to have had an appreciable impact on the population composition. Calf ratios observed are down a bit from last year but at 49:100 cows we are still looking at reasonably good production. Also, since we had such a high calf crop a year ago (71:100) we assume there has been an influx of yearling, non-producing cows which would tend to lower the observed ratio.

We monitor age and antler spread of harvested bulls to detect trends in the age structure of the bull population, which in turn indicate the mortality rate on the bull population (Figure 3). In 2000, the mean antler spread and mean age of bulls taken increased. To date our increased hunting has apparently not reduced the availability of mature bulls. Even in the 49 Degrees North Unit where we have some concern for the harvest impact due to the lack of escape cover we averaged a relatively old mean bull age of 6.9 years.

This is even slightly higher than the 6.6 mean bull age in the Selkirk Unit where hunting conditions are most difficult. It is interesting how old some of these bulls

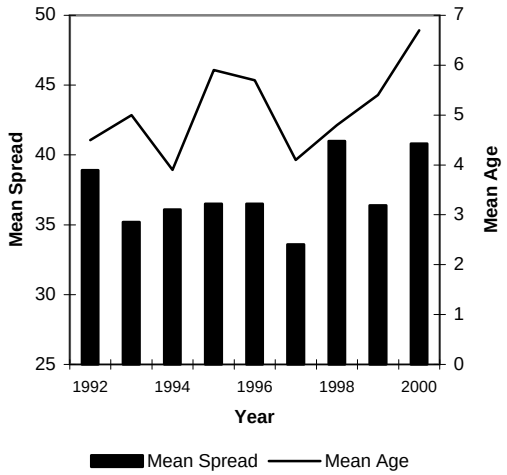

Figure 3. Age (years) and antler spread (inches) of bull moose harvested in Colville District.

get: hunters harvested at least 3 bulls over 10 years of age (11-Selkirk, 12 & 13-49 Degrees North). The 2000 bull moose harvest included no yearling bulls and 63% that were "prime" (over 5 years old). The running 5-year average hunter harvest of prime bulls stands at 50% (Table 4).

Habitat condition and trend

The 2000-2001 winter was long but the mountain snow levels were below normal and moose losses due to winter severity should have been minimal.

Moose prefer 15-25 year old clear-cuts or thinnings on mesic sites. Logging was intense in northeast Washington in the 1980s on public and private lands. More recently the rate of logging on public lands has decreased but private lands have been heavily logged. Generally, it appears conditions for moose production will be optimal for the next few decades. Our observations during winters with relatively deep snow leads us to believe that mature forest stands for snow intercept cover adjacent to forage units may be the critical habitat component of the next decade in the heavily logged areas.

Human safety and nuisance problems

Moose occasionally create a nuisance and potential safety problem in one or more of the small towns or communities in the Colville District but these are usually handled by either gently herding them out of the city limits or stopping traffic long enough for them to find their own way out.

Possibly more serious in the rural areas of this district are the increasing moose vs. vehicle collisions. Moose also attack snowmobilers and at least on one occasion hikers on foot. We're not aware of any human injuries but the local snowmobile shop has had a couple heavily damaged machines come in.

Management conclusions

Permit levels for 2001 in the Selkirk and 49 Degrees North units were increased by 20% in light of the relatively high bull:cow ratios, 6.7 mean bull age, lower days per kill, and the continued favorable calf:cow ratio. While harvest and hunter observations provide favorable information for the Threeforks Unit the sample size is small and we would like better survey data or more years of harvest data prior to recommending changes there.

While there may not be any specific need for more cows to be harvested the fact we consistently take so few at least suggests there may be an opportunity to discuss hunts directed specifically at antlerless animals.

The availability of survey funds generated by the moose raffle and auction hunts has contributed greatly to moose hunting opportunity and habitat mapping. This has been a great example of hunters getting a direct return from funds they have contributed.

Table 4. Tooth age and antler spread in inches for harvested bull moose in the Colville District, 1992-2000.

Year	*n*	Mean Age	Mean Spread	Yearling	2-5 yrs.old	> 5 yrs.old
1992	5	4.5	39	0%	80%	20%
1993	6	5.0	35	0 %	67%	33%
1994	8	3.9	36	0 %	75%	25%
1995	8	5.9	37	0 %	50%	50%
1996	17	5.7	37	6 %	29%	65%
1997	16	4.1	34	13 %	56%	31%
1998	22	4.8	41	0%	55%	45%
1999	22	5.4	36	10%	45%	45%
2000	34	6.7	41	0%	37%	63%

MOOSE STATUS AND TREND REPORT: REGION 1
GMUs 124, 127, and 130

DINAH J. DEMERS, Regional Wildlife Program Manager

Population objectives and guidelines

Moose population management objectives in Washington are to maintain a healthy population and provide quality-hunting opportunity through limited entry permits. Increased emphasis on harvest is needed to address moose damage and nuisance activity near the Spokane metropolitan area.

Hunting seasons and harvest trends

Moose hunting opportunity in Washington is limited by permit, and is generally a once in a lifetime opportunity if drawn (this stipulation is waived for the Mt. Spokane youth-only permit hunt). Permit season dates remained October 1 - November 30, 2000. Moose hunts were open for the use of any legal weapon in order to provide eligibility to all hunters for all units and maintain hunter weapon choice.

Twenty-seven permits were available in the Mt. Spokane and Hangman units and a total of 7635 hunters applied for the general permit drawing in 2000. The Hangman and Mt. Spokane units each had an either-sex moose hunt; in addition, two antlerless only moose hunts were for the Mt. Spokane unit.

Twenty-five permittees submitted harvest reports for 2000, and all reported that they hunted moose. Twenty-four moose were killed (6 bulls, 18 cows) for a hunter success rate of 96%. The mean number of days hunted per hunter was 3.8 days (Table 1). The youth hunt in GMU 124, Mount Spokane, was very successful. All the youngsters (15 years or younger) hunted and all harvested an animal.

Surveys

During the winter of 1999-2000, standardized aerial surveys of moose in the Mt. Spokane Unit and adjacent units of Idaho was conducted by WDFW ungulate biologist W. Myers, in cooperation with Idaho Fish and Game. Survey data were used to develop a sightability model and population estimate. The total population estimate for the Mount Spokane unit on both sides of the Washington - Idaho state line was 180 moose (Myers, pers. comm.) (Table 2). The estimate for the Mt. Spokane Unit in Washington was 84 moose. This aerial survey is scheduled to be repeated in the winter of 2001-2002.

Table 1. GMU's 124,127,130 moose harvest and hunter effort.

Year	Permits	Success	Bull	Cow	Total	Days /hunt	Days /kill
2000	27	96%	6	18	24	3.8	3.8
1999	17	100 %	9	8	17	2.6	2.6
1998	15	87%	8	5	13	3.9	3.4
1997	11	91%	10	0	10	4.4	4.4
1996	8	100%	6	2	8	5.3	5.3
1995	5	100%	5	0	5	3.8	3.8
1994	4	100%	3	1	4	11.0	11.0
1993	3	100%	3	0	3	5.3	5.3

Population status and trend analysis

Several pieces of information support the observation that the moose population in District 2 has increased over time. Moose numbers observed during three aerial surveys has increased over time (Table 3); hunting success has averaged over 96% since 1993; 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 are not infrequent.

Habitat condition and trend

Moose prefer 15-25 year old clear-cuts or thinned stands on mesic sites. Generally, in the Mt. Spokane unit, it appears conditions for moose production will be optimal for the next few decades. This unit is made up of private timberlands east and northeast of the Spokane metropolitan area. Timber management practices on private lands from about the past 15 years are providing excellent forage areas for moose. 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.

Human safety and nuisance problems

Individual moose can cause human safety or nuisance concerns within the metropolitan area of Spokane. The procedure for addressing moose within the urban/suburban area is addressed in the WDFW Dangerous Wildlife Policy. During 2000 there were 12 moose captured and relocated by WDFW personnel (Capt. Whorton, WDFW).

Management conclusions

There is tremendous interest in moose hunting in Washington. Populations appear to be expanding their range. This is a species for which we may be able to

Table 2. Population composition counts by area surveyed in 1999.

Area	GMU	Date	Bull	Cow	Calf	Total	B:100C:Calf	Pop. Estimate
Mt. Spokane WA Unit	124	1999	8	22	11	41	36:100:50	84
Idaho-Unit		1999	6	27	14	47	22:100:52	96
Total			14	49	25	88	28:100:51	180

increase hunting opportunity.

The number of moose in the Hangman unit is limited to the northern end of the units (GMUs 127 and 130). Though moose have been observed wandering in other areas of these units the population does not seem to be increasing as quickly as the herd in GMU 124.

Mt. Spokane unit is all of the GMU 124 in northern Spokane County. Moose habitat is currently improving as plant succession of clear cuts on private lands advances. The first five years after timber harvest may be of limited use to moose and other forest species but gradually thereafter, moose and other species will utilize brush fields created by logging. The Mt Spokane unit is largely composed of private timberlands in some stage of succession that is of benefit to moose especially for winter range. The "uncanopied, 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", according to Costain (1989).

Table 3. Herd composition from aerial surveys of the Mt. Spokane unit.

Year	Total moose seen	Bull:Cow:Caft
1990	7	39:100:61
1992	7	50:100:25
1999-2000	41	36:100:50

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.

Whorton, M. Capt. Personal communication.

BLACK BEAR STATUS AND TREND REPORT
Statewide

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

Population objectives and guidelines

The goals for black bear management in Washington are: 1) maintain sustainable, healthy populations of black bears through all bear habitats, 2) maximizing recreational hunting opportunities consistent with the status of bear populations, 3) minimizing black bear nuisance and damage activity.

Sex ratio and median ages of harvest bears are used as indicators of the overall bear health and vigor, and reflect the impact of harvest levels on bear populations (Table 1).

Table 1. Guidelines for black bear harvest management.

Criteria	Over	Harvest Acceptable	Desirable
%Females in harvest	≥40%	≤36%-39%	≤35%
Median harvest age	≤3 Years	≥4 Years	≥5 Years
Median age of males in harvest	≤2 Years	>2 Years	≥4 Years
Median age of females in harvest	≤4 Years	≥5 Years	≥6 Years

Hunting seasons and harvest trends

Black bear seasons have changed significantly over the last 6 years. Washington voters passed Initiative 655 (which banned the use of bait and hounds for hunting black bear and the use of hounds for hunting cougar and bobcat) in the November 1996 general election. Therefore, the use of bait and hounds for the hunting of black bear became illegal for the 1997 season. In an effort to mitigate the anticipated decrease in bear harvest (i.e., post I-655), 1997 bear seasons were lengthened, and bear bag limits were increased in some areas. Legislation also was passed that provided the authority to the Fish and Wildlife Commission to establish reduced costs for black bear and cougar transport tags; an effort to increase the number of bear hunters and, therefore, bear harvest. As a result of these efforts, the 1998-2000 black bear harvest increased above previous levels (Table 2, Figure 1).

Population status and trend analysis

Based on a model using population reconstruction methods and harvest age data, the statewide black bear population in Washington likely ranges between 25,000-30,000 animals, with a stable to slightly increasing statewide population. At the Black Bear Management Unit (BBMU) level, bear populations are generally healthy. To maintain these stable populations, modifications to harvest levels are made (on a 3-year basis) as indicated by recent trends in female harvest and median ages (Figure 2).

Surveys

No formal surveys are conducted in Washington for black bears. In the past, Washington Department of Fish and Wildlife conducted bait station surveys as a measure of bear abundance. However, an analysis of statistical power indicated that at the level of survey intensity (limited by funding), we would not be able to detect a change in bear abundance using bait stations. As such, the survey technique was discontinued. Ideas for future survey efforts are being discussed and will likely focus on population monitoring in suburban habitats via capture-recapture, DNA, or resight methods.

Nuisance and damage activity

The total number of black bear-human interactions decreased slightly between 1999 and 2000, from 624 to 485, respectively (Figure 3). Black bear nuisance and damage activity may not be a good indicator of the status of the population, but more likely it reflects environmental conditions. For example, in 1996 we had a late spring with poor forage conditions for black

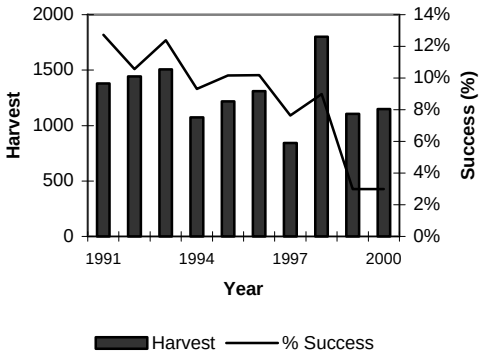

Figure 1. Black bear harvest and hunter success in Washington, 1991-2000.

Table 2. Statewide black bear harvest, hunter effort and median age information, 1990 - 2000.

								Median Age		
Year	Male	Female	Total	# of hunters	% Success	Hunter Days	Days per kill	Males	Females	% females
1990	NA	NA	NA	NA	NA	NA	NA	2.5	4.5	NA
1991	876	503	1,379	10,839	13%	84,771	61	3.5	4.5	36%
1992	921	521	1,442	13,642	11%	98,434	68	4.5	4.5	36%
1993	986	521	1,507	12,179	12%	102,558	68	3.5	5.5	35%
1994	654	419	1,073	11,530	9%	110,872	103	3.5	4.5	39%
1995	850	368	1,218	11,985	10%	102,859	84	3.5	4.5	30%
1996	951	359	1,310	12,868	10%	104,431	80	4.5	5.5	27%
1997	546	298	844	11,060	8%	97,426	115	4.5	5.5	35%
1998	1,157	645	1,802	20,891	9%	216,456	120	4.5	5.5	36%
1999	757	349	1,106	37,033	3%	481,319	435	4.5	5.5	32%
2000	777	371	1,148	37,401	3%	296,849	259	4.0	6.0	32%

bear, followed by a poor fall huckleberry crop.

Management conclusions

Washington has a unique and challenging situation when it comes to management of our black bear population. Washington is the smallest of the eleven western states, yet we have the second highest human population; a population that continues to grow at record levels. We also have one of the largest black bear populations in all of the lower 48 states. Given that approximately 75% of our black bear habitat is in Federal or private industrial ownership a large portion of core black bear habitat is relatively secure. This means that the long-term outlook for black bear is generally good.

As local bear populations respond to current reduced levels of harvest a greater emphasis on monitoring populations within individual bear management units will be necessary. Continued changes to bear seasons, bag limits, and depredation processes are likely as we seek to minimize levels of human-black bear conflicts by using general season hunting, public education, and depredation control.

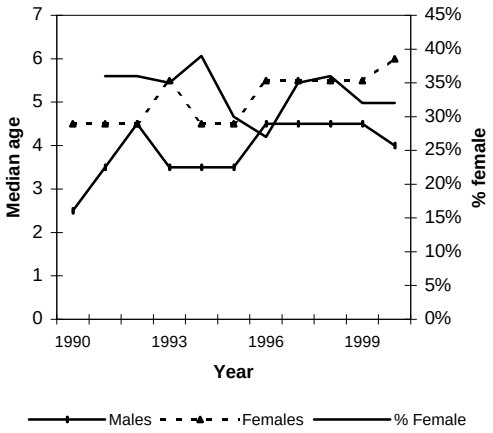

Figure 2. Median ages of harvest bears and % females in harvest, Washington 1990-2000.

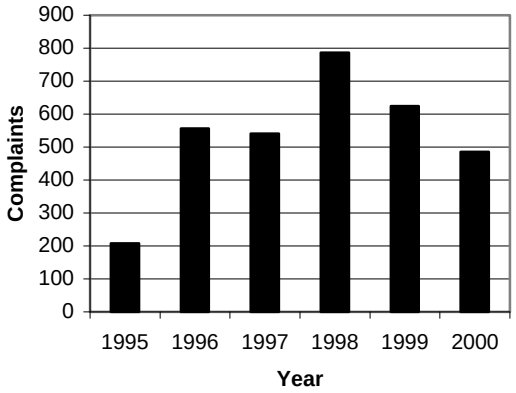

Figure 3. Trend in confirmed human-black bear interactions, 1995-2000 (1995 based on 10 months of data).

BLACK BEAR STATUS AND TREND REPORT: REGION 6
Coastal Black Bear Management Unit (BBMU1)

WARREN MICHAELIS, Wildlife Biologist

Population objectives and guidelines

In view of the increasing number of bear complaints in residential areas, the current objective is to balance bear population growth with human-bear conflict. This is to be achieved while maintaining a viable and healthy bear population.

Hunting seasons and harvest trends

The estimated total black bear harvest for the coastal region in 2000 was 159 (Table 1). Total harvest decreased from 1999 and 1998 and was more similar to the total 1997 harvest. About 80% of total harvest was males and 20% females. Hunter success declined, as did the estimated number of days/kill from 401 in 1999 to 327 in 2000 (Table 1). The 2000 general black bear season extended from August 1 through November 12 and, through use of a damage bear tag, hunters could take up to two bears. Damage bear tags were valid in the coastal bear unit.

Population status and trend analysis

The median age for black bear harvested in 2000 was determined by cementum annuli from black bear tooth samples submitted by successful hunters. Seventy-five teeth from male bears and 28 from females were aged. The median ages for males 4.5 and females 5.5 were identical to the median ages from the teeth submitted from the 1999 harvest (Table 2).

Nuisance and damage activity

Spring timber damage seasons in Region 6 are on an "as needed" basis. Total take for the 2000 spring season was 46 bears. The 2000 take was down considerably from the 1999 spring season where 72 bears were taken as a result from nuisance and damage complaints. Nuisance harvest of bears is from animals considered to be a threat to humans or livestock. The number of confirmed complaints and the number of bears removed as a result are summarized by GMU's that collectively constitute the coastal BBMU (Table 3).

Management conclusions

Total harvest for 2000 was down from the previous 1998 and 1999 seasons. However, harvest of male bears stayed at similar levels with the previous 1998 and 1999 seasons. Reduced harvest on the female component of the population may be a result of reduced hunting method effectiveness rather than an indicator of decreased population density. Male bears are more likely to cover larger distances and hence be more vulnerable than the females whose movements are more confined.

Table 1. Region 6 bear harvest summary 1996-2000.

Year	Male	Female	Total	Days/Kill	Hunter Success
2000	127	32	159	327	2%
1999	126	98	224	401	3%
1998	131	90	221	178	5%
1997	102	56	158	92	9%
1996	222	44	266	103	10%

Table 2. Age distribution of male and female black bear harvested in the Coastal BBMU from 1996-2000 (*n*=number of tooth samples).

	Male age				Female age			
Year	*n*	Min.	Max	Median	*n*	Min.	Max	Med.ian
2000	73	1.5	16.5	4.5	28	1.5	10.5	5.5
1999	65	0.5	16.5	4.5	57	1.5	19.5	5.5
1998	46	0.5	24.5	6.5	27	0.5	24.5	6.5
1997	39	1.5	21.5	4.5	19	2.5	20.5	8.5
1996	63	1.5	20.5	3.5	32	1.5	19.5	5.5

Table 3. The number of confirmed 2000 bear damage complaints by GMU's and the number of bears removed from BBMU 1[a].

GMU	Confirmed	Bears removed
506	1	1
602	4	4
603	1	0
621	2	0
642	2	0
648	1	1
684	5	0
Total	16	6

[a] Reporting area changed from counties to GMUs.

BLACK BEAR STATUS AND TREND REPORT: REGION 6
Puget Sound Black Bear Management Unit (BBMU 2)

GREG SCHIRATO, District Wildlife Biologist

Population objectives and guidelines

Population objectives for black bear in the Puget Sound Bear Management Unit (BBMU 2) are to maintain healthy populations that can sustain a recreational hunt, while minimizing nuisance and damage complaints from timberland owners and people living in urban areas.

Hunting seasons and harvest trends

Black Bear Management Unit 2 is comprised of Game Management Units 407, 410, 484, 652, 624, 627, 633, 666, and 667. Hunting seasons in BBMU 2 are the same as the statewide seasons established for western Washington. This allows a two bear bag limit and includes one bear tag with a big game license.

Table 1 and Figure 1 show the median ages and percent of females harvested for the years 1995 through 2000. Statewide harvest criteria are: maintain a female harvest at 40% or less of the total harvest, with median ages for males at 2.5 years or older, and that of females at 5 years or greater. Data for BBMU 2 indicate that current harvest levels are reasonable.

Hunter numbers increased in 1998 through 2000 (Figure 2), with a liberalization of the tag purchases and availability of including a bear tag with a big game license.

The current recreational harvest exceeded harvest levels pre-dating the 1996 bear hunting initiative. Over this same time frame the number of hunters continued to increase and hunter success continued to decline (Table 1, Figure 2).

Population status and trend analysis

Population modeling prior to the initiative showed the statewide population to be increasing. The annual mortality rate was estimated to be 0.22/2000, 0.31/1999 similar to the calculation of 0.33 in 1996 when the population was increasing (the annual mortality rate, as determined as the percent of bears at recruitment age of 3.5 years, was calculated for the past 5 years). These calculations do suffer from small sample sizes.

Habitat condition and trend

Large areas of BBMU 2 are in commercial forest production. Continued conversion of forestland to urban and suburban development is expected to continue in this low elevation unit. Nuisance complaints are on the increase from people living in these areas and we expect to see more conflicts as more people move into the area.

Nuisance and damage complaints

Within the counties of BBMU 2, 347 bear complaints were recorded. In addition, under the bear voter initiative, private landowners could continue to use hound hunting to control problem bears destroying property. Harvest figures do not include these damage

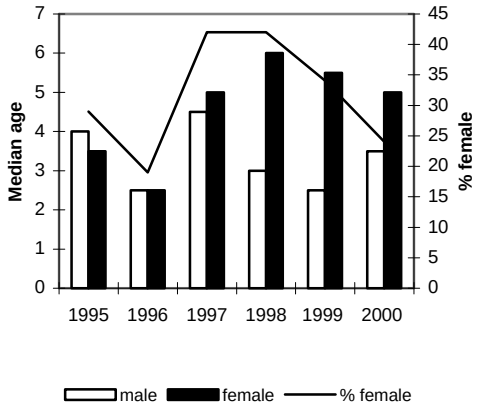

Figure 1. Median age and percent females in black bear harvest, BBMU 2.

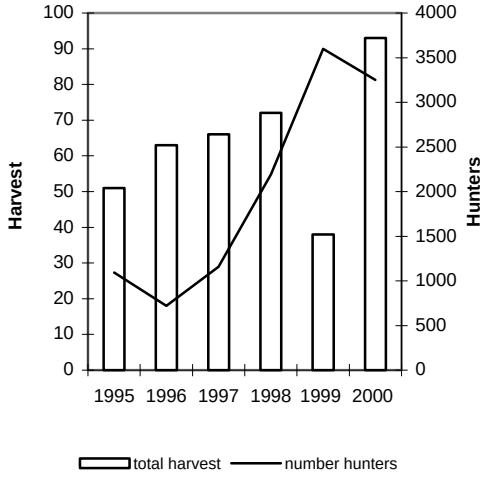

Figure 2. Total harvest and number of hunters, BBMU 2.

Table 1. Harvest statistics for Puget Sound black bear management unit, 1995-2000.

	Harvest				Number	Median age		
Year	male	female	Total	days/kill	hunters	Male	Female	% female
1995	36	15	51	185	1094	4	3.5	29
1996	51	12	63	83	719	2.5	2.5	19
1997	38	28	66	89	1159	4.5	5	42
1998	42	30	72	216	2193	3	6	42
1999	25	13	38	837	3598	2.5	5.5	34
2000	75	18	93	201	3250	3.5	5	24

bears. During 1999, almost 50% of the bear removals in BBMU 2 occurred with hounds outside the recreational harvest.

Management conclusions

Current age and sex ratios were within the statewide harvest criteria. Harvest success rates continued to drop as participation increased. Some effort should be made to control timberland damage with recreational harvests.

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

RUTH MILNER, District Wildlife Biologist

Population objectives and guidelines

Population objectives for black bear in the North Cascades Bear Management Unit (BBMU 3) are to maintain healthy populations that can sustain a recreational hunt, while minimizing nuisance and damage complaints from timberland owners and people living in urban areas.

Hunting seasons and harvest trends

Black Bear Management Unit 3 encompasses Game Management Units 418, 426, 437, 448, 450 and 460. Hunting seasons in BBMU 3 are the same as the statewide seasons for western Washington.

Statewide criteria for assessing acceptable harvest levels for black bear include a percentage of females harvested that is less than 40%; the median age of males harvested of greater than 2 years; and the median age of females harvested greater than 5 years. Median ages of harvested males and females harvested in 2000 are within acceptable levels, as is the case for the 6-year average from 1995-2000. The percentage of females harvested increased in 2000 (43%) and is slightly above acceptable levels (Table 1, Figure 1).

Region 4 records indicate 14 male and 7 female bears were taken with depredation permits issued in BBMU 3 in 2000. Age data, determined from tooth analysis, are not available for bears taken under depredation permits. When the depredation harvest is added to hunter harvest, the total percentage of females harvested increased an additional 1% to 44%.

Total number of hunters decreased slightly in 2000, with 3,065 hunters reporting that they hunted the North Cascade Unit (Figure 2). This number is representative of the mean number of hunters in BBMU 3 from 1998-2000 (3,095, SD=165), and is about twice the mean number of hunters hunting BBMU 3 from 1995-1997 (1,502, SD=336).

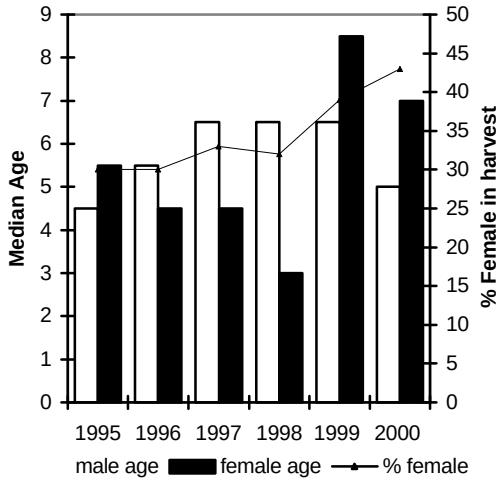

Figure 1. Median ages of black bears and % female in harvest, BBMU 3.

Total harvest in the North Cascades Unit increased slightly in 2000 compared to 1999 (Figure 1). However, the 169 bears harvested in 2000 was slightly below the mean number of bears taken over the last 6 years (177, SD=57).

Population status and trend analysis

Black bear population surveys were not conducted in BBMU 3 in 2000. Harvest data indicate the black bear population continues to be stable, with the population adequate to maintain a hunting season.

Habitat condition and trend

Habitat condition, in general, appears stable in BBMU 3. Rainfall in 2000 was below average; however regular rain events occurring during a warm

Table 1. Harvest data for North Cascades Black Bear Management Unit, 1995-2000.

						Median Age		
Year	Male	Female	Total Harvest	Days/kill	No. Hunters	Male	Female	% Female
1995	107	46	153	60	1,658	4.5	5.5	30
1996	130	55	185	63	1,733	5.5	4.5	30
1997	78	38	116	54	1,117	6.5	4.5	33
1998	192	91	283	69	2,948	6.5	3.0	32
1999	95	62	157	210	3,273	6.5	8.5	39
2000	118	51	169	108	3,065	5.0	7.0	43

spring and summer likely resulted in adequate forage availability for bears.

Many state and private lands in BMU#3 now have gated entrances, where hunting is allowed, but access to motorized vehicles is prohibited.

Management conclusions

Increased numbers of hunters harvested fewer bears in 1999 compared to 1998. Reasons for this are unclear; however, harvest levels apparently remain within acceptable limits for this species.

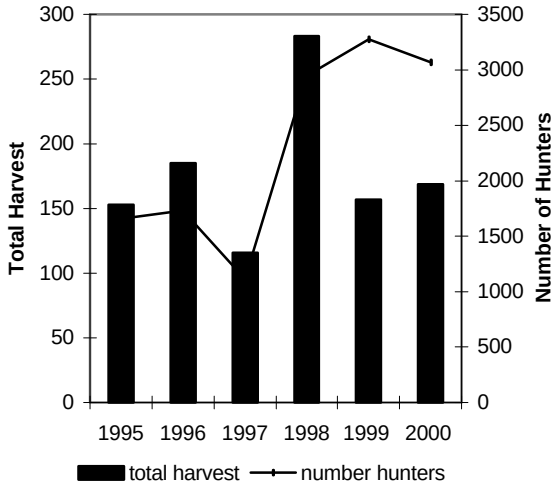

Figure 2. Total harvest and number of hunters, BBMU 3, 1995-2000.

BLACK BEAR STATUS AND TREND REPORT: REGION 5
South Cascades Black Bear Management Unit (BBMU 4)

DAVID ANDERSON, District Wildlife Biologist
MIN HUANG, Wildlife Biologist

Population objectives and guidelines

Black bears are managed in western Washington to provide maximum recreational opportunities without detrimentally affecting black bear population levels. Black bear population levels are monitored through harvest statistics (median harvest age for each sex and percentage of females in the harvest). Acceptable harvest parameters for black bears in the South Cascade Bear Management Unit (BBMU 4) are: <40% females in the harvest, median female harvest age $\geq$5, and median male harvest age of $\geq$2. Bear harvest also is managed in an attempt to reduce timber damage, property damage, and black bear-human interactions.

Hunting seasons and harvest trends

General Season

The general black bear season in the BBMU 4 was from 1 August to 15 November, with a season limit of 2 bears. The 2000 general season was the fourth since the passage of Initiative 655, which banned the use of bait and hounds. Prior to the passage of I-655, many hunters used bait and hounds and had much greater success than hunters who did not (boot hunters). Evidence from other states indicates that harvest by boot hunters will increase over time, as greater numbers of hunters choose to hunt bear and learn new methods of hunting them. In 2000, hunter success (0.02%) and was higher than 1999, but still below levels prior to passage of I-655. The reported 2000 general season black bear harvest in the BBMU 4 was the second highest in the 1990s (Table 1). Late summer berry production and abundance of other fall foods likely increased vulnerability of black bears to ancillary harvest by deer and elk hunters with a bear tag. Bear hunter numbers were second highest in the 1990s, similar to those reported in the 1999 general season (Table 1). Many of these hunters purchase a bear tag on the chance of an encounter during a deer or elk hunt. Total black bear harvest in BBMU 4 increased substantially from 1999 to 2000 while the same trend did not follow statewide. Harvest numbers in BBMU 4 increased 50% while statewide numbers increased 5% from 1999 levels. This trend should be monitored over the next few years so population changes can be assessed.

Depredation Season

In addition to general season hunting, black bear depredation permits continued to be issued to landowners during the spring of 2000 to mitigate timber damage. A total of 58 bears were taken (24 males, 19 females, 15 unknown). The overall effect of the spring depredation permit harvest on bear populations and the benefit these hunts have in the reduction of timber damage needs to be evaluated.

Population status and trend analysis

Harvest data from general season take indicate that historic bear harvest levels in the BBMU 4 are within acceptable limits. Harvest reports in 2000 reveal some improvement in population demographics, at least of harvested bear. In 2000, the percentage of females in the harvest was 38% and was within the target levels of less than 40%. By comparison, the 1998 figures reported more than 56% of the population were females, which exceeded target levels. Median age of the female harvest was 5.5, which was also within management goals for BBMU 4.

Surveys

Table 1. General season black bear harvest in the South Cascades Black Bear Management Unit, 1991-2000.

Year	Male	Female	Total	Success	Hunters	Days Hunted	Days/Kill
2000	127	44	171	0.02	7,206	57,733	338
1999	71	15	86	0.01	7,669	74,857	870
1998	95	67	162	0.03	5,112	45,061	278
1997	36	30	66	0.02	2,707	17,778	269
1996	127	70	197	0.08	2,447	13,629	69
1995	70	26	96	0.04	2,368	16,307	170
1994	97	44	141	0.05	2,710	19,503	138
1993	97	44	141	0.06	2,405	16,663	118
1992	84	46	130	0.05	2,407	15,698	121
1991	92	53	145	0.07	2,070	13,055	90

No bear surveys were conducted in BBMU 4 in 1999-00. Bear survey did not rank high in our prioritization of activities for 2000, when competing against other essential tasks.

Nuisance and damage

During the time period 1 January to 31 December 2000, enforcement officers responded to a total of 63 black bear complaints, up significantly from 41 in 1999. Of these complaints 15 were responded to by trapping and relocating the problem bear. The remaining 48 complainants were given advice and sometimes capture of the problem bear was attempted but without success. No nuisance bears were removed by lethal means.

As urbanization continues to encroach on bear habitat in BBMU 4 the volume of complaints will likely increase. Although acceptable harvest parameters have recently been exceeded in BBMU 4, as revealed by the lower than acceptable median ages in 1997-98 (Table 2), human health and safety concerns will continue to justify localized high harvest levels and removal of 'problem' bears.

Damage to certain industrial and private timberlands continues to be addressed through the issuance of depredation permits. Many industrial timber companies, however, continue to administer feeding programs to reduce spring bear damage to young trees. Forest industry biologists believe that feeding programs have resulted in the desired decrease in damage, without lethal removal of bears.

Habitat condition and trend

Black bear habitat is affected by both timber and land-use practices. Timber harvest in BBMU 4 has remained relatively constant on private timberlands. Due to the creation of late successional reserves, timber harvest on USFS lands within BBMU 4 will continue to be low to moderate, while industrial timber harvest will continue to be high. Encroaching residential development, however, poses the greatest threat to black bear habitat in BBMU 4. Since 1990, the human population in the unit has increased by 37.2% (Office of Financial Management). The statewide population increase over the same time period was 25.1%. Increasing development will reduce suitable habitat and lead to an increase in bear-human encounters and conflicts.

Management conclusions

Black bear harvest increased in 2000 and rose to the second highest level in the past 10 years. Harvest demographics in 2000 represent an improving trend from 1998 when median female harvest was well below the 5 year old age class. Although the percentage of females in the harvest has declined in 1999 and 2000 (Table 1), the median age of harvested females was still lower than objectives. In fact the median age was greater than 5.5 years only twice in the last ten years. This suggests that harvest intensity may be too high (Table 2). To better evaluate the impacts of the added harvest pressure, WDFW hopes to increase the number of tooth samples returned from the bear harvest, particularly from bears taken during the spring depredation permit hunt. Due to the extremely small tooth sample size the overall effect of spring depredation hunting on bear population demographics is unknown.

Recent short-term habitat conditions (i.e. berry crop failures) and long-term habitat changes (i.e. encroaching human development) contribute to changing bear populations. Drought conditions in 2000 may impact overall bear productivity in this Unit. With continued heavy hunting pressure we may see declines in this population should present conditions continue.

Table 2. Median age of black bear harvested in the South Cascades Black Bear Management Unit, 1991-2000.

Year	Male	*n*	Female	*n*	Sexes Combined	*n*
2000	4.5	27	5.5	17	4.5	44
1999	4.5	32	5.0	8	4.5	40
1998	4.5	28	3.0	16	4.0	44
1997	2.5	7	5.0	14	3.5	21
1996	3.5	21	7.0	18	5.5	39
1995	3.5	32	5.5	8	4.0	40
1994	5.5	13	6.5	5	5.5	18
1993	4.5	31	3.5	23	4.5	54
1992	4.5	26	3.5	14	3.5	40
1991	3.5	33	8.5	23	3.5	56

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

SCOTT FITKIN, District Wildlife Biologist

Population objectives and guidelines

The management objective in Black Bear Management Unit 5 is to provide maximum recreational harvest opportunity, and minimize nuisance and damage complaints, while maintaining a productive and well-distributed population. The health of the population is monitored by examining the median age of bears harvested and the percentage of females in the harvest. Desirable minimums are a median male age of $\geq$4, a median female age of $\geq$6, median age for all bears of $\geq$5, and a female harvest percentage of less than $\leq$35%.

Hunting seasons and harvest trends

The 2000 black bear season in the Okanogan BBMU was from August 1-November 5. Hunting conditions were generally favorable and access remained good throughout the season.

Hunter numbers and days per kill remained high, and success remained low in 2000 (Table 1). This is expected since many bear hunters buy tags with expectation of taking a bear incidentally while hunting other species. The high number of tag holders is the product of dramatically reduced tag fees adopted in the late 1990s, following the statewide ban on black bear baiting and hound hunting.

Despite reduced success, harvest is now fluctuating near average levels achieved before recent harvest technique restrictions. It appears that in the Okanogan BBMU, low tag fees and longer seasons have successfully mitigated for harvest technique restrictions (Figure 1).

Population status and trend analysis

Bears have always been a difficult animal to survey and census. Results from recent WDFW black bear research have helped refine statewide population estimates; however, no estimate for the Okanogan BBMU exists.

Past dramatic statewide declines in harvest, combined with the relatively young age structure of recent years, suggest black bear numbers declined significantly after the middle part of the century. To what extent this was a function of harvest pressure versus habitat loss is unclear. These statewide trends probably also applied to the Okanogan.

More recently, bear numbers have likely improved statewide, as indicated by improvements in population parameters. Until this past season, bear population parameters for the Okanogan BBMU had also improved in recent years, and no longer hovered at or below minimum thresholds. In particular, the percentage of sub-adults in the harvest had steadily declined (Figure 2).

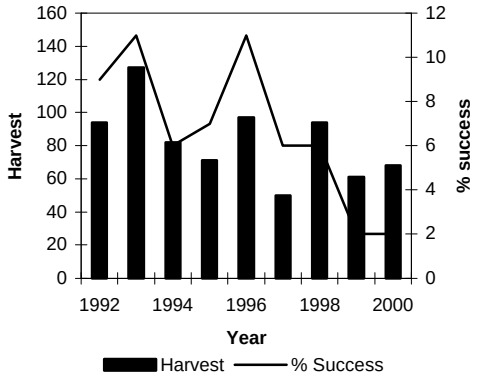

Figure 1. Trend in bear harvest and success, BBMU 1992-2000.

Last year's harvest data suggests a change. The median age of males was below the desirable threshold, and the percentage of females in the harvest was more than twice the desired maximum. This data may require changes to season structure next year.

Nuisance and damage activity

Wildlife officers routinely respond to complaints of bears damaging property or threatening human safety near rural residences or campgrounds. The number of complaints varies widely from year to year as a function of weather and changes in natural food availability. Nuisance complaint levels remained low in 2000. A mild winter, and a bumper crop of many shrub fruits provided ample natural forage, and reduced the potential for bears to come into conflict with people while seeking alternative food sources. Similar conditions existed in 2001 as well.

Habitat condition and trend

At lower elevations throughout bear range in the Okanogan BBMU, human development continually

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
1990	--	--	--	--	--	--	--	2.5	4.5	36%
1991	--	--	--	--	--	--	--	3.5	3.0	36%
1992	54	40	94	990	9%	5,124	55	3.5	3.5	43%
1993	85	42	127	1,153	11%	5,448	43	3.5	3.5	33%
1994	53	29	82	1,384	6%	7,979	97	3.5	2.5	36%
1995	59	12	71	1,047	7%	6,343	89	5.5	8.0	23%
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%

nibbles away at bear habitat, and noxious weeds continue to displace native grasses and forbs. 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.

On the other hand, successful efforts to recover wild salmonid stocks would increase the bear forage base. Also, black bears are benefiting from more aggressive road management occurring on public lands on behalf of a variety of different wildlife species.

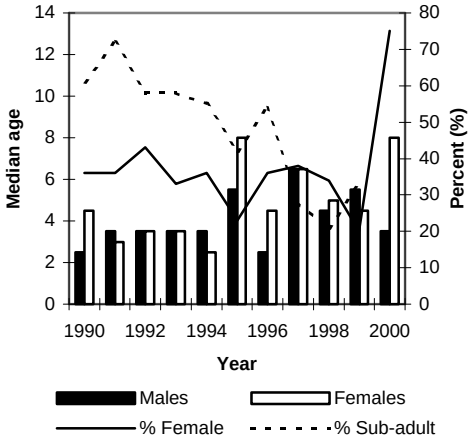

Figure 2. Harvest statistics, BBMU 5, 1990-2000.

Management conclusions

It appears that recent hound hunting and baiting restrictions briefly reduced hunting pressure and harvest, boosting production and improving population age structure. Hunting pressure and harvest have rebounded in response to lower tag fees and longer seasons. Also, hunters appear to be adjusting well to the change in regulations governing harvest techniques. As a result, future population trend will likely be a function of hunter pressure, modified by annual variations in forage availability that influence success rates. The recent spike in female harvest suggests a reduction in season length is appropriate, until we know if this indicates an adverse trend, or is just a one-year anomaly.

Threats to habitat continue, and these will affect overall carrying capacity. The effort to pursue more aggressive road management should be supported. 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. WDFW's ongoing land acquisition in the Methow 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 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.

Existing WDFW culvert traps should be modified or replaced with more modern versions that minimize tooth and claw damage to captured bears. Obtaining state-of-the-art culvert traps for bears is currently a top priority of the North Cascades Grizzly Bear Technical Group.

BLACK BEAR STATUS AND TREND REPORT: REGION 2
East Cascades Black Bear Management Unit (BBMU 6)

TOM McCALL, Wildlife Biologist

Population objectives and guidelines

The management objective for black bears in 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 criteria associated with percent females in the harvest and median ages of harvested bears (Table 1).

Hunting seasons and harvest trends

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 rate decreased from 6.0 percent in 1998 to 1.0 percent in both 1999 and 2000.

In 2000, the damage bear tag area (GMUs 304, 306, 308, and 316) in eastern Washington was eliminated, and the bag limit for bears in eastern Washington was reduced from two to one. The elimination of the damage bear tag area and the reduced bag limit in 2000, were imposed to reduce excessive harvest of black bears.

The harvest of black bears in BBMU 6 was stable from 1989 to 2000 (r =-0.12, P=0.735, n=11). In 2000, 120 black bears were harvested, 34 percent lower than the average between 1990-1999 (182). In 2000, the median age of males (4.0 years) and females (8.5 years) and the percent females in the harvest (28%) were within the acceptable and desirable categories (Table 1).

Table 1. Guidelines for acceptable black harvest in Washington State.

	Harvest level		
Criteria	Over-harvest	Acceptable	Desirable
% Female	≥40%	≤36%-40%	≤35%
Median age	≤3 years	≥4 years	≥5 years
Median male age	≤2 years	>2 years	≥4 years
Median female age	≤4 years	≥5 years	≥6 years

Population status and trend analysis

Harvest statistics suggest the bear population in BBMU 6 was not over-harvested. The percentage of females in the harvest has declined since 1995, while average age of male bears harvested has remained stable and female age has increased. Population models on the statewide scale suggest the bear population is growing slowly.

Nuisance and damage activity

Bear damage in BBMU 6 was concentrated in Chelan County. In general, nuisance and damage complaints of bears increased from 1994 to 1998, following fires that burned large areas in 1994. However, fewer damage complaints were received in 1999 and 2000. Complaints have decreased as the burned areas have recovered and began to provide cover and foraging habitat.

Table 2. Black bear harvest information and median age of black bears for Black Bear Management Unit 6, 1989-2000.

							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
Avg.	120	56	175	4,634	4.8	29,111	4.2	5.4	30

[a] No harvest data available.

Habitat condition and trend

In 1994, fires in Chelan County reduced the amount of forage and cover for black bear. But the impact on forage for black bear was short-term. Since the fires the amount of forbs and soft mast has increased, which should benefit bears. Mast production in BBMU 6 is typically better in cool, moist years. Mast is not surveyed in BBMU 6, but casual observations and reports indicate that 2000, 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. The perception was for bear populations to expand given the ban on baiting and use of hounds in 1997. In 1998, the number of hunters and harvest was well above the 10-year average, but harvest declined in 1999 and 2000. It is not clear whether the ban on baiting and hound hunting will result in an increase in the black bear population. The age and sex ratio of harvested bears will continue to be monitored closely.

BLACK BEAR STATUS AND TREND REPORT: REGION 1
Northeastern Black Bear Management Unit (BBMU 7)

STEVE ZENDER, District Wildlife Biologist

Population objectives and guidelines

The objective for BBMU 7 is to sustain a well-dispersed and healthy bear population. 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. Median ages of males and females should be $\geq$ 2 years and $\geq$ 5 years, respectfully. The desirable percentage of females in the harvest is $\leq$ 35% with an acceptable range of 36%-39%. Greater than 39% is considered over-harvest.

Hunting seasons and harvest trends

Bear season in the primary bear harvest units (GMUs 101-117) of BBMU 7 was shortened by delaying the opening until September 5, the day after Labor Day. The median age of females in BBMU 7 was equal to or below the guideline of $\geq$5 from 1996-1999. An exceptionally high harvest occurred in 1998 and the median female age dropped to 3 in 1999. This prompted the recommendation to eliminate the August hunt in the primary units, thus taking at least some harvest pressure off the bear population. The bag limit was one bear.

From 1991-97, an average of 2,894 people hunted bear in the Northeastern BBMU. With the changes in the hunting regulations and tag prices, hunter numbers increased to over 5,000 in 1998 and to 9,292 in 1999. There was little change in the hunter numbers or bear harvest from 1999 to 2000 (Table 1, Figure 1). There was a significant change in the number of hunter days and the resulting days/kill though due to the closure of the August season in most GMUs. There was a 40% decline in the number of days to take a bear so this may point out the extra August season was providing increased opportunity but was an inefficient time to pursue bear. The Northeast BBMU maintained a hunter success rate (3%) equal to that of the total statewide rate (3%).

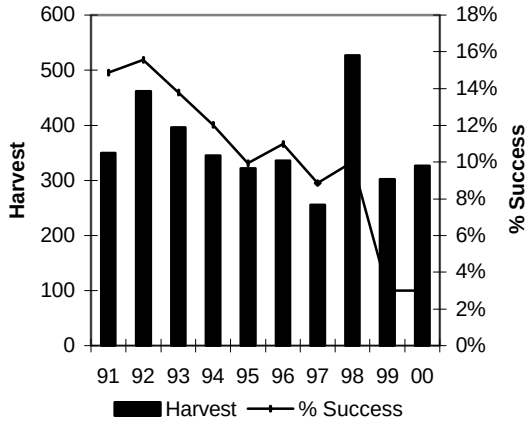

Figure 1. Total harvest and % hunter success, BBMU 7, 1991-2000.

Population status and trend analysis

In BBMU 7, the median age of harvested female

Table 1. Black bear harvest, hunter effort, and median age, Northeastern Black Bear Management Unit, 1991-2000.

								Median Age		RCards
Year	Male	Female	Total	# of hunters	Success	Hunter Days	Days per kill	Males	Females	% females
1991	226	124	350	2,356	15%	15,136	43	3	5	36
1992	266	196	462	2,971	16%	16,234	35	3	6	43
1993	262	134	396	2,876	14%	14,820	37	2	5	34
1994	183	162	345	2,870	12%	15,391	45	3	4	45
1995	215	107	322	3,240	10%	18,884	59	3	5	38
1996	214	122	336	3,055	11%	17,400	52	3	4	37
1997	166	90	256	2,889	9%	16,171	63	3	4	35
1998	347	180	527	5,301	10%	40,687	77	4	5	34
1999	228	74	302	9,292	3%	92,813	307	3	3	25
2000	210	117	327	9,538	3%	60,127	184	2	5	36

bears in 2000 increased to 5 from 3 years old in 1999. This is encouraging; we need to see a trend in female median age that exceeds the guideline of $\geq$ 5 years. The median male age was also 2 years, which is acceptable but below the desirable age of $\geq$ 4 years. Females comprised 36% of the harvested bears, which is acceptable (Figure 2).

Nuisance and damage activity

Fish and Wildlife Officers received 72 black bear complaints in the Northeast BBMU in 2000. This is down from 133 in 1999 and well below the unusually high number (375) of complaints in 1998. The highest number of complaints came in from GMU 121 (22) and this is a unit that we maintained the general August opener in to help deal with the normal high incidence of complaints.

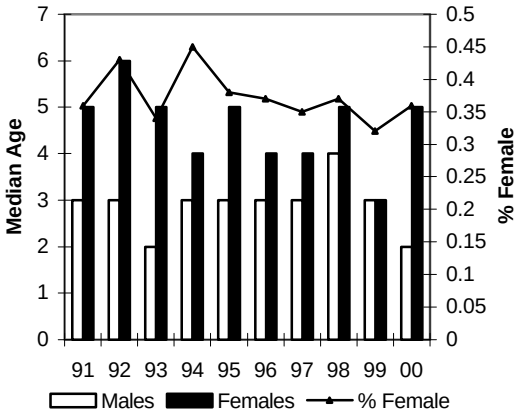

Figure 2. Median ages of harvest bears and % female in the harvest, BBMU 7, 1991-2000.

Habitat condition and trend

In the short-term, summer huckleberry production during the 2001 season was poor and may result in reduced cub production or survival. The long-term bear habitat condition and trend appears relatively stable.

Management conclusions

Delaying the opening of bear season in the primary bear units (GMUs 101-117) where most of the public lands are located appeared to have accomplished the goal of stabilizing the harvest at or near acceptable levels. While hunter days of recreation declined by 40% from 1999 to 2000, probably due to the August season cut, the bear harvest, hunter numbers, and hunter success were not affected and maintained near 1999 levels. Given these results, maintaining this long-traditional season framework opening after Labor Day is attractive as it also means less potential for conflict with non-hunters, concern for fire danger, and confusion with special closures for the grizzly bear recovery efforts.

BLACK BEAR STATUS AND TREND REPORT: REGION 1

Blue Mountains Black Bear Management Unit (BBMU 8)

PAT FOWLER, District Wildlife Biologist

Population objectives and guidelines

Black bear populations are managed at a level that provides optimal recreational opportunity for both consumptive and non-consumptive users, while minimizing conflicts with other management objectives.

Hunting seasons and harvest trends

The black bear hunting season has changed dramatically over the last ten years. Since the passing of Initiative 655, the general bear season was lengthened to offer hunters more opportunity, and to achieve an adequate bear harvest. The 2000 bear-hunting season was 62 days, from September 5 to November 5. The August portion of the season was dropped due to implementation of a permit controlled spring season in April and May of 1999. During the 2000 general season, hunters harvested a total of 33 bear in the Blue Mountains. The harvest is 57% below the 1992-99 average of 77 bears/year. The number of days per kill increased substantially from 1992-99 average of 144 days/kill, to 492 days/kill. Hunting conditions in the fall of 2000 were poor due to hot, dry weather, which made bear hunting extremely difficult.

Harvest distribution evened out in 2000, with only 58% of the fall harvest coming from the west Blue Mountains. Two GMUs, the Dayton and Blue Creek units produced 58% of the district harvest. The Lick Creek and Mount View units produced 27% of the harvest, which is slightly higher than normal for these units.

The composition of the fall bear harvest shifted, with 48% of the harvest consisting of males. The 1999 harvest consisted of 83 males and 13 females (86% male), compared to 40 males and 42 females (49% male) in 1998. The reason for the dramatic shift in composition of the harvest is unknown. The median age of boars harvested was 5 years (*n*=12), with a range of 2.5 to 12.5 years. The median age of sows harvested was 3.5 years (*n*=5), with a range of 1.5 to 5.5 years.

A permit controlled spring bear season was continued in the Blue Mountains in 2000. A total of 170 permits were issued in 1999 and 2000 for the spring season, with 133 hunters actually hunting. Hunter success averaged 18%, with boars comprising 79% of the harvest. The spring season results in a much lower percentage of females in the harvest. In 1999 and 2000, hunters averaged spending 5 days afield, and observed 4.2 bears per hunter. Data from the 2001 spring season will not be available until January 2002.

Concerns raised by opponents of the spring bear season have not materialized, such as, females with young being killed, resulting in numerous orphaned cubs. Fears that the Department would be inundated with orphaned cubs did not materialize, and no

Table 1. Black Bear General Season Harvest Summary 1992-2000, Blue Mtns., Washington.

	Bear Harvest							Median Age	
Year	Male	Female	Total	# of hunters	% Success	Hunter Days	Days per kill	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	14	96	3057	3%	25212	263	5.0	2.5
2000	16	17	33	2782	1%	16224	492	5.0	3.5

Table 2. Spring bear hunting statistics.

		Bear Harvest					
Year	Permits	Hunters	Boar	Sows	Hunter Success	Days/Htr.	Bear Obs/Htr.
1999	70	51	5	2	14%	4.5	4.2
2000	100	82	14	3	21	5.4	4.2
Total	170	133	19	5	18%	5.0	4.2

orphaned cubs were picked up by Department personnel. This is probably a result of the hunter education video WDFW sent to all permit holders that shows how to differentiate between male and female bears in the field.

Population status and trend analysis

Based on field observations, sightings, and damage complaints, bear populations in the Blue Mountains remain at fairly high levels.

Bear densities appear to be highest on the westside of the Blue Mountains and in the Wenaha-Tucannon Wilderness. The bear population on the eastside of the Blue Mountains has increased in recent years, because sightings and damage complaints are becoming more frequent.

Nuisance and damage

The number of bear complaints declined, from 10 in 1998 to 5 in 1999. Only five complaints were filed in 2000. Only one complaint necessitated removal.

Habitat condition and trend

Although habitat conditions have changed due to fire suppression, the bear population remains at a high level. The implementation of controlled burning on National Forest lands will improve habitat for bear by increasing the forage base, such as huckleberry fields in the mountains.

Management conclusions

Black bear population growth in the Blue Mountains has probably stabilized, and the population remains at a fairly high level. However, our ability to adequately harvest bear by GMU was severely crippled by Initiative 655. The Mill Creek Watershed and Wenaha-Tucannon Wilderness have high density bear populations that receive little to no hunting pressure and very low harvest rates, which supplements bear populations in adjacent units. These areas help to maintain the bear population at a high level. Combining the general bear season with a permit controlled spring bear season enhances our ability to provide a well-balanced harvest by game management unit.

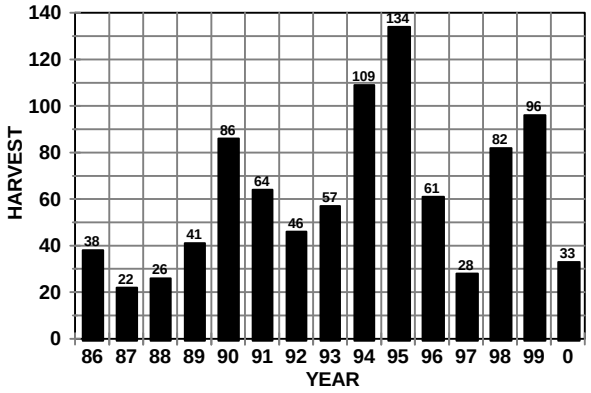

Figure 1. General season harvest, Blue Mountains, 1986-2000.

COUGAR STATUS AND TREND REPORT
Statewide

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

Population objectives and guidelines

The statewide cougar management goal is to maintain healthy, self-sustaining cougar populations within each of 9 cougar management units, while minimizing the number of negative human-cougar interactions. In the past, harvest characteristics were used as guidelines for managing statewide cougar populations; as population management was primarily achieved through recreational hunting. Human-cougar interactions are managed through education, capture-removal, depredation permits, and public safety cougar removals. Given current level human-cougar interactions, increasing harvest opportunities in high complaint areas is a priority.

Hunting seasons and harvest trends

Cougar seasons have changed significantly over the last several years (Figure 1). During the November 1996 general election, Washington voters passed initiative 655 which banned the use of hounds for hunting cougar and bobcat, and the use of bait and hounds for hunting black bear. Initiatives become effective 30 days after passing in Washington, therefore, the use of hounds for hunting cougar became prohibited 8 days into the 1996 cougar permit season. In an effort to mitigate the anticipated decrease in cougar harvest (i.e., post I-655), permit-only seasons were replaced with general seasons, cougar seasons were lengthened from approximately 6 weeks to 7 and one-half months, and bag limit was increased from 1 to 2 cougar/year. Legislation was also passed that provided the authority to the Fish and Wildlife Commission to establish reduced costs for cougar and black bear transport tags. With these efforts, annual cougar harvest during post I-655 years has ranged within similar levels as pre I-655 years (Figure 1).

Population status and trend analysis

Due to the elusive nature of cougars and their relatively low densities, no formal surveys are conducted to determine cougar population status. Rather, the status of cougar populations is estimated through computer population simulation models, harvest characteristics, and trends in human-cougar interactions.

Based on population reconstruction models, harvest age data, the statewide cougar habitat estimates, the cougar population in Washington is likely between 2,400–4,000 animals. This represents a doubling of the estimated cougar population since 1980.

Typically, the status of local or regional cougar populations are monitored via hunter effort and success, median age data, and percentage of females in the harvest; but only when viewed over several years with consistent harvest methods. Due to the changes in harvest methods during the last several years (predominantly hound hunters during pre I-655 years versus entirely spot-stalk hunters during post I-655 years), no reliable trend data exist to accurately assess regional cougar populations or exploitation levels (Figure 2). Nonetheless, our best information from age data of harvest cougar, harvest levels, and human-cougar interaction levels suggest Washington's cougar population is stable to increasing, and is moderately exploited at the current (3-year trend) harvest level.

Nuisance and damage activity

Human-cougar interactions continued to be at high levels during the 2000 calendar year, and addressing those interactions was a top priority of Washington Department of Fish and Wildlife (Figure 3). As such, the Department developed a special depredation process to address cougar densities in areas with high

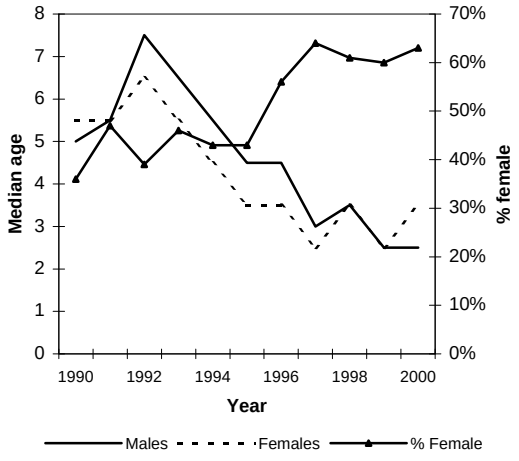

Figure 2. Median ages of harvest cougar and percent females in harvest, 1990-2000.

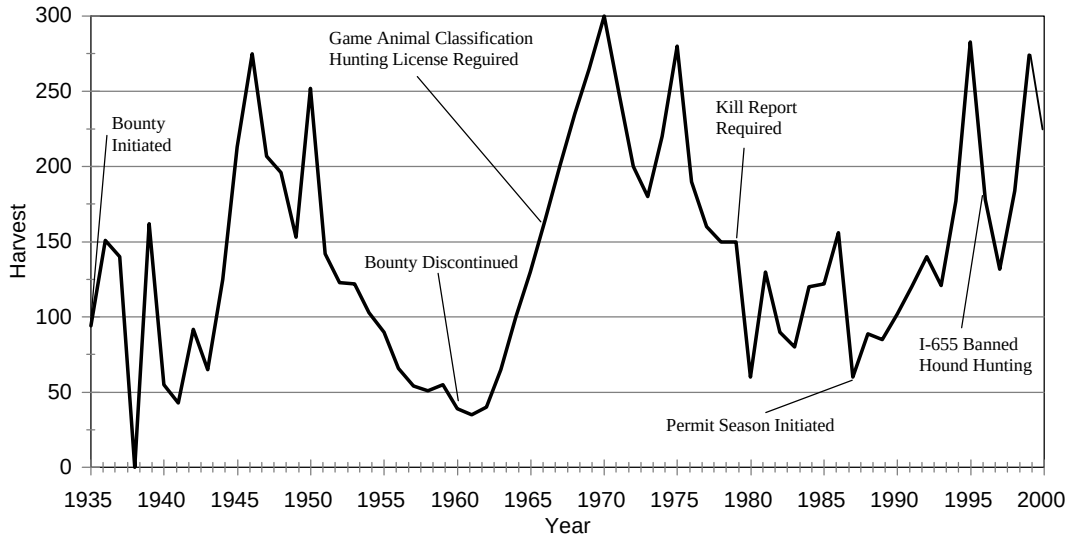

Figure 1. Trend in statewide cougar harvest and harvest method, 1935-2000.

levels of human-cougar interactions. Under rules adopted by the Fish and Wildlife Commission, public safety cougar removals occurred in 17 Game Management Units during the first removal period (Dec 16, 2000–Mar. 15, 2001). Seventy-four cougar were identified for removal and licensed hunters removed 23 animals (31% success rate).

Management conclusions

The statewide cougar population appears to be stable to increasing at this time. However, robust information of regional cougar populations is absent. As such, future efforts should focus on developing survey methods, harvest indicators, or other means to assessing population vigor.

Given the distribution of cougars in Washington and the projected growth of human populations, interactions between humans and cougars will likely continue. As such, the long-term future of cougar in Washington ultimately rests in our ability to co-exist. Therefore, management efforts should also continue to look for ways to minimize human-cougar interactions, particularly at the local population level.

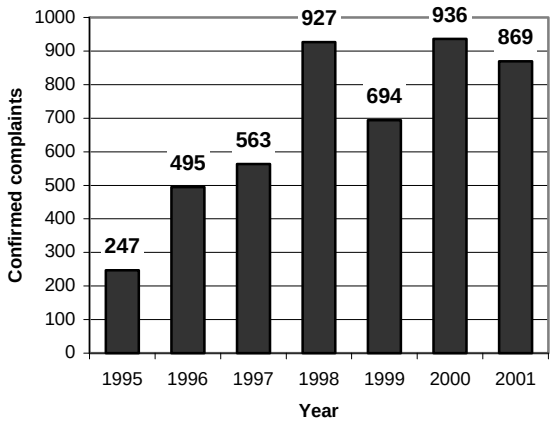

Figure 3. Trend in total confirmed cougar complaints in Washington, 1995-2001 (Includes human safety incidents, pet and livestock incidents, and sightings in suburban or unexpected areas).

COUGAR STATUS AND TREND REPORT: REGION 6
Coastal Cougar Management Unit (CMU 1)

H. M. ZAHN, District Wildlife Biologist

Population objectives and guidelines

The goal for cougar management in the Coastal Unit is to maintain cougar populations at a level that is both self-sustaining and consistent with human safety concerns.

Hunting seasons and harvest trends

The 2000 cougar season extended from August 1, 2000 through March 15, 2001. There were no permit or pursuit-only seasons. Since the passage of Initiative 655 the use of hounds in cougar hunting is prohibited.

A total of 14 cougars were taken during the 2000-2001 cougar season in the Coastal Management Unit (4 additional male cougars were killed for public safety or depredation reasons). Fourteen percent of the harvest was females. Teeth from 9 harvested cougars (7 males, 2 females) were submitted for aging. The 2 females were 2.5 and 6.5 years old. The 7 males ranged in age from 2.5 to 5.5 years of age, with the median age being 3.5 years (Figure 1). The relatively large yearly fluctuations in age and sex ratio parameters are likely the result of small sample sizes.

Table 1. Cougar hunting harvest and percent females in harvest for 1996-2000.

Year	Hunt Type	Harvest	% Females
1996	Permit Hunts	14	57
1997	Permit Hunts	11	45
1998	General Season	15	60
1999	General Season	24	75
2000	General Season	14	38

Population status and trend analysis

Indirect indications, such as human-cougar interactions, suggest that cougar numbers are still increasing. Table lists human encounters with cougars as well as nuisance and depredation cases for all GMUs in the Coastal cougar unit. Only cases that are confirmed or involving reliable witnesses are displayed. To be recorded as a human-cougar encounter, all incidences have to occur outside of areas where cougars are expected to occur. Thus, GMUs like 615 and 618 have large tracts of forest land but because of very low human densities no unusual encounters were recorded although cougar are seen frequently in these areas.

Management conclusions

Harvest has not increased with increasing cougar populations. Increasingly cougars are being killed by Fish and Wildlife Officers or by landowners in damage situations. Seasons may need to be further liberalized to increase efficiency and allow the stabilization of the cougar populations.

Table 2. Numbers of cougar incidences by GMU in 2000 for the Coastal Management Unit.

GMU	Human Encounter	Depredation/ Nuisance	GMU Total
501	2	1	3
504	2	0	2
506	0	1	1
530	1	3	4
601	2	0	2
602	3	1	4
603	4	1	5
607	1	1	2
612	0	1	1
615	0	0	0
618	0	0	0
621	10	11	21
636	1	1	2
638	0	0	0
642	0	0	0
648	5	2	7
651	0	1	1
658	1	2	3
660	0	3	3
663	7	1	8
672	0	0	0
673	2	2	4
681	0	0	0
684	1	5	6
Total	42	37	79

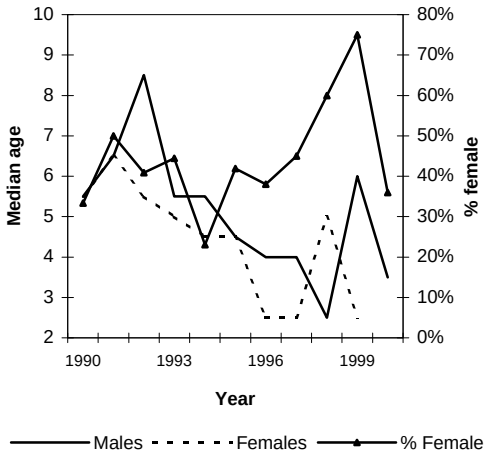

Figure 1. Median ages and percent females of cougar harvest, 1990-2000.

COUGAR STATUS AND TREND REPORT: REGION 4
Puget Sound Cougar Management Unit (CMU 2)
North Cascade Cougar Management Unit (CMU3)

ROCKY SPENCER, District Wildlife Biologist

Population objectives and guidelines

The population objectives for the Puget Sound and North Cascades Cougar Management Units (CMUs) are to provide recreational opportunity and minimize human-lion encounters. A harvest level that maintains cougar populations slightly below current levels may help reach these objectives. However, we are uncertain of the variable circumstances associated with human-cougar encounters. How or if cougar harvest may affect the dynamic of human-cougar encounters remains to be seen.

Hunting seasons and harvest trends

Lion harvest is often dependent on snowfall and hunter access; therefore, harvest can vary from year to year. Harvest level and trends for the Puget Sound and North Cascades CMUs are presented below in table 1.

The general lion hunting season was from August 1, 1999- March 15, 2000. A hunting license and a cougar tag were required to hunt.

The passage of Initiative 655 in 1996 restricted the use of hounds to hunt lions. Subsequently, we should theoretically expect a decrease in hunting related mortality and an increase in human related non-hunting mortality (hit by vehicle, depredation kills etc. Spencer et. al. 1996). Estimation of the number of the non-hunting human related lion mortalities is difficult to predict. However, based on modeling efforts it appears lion populations will continue to increase about 1.5% per year for the next few years (Bender, unpublished data). This increase is, in part, due to the current regulations governing harvest of lions. Although it appears cougar harvest has not declined, despite the ban of use of dogs.

Hunting conditions for the 1997 season were characterized by below average snowfall at the lower elevations making tracking of lions more difficult. In 1998 and 1999 snowfall levels reached record depths at elevations above 2,800 feet, likely forcing lions to lower elevations thereby increasing vulnerability to hunting. Deep snow conditions at high elevation, the extended season compared to past years, and reduced license fees may have contributed to the increase in harvest in 1998 and 1999. The 2000 season was characterized by record low rainfall and mountain snow accumulation; yet harvest declined only slightly to 29 from the previous three-year average of 32.

In the Puget Sound and North Cascades CMU, 29 lions were killed (all sources combined) during the 2000 season; a decrease of about 20% from 1999 (Table 1). In these CMUs, the average percent female lions in the harvest for the 7-year period (1990-96) was about 39%, compared to 63% for 1997-98 and 69% for 1999. In 2000 the percent female dropped notably to 45%. Excessive harvest levels are characterized by a high proportion of females in the harvest (WDFW Draft Cougar Mgmt Plan 1997 p. 49). However, this statement should be evaluated with caution. This increase in the proportion of females in the harvest may be related to the "random" harvest by boot hunters; that is deer and elk hunters who harvest a lion incidentally to their deer and elk hunting efforts. This is contrary to lion harvest by hound hunters, as they more often had the opportunity to "selected" harvested lions. With increasing lion populations, yearly harvest that includes a high percentage of females should be followed and averaged on a three-year basis prior to evaluation of potential impacts to the population in these CMUs.

Population status and trend analysis

Statewide population status and trend analysis are projected from two methods: 1) habitat availability and lion numbers based on density of 2.9 lion/100 km^2 and 2) sex and age ratios, cohort reconstruction, and computer simulation modeling (POPII)(Bender, unpublished data).

Based on computer modeling, the lion population in Washington has increased by about 1.5% per year since 1989 (Figure 1). Projections at the CMU level are difficult and less precise, but these CMUs likely have between 275-450 lions.

The 1997 statewide population estimate from the computer simulation method was about 2,375 lions compared to 2,566 based on habitat availability.

The increase in the lion population is occurring during a period of notable habitat alteration and loss, primarily due to development. While this may appear contradictory, it is likely the result of lion adaptability and recolonization of previously unoccupied habitats. Preliminary data suggests lion adaptability provides them the ability to effectively use vacant rural, suburban, and limited urban and other marginal

Table 1. Harvest, Depredation, Public Safety Removal, and Other Mortality Sources for Cougars CMU's 2-Puget Sound and 3-North Cascades for Years 1997-2000.

	Female					Male					
Year	Hunter Harvest	Depredation Take	Public Safety	Other	Female Total	Hunter Harvest	Depredation Take	Public Safety	Other	Male Total	Total
1997	14	1	na	1	16	7	0	na	0	7	23
1998	20	0	na	1	21	13	1	na	3	17	38
1999	24	1	na	0	25	10	1	na	0	11	36
2000	10	1	2	0	13	11	2	3	0	16	29
Total	68	3	2	2	75	41	4	1	3	49	126

Note: 2000 represents first year of public safety cougar removals.

forested patches. These areas are often classified as designated open space, timbered watershed preserves, and habitat provided by riparian and stream corridors. These sites can provide ample interim and potentially long-term alternative prey species, such as racoon, opossum, coyote, with some areas supporting traditional prey such as deer (Spencer, unpubished data).

Nuisance and damage activity

Lion damage to private property primarily involves killing and injuring pets and livestock. Little information is available to quantify livestock and pet depredation activities.

The incidents of nuisance lions reported to the WDFW has increased significantly. There were 247 reports in 1995 and a 50% increase to 495 in 1996, rising to 563 in 1997 (WDFW Draft Cougar Mgmt Plan 1997). Much of this increase in lion complaints has been in the Puget Sound CMU; where approximately 75 lion nuisance reports were filed.

Habitat condition and trend

There are currently about 8,849,668 ha of habitat available to lions in Washington; the Puget Sound CMU covers 12% of this range (1,052,410 ha). Habitat loss and alteration, coupled with human population growth, can have significant long-term negative impacts to wide-ranging carnivores such as lions. These impacts will likely be most significant in the rapidly urbanizing western counties in the Puget Sound CMU. For example, in King County alone there are approximately 9,750 homes constructed to house the 16,285 new people every year, much of this construction will occur in the suburban and rural areas currently occupied by lions. King County is projected to have an additional 146,250 homes and 244,275 people by the year 2010 (King County Comp. Plan 1994). This will have an influential effect on lion habitat availability, juvenile and adult survival, and population levels.

Management conclusions

There are currently about 8,849,032 ha (21,872,532 acres) of mountain lion habitat within the overall range of lions in Washington State; these CMUs cover about 23% of this range, or about 1,673,000 ha. Much of the western portion of this lion habitat is adjacent to major metropolitan areas (e.g., Seattle, Tacoma, and Everett) and within dispersal range of subadult lions. These rapidly urbanizing areas of western Washington pose unique circumstances that affect lion survival. These include: 1) reduced capacity of the landscape to support lions, 2) increased potential for human-lion encounters, 3) increased intra-specific cougar interactions and mortality, and 4) increased likelihood for non-hunting human-related lion mortality versus hunting mortality (hit by vehicle, depredation kills etc.).

Currently, more than 42% (2,248,000 people) of Washington's State's 5,335,000 total population live within the Puget Sound CMU. The continued human population growth and subsequent habitat loss will have a profound effect on the population dynamics of all wide ranging carnivores, including mountain lions. We are uncertain of the variable circumstances associated with human-cougar encounters. Lion harvest for "public safety" is politically and with some socially

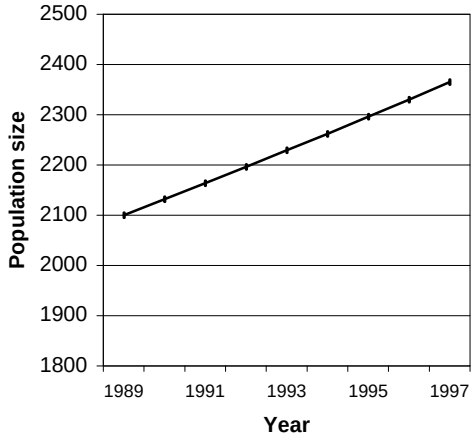

Figure 1. Estimated cougar population growth based in reconstruction (Bender, unplished data).

popular; yet how or if harvest of mountain lion for public safety may affect the dynamic of human-cougar encounters is uncertain.

Literature cited

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COUGAR STATUS AND TREND REPORT: REGION 5
South Cascades Cougar Management Unit (CMU 4)

PATRICK J. MILLER, District Wildlife Biologist
MIN T. HUANG, Wildlife Biologist

Population objectives and guidelines

Management goals for cougar populations in the South Cascades Cougar Management Unit (CMU 4) are to maximize recreational opportunities and attempt to minimize potentially dangerous cougar-human conflicts.

Hunting seasons and harvest trends

The cougar hunting season was from 1 August, 2000 to 15 March, 2001. The bag limit was one cougar. The suspected reduction in cougar harvest after the passage of Initiative 655, which banned the use of hounds, has not been manifest in the South Cascades Cougar Management Unit (Table 1). Harvest report cards indicate that cougar harvest in CMU 4 has increased since passage of the Initiative.

Surveys

Because cougars are difficult to survey and budget limitations, no surveys for cougar were conducted in the CMU 4.

Population status and trend

Based upon harvest and complaint data, the cougar population in CMU 4 is stable to increasing. The prey base and habitat in the unit are well distributed and cougar are probably utilizing most, if not all, available habitat. Nuisance complaints involving cougar are increasing, but no public safety or depredation removals took place in CMU 4.

Habitat condition and trend

The major problem facing cougar in CMU 4 is the encroachment of human civilization. In the six counties that roughly comprise the Unit, human populations have increased 37% since 1987 (WA Office Financial Management 1998). This trend is likely to continue, as the Region's economic prosperity continues to draw new residents. Encroaching human habitation will lead to increased human-cougar conflicts, as cougars follow the prey base into an increasingly urban environment.

Management conclusions

Despite a three-year increase in the reported cougar harvest in CMU 4, the modification in lawful hunting methods in conjunction with an increasing human population will result in increased cougar-human conflicts. Increasing urbanization will force cougar to utilize areas frequented by humans, leading to increased risk for public safety. Recent legislation that allows for hound hunting in selected areas may prove a useful tool in dealing with human-cougar conflicts, if complaint levels increase.

Table 1. Cougar harvest in the South Cascades Cougar Management Unit 4 (South Cascades), 1994-2000.

Year	Male	Female	Unk	Total
2000	7	7	1	15
1999	4	10	2	16
1998	9	8		17
1997	5	8		13
1996	1	5		6
1995	9	7		16
1994	6	2		8

COUGAR STATUS AND TREND REPORT: REGION 2
East Cascades North Cougar Management Unit (CMU 5)
Columbia Basin Cougar Management Unit (CMU 6)

TOM McCALL, Wildlife Biologist

Population objectives and guidelines

The East Cascades North Cougar Management Unit (CMU 5) includes the mountainous habitats within Okanogan, Chelan, Kittitas, and Yakima counties. The Columbia Basin CMU (6) includes the drier lowlands of Chelan, Kittitas, Okanogan, and Yakima counties as well as all of Douglas and Grant counties. Management objectives for CMUs 5 and 6 are to maintain healthy cougar populations in suitable habitat and to prevent increases in depredation and threats to human safety by responding to cougar complaints and encouraging recreational cougar hunting.

Hunting seasons and harvest trends

Until 1996, about 70 percent of the cougar harvested in Washington were taken by hunters using hounds. Approximately 70 percent of Washington's cougar harvest comes from eastern Washington.

During the last 60 years, cougar management in Washington has progressively become more conservative. Cougar were classified as a predator and were bountied prior to 1961. Although cougar were still classified as a predator, they were not bountied from 1961 to 1965. In 1966, cougar were reclassified as a game animal, but no bag limit was imposed. In 1973, the yearly bag limit for cougar was reduced to one animal. In 1982, a special tag was required (in addition to a hunting license) to hunt for cougar. Beginning in 1987, cougar were managed as a trophy big game animal with hunting restricted to those persons drawing a limited numbers of tags. On December 5, 1996 the use of hounds to hunt for cougar was banned by public initiative.

Cougar hunting season is long, extending from August 1 to March 15. The cost of a black bear and cougar tag is $21.90.

Cougar harvest in Unit 5 (mountainous areas) has increased (P = 0.002, n = 10) dramatically during 1991-2000 (Fig. 1). Whereas, in Unit 6 (Columbia Basin) harvest of cougars has been relatively stable (P = 0.65, n = 10) from 1991-2000. The harvest of cougars in Unit 5 in 2000, was 42, which was 50% greater than the average annual harvest during 1991-1999 (28). In 2000, 14 cougars were killed in Unit 6; the same as the average number of cougars killed in the unit from 1991-1999. Since 1991, cougar harvest in units 5 and 6, has averaged 41 animals, 21 percent of the average statewide harvest. Twelve percent more females (226) than males (199) have been killed since 1991 (Table 1). Since 1991, median age of cougar killed by unit and sex has varied from 2.5 to 8 years old. In 2000, the median age of cougar harvested in CMU 5 was 3.5 and 3.0 for CMU 6.

In 2000, the Fish and Wildlife Commission authorized the use of hounds for the removal of cougar on a limited-permit basis. Permit levels were based on the number of complaints. There were 2 permits issued for the Swakane area in 2000, but no cougar were removed.

Population status and trend analysis

Table 1. Cougar harvest for Cougar Management Unit 5 (East Cascades North) and Unit 6 (Columbia Basin), 1991-2000.

	Unit 5				Unit 6				Combined
Year	M[a]	F	Unk.	Total	M	F	Unk.	Total	total
1991	9	4		13	9	4		13	26
1992	8	4		12	5	1		6	18
1993	7	11		18	7	7		14	32
1994	15	7		22	13	12		25	47
1995	18	16		34	10	15		25	59
1996	10	20		30	5	9		14	44
1997	11	14		25	5	4		9	34
1998	12	22		34	4	4		8	42
1999	24	38		62	7	2		9	71
2000	15	24	3	42	5	8	1	14	56

[a] M = male, F = female

We have no population estimates for cougar in CMUs 5 and 6. Based on the number of reports received from hunters and landowners, the number of cougars has been at a relatively high level for several years. This expanding cougar population is probably due to increasing mule deer numbers following the severe winter of 1996-97.

There were 130 complaints related to cougar in Unit 5 during 2000. Fifty-five were human encounters, 33 livestock, 9 nuisance, 13 depredation, and 20 other. Only five complaints came from Unit 6, with most related to human encounters.

Habitat condition and trend

Loss of mule deer winter habitat due to wild fire is indirectly affecting cougar in Chelan County. Expanding human population is a more serious long-term threat to cougar. Increased human population results in more cougar encounters and reduced prey base.

Management conclusions

Washington's human population continues to grow and displace wildlife. More people and rural home-sites result in increased cougar encounters and depredation. It may take several years to evaluate changes in hunting regulations and the ban of hound hunting. Until cougar populations are reduced, human encounters will continue.

COUGAR STATUS AND TREND REPORT: REGION 3
East Cascades South Cougar Management Unit (CMU 7)

JEFFREY A. BERNATOWICZ, District Wildlife Biologist

Population objectives and guidelines

Management objective for East Cascades Cougar Management Unit (CMU 7) is to maintain a cougar population at a socially acceptable level while providing recreational opportunity.

Hunting seasons and harvest trends

Fourteen cougar were taken during the 1999-00 season (Table 1). The harvest since 1997 was surprising because it was speculated that cougar harvest would be significantly lower without the aid of dogs. Data specific to CMU 7 is not available prior to 1995. The 6-year average harvest is now 7 cougar.

Population status and trend analysis

Prior to the 1970s cougar were rare in Yakima County and no cats were reported in Klickitat County. The limited harvest and anecdotal information suggests the population has grown, but is still limited in distribution and size.

Nuisance and damage activity

Nuisance and damage activity in CMU 7 was low. No cougar have been moved or harvested for depredation or threats to public safety.

Habitat condition and trend

Cougar populations in CMU 7 were probably limited more by prey base (especially deer) than habitat. The deer population reached historic lows after the winter of 1996-97, especially in the northern portion of CMU 7. The deer herd is now recovering and is especially healthy in Klickitat County. Elk populations remain healthy.

Table 1. Cougar harvest in CMU 7.

Year	Hunt Type	Harvest	% Females
1995	Permit only	8	37
1996	Permit/General	0	NA
1997	General Season	3	100
1998	General Season	8	25
1999	General Season	9	22
2000	General Season	14	61

Management conclusions

Data is limited on cougar in CMU 7, but suggests the population is growing. There are few nuisance or damage complaints. Maintaining an adequate harvest without hound hunting was thought to be difficult. The harvest since 1997 suggests that boot hunters are successful.

COUGAR STATUS AND TREND REPORT: REGION 1
Northeastern Cougar Management Unit (CMU 8)

STEVE ZENDER, District Wildlife Biologist

Population objectives and guidelines

Long-term objectives are to maintain healthy cougar populations within the Northeast Cougar Management Unit (CMU 8) while limiting numbers compatible with public safety and property protection. Opportunity for recreational hunting is provided at levels consistent with achieving these objectives. Nuisance and depredation complaints continue at a relatively high level, so maintaining a high harvest is the short-term goal.

Hunting seasons and harvest trends

Hunting season in the Northeast CMU was consistent with the statewide season of August 1, 2000 - March 15, 2001. In 1999, the season limit on cougar was raised to 2 per hunter and remained so in 2000.

Cougar harvest levels over the past season continued to exceed the take prior to the ban on the use of hounds for sport hunting in 1996 (Figure 1). Most of the harvest (83-75%) was accomplished by sport hunters. Depredation hunts and other mortalities accounted for 14% (15) and Special Public Safety Removal Permits (hounds allowed) accounted for 12% (13).

The greatest harvest occurred in GMU 117, 49 Degrees North with 21 cougar taken. Other primary harvest units included: Threeforks (18), Sherman (17), and Mt. Spokane (15)

Human safety and wildlife damage

Wildlife Officers received 291 public contacts regarding complaints or encounters with cougar in the Northeastern CMU during the 2000 calendar year. Most of these are sightings and nuisance complaints, from a reliable witness; others were depredation on livestock or attacks on pets. At least 22 cougar were reported removed in relation to the most serious threats to public safety or property.

Population status and trend analysis

The percentage of females in the harvest exceeded 50% again in 2000 with 70% of the known sex being female. This is the third year in a row with more females taken than males during a high cougar harvest year (Table 1).

The mean age of harvested cougars in the Northeastern Unit was 3.5 this year. This is a bit of an increase over the continual decline we saw for the past several years (Figure 2). It is unknown at this time if this is a reflection of declining recruitment but that would be a possibility as the harvest rate continues at a high pace.

Cougar sightings and resultant concern by the public continue at relatively high levels and are broadly distributed throughout the Northeast CMU. This suggests cougar population levels in the Northeast CMU remain near or above human tolerance levels at this time.

Habitat condition and trend

Deer populations are at moderate population levels with the highest densities, especially white-tailed deer, in the lower elevations and agricultural areas. Cougar, especially females with young, are common in these areas

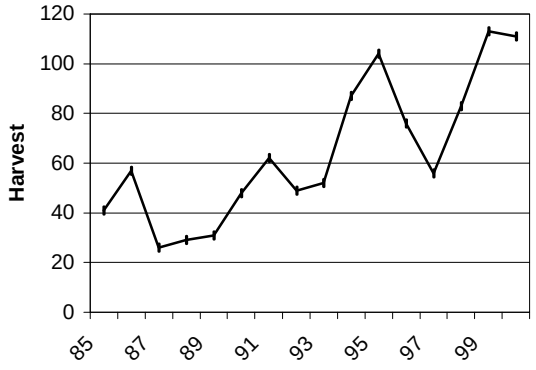


Figure 1. Cougar taken by hunters, depredation, and other means, CMU 8, 1985-2000.

Figure 2. Mean age of harvest cougar (sample size range from 30 - 92, CMU 8, 1989-2000.

and likely are responding to the increased demand for readily available food.

I am not aware to what extent cougar might prey on turkey but hunters have had cougar respond to turkey calls. It is likely they do seek turkey as a food source. The turkey population has increased dramatically in much of the Northeast unit in the last several years and may be providing a significant alternate prey source that has not traditionally been available.

Management conclusions

The cougar harvest continued at a high level in 2000 suggesting population numbers were still at all time highs. The mean age increased slightly so it is possible the high rate of harvest on females and the relatively high total kills have reduced recruitment of younger cats. It will be important to continue to collect the age data and monitor the trend next season. The mean age is still relatively low though, so sub-adult cougars constitute a large proportion of the total population. This young population of cougar is likely predisposed to causing concern for public safety and depredation of property.

The rules of take for the use of hounds to hunt cougar with Public Safety Permits have been modified for 2001-02 and should result in higher success on the permits issued. A total of 68 Safety Permits have been issued for qualifying areas within most of the GMUs in the Northeast CMU. This will likely put significant additional harvest pressure on this heavily hunted population.

Table 1. Cougar harvest and other kills, CMU 8, 1993-2000.

Year	Female			Male			Combined Harvest			
	Hunter Harvest	Other Take	Female Total	Hunter Harvest	Other Take	Male Total	Hunter Harvest	Other Take	Total Harvest	Percent Female
2000	59	16	75	22	10	32	83	28	111	70%
1999	54	10	64	42	4	46	97	16	113	58%
1998	42	10	52	22	9	31	64	19	83	63%
1997	22	4	26	20	10	30	42	14	56	46%
1996	32		32	36		36	36	8	76	47%
1995	39	6	45	53	6	59	98	12	110	46%
1994	38	3	41	41	5	46	79	8	87	47%
1993	18	2	20	29	3	32	47	5	52	38%

COUGAR STATUS AND TREND REPORT: REGION 1
Blue Mountains Cougar Management Unit (CMU 9)

PAT FOWLER, District Wildlife Biologist

Population objectives and guidelines

Managing cougar population is extremely difficult after implementation of Initiative 655. We will attempt to manage cougar populations at a level that provides optimum recreational opportunity for consumptive and non-consumptive users, while minimizing conflicts with other management objectives.

Hunting seasons and harvest trends

Mountain lion hunting has evolved from general open seasons allowing the use of hounds prior to 1987, to permit controlled hunting allowing hounds from 1987-1996, to general seasons prohibiting the use of hounds after Initiative-655 passed in 1996. The 2000 cougar season opened August 1 and closed on March 15, 2001 (228 days), and was open to any hunter possessing a valid 2000 cougar tag. In 1999, the bag limit for cougar was increased to two.

The total cougar harvest (hunting and damage) declined from 34 in 1999-00 to 18 in 2000 (Figure 1). During the general season hound-hunting era between 1974-86, the average annual harvest (both complaint and recreational) was 2 cougar/year. During the permit controlled seasons when hounds were allowed, 1987-96, the average annual harvest was 17 cougar/year. After Initiative 655 and the ban on hound hunting (1997-99), the cougar harvest has ranged from 7 - 34, with an average of 22 cougar/year. Several factors have probably influenced the increase in harvest; reducing the price of cougar tags allowed more hunters to possess cougar tags while hunting deer and elk, more hunters appear to be hunting specifically for cougar during the winter months, and a large cougar population that increases hunter-cougar contact. Also, hunters are having reasonably good success by tracking cougar in fresh snow, and using predator calls.

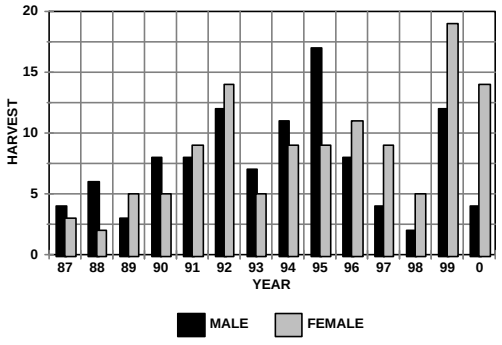


Figure 1. Cougar harvest in CMU 9, 1987-2000.

The percentage of females in the harvest has changed dramatically from the hound-hunting era to the present. From 1987-96 when hounds were allowed for cougar hunting, the percentage of females in the harvest ranged from 32%-63%, and averaged 43%. Since 1996, when hound hunting was terminated, the percentage of females in the harvest has increased dramatically, ranging from 61% to 78%, and averaging 70%. The dramatic increase in the percentage of females in the harvest may indicate hunters are not selective and harvesting the first cougar observed, and females may be more vulnerable to harvest (Table 1).

The cougar harvest was evenly distributed between the east and west Blue Mountains during the 2000-01 season. The age of male cougar harvested ranged from 1.5 to 3.5 years (n=4), with a median age of 3.0 years. The age of female cougar harvested ranged from 0.5 years to 14.5 years (n=11), with a median age of 3.5 years. Many of the cougar harvested were fairly young.

Population status and trend analysis

WDFW does not conduct cougar surveys to determine population trend. Cougar populations are undoubtedly at high levels considering the abundance and frequency of sightings, harvest, and the level of damage complaints. Cougar sightings in the Blue Mountains continue to be a common occurrence, especially in the foothills and mountains. Multiple sightings have occurred in areas where cougar have not been reported in the past, such as areas to the west of Walla Walla (suburbs), the agricultural areas to the north near the Snake River, and even in residential areas of Asotin, Waitsburg, and Dayton.

Nuisance and damage complaints

Cougar nuisance and damage complaints remain at a high level. During 1998 and 1999, 44 and 34 cougar complaints were filed, respectively, while 34 were filed in 2000. Prior to 1990, cougar complaints and sightings were rare in southeast Washington.

Management conclusions

The passing of Initiative 655 has greatly limited our ability to harvest mountain lion. Cougar

populations in the Blue Mountains have increased significantly over the last 10 years and remain at a high level. If the cougar population does not stabilize or decline in the near future, complaints and other problems will continue at a high level.

Table 1. Cougar Harvest Trend 1992-2000, Blue Mtns. Wash.

Year	Hunt Type	Males	Females	Unk.	Total	% Females
1992	Permit Hunts	14	12		26	46%
1993	Permit Hunts	7	5		12	42%
1994	Permit Hunts	14	9		23	45%
1995	Permit Hunts	19	11		30	37%
1996	Permit\General	9	10		19	53%
1997	General Season	4	10		13	71%
1998	General Season	2	5		7	71%
1999	General Season	12	19	1	32	59%
2000	General/Damage	4	14		18	78%

BAND-TAILED PIGEON AND MOURNING DOVE
Statewide

DON KRAEGE, Waterfowl Section Manager

Population objectives and guidelines

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 has established a population objective for band-tailed pigeons in Washington as the five-year average call-count survey index for 1980-84. This objective is based on a population level capable of sustaining recreational harvest. The current three-year average call-count index must be above this level to provide a hunting season. PFC is currently working to develop a population objective for mourning doves.

Hunting seasons and harvest trends

The band-tailed pigeon season has been closed in Washington since 1991. The mourning dove season has run September 1-15 since 1980, with bag/possession limits of 10/20.

Surveys

The call-count survey was initiated in 1975, and was patterned after the mourning dove survey. WDFW also participates in the annual mourning dove survey coordinated by U. S. Fish and Wildlife Service (USFWS). This report describes the results of band-tailed pigeon call-count surveys completed in the summer of 2000 and mourning dove surveys completed in the late spring of 2001.

Methods

Band-tailed pigeon call-count survey. The band-tailed pigeon call-count surveys are similar to mourning dove call-count routes. A total of 50 routes, 5.7 miles in length comprise the survey, conducted in western Washington below 1,000 ft. elevation. Surveys are completed during a 16-day period beginning the Saturday closest to June 21. Routes are distributed fairly uniformly throughout western Washington, and are selected based on logistics concerns in known or likely band-tail habitat. Routes are started exactly 10 minutes before sunrise and are made up of 20 listening stations along roads. At each stop observers record the time at the stop, the number of individual band-tails heard calling, the number of band-tails seen, the disturbance level, and any comments related to conditions at the stop. Additional details on survey design can be found in Jeffrey (1989) and WMUGBTC (1976).

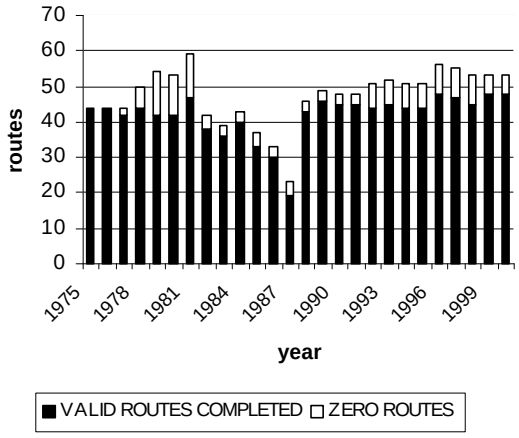


Figure 1. Call count survey routes, 1975-2000.

Routes that have band-tails present and subsequently are without band-tails for a three-year period are relocated in the vicinity of the existing route, and are added to the database as an automatic zero (without additional survey) for use in the data analysis. New routes without band-tails present are relocated without further consideration. Routes were evaluated in 1988, 1992, and 1996 to determine which were to be relocated, dropped, or converted to automatic zeros.

Data are entered into the WDFW mainframe computer by data entry staff and then are evaluated to ensure that routes were conducted within allowable survey dates and start/stop times. Beginning in 1992, data from acceptable routes completed and zero routes have been sent to USFWS in Laurel, MD (Bill Kendall) for analysis using route regression programs developed for the mourning dove survey. The number of acceptable routes completed and zero routes is shown in Figure 1.

Mourning Dove Survey. The mourning dove survey was completed between May 20-31, following methods in Dolton and Smith (2000). Routes were completed by cooperators from WDFW, USFWS, Yakama and Colville Tribes, and Chelan P.U.D. Data were sent to USFWS in Laurel, MD.

Results

Band-tailed pigeon call-count survey. The Washington call-count survey results are presented in Table 1 and Figures 1-2.

Mourning Dove Survey. The mourning dove analysis and report were completed by Dolton and Smith (2000). Dove harvest and hunter numbers are presented in Figure 3.

Population status and trend analysis

Table 1 and Figure 2 show that based on the call-count survey, the band-tailed pigeon population has stabilized since 1975, and has generally increased recently. The route regression method is not as precise in determining short-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. However, the confidence intervals for the long-term trends are much narrower, pointing to the utility of the survey in monitoring the population. The three-year average index of 2.30 was below the 1980-84 population objective index (this index varies each year because of route-regression analysis methods, but was 2.43 for the 2000 analysis). Figure 3 shows mourning dove harvest and hunter trends, derived from the state hunter questionnaire.

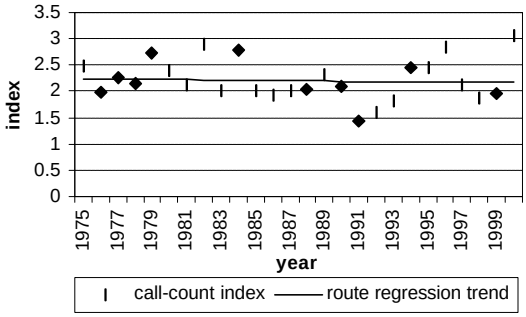


Figure 2. Call-count survey index and route regression trend.

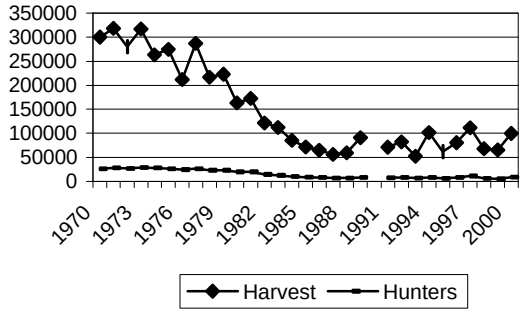


Figure 3. Dove harvest and hunter trends.

Table 1. Call-count survey results - route regression method.

Start Year	End Year	Change	Lower 90% CI	Upper 90% CI	Routes Used	Sign. 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.

WATERFOWL STATUS AND TREND REPORT
Breeding Populations and Production

RON FRIESZ, Acting Waterfowl Specialist

Introduction

This report summarizes data collected during 2001 for breeding waterfowl populations, duck broods, pond index, and goose nest surveys for the state of Washington. Data were collected by Washington Department of Fish and Wildlife, U.S. Army Corps of Engineers, Yakima Indian Nation, Colville Confederated Tribes, Mid-Columbia Wildlife Refuge, Batelle NW, Washington Waterfowl Association, and Chelan County Public Utility District.

Breeding Waterfowl Survey (Pair Surveys)

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 Irrigated (Fig. 1). Surveys were 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 1/4-sections in the Columbia Basin Irrigated strata.

In 1997, breeding duck surveys were initiated in western Washington using a stratified random quadrat design. Survey plots were defined by section lines, or square mile areas, selected at random from strata delineated based on knowledge of breeding duck densities. Most areas were 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

The index of breeding duck populations in eastern Washington was 164,804 (Table 2, Fig. 2), up 5% from 2000 and up 1% or nearly even with the long term average (Table 2, Fig. 2). Mallard numbers were 62,576, up 3.5% from 2000 and up 12% from the long-term average (Fig. 3, Table 2). This year there were increases from 2000 in all strata except for the irrigated which declined for the second year which may be indicative of a continued downward trend since the mid-1980's (Fig. 4., Table 3).

The western Washington surveys resulted in large increases in the estimated population of breeding mallards from 11,118 in 2000 to 42,088 this year for a 276% increase or 166% above the average of the five year (1997-2001) survey (Table 4, Fig. 5).

Most of the long-term variability in our breeding-duck index has come from surveys in the Potholes area (Fig. 4). This area has inconsistent precipitation patterns and many semipermanent and ephemeral wetlands. This year 54%of the breeding ducks in all strata were found in the Potholes strata. Duck numbers in this strata were up 26% from 2000, and 34% from the long term average (Fig. 4, Table 3). However, due to personnel limitation three key transects (Far East Potholes) were not completed this year. To provide population estimates for these routes, the previous three years of data were averaged. These data may be inflated upward due to the drought conditions and reduced numbers of total ducks found in the other pothole strata routes. For example, totals duck numbers of the five routes that were run were down an average of 3% while the averaged total numbers for the three routes that were not run were up 59%.

The irrigated strata had been relatively stable since 1987, but dropped 16 % from the long-term average in 2000 and dropped again in 2001 by 22 % from last year or 34% from the long-term average (Fig. 4, Table 3). It remains uncertain why this drop has occurred. Waterfowl numbers within the Columbia Basin part of the Irrigated strata have been gradually decreasing since 1985 (Fig. 6). Declines have occurred in both the Wasteway and Irrigated substrata. Decreases in the availability of open water, caused by advanced wetland succession, may be part of the reason for the decline.

The rate of decrease for ducks that actually breed in the Columbia Basin is more substantial than total

survey data indicates. The name Breeding Duck Survey is somewhat misleading, since all waterfowl are counted and many do not breed. Along with the decline in common breeding species (Fig. 4), has come a large and steady increase in the number of nonbreeding scaup. Scaup broods are uncommon but scaup numbers from our surveys are currently six times higher than they were in the early 1980s. These scaup may be too young to breed, since many do not breed until they are 2 or 3 years old.

The breeding duck population within the Northeast strata was up 16% from 2000 and up 19% from the long-term average (Fig. 4, Table 3). Perhaps, this increase represents breeding pairs displaced from areas more affected by the current drought conditions.

Cinnamon and blue-winged teal have not been separated in the long-term database because of differences among observers in recording data. About 80-85% of these teal are cinnamon teal. Next to mallards, cinnamon teal are the most common breeding duck in eastern Washington. These birds are down 4% from 2000 or 39% from the long-term average (Fig. 3, Table 2). This downward trend has occurred since 1985. In the mid-1980's we had about 3.25 times as many teal as we have currently.

After a mild recovery of the redhead population in 2000 from reduced numbers in the 1990's, there was a reduction of 21% of the estimated breeding population this year which also represents a reduction of 26% from the long term average (Fig. 3, Table 2). The last year numbers were lower than this year was in 1992 with an estimated population of 9,434 or 43% below the long term average.

Gadwall numbers increased by 24% from 2000 or 51% above the long-term average (Fig. 3, Table 2). This reinforces the continued upward trend of gadwall numbers 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. There may be a correlation of the increased numbers and hunters avoiding the harvest of gadwalls due to mis-identification of the similar appearing mallard hens and pintails which have had restrictive bag limits beginning in the mid-1980's.

Pond Index

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. 7, Table 5). The 1997 index was the highest ever recorded. This year the index dropped 8% from last year, but is still up 27% above the long-term average. However, as stated above, three key transects (Far east potholes) were not run this year. To provide estimates of total number of ponds available on these transects, the previous year's data (2000) was used with the assumption there was no net increase of ponds due to the drought conditions across eastern Washington. This conservative approach may still represent an upward inflation of the actual total number of ponds based on a comparison of the five transects that were run in the Pothole strata. They averaged a reduction of 26% of total ponds from 2000 to the assumed no net loss of ponds for the three transects not counted.

Duck Production (Brood Surveys)

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 areas were designed to estimate average brood size. As a result the survey effort varied somewhat among years. To provide more consistency, the surveys in the Columbia Basin were redesigned in 1995 by using six sample sites to provide an index to production.

Broods for most species are highly secretive and difficult to observe. The current year's growth of emergent vegetation is more developed than during breeding population surveys in May. Production surveys should be viewed as a rough estimate of production with greater value for long-term trends than for year-to-year changes.

Results

The 2001 duck production survey data for eastern Washington indicated a 15% increase in total number of broods observed from 2000 (Table 6), but remained 14% below the long-term average. There were significant increases in the brood index for the Okanogan and Northeast areas (Table 7) which may represent areas less affected by the summer drought conditions. Brood production values for the three Far east Potholes transects which were not run and are within the Channeled Scablands area were estimated by averaging the three previous years data. As discussed elsewhere in this report, this may represent an upward exaggeration from the actual production due to the drought conditions. The brood index for the Columbia Basin was 14% below last year and 16% below the long-term average (Table 6) .

Canada Goose Breeding Population Index

Methods

Canada goose breeding populations are indexed by nest searches conducted within four major geographic areas (Table 8), mainly along the Snake and Columbia rivers. Surveys are conducted annually, biennially, or periodically. Twelve surveys were added between 1975 and 1982. Survey areas have been constant since 1982. Total number of goose nests found are used to index the goose breeding population. Geese are also recorded on the breeding duck surveys (see above). Geese observed during the breeding duck surveys (Fig. 1) are weighted (Table 1) and provide an index to the goose population. Our nest surveys are conducted 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 counted in the western Washington breeding duck survey.

Results

Our index from goose-nest surveys showed a 14% increase from last year and a 14% increase above the long-term average (Table 9, Fig. 9). The most noteworthy increases were for the Snake River and Wells Pool on the Upper Columbia River. This index increased between 1982 and 1987, and has remained relatively stable since (Fig. 9, Fig. 11, Table 9).

Surveys in the Upper Columbia indicated an overall slight decline (2%) in nesting attempts from 2000 (Table 9, Fig.9). However, most sub-sample areas had noticeable population decreases. The exception was Wells Pool which had a 41% increase from 2000 and 78% above the long-term average. No explanation was provided for this large increase. Numbers of nesting attempts in the Rock Island and Rocky Reach pool seems to have stabilized averaging 127 nesting attempts during the past four years since the removal of the game reserve in 1997. The four years previous to the removal of the reserve, the average nesting attempts was 215 or a reduction of 41% from the recent average. It then appears the more liberal hunting season was effective in reducing the breeding population.

The total number of nests found on the Lower Columbia has remained stable since about 1988 (Table 9, Fig.9). However, incomplete surveys in 2001 due to personnel changes and severe windy weather makes population comparisons difficult, although surveys at the Tri-Cities area and below Vancouver found increases in nesting attempts from 2000 by 15% and 21%, respectively, which may be indicative of increased number for the entire area. The Snake River area also showed an increase of 32% in nesting attempts.

The total number of nests found in the Columbia Basin increased by 74%, but still remained 4% below the long-term average (Table 9). The increase for this year was represented by a large increase of nests found on Potholes Reservoir, 160% above last year. Potholes Reservoir has a history of large fluctuation of totals nests ranging between 141-436 between 1993 and 2001. This is believed to be related to different water levels in the reservoir during the nesting season. During years of very low water, many islands become connected to the mainland and vulnerable to predators while during years of very high water much of the habitat is flooded. Optimum conditions are believed to be at more moderate levels that provides adequate nesting area free of land predators.

The weighted number of geese observed during the breeding duck survey was included in this report since 1995 (Table 9, Fig. 10). This index provides information about the expansion of Canada geese in areas of eastern Washington outside of our traditional goose nest index areas. This index provides parallel results to the information obtained from the goose nest index (Fig. 9, Fig. 11). The 2001 index decreased by 44% from 2000 which had largest number ever recorded.

For western Washington, the population estimates for Canada geese declined by 32% from 2000 and 36% from the five year average of the survey (Table 3, Fig. 5).

Potential Improvements to Breeding Waterfowl Surveys

Breeding Duck Survey

- Expand this report to better cover western Washington
- 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.
- Calculate a "Lone Drake Index" from past data to determine the chronological timing of past surveys.

Pond Index

- Include pond counts that are made during production surveys in future reports.

Duck Production

- Standardize brood surveys in the Yakima Irrigation areas and continue to modify where necessary.

- Utilize the number of broods seen during the Breeding Duck Population Survey for an additional index to early nesting duck broods. Current methods do not utilize broods seen during these surveys.

Goose Surveys

- Increase survey efforts in other areas particularly northeastern Washington. Explore the possibilities of including data from National Wildlife Refuges.
- Expand the database to include goose data from breeding duck surveys prior to 1979.
- Change annual surveys to biennial and use time savings to expand survey coverage.

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		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		
		Moulson-Sidley		
	Palouse Streams		32.52	3.1
		Union Flat		
		Palouse River		
		Walla Walla River		
		Touchet River		
Irrigated				
	Columbia Basin		37.25	2.7
	65 sections			
	Wasteways[a]		10.05	9.9
	19 1/4-sections			
	Yakima		25.49	3.9
	21 sections			

[a]Surveyed by helicopter beginning in 1994.

Table 2. Weighted breeding duck population indices by species for eastern Washington, 1994-2001.

Species	1994	1995	1996	1997	1998	1999	2000	2001	79-01 AVG	% change from 2000	% change from AVG
mallard	52675	58582	61290	66666	78962	86243	60434	62576	55797	3.5	12
gadwall	10520	11028	14996	15306	17077	17130	13908	17381	11441	24	51
wigeon	4477	3761	6010	8392	7039	5721	4523	5005	6223	10	-20
green-winged teal	1607	2987	3953	7040	3983	3665	3320	3107	3223	-6	-4
bwt+cinn	19768	16362	14080	16903	20228	20916	19848	19087	31345	-4	-39
northern shoveler	3921	5194	6092	11770	12580	14926	9100	10104	6861	11	47
northern pintail	931	1164	1849	2802	2110	2145	970	1647	2085	7	21
wood duck	2342	1256	2056	1584	1836	2496	1841	2244	1709	22	31
redhead	13323	12943	14042	12363	12399	13568	15584	12308	16542	-21	-26
canvasback	121	677	640	1362	619	1032	603	1110	738	84	50
scaup	5010	9942	11762	8433	7674	10697	6982	11164	9088	60	23
ring-necked duck	1059	5938	3815	2490	2490	3835	5100	3035	2878	-40	5
goldeneye	1383	2459	2358	1877	1308	1993	2126	3643	2379	71	53
bufflehead	77	2462	4886	5355	805	1094	410	708	1210	71	-41
ruddy duck	6476	9956	14511	9837	15474	14566	11419	11305	11116	-1	2
merganser	224	2277	593	270	668	182	161	381	389	136	-2
TOTAL	123912	146987	162933	172451	185251	200210	156328	164804	163038	5	1
coot	20079	27737	34797	62074	49629	43832	25945	44568	33723	72	32
Canada goose	9396	15017	12758	13019	11199	22598	23449	13307	8982	-43	52675

Table 3. Weighted breeding duck population indices by areas for eastern Washington, 1979-2001.

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	88324	2721	26321	164038
1979-00 AVG	71648	65709	3615	22066	163038
% change					
from last year	-22	26	7	16	5
from AVG	-44	34	-25	19	1

Table 4. Breeding population estimates from western Washington strata, 1997-2001.

Species	1997	1998	1999	2000	2001	97-00 AVG	% change from 2000	% change from AVG
mallard	10350	18574	23235	11184	42088	15835	276	166
wood duck	4510	1640	5227	2481	3050	3464	23	-12
Canada goose	3256	1790	2709	2367	1612	2530	-32	-36

Table 5. Weighted pond index from transects within the Potholes Area of Washington, 1979-2001.

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
1979-1999 AVG	966	625	353	3729	1132	6804
% change						
from last year	-25	-20	-45	0	0	-8
from AVG	-2	-1	-14	43	26	27

[1] 2001 field surveys were not completed; 2001 table values determined by extending forward the 2000 values assuming no net gain in ponds.

Table 6. Weighted duck brood indices by species for the Potholes, Palouse, and Northeast areas of Washington, 1994-2001.

										% change from	
	1994	1995	1996	1997	1998	1999	2000	2001	94-00 AVG	2000	AVG
mallard	1954	1189	2054	2316	2978	3226	1864	1762	1877	-5	-6
gadwall	331	107	277	433	842	332	281	740	433	164	71
wigeon	162	45	305	96	93	153	102	153	325	50	-53
green-winged teal	61	15	474	104	641	306	255	204	149	-20	37
blue-winged teal	185	76	251	340	466	357	281	281	730	0	-62
cinnamon teal	675	14	252	131	699	153	51	281	104	450	170
northern shoveler	0	0	350	41	406	255	230	357	187	56	91
northern pintail	114	0	199	77	342	77	230	128	142	-44	-10
woodduck	65	26	77	128	70	0	51	51	40	0	28
redhead	407	143	726	227	684	536	230	128	532	-44	-76
canvasback	26	51	51	0	26	51	26	51	26	100	100
scaup	52	0	5	228	127	102	26	0	60	-100	-100
ring-necked duck	48	19	16	26	31	77	0	0	56	0	-100
goldeneye	127	70	97	192	282	332	77	230	138	200	66
bufflehead	0	0	0	0	0	0	0	0	0	0	0
ruddy duck	109	189	500	530	411	255	102	51	270	-50	-81
merganser	0	0	15	29	14	26	26	0	47	-100	-100
TOTAL BROODS	4316	1943	5649	5334	8112	6239	3830	**4417**	5125	15	-14

Table 7. Weighted duck brood indices by areas for Washington, 1979-2001.

Year	Chan. Scab.	Okanogan.	Northeast	Palouse	Total	Col. 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	1584	1864	184	5334	179
1998	5193	1837	919	163	8112	279
1999	2681	2681	715	163	6239	170
2000	2732	434	536	128	3830	192
2001	2706	945	715	51	4417	167
1979-00 AVG	2974	1005	909	236	5125	195
% change from	---	---	---	---	---	---
last year	-1	118	33	-60	15	-14
AVG	-9	-6	-21	-78	-14	-16

Table 8. Goose nest surveys conducted in Washington.

Survey Area	Year Survey Initiated	Agency Conducting Survey	Frequency of Survey	Annual Rate of Change 84-88	89-93	94-99	00-01
UPPER COLUMBIA				5%/yr	5%/yr	-3%/yr	-2%/yr
Hanford	<1974	Battelle & WDFW	Biennial				
Priest Rapids	<1974	WDFW	Annual				
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				
Ruffus Woods	1981	Army Corps	Annual				
Mouth of Yakima	<1974	WDFW	Historic				
SNAKE RIVER				10	8	-5	32
Snake River	1975	Army Corps	Annual				
Snake River Cliff	1979	Army Corps	Periodic				
LOWER COLUMBIA				21	4	-1	7
McNary	<1974	Army Corps	Annual				
John Day	<1974	Army Corps	Annual				
Dalles	<1974	Army Corps	Annual				
Bonneville	1982	Army Corps	Annual				
Tri-Cities	1982	WDFW/Umat NWR	Annual				
I-5 to Bonneville	1981	WDFW	Periodic				
I-5 to Puget Island	1981	WDFW	Annual				
COLUMBIA BASIN				5	-12	9	74
Moses Lake	1981	WDFW	Biennial				
Potholes Res.	1981	WDFW	Biennial				
Lenore, Alkali and Park	1981	WDFW	Biennial				
TOTAL				11	2	-3	0
Geese Observed During Breeding Duck surveys		WDFW	Annual	28	8	6	-44

*Data are inadequate for trend.

Table 9. Canada goose nest survey results in important areas of Washington, (1974-2001) and weighted number of geese observed during breeding duck population surveys (1979-2001).

	Number of Nests					Geese observed
Year	Upper Columbia	Snake River	Lower Columbia	Columbia Basin	TOTAL	during breeding duck surveys
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	2552	23449
2001	790	273	1331	539	2867	13307
1984-00 AVE	774	204	1040	562	2580	8982
% Change from	---	---	---	---	---	---
1999	-2	32	7	74	14	-44
AVG	2	34	28	-4	14	48

[a]Helicopter surveys were conducted by U.S. Army Corps of Engineers to count cliff nesting Canada geese on the Snake River.

Fig. 1. Breeding duck surveys in eastern Washington.

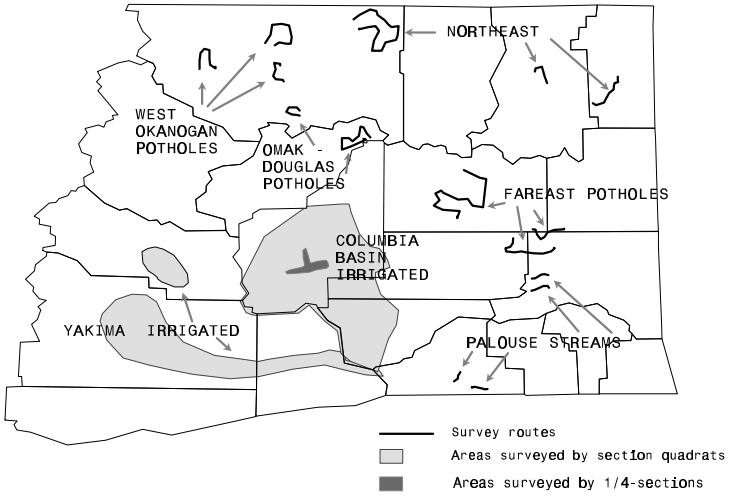
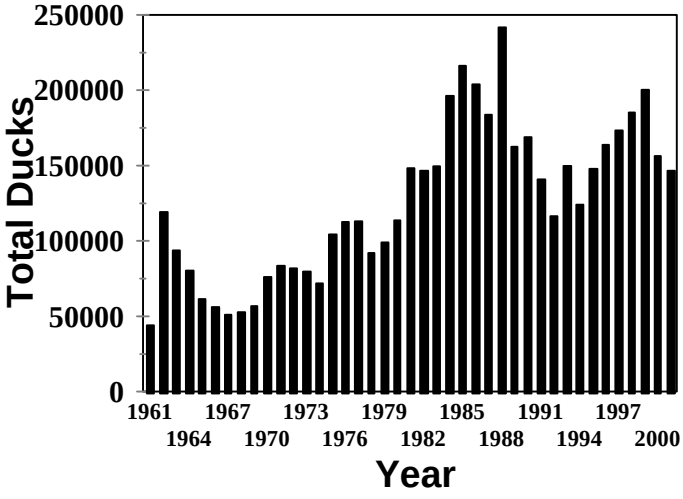


Fig. 2. Breeding duck population in eastern Washington.



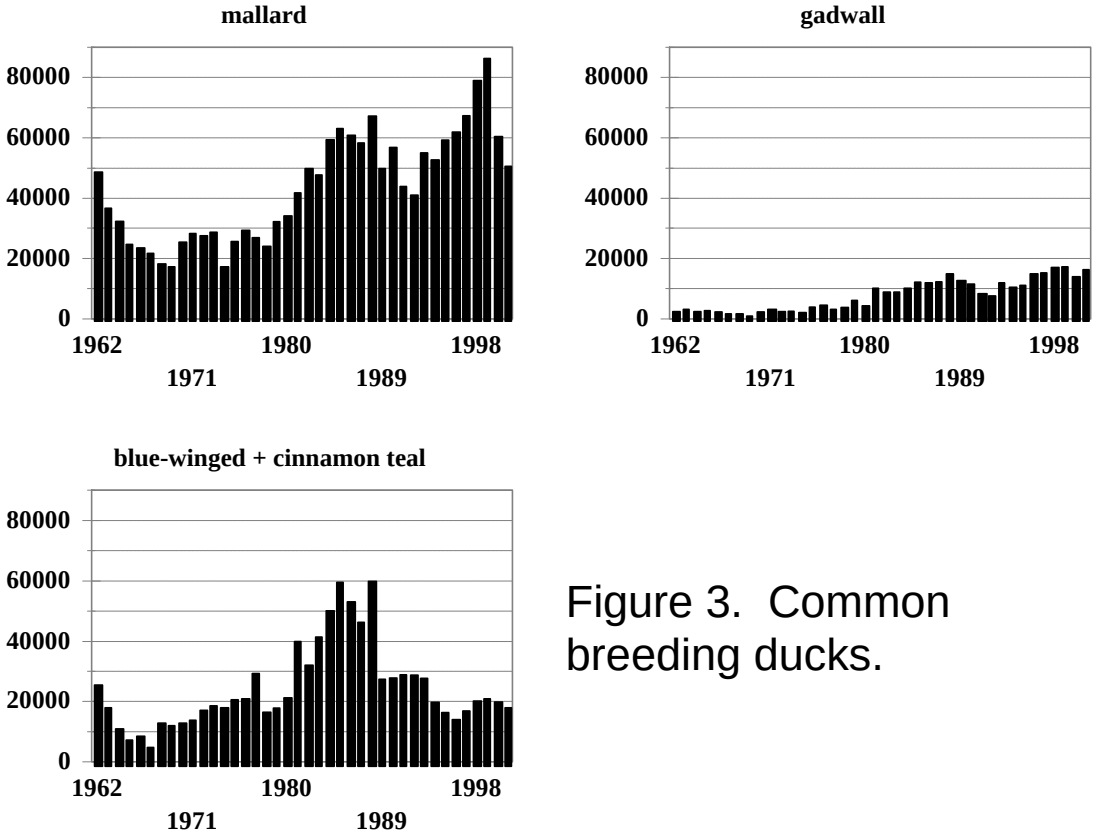


Figure 3. Common breeding ducks.

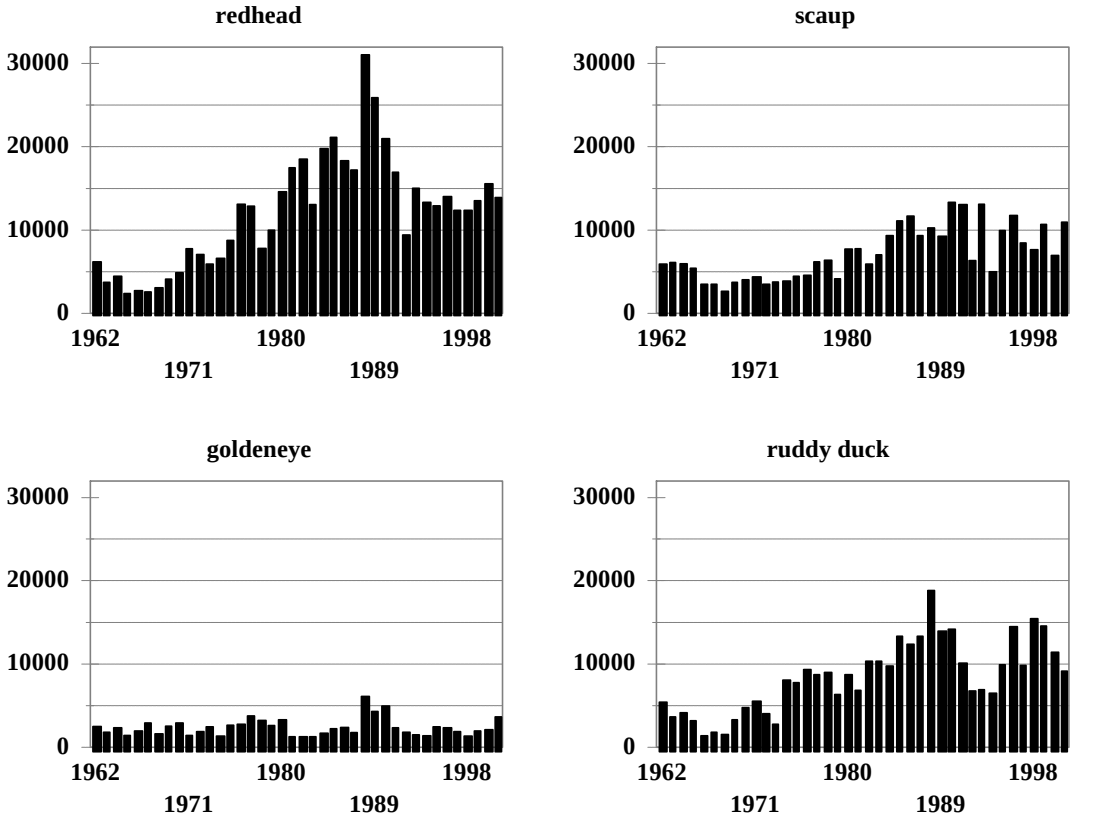


Fig. 4. Breeding ducks by strata.

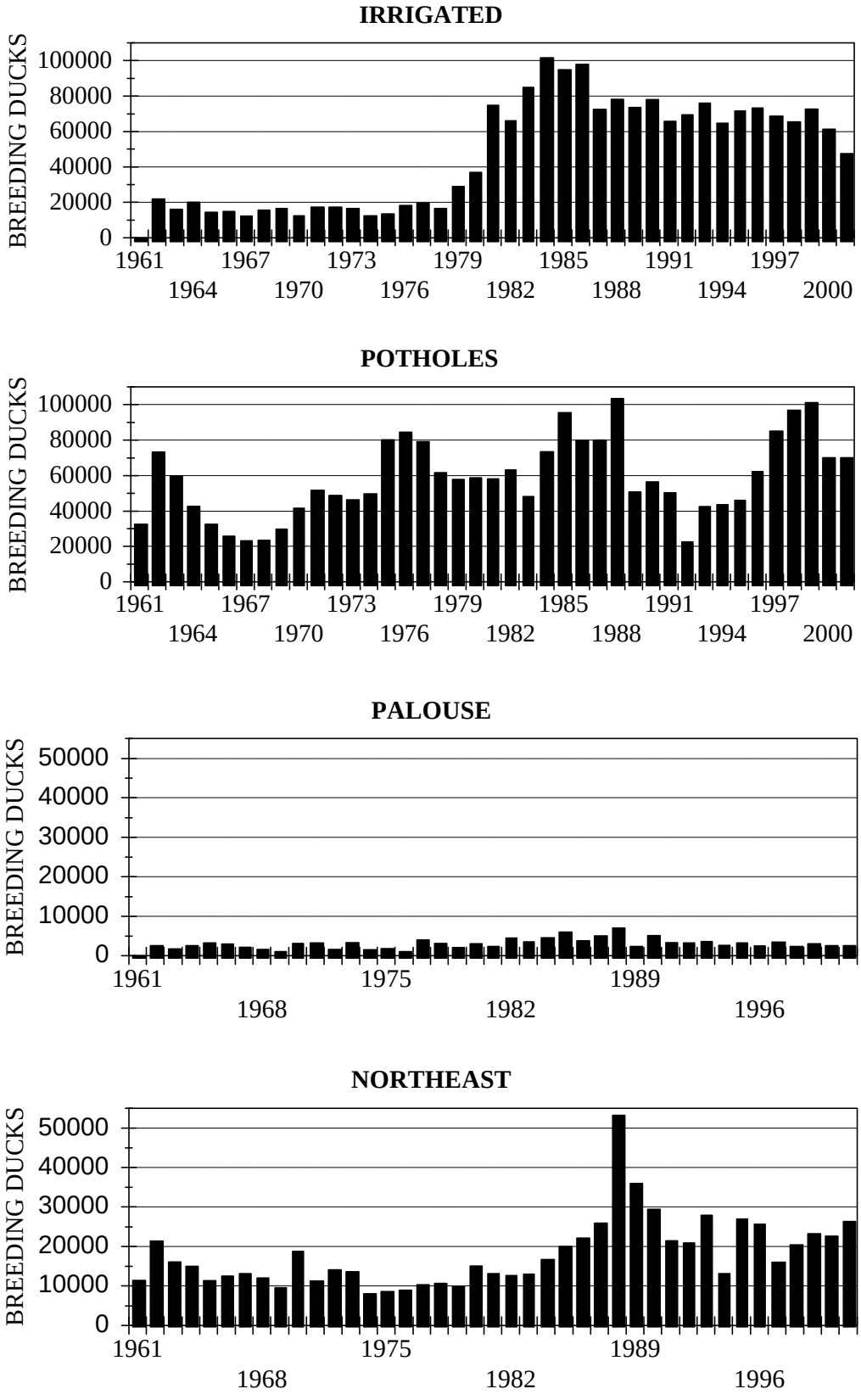


Fig. 5a. W. Washington Mallards

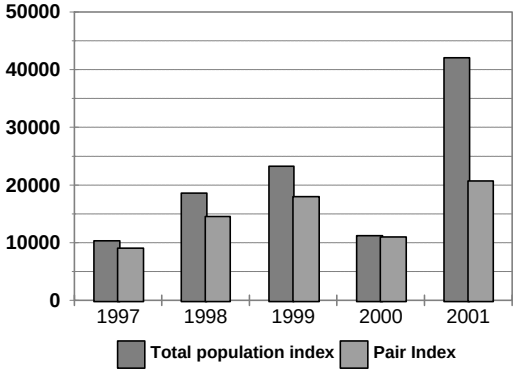


Fig. 5b. W. Washington Other Species

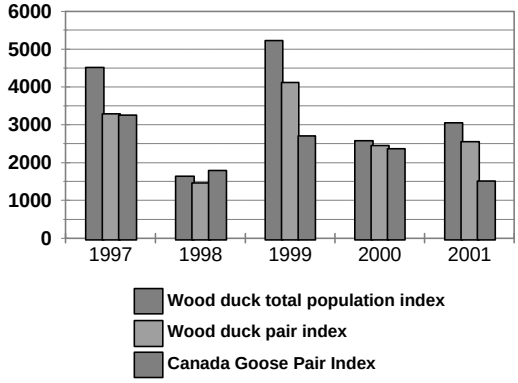


Fig. 6. Columbia Basin Breeding Duck Populations

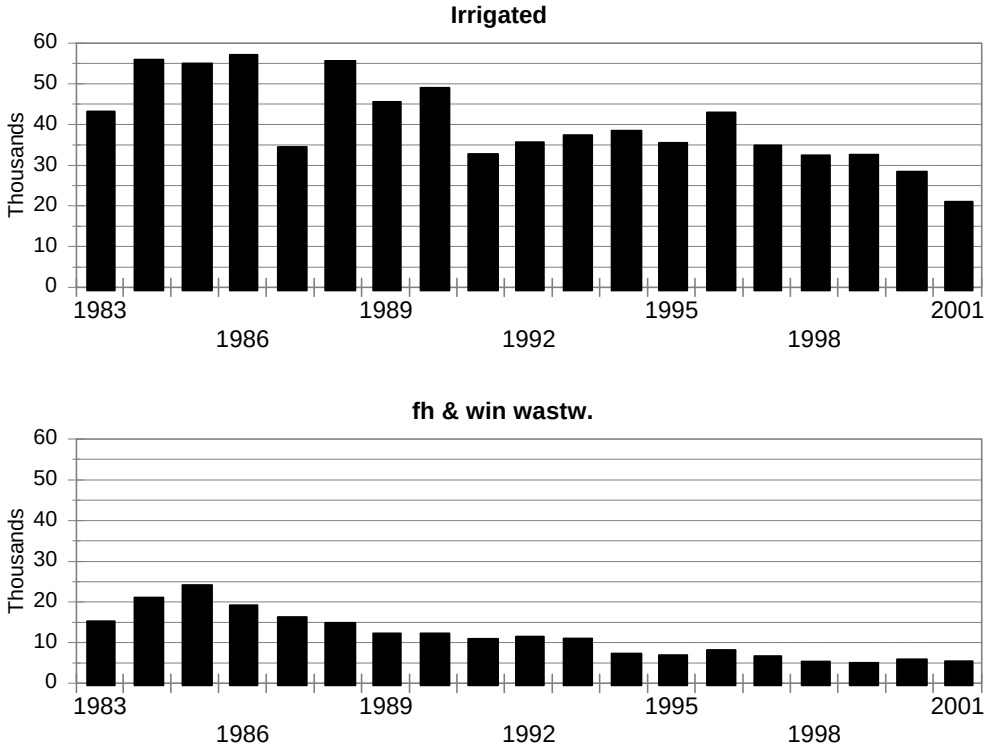


Fig. 7. Index to pond numbers in the potholes strata.

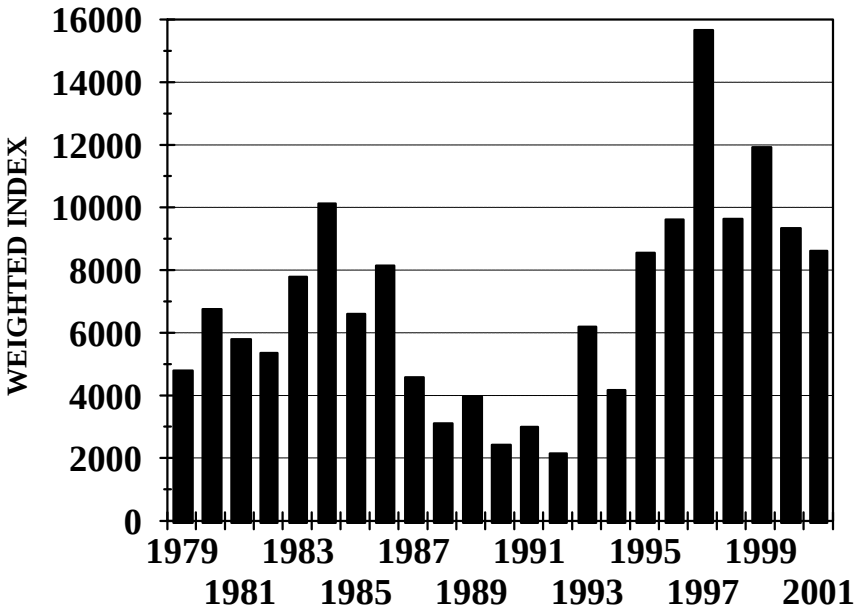


Fig. 8. Duck brood index.

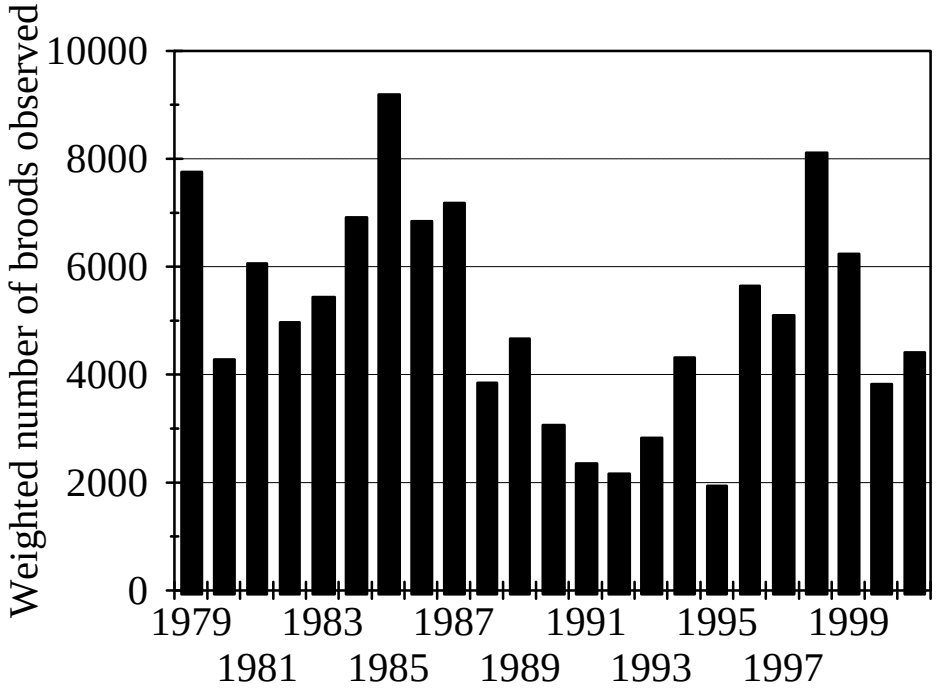


Fig. 9. Canada Goose Nest Surveys.

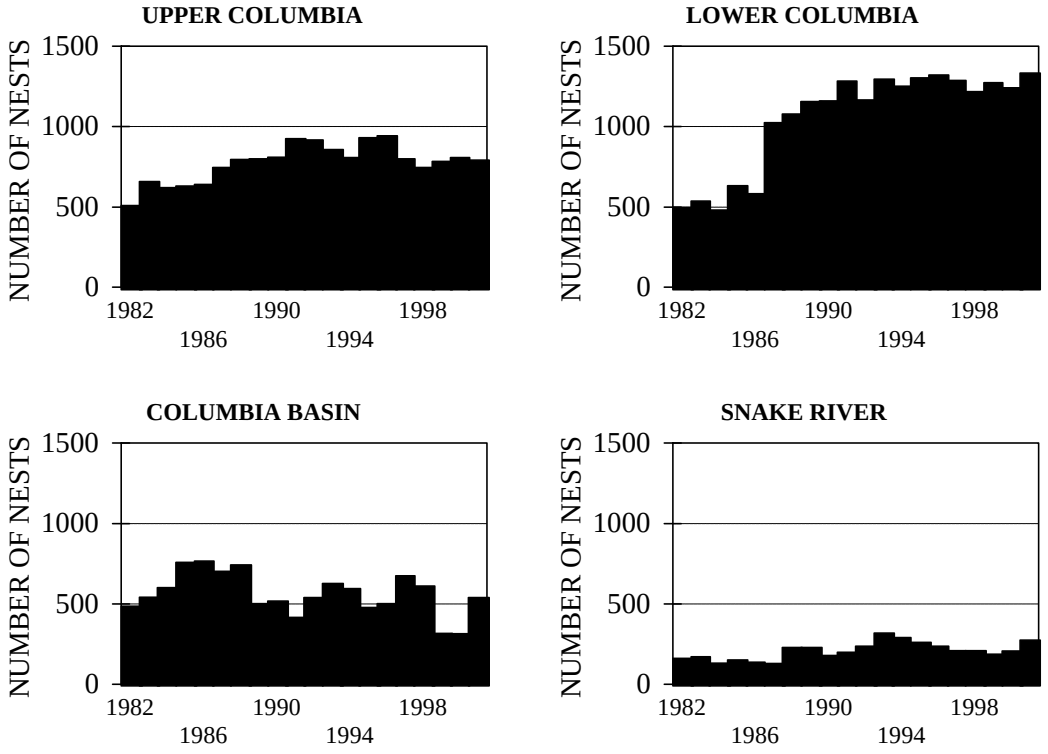


Fig.10. Geese counted on duck surveys.

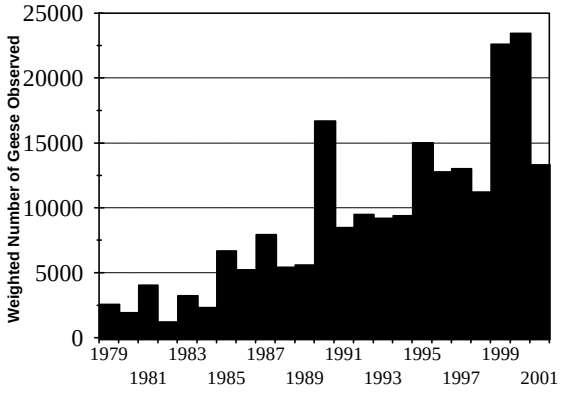
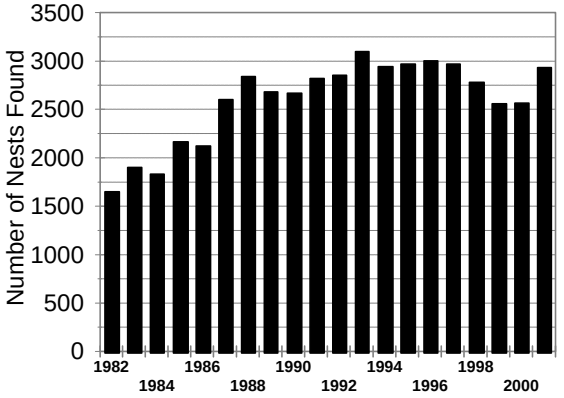


Fig. 11. Total nests found during Canada goose nest surveys.



WATERFOWL STATUS AND TREND REPORT
Winter Waterfowl Populations and Harvest

RON FRIESZ, Acting Waterfowl Specialist

Introduction

This report summarizes the 2000-01 waterfowl hunting season regulations, winter waterfowl surveys, and waterfowl harvest. This report compares current data with data collected over the past 25 years. These data are archived and part of a long-term database for Washington Department of Fish and Wildlife's (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 in the flyway is the Midwinter Waterfowl Inventory, completed throughout the Pacific Flyway in January. This is a coordinated, comprehensive survey of all important wintering areas, using a combination of standardized surveys from fixed-winged aircraft and ground observation locations. Waterfowl surveys are combined effort among several agencies, including WDFW, U.S. Fish and Wildlife Service, and Canadian Wildlife Service. However, this survey does not capture migration peaks and full habitat use patterns during other times of the fall/winter period. Because of these limitations, additional surveys are completed from October through March in key wintering areas of Washington, using fixed-wing aircraft and ground survey techniques. Specific age structure surveys are also completed in the north Puget Sound area for snow geese, brant, and swans, along standard ground observation routes.

Midwinter Waterfowl Inventory Results

The 2000-01 midwinter waterfowl inventory was completed by WDFW and U.S. Fish and Wildlife Service (USFWS) personnel. Washington's data show decreases of 8% from last year and 12% from the long-term average (Table 1). This represents a population decline for the past two years, compared to unusually high numbers during the winters of 1998 and 1999. The lower numbers of the past two years are apparently a result of ducks redistributing to other parts of the flyway. The Pacific Flyway midwinter indices for total waterfowl have remained similar for the last four years, averaging just under 7 million waterfowl.

The 2001 Midwinter indices for the 11 Pacific Flyway states was 5,683,195 total ducks (Fig.2) which was slightly above (0.3%) the 2000 count of 5,664,507, and was 21% above the long-term average. In Washington, the total duck population was 722,349, slightly below (4.2%) last year's population of 753,808 (Fig. 3). This year's index represents 12.7% of the flyway index which was also slightly below the state's long-term average of 14.5% of the flyway population (Fig. 4).

For mallards, Washington holds a long-term average of 36.5% of the Pacific Flyway population. Even though mallard number were down in both the flyway and state indices from last year (27% and 31%, respectively), the proportion of total mallards in the state remained near the average at 33.6%. Redheads showed a dramatic increase in the flyway at 52,026 for a 93% increase from 2000 and 103% above the 10-year average. Of these, 27, 918 or 54% were found in Washington.

Canada geese are not well represented in midwinter surveys due to their behavior of foraging in widespread agricultural areas making them difficult to locate during aerial surveys. The highest counts of Canada geese within the Pacific Flyway's Midwinter Survey have occurred within the last 8 years with the highest count on record coming during 1999-00 survey when 498,026 geese were recorded. In 2000-01, the count was 456,730, or down 8.3% from last year, but remained 7.7% above the 10-year average. The number of geese wintering in Washington has been variable over the past 20 years, but the 2000-01 count was the lowest during the past 10 years at 41,351 or down 50% from last year and 55% from the 10-year average.(Table 1, Fig. 5). No explanation was provided for this decline, but may have related to survey conditions. The next lowest year was 1997 when 47,901 Canada geese were counted.

Midwinter snow goose numbers from photo counts in northwest Washington and southwest BC were 56,418, the third straight year with population increases and the highest number ever recorded in the state (Table 1, and Fig. 6). The 1987 count was the previous high at 55,350 when 43% of the flock were juveniles. For the 2000-01, the post-hunting season population contained 20.3% juveniles. Complete age ratio counts are presented in Table 2. The number of brant counted during the Washington midwinter survey was 10,197, a 26% decline from the previous year and 24% below the long-term average (Table 2, Fig. 7). It is uncertain

whether the long-term decline represents a population decline or a shift in wintering areas.

Periodic Aerial Survey Results

Aerial waterfowl surveys in northern Puget Sound were accomplished by WDFW (Table 2). Surveys in the Columbia Basin were conducted cooperatively between USFWS and WDFW. The highest count in the North Columbia Basin during 2000-01 occurred during the November with 450,467 total waterfowl; for the South Columbia Basin the highest count was in December with 164,308 total waterfowl; and the highest count in Northeastern Puget Sound occurred during the December survey with 228,375 total dabbling ducks.

Hunting Season Regulations

The 2000-01 waterfowl harvest was conducted under Washington State regulations (Table 3). Flyway waterfowl populations have increased over the last 5 years, which has allowed for longer seasons and larger bag limits (Table 4). Under the federal framework, we were allowed the maximum number of days allowed under the Migratory Bird Treaty, 107 days. Our season length was 105 days east side and 105 west side and two days were given for the Youth Hunt statewide on Sept.23-24. The bag-limit was 7 ducks to include not more than with 2 hen mallards, 1 pintail, 4 scaup, 2 redheads, 1 canvasback, 1 harlequin, 4 scoters, and 4 oldsquaws (Table 4).

The season length between 1988-89 and 1993-94 were the most restrictive in the State's history. Current regulations are among the most liberal ever offered in Washington. Only in 1964-65 and 1970-71 were seasons as long at 107 days on the east side.

WDFW instituted a new licence format for the 1999-00 hunting season. A small game licence and large game licence replaced a general hunting licence. For people who hunted a variety of small game species, their was little change in total costs. For people who hunted waterfowl exclusively, the new format resulted in an increase in cost. Fees for state and federal migratory bird stamps did not increase for the 2000-01 season (Table 4).

Goose hunting regulations have been dynamic in recent years. Changes have resulted from efforts to protect declining populations of particular 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 2000-01 (Fig. 1).

Harvest surveys

Methods

Harvest estimates were based on the 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 counties. 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 (Table 5).

The 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 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.

The harvest of Dusky Canada geese is determined at mandatory hunter check stations, summarized in a separate report.

Harvest Estimates

The waterfowl harvest was separated by WDFW regions (Table 6, Fig. 8). Three regions had similar percentages of the harvest. The largest harvest occurred Region 2 (25.2%), followed by Region 3 (22.1%), and Region 4 (19.3%).

The 2000-01 Washington duck harvest of 528,110 was 9% higher than the previous year harvest of 482,596, but remained 5% lower than 1998-99 harvest of 557,705 which represents the recent high for the harvest of ducks (Fig. 9). The harvest in Washington had declined steadily from over 1,000,000 in the late 1960's, to a low of 242,517 in 1993-94 (Fig. 9). Since that time there has been a slow and gradual increase. Mallards made up 53% of the harvest while green-winged teal and wigeon were next in harvest numbers at 13% and 14%, respectively (Table 5).

The total Canada goose harvest remains high and on a positive trend since the 1986-87 season (Fig. 10). Local production of large Canada geese has increased in Washington and have contributed to the increased harvest. The harvest of large Canada geese has been increasing since the early 1960's and reached a record harvest in 2000-01 of 40,969 geese. The previous high harvest was in 1996-97 at 37,799. Conversely, the harvest of small Canada geese has declined from a

record high of 47,270 in 1979-80 to a low of 14,284 in 1995-96. In recent years there has been a minor recovery in the harvest of small Canada geese (Fig. 10). This year the harvest was 24, 266 compared to 24,833 last year. The reasons for the decline in small goose harvest from the late 70's-early 80's are uncertain. A shift in wintering areas may be occurring from central Washington to the mouth of the Columbia and Willamette Valley. Unfortunately, declines in Washington's small Canada geese have not been well documented. Banding information is minimal and aerial surveys are logistically difficult.

The snow goose harvest in Washington is highly variable (Appendix 1, Fig. 12). It has been on a negative trend since the mid 1980's. However, the harvest of snow geese has doubled over the past two years from 916 in 1998 to 1,484 in 1999 and 1,995 in 2000. However, the snow goose harvest in Washington remains low at 1,995, or 4.1% of the population (Fig. 12). The harvest of snow geese in northern Puget sound is weather dependent. Cold and windy weather force geese from their estuaries to forage inland where they are more vulnerable to hunters. This factor may be of greater importance than annual recruitment, because the erratic annual harvest (Fig. 12) does not follow the number of geese counted in Washington during the midwinter count (Fig. 6).

The brant harvest in Washington increased after the season was reopened in 1986-87 (Fig. 11) to a maximum of 1,534 in 1996-97. (The season was closed from 1983 to 1986). However, the brant harvest dropped significantly in 2000-01 to 108 brant compared to 667 the previous year, because the Skagit County season was closed in 2001 due to low wintering numbers (4,881, below the closure threshold of 6,000).

Hunter Numbers

The Washington hunter survey is used to estimate the number of waterfowl hunters in the state (Fig. 13). During the 2000-01 season an estimated 38,547 hunters participated in the waterfowl season, up 16% from 1999-2000. This increase follows a decline in the number of waterfowl hunters for the past two years. There was a steady decline in hunters through the 1980's (Fig. 14). The average number of ducks harvested per hunter in 2000-01 was 13.7 or 8% lower than last year which had the highest ever recorded at 14.9 ducks per hunter. Hunter success, based on ducks harvested per hunter per year, has been stable if not on an upward trend for the past 20 years (Fig. 14). Therefore, it appears the downward trend in duck harvest (Fig. 9) is largely a result of hunter numbers (Fig. 13) and not decreased annual hunter success (Fig. 14). The high success rate may indicate that we have 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. 13), 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 downward 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 exceptional. Decreased hunter numbers results in lower hunter densities in the field and success has remained stable. In addition, this State is holding a large percentage of the Flyway's ducks. Canada goose regulations are being liberalized and harvest has been increasing since the 1987-88 season. More large Canada's were harvested in recent years than the previous 20 years. These factors combined demonstrate the value of Washington’s waterfowl resources to the state’s hunting population.

Table 1. Washington Department of Fish and Wildlife annual waterfowl inventory - January 2001.

Species	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	01 vs. 00	91-00 ave.	01 vs. ave.
Mallard	861433	764514	211497	421864	419005	310724	240838	547134	979679	442811	356830	-19%	519950	-31%
Gadwall	5908	4528	2218	4556	2565	3165	6304	7482	5243	8043	10571	31%	5001	111%
Wigeon	175887	101733	81998	95801	116748	73771	68478	117536	172049	112926	133465	18%	111693	19%
Green-winged Teal	8361	11466	8612	11834	18247	10993	7121	6729	12486	11089	6098	-45%	10694	-43%
B.W. & Cinn. Teal	0	100	19	54	425	0	0	0	2	0	0	0%	60	-100%
Shoveler	1149	1681	571	1060	1305	2310	1313	3100	2890	3036	1358	-55%	1842	-26%
Pintail	141149	62813	38361	35896	56808	48227	39156	43763	81653	70040	75597	8%	61787	22%
Wood Duck	90	105	48	381	454	162	30	72	329	84	206	145%	176	17%
Redhead	5077	4014	4673	3744	6779	1517	6782	2495	2335	1505	27918	1755%	3892	617%
Canvasback	4352	2423	3439	1401	2941	4673	6115	6261	4841	2898	6020	108%	3934	53%
Scaup	43477	25685	39719	26590	40644	32261	36545	28684	28274	26933	28833	7%	32881	-12%
Ringneck	4188	3709	6526	1419	5456	4314	3782	3327	3240	7488	6386	-15%	4345	47%
Goldeneye	16572	15730	19277	16910	22360	19663	16951	12894	10851	13157	17177	31%	16437	5%
Bufflehead	12421	24750	51571	21317	26724	19441	20818	14780	17185	18017	20647	15%	22702	-9%
Ruddy Duck	1865	2039	1918	3588	3372	4248	3417	2712	2476	3819	3075	-19%	2945	4%
Eider	0	0	0	0	0	0	0	0	0	4	0	-100%	0	-100%
Scoter	27326	42356	30165	23952	35437	26059	26939	21386	21507	20326	15932	-22%	27545	-42%
Oldsquaw	467	162	464	356	1550	636	1046	575	645	450	559	24%	635	-12%
Harlequin	91	164	507	750	884	1077	909	791	696	843	603	-28%	671	-10%
Merganser	5757	9099	10282	11212	10971	9830	7039	5750	6653	7762	9535	23%	8436	13%
Unidentified Ducks	2289	4496	19468	16336	8338	8064	4304	7364	3527	2577	1539	-40%	7676	-80%
Snow Goose*	32054	21855	30912	34867	36681	32340	44441	42666	38185	48843	47743	-2%	36284	32%
White-fronted Goose	2	0	0	2	2	25	20	1	0	3	34	1033%	6	518%
Canada Goose	86658	113333	65248	90780	67383	76884	47901	95444	88698	91229	41351	-55%	82356	-50%
Brant	16221	13505	13054	13595	20308	7082	9753	10881	15252	13859	10197	-26%	13351	-24%
Tundra Swan**	2248	3209	883	2616	1332	4118	3211	3424	2802	4342	4597	6%	2819	63%
Trumpeter Swan**	1263	308	55	171	75	3017	2817	2352	3215	3896	4047	4%	1717	136%
Unknown Swan**	124	113	575	129	251	85	103	371	11	402	49	-88%	216	-77%
Coot	28152	43690	36341	33378	52746	59652	64956	58199	104706	62387	74250	19%	54421	36%
TOTAL	1484585	1277581	642060	841181	959791	764338	671089	1046173	1609430	978769	904617	-8%	1027500	-12%
*B.C. Snow Geese	0	17244	2342	12371	5179	7206	806	1418	7759	879	8675	887%	5520	57%
Skagit/B.C. Total	32054	39099	33254	47238	41860	39546	45247	44084	45944	49722	56418	13%	41805	35%

**Comprehensive western Washington swan surveys in 1989, 1991, 1996 only

Table 2. 2000-01 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[1]	Oct. 18	Nov. 16-17	Dec. 17	Jan. 4-6
Mallard	22,433	295,473	174,055	137,747
Total Ducks	67,438	390,916	264,981	221,755
Total Geese	40,089	59,415	13,491	9,058
Total Swans	0	136	111	41
TOTAL WATERFOWL	107,527	450,467	278,583	230,854

South Columbia Basin[2]	Oct. 16	Nov. 18	Dec. 18	Jan. 4-6
Mallard	16,019	60,816	104,086	100,873
Total Ducks	34,553	77,426	147,633	143,742
Total Geese	9,185	24,355	16,649	4,856
Total Swans	0	90	26	27
TOTAL WATERFOWL	43,738	101,871	164,308	148,625

Northeastern Puget Sound[3]	Oct. 16	Nov. 1	Dec. 4	Jan. 2
Mallard	40,980	67,833	123,402	74,659
Northern pintail	28,902	39,605	36,858	26,075
American wigeon	21,495	36,522	58,086	54,574
Green-winged teal	6,020	6,540	10,029	1,542
Dabbling Ducks	97,400	159,500	228,375	156,850
Brant	0	5	0	720

Snow Goose Photo Counts	Date	Skagit/Snohomish	Fraser	Total
	Jan	47,743	8,675	56,418

Black Brant Aerial Surveys	Jan.2	Feb. 14
Skagit County	4,881	4,535
Whatcom	1,095	735
Total	5,976	5,270

Age-ratios obtained from field observations in Northern Puget Sound

Species	Date	Sample size	Juveniles
Brant (black)	12/1/2000	81	14.8%
Brant (gray)	12/18/00-2/3/01	1,214	27%
Snow Geese	Within hunting season	6,000	26.2%
Snow Geese	Postseason	3,000	20.7%
Trumpeter Swan	01/8-13/2001	3,331	14.2%
Tundra Swan	01/8-13/2000	1,940	12.9%

1 Columbia River between Priest Rapids and Coulee Dam; and the Columbia Basin Irrigation Project
2 Lower Snake River; Columbia River from Hanford Reach and John Day Pool; and Yakima Valley
3 Coastal areas from norther Port Susan to the Canadian border.

Table 3. Waterfowl hunting season regulation summary 2000-2001.

Ducks	
	WESTERN WASHINGTON Sept. 23-24 (Youth Hunters Only), Oct. 7-18, and Oct. 21 - Jan. 21, 2001 (105 days) EASTERN WASHINGTON Sept. 23-24 (Youth Hunters Only), Oct. 7-18, and Oct. 21 - Jan. 21, 2001 (105 days) Bag Limit --7d(day)/14p (possession) ducks -- not more than 2d/4p hen mallard, 1d/2p pintail, 2d/4p redheads, 1d/2p canvasbacks, 1d/1p harlequin, 4d/8p scoters, and 4d/8p oldsquaw.
Geese (except Brant and Aleutian Canada Geese) See Map 1.	
	STATEWIDE, Early Goose Season (except western Wash. Goose Mgmt. Areas 1 & 3): Sept. 9-14, Bag Limits 3d/6p Canada geese. (Goose Mgmt. Areas 1 and 3: Sept. 9-14; Bag Limits 4d/8p Canada geese.) STATEWIDE, Youth Hunt (Except W. WA Mgmt. Area 2): Sept. 23-24; Bag Limits 4d/8p Canada geese WESTERN WASHINGTON; Goose Mgmt. Area 1: Oct. 7-26 and Nov. 4-Jan 21; except snow geese may only be taken Oct. 7-Jan. 1. Bag Limits 4d/8p; not to include more than 3d/6p of Snow, Ross' or Blue geese WESTERN WASHINGTON; Goose Mgmt. Area 2: 8am-4pm Sat. Sun. Wed only, Nov. 22-Jan 14; except Ridgefield NWR Sat. Sun. Wed only and closed Dec. 25 and Jan. 1 on Ridgefield NWR only. Bag Limits 4d/8p to include not more than / season dusky Canada goose, and not more and 3d/6p snow, Ross' or blue goose. WESTERN WASHINGTON; Goose Mgmt. Area 3: Oct. 7-26 and Nov. 4-Jan. 21. Bag Limit 4d/8p not to include more than 3d/6p snow, Ross' or blue goose EASTERN WASHINGTON; Goose Mgmt. Area 1: Sat. Sun. Wed. only; Oct 7-26 and Nov. 4 - Jan. 14;Nov. 23, 24, and Dec. 25; Jan. 1 and everyday Jan. 15-21. Bag Limit. 4d/8p not to include more than 3d/6p snow, Ross's or blue geese EASTERN WASHINGTON; Goose Mgmt Area 2: Oct. 7-26 and Nov. 4 - Jan. 21. Bag Limit. 4d/8p not to include more than 3d/6p snow,Ross' or blue geese.
Brant	SKAGIT AND PACIFIC COUNTIES ONLY, Jan. 13, 14, 17, 20, and 21 2001 (Written authorization required). Bag limit - 2d/4p
Coots	Concurrent with duck season. Bag limit - 25d/25p
Snipe	Concurrent with duck season. Bag limit - 8d/16p

Table 4. Significant historical changes in duck hunting regulations.

	Season		Bag Limit		Special Limits		Stamp Fees		Hunting	Steel shot
Year	East	West	East	West	Mall.	Pint.	State	Federal	License	Regulations
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	1&	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&)	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	1&	2	6.00	15.00	15.00	Bismuth 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	Tungsten-nickel-tin added

1Non-toxic shot zones were established at Barney Lake, Skagit Bay, and the Columbia River flood plain.
2Only Barney Lake was retained as a non-toxic shot zone.
3Steel shot in progressively larger zones from 86-87 through 91-92 when steel shot was required statewide.
4New small game license format.
5Youth hunt one additional day
6 Youth hunt two additional days

Table 5. Waterfowl harvest by species in Washington (2000-01)[1].

Species	No. harvested	% of total
Mallard	279,118	53%
Northern pintail	25,178	5%
American wigeon	64,617	12%
Green-winged teal	70,076	13%
Other ducks	89,121	17%
Total ducks	528,110	100%
Large Canada	40,969	55%
Small Canada	24,266	33%
White-fronted	670	1%
Snow	2,329	3%
Total geese	73,884	100%
Total waterfowl	601,994	

[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 Game Harvest Questionnaire.

Table 6. Waterfowl harvest by region (2000-01).

Regions	Ducks & Geese Harvested	% of State Total
Region 1	92,624	15.4%
Region 2	151,541	25.2%
Region 3	132,941	22.1%
Region 4	116,322	19.3%
Region 5	45,035	7.5%
Region 6	63,531	10.6%
Total	601,991	100%

Appendix 1.

Brant hunting harvest report summary.

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Permits Issued	6 5 4	747	1194	1069	1207	1445	1331	1348	1336	1295
Hunters	330	319	496	287	343	254	197	243	218	39
Days (Successful)	647	709	765	484	552	549	326	350	386	59
Season Days	11	11	11	6	11	11	5	5	9	5
Harvest										
Skagit	790	950	1347	825	918	1493	597	570	581	0
Whatcom	3	9	7	0	0	0	0	0	0	0
Pacific	52	18	53	23	44	41	59	18	86	108
Total	845	977	1407	848	962	1534	656	588	667	108

*These figures are based on analysis of mandatory harvest report returns, corrected for nonresponse bias.

Snow goose harvest report summary.

Year	1993	1994	1995	1996	1997	1998	1999	2000
Permits Issued	2298	2588	2313	2363	2795	3086	3061	3076
Hunters	572	433	221	427	424	341	445	460
Days (Successful)	1096	664	373	996	812	585	777	1039
Harvest								
Island	58	60	57	39	38	29	71	18
Skagit	677	496	99	381	545	678	815	1058
Snohomish	1124	522	331	1400	749	262	598	919
Total	1859	1078	487	1820	1332	969	1487	1995

*These figures are based on analysis of mandatory harvest report returns, corrected for nonresponse bias.

Figure 1. Goose management zones.

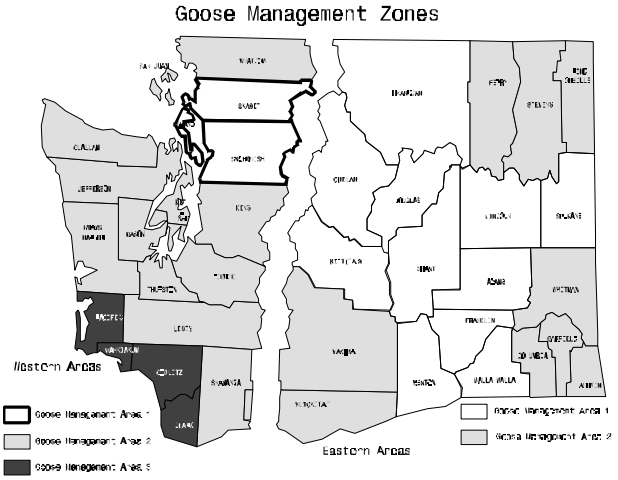


Fig. 2. Midwinter Inventory - Total Ducks Pacific Flyway.

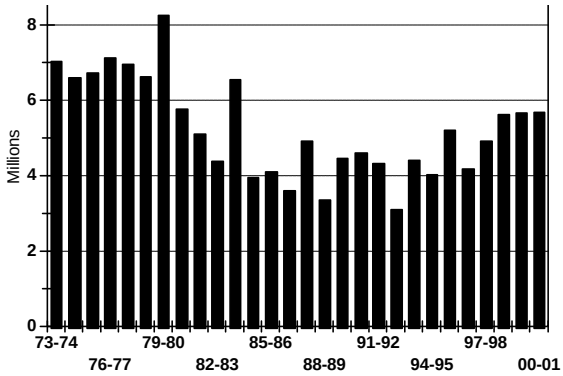


Fig. 3. Wash. Midwinter Duck Survey

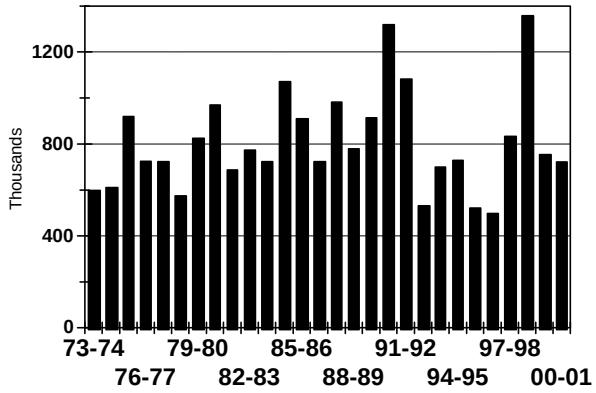


Fig. 4. Proportion of Pacific Flyway ducks in Washington during the midwinter survey.

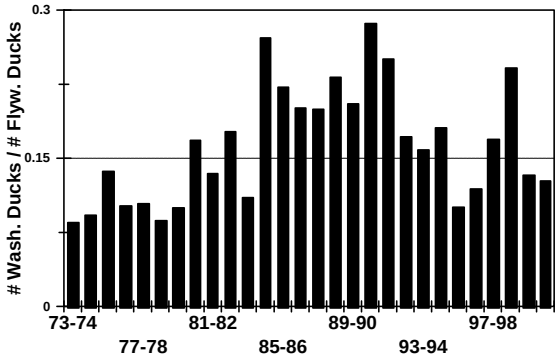


Fig. 5. Midwinter Canada geese in WA

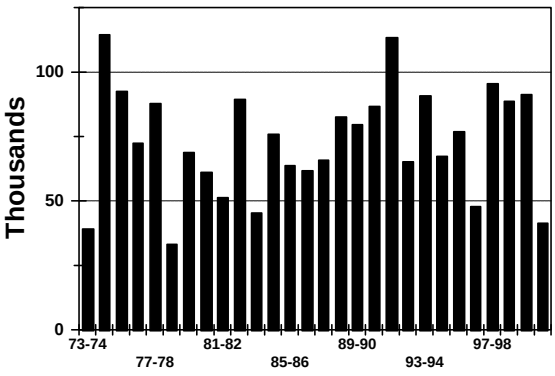


Fig. 6 Skagit Snow Goose Population

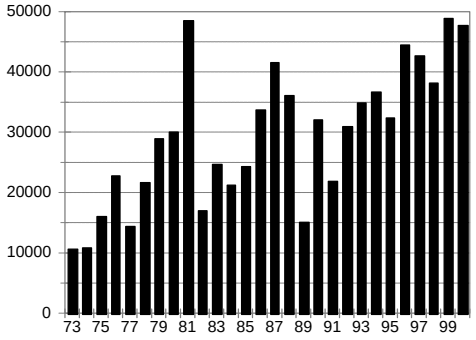


Fig. 7. Midwinter brant counts in WA.

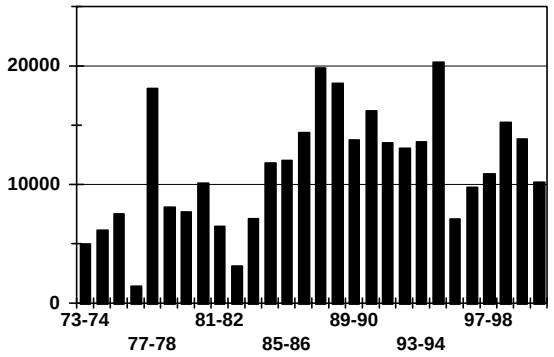


Fig. 8. Waterfowl harvest by regions.

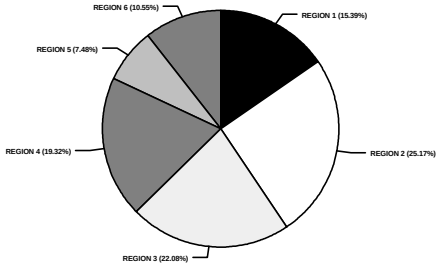


Fig. 9. Washington duck harvest.

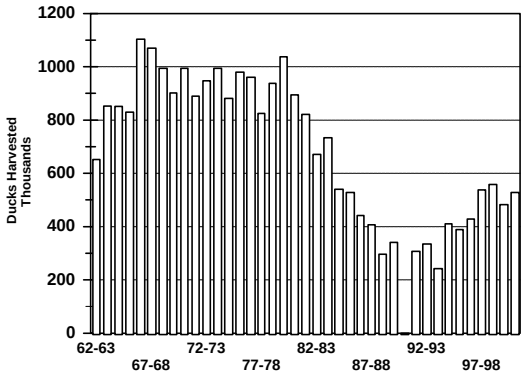


Fig. 10. Wash. Canada goose harvest.

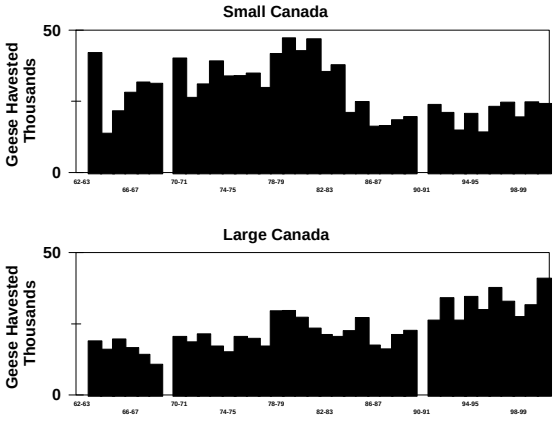


Fig. 11. Washington brant harvest.

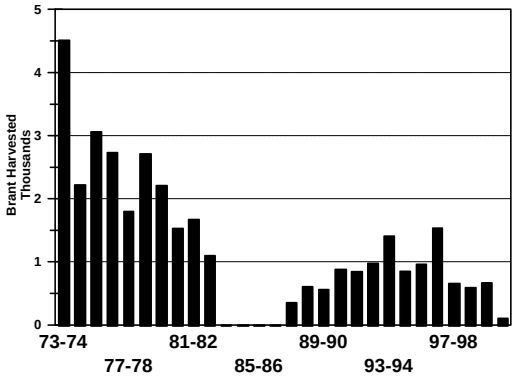


Fig. 12 Skagit Snow Goose Harvest

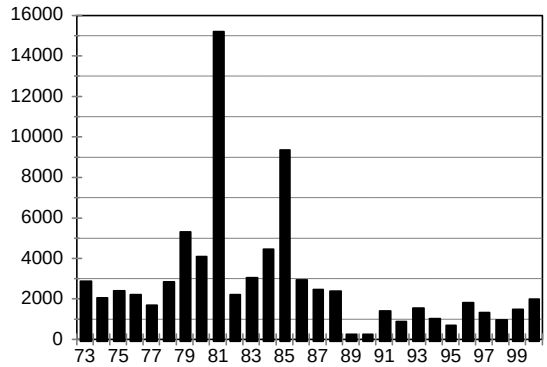


Fig. 13 Washington waterfowl hunters

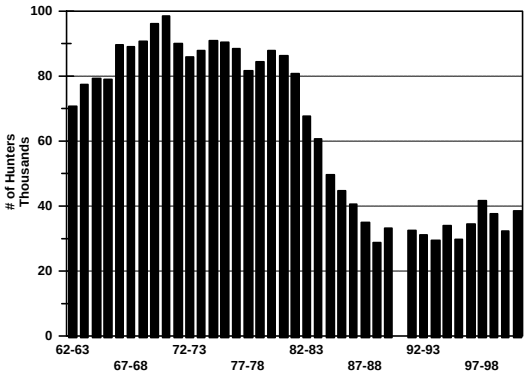
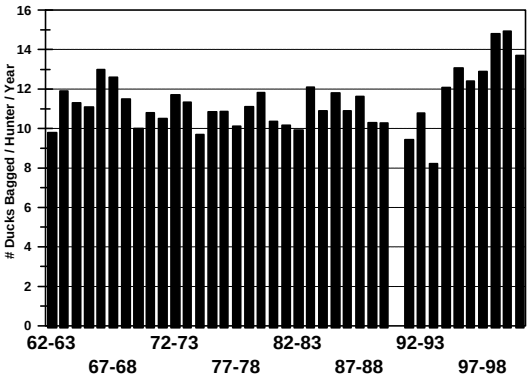


Fig. 14 Duck hunter success rates



WILD TURKEY STATUS AND TREND REPORT
Statewide

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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. In the past 12 years, an aggressive release project has been conducted by the Department of Fish and Wildlife (WDFW). Three subspecies of turkeys were introduced or reintroduced throughout Washington.

Merriam's turkeys were released in Ferry, Klickitat, Lincoln, Okanogan, and Stevens counties; Rio Grande turkeys were released in Chelan, Kittitas, Yakima, Walla Walla, Garfield, Columbia, Asotin, Lincoln, Whitman, and Okanogan counties; and the eastern subspecies was introduced in Pacific, Cowlitz, Thurston, Lewis, and Grays Harbor counties.

Current operations are focused on translocation of turkeys as a landowner incentive to enhance wildlife habitat and to provide additional opportunities on public lands (e.g., Wildlife Areas). This activity is being implemented through the Upland Wildlife Restoration Program.

Hunting seasons and harvest trends

Estimated harvest of wild turkeys is based on successful hunter report card returns. Successful hunters are required to submit a harvest report card with date, location, sex, and age of harvested birds. Reporting rate is estimated at 70 percent so harvest is projected by expanding reported harvest by 43 percent.

Hunting seasons for wild turkeys have varied from a 2-day, fall season in 1965 to the current 31-day spring season statewide and 5-day fall, permit-only seasons in selected counties beginning in 2000. The statewide, April 15 to May 15, spring season was established in 1994. The shortfall season has existed since 1965. The fall season was moved to late November in 1990. In 2000, fall hunting was changed from a general season to a permit-only hunt by drawing. Fall hunt dates were moved from late November to early October to avoid overlapping other seasons.

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. Subspecies are defined by county of kill. Multiple tags could only be purchased prior to the spring hunting season. After the spring season starts, only one turkey tag may be purchased. Starting with the 2001 spring season, hunters can harvest 2 bearded turkeys in most eastern Washington counties and purchase tags throughout the season.

Turkey hunting is open to shotgun and archery hunting only, use of dogs is not allowed, decoys are legal, and hunting hours are one-half hour before sunrise to sunset.

Current regulations are considered relatively conservative. Spring season timing results in harvest of gobblers after peak breeding. The season ends before most nests hatch, so disturbance is minimized.

Statewide harvest has increased each year as have hunter numbers (Figure 1). In 1998, 1,000 turkeys were taken and 6,659 tags were purchased. Prior to turkey augmentation activity in the late 1980s, hunter numbers fell to a low of 428 (1987) and turkey harvests averaged 65-birds/ year (1983-1987).

1,550 wild turkeys were harvested in Region 1 during the general and permit seasons in 2000. Region 1 harvest accounts for 86.5% of the statewide turkey harvest (Table 1). The spring season is extremely popular with hunters, and some hunting areas have become so popular that hunter crowding and safety are becoming a concern on opening day and weekends.

In Region 2, annual turkey harvest from 1992 to 1999 fluctuated between 10 and 22 birds. In 2000, turkey harvest increased to 32 (Table 1). This increase was most likely the result of the previous mild winter that translated into good over-winter turkey –survival, as well as the release of 93 turkeys that year. The vast majority (97% in 2000) of turkey harvest in Region 2 takes place in Okanogan County, usually on or near the WDFW Chiliwist Wildlife Area.

Only 5 birds have been harvested in Region 3 in

Table 1. Spring Turkey harvest by county, Washington, 1992-99.

County	1992	1993	1994	1995	1996	1997	1998	1999
Region 1								
Asotin	9	8	22	25	16	16	29	50
Columbia	31	23	50	62	67	74	67	128
Garfield	22	22	23	21	10	9	20	34
Walla Walla	3	12	13	42	17	26	25	46
Whitman				1	3	7	4	9
Ferry	12	12	29	36	33	62	87	113
Pend Oreille		1	3	4	18	7	12	43
Spokane		1	0	3	9	16	25	46
Stevens	22	36	61	130	150	277	395	633
Lincoln	31	40	57	104	101	157	143	262
Total	130	155	258	428	424	651	807	1,364
Region 2								
Grant		4	0	0	0	1	0	1
Okanogan	10	12	17	12	22	10	20	20
Total	10	16	17	12	22	11	20	21
Region 3								
Chelan	3	1	0	0	0	0	0	0
Kittitas	1	0	0	0	0	0	0	1
Yakima	3	3	0	1	0	1	0	0
Total	7	4	0	1	0	1	0	1
Region 5								
Cowlitz							3	8
Klickitat	62	66	83	109	140	121	129	178
Lewis							7	12
Skamania	5	0	3	3	5	2	3	5
Wahkiakum								1
Total	67	66	86	112	145	123	142	204
Region 6								
Grays Harbor	1	0	0	1	1	1	3	4
Pacific	1	1	0	7	4	5	10	8
Thurston	3	5	7	5	7	13	16	13
Pierce							1	0
Total	5	6	7	13	12	19	30	25

the last 5 years. Severe winters in 1992-93 and 1996-97 have nearly eliminated the population. Three birds were harvested in 1999.

Turkey harvest started slowly in Klickitat County in the 1960s but built to a harvest of 98 turkeys in 1970. Harvest was relatively stable through the 1970s and early 1980s. By 1986, harvest had dropped to <50 turkeys. Harvest reported for Klickitat County has increased substantially since supplemental releases in 1988-89 and exceeded 120 since the 1996 season (Table 1). The 1997 and 1999 releases may have contributed to the 38% increase in turkey harvest from 1998 to 1999.

Turkey harvest in western Region 5 has increased over the last 7 years as a result of the recent releases and increasing hunter effort, although harvest in Lewis, Cowlitz, Skamania, and Wahkiakum counties is small. Turkey harvest in Lewis and Cowlitz counties remains at a very low level, and although much suitable habitat exists, population expansion has been slower than in some parts of Washington.

Turkey harvest within Region 6 increased in 2000, as did effort, however harvest totals remain fairly low. Thirty eight turkeys were harvested in Region 6 in 2000 (Table 1).

Population status and trend analysis

In the Blue Mountains (Region 1), 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 translocated 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 236 in 2000.

Based on harvest trends (Table 1), 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.

Wild turkeys of the eastern subspecies were released in Stevens County in 1919, but a sustainable population did not develop. 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. Fourteen were released in Ferry County over a 3-year period and 12 birds were released in Spokane County. 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. Spring harvest in Stevens County has climbed each year with a record harvest of 761 turkeys in 2000.

During the 1988-89 time period, 32 Merriam's turkeys were also released in Ferry County. Harvest in Ferry County has generally increased from 12 birds in

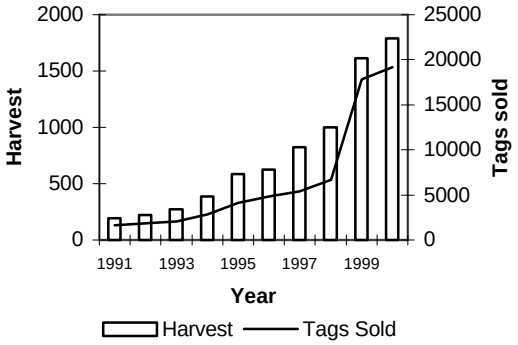


Figure 1. Trend in turkey harvest and number of tags sold Washington, 1991-2000.

1992 to 114 turkeys in 2000. Stevens, Pend Orielle and Ferry counties contain good habitat for the Merriam's subspecies, which seems to be increasing and rapidly occupying available habitat.

While the only release records for Pend Oreille County were 60 Merriam's turkeys released in 1996, a few turkeys have been harvested each year since 1993. 57 turkeys were harvested in Pend Oreille county in 2000. This harvest is attributed to a combination of 1996 releases, game farm-raised turkey releases, and birds moving in from adjacent release sites in Idaho and Washington.

Harvest records suggest that populations in Ferry and Stevens counties continue to expand their range and increase in density. This population should continue to expand depending on winter conditions and pine seed production. While severe winter conditions have limited turkey populations in other parts of the United States, the harsh winter of 1995-96 did not appear to significantly impact the northeast Washington population.

In the central district of Region 1, the earliest recorded releases occurred in 1970 when 10 Merriam's turkeys from Stevens County were translocated to the Hawk Creek area in Lincoln County. One or 2 birds were harvested each year until 1981. Northern Lincoln County near the Columbia and Spokane River breaks is currently the highest quality and most densely populated area of the central district in Region 1.

Harvest in Spokane County increased from 9 in 1996 to 59 in 2000; these turkeys are occupying edge habitat in urban areas and are the result of natural expansion because WDFW has not recently released birds into Spokane County.

Beginning in 1988, there were several turkey releases in Lincoln County. In 1988, 37 Merriam's turkeys were released; in 1989, 39 Rio Grande turkeys were released; and in 1990, 33 more Rio Grande turkeys were released. Turkey harvest in Lincoln County increased dramatically from 23 gobblers in 1991 to 185 in 2000 (Table 1).

Turkey populations in Region 1 continue to expand and should provide high harvests as populations continue to grow. Precipitation levels were near normal during the 2000 nesting season and production has been only moderate to good. During drought years of the early 1990s, production was often excellent in many areas of Region 1. Observations of wild turkey broods were very limited in 2000, but averaged between 5 and 6 young/brood in Lincoln County. This is moderate to good production; during a year of poor production an average brood might contain only 1 or 2 young.

Winters have generally been very mild so there has been excellent carryover from year to year. Turkeys in Region 1 are often associated with wheat stubble fields during winters and winter mortality may be low unless snow is unusually deep for long periods.

Weather affects turkeys by controlling insect production levels during brood-rearing season. In dry, warm summers poults have an abundance of grasshoppers to utilize for protein and rapid growth results. In normal or above normal precipitation years, chick survival often suffers. During summer 2000 very large numbers of grasshoppers were observed in Region 1 and turkey broods were observed in pursuit of grasshoppers in pastures and hayfields near timbered areas.

Wild turkeys in Region 1 are gradually occupying new areas as numbers increase and as trap and translocation projects remove excess turkeys from areas of concentration (Table 2). The general trend over the past 10 years has been a steady increase in localized areas in spite of periodic severe winter conditions.

Rio Grande turkeys released in Whitman County are expanding into all available habitat in that heavily agricultural county. Palouse River drainage contains the highest quality feeding and roosting areas for birds in Whitman County.

Eight turkeys were released in Douglas County (Region 2) from the Stevens County population in 1965. Up to 12 turkeys were harvested from Douglas County per year from 1966 to 1973. An occasional turkey is still harvested in Grant County every couple of years.

In Okanogan County, the earliest records of turkey releases in Okanogan County occurred in 1931. Merriam's turkeys were trapped in Stevens County and released in Okanogan County in the early 1960s. Four were released on the Sinlahekin Wildlife Area in 1960,

six more were released in 1963, and 10 more in 1966. A total of 9 birds were released on the Methow Wildlife Area in 1967. A few birds were harvested in Okanogan County in 1968 and 1969, but no harvest was reported after that until additional releases were made in the late 1980s and early-1990s.

Table 2. Turkey trap and translocation summary, Region 1, Washington, 2000-2001.

Subspecies	Source County	No.	Release County	No.
Rio Grande	Lincoln	94	Whitman	19
			Asotin	12
			Walla Walla	10
			Lincoln	53
Rio Grande	Asotin	30	Asotin	20
			Garfield/ Columbia	2
			Walla Walla	8
Rio Grande	Columbia	7	Asotin	7
Merriam's	Stevens	476		
Merriam's	Ferry	191		
Merriam's	Spokane	44		
Merriam's	Pend Oreille	34		
Merriam's			Pend Oreille	34
Merriam's			Klickitat	47
Merriam's			Okanogan	169
Merriam's			Chelan	230
Merriam's			Yakima	265

Thirty Merriam's turkeys were released in eastern Okanogan County in 1989. Records do not indicate any harvest in eastern Okanogan County after these releases. However, Rio Grande turkeys released in western Okanogan County on Chiliwist Wildlife Area have resulted in sustained harvests in this area (Table 1) indicating that the population is probably stable or increasing slowly. The population likely declined as a result of the 1996-97 winter; however, the mild weather of the next three winters is fostering a population rebound. In 2001, 93 Merriams turkeys, from Ferry and Stevens counties, were released in to Okanogan County, representing the largest release ever in the area.

No population estimate has been calculated for the Okanogan County turkey population. There appears to be a small, but slowly growing and expanding population. Turkeys are expanding into drainages west and south of traditionally inhabited areas of the Chiliwist watershed. The lack of grain farming in the area may eventually limit population growth.

Turkeys are also colonizing tributary streams of the lower Methow. At least some of these birds likely originated from releases by private individuals. The subspecies of these birds is unknown. Turkeys also appear to be expanding from Canada onto private land near the border just west of Oroville.

In the mid-1960s, 6 Merriams turkeys from the Ellensburg Game Farm and 2 from Stevens County were released in to Chelan County. During this same period, 8 Merriams turkeys from Stevens County were released on to Badger Mountain in Douglas County. A total of 80 Rio Grande turkeys were then released in Chelan County in 1986 and 1988, followed by 28 Merriams turkeys in 1990. These releases proved unsuccessful, probably due to the small number of turkeys released and the lack of winter-feeding during harsh winters.

In 2000, 156 Merriams turkeys (110 hens, 46 toms) were released into Chelan and eastern Kittitas counties. Two-hundred twenty five Merriam's turkeys (170 hens, 55 toms) were released in to these counties in 2001. Poult production (1.3 poults per hen) in 2001, was half that (2.6 poults per hen) in 2000. The cold, wet May of 2001, along with the drought conditions during the summer probably reduced poult production. From February-October 2001, 54 percent of radioed hens (13 of 24) survived. The radioed birds that died were either killed and/or fed upon by bobcat or cougar. Groups of wintering birds have ranged from 10 to 90 birds. Based on production and survival data, the Chelan and eastern Kittitas counties' turkey population is estimated at 500 birds.

In Region 3, attempts to establish wild populations of turkeys in Yakima County between 1913 and 1931 were unsuccessful. In all, 94 turkeys were released. These early releases relied on game farm-reared birds of the eastern subspecies.

Oak Creek Wildlife Area was the target of some early releases of wild-trapped turkeys in the early 1960s. Twenty Merriam's turkeys were released, but no significant population was established. In the mid-1960s 4 Merriam's turkeys were trapped from Stevens and Spokane counties and released on Colockum Wildlife Area in Kittitas County. This release did not result in population establishment.

More recent releases in Region 3 began in 1984. Thirty-eight Rio Grande turkeys were released in Yakima County in 1984 and 1985. Only 5 turkeys were harvested in the last 5 years in this area (Table 1), indicating that it has not seen the same success as turkey introductions in other areas of Washington.

Although pockets of Rio Grande habitat occur throughout Region 3, the overall habitat is probably better suited for the Merriam's subspecies. Since 1999, 267 and 40 wild trapped Merriam's turkeys from Stevens County were released in Yakima and Kittitas Counties.

In south-central Washington, 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 Klickitat County in 1997 and 1999. No releases occurred in Klickitat County or the other counties of Region 5 in 2001.

The south-central turkey population appears to be relatively stable. Recent increases in harvest may be tied to improved weather conditions in combination with additional birds released in the late 1980s and late 1990s. Recent reports by hunters and local biologists indicate that the population may be expanding its range and increasing in number as previously unoccupied habitats become colonized. While the overall harvest for Region 5 was less in 2000 than in 1999, turkeys were harvested from all 6 counties in the region, suggesting a population expansion (Table 1).

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, and then Orcas Island in San Juan 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. A history of eastern wild turkey releases is summarized in Table 3.

Determining population trends for the wild turkey population in Region 6 is difficult. Although harvest was at a period high level of 38 in 2000, the release of 268 turkeys in the late winter and early-spring of 2000 likely contributed to the higher harvest. However, sightings of wild turkey continue to increase throughout the year, as well as, sightings in locations away from release sites. Also, turkeys continue to be harvested throughout the season. These factors, considered together, suggest wild turkeys may be reproducing and perhaps maintaining a viable population in Region 6.

Habitat condition and trend

The most significant impact to statewide turkey habitat is similar to most wildlife species: the end of an 8-year drought in 1994. Vegetation conditions have improved and with minimal snowfall in wintering areas, turkey populations should fare well.

Most of 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 excellent habitat for the Rio Grande subspecies. Stevens, Pend Oreille, and Ferry counties contain good 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. Vegetation conditions in eastern Washington tend to improve during wetter years. Much of the habitat in Okanogan County is intensively grazed, and turkeys may compete with livestock for certain plant foods. In addition, the lack of grain farming in the area may be hampering population expansion. Populations of wild turkeys have flourished in a diversity of habitats in the United States, so we are optimistic they will do well in Chelan, eastern Kittitas, and Okanogan counties.

In Okanogoan County, vegetation conditions continue to improve during the wetter weather of recent years. 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 be hampering population expansion.

Most of Region 3 is probably marginal turkey habitat. The forested zone (Merriam's habitat) is on the edge of higher elevations and receives significant snowfall. Deep snows in 1992-93 and 1996-97 plagued the region. In 2000, snowfall and spring moisture was normal. However, no significant rain fell after June 1, possibly limiting insect production.

Habitat in the lower Yakima Valley around Sunnyside is probably suitable Rio Grande turkeys. The area rarely receives significant snow and food is abundant. However, conflicts with agriculture (e.g., vineyards, orchards) in the area are likely

In Region 4, selected landings and roads in the vicinity of release sites were seeded with a clover/grass mix, at the Pilchuck Tree Farm's expense in spring 1999. Results of this attempt to improve forage conditions for turkeys and other species are not yet known.

Winter conditions in eastern Klickitat County (Region 5) can sometimes be severe. In particular, winter 1996-97 may have caused some mortality in resident turkeys that in turn may have triggered the small decline in turkey harvest in 1997. Harvest in 1998 harvest was also low (82 birds) in Klickitat County, but harvest more than doubled from 1998 to 1999 when 178 turkeys were harvested. This increase in harvest suggests the Klickitat County population recovered from the harsh winter of 1996-97.

Although we do not specifically survey habitat conditions related to turkeys in Region 6, conditions should continue to be favorable, as there were no significant changes in habitat management or weather conditions during 2000-2001 that would have affected turkey survival.

Augmentation and habitat enhancement

During the winter of 2000-2001, 745 Merriam's and 131 Rio Grands wild turkeys were trapped and translocated in Region 1 (Table 2). These birds, trapped primarily in response to damage complaints, have been used to enhance existing populations and establish new populations in appropriate habitat.

The UWRP continues to aggressively enhance habitats for all wildlife within the range of the wild turkey in Region 1. in 1997, several new habitat and hunter access agreements were signed with private timber companies and with the Department of Natural Resources. Since then, several acres of habitat enhancements have been completed with several more planned in the next few years. These landowners have a great interest in working with WDFW to enhance habitats and establish huntable populations of eastern wild turkeys on their land holdings.

Nearly 500 turkeys have been released in Region 2 during 2000-2001. In 2001, 93 turkeys were released in Okanogan County. One-hundred fifty six Merriams turkeys were released in Chelan and eastern Kittitas counties in 2000, and 225 in 2001. Turkeys were released on WDFW, Department of Natural Resources, and private land between the Colockum Wildlife Area and the Chelan Butte Wildlife Area. Flocks were established every 2-6 miles. Landowners were contacted prior to releases and were enthusiastic about release efforts. Fifteen turkeys (11 hens, 4 toms) were released at each site. Turkey feeders were constructed at each release location and were filled with wheat to ensure birds survived a harsh winter. In 2000, movements of released birds has averaged 2 miles (range = 1-6 miles). In 2002, at least 150 additional turkeys will be released in Okanogan County and 200 in Chelan and eastern Kittitas counties.

During winter 1999-00, Merriam's turkeys were trapped in Stevens County and released in Yakima and Kittitas counties. Eight birds were equipped with radio transmitters. The project created much enthusiasm among local hunters who formed a chapter of the National Wild Turkey Federation (NWTF). Releases and radiomarking will continue in 2000-01 with the help of NWTF. The local chapter will feed birds and is exploring habitat improvements as well as releasing Rio Grande turkeys in the Sunnyside area.

Thirty-eight turkeys were introduced on Pilchuck Tree Farm lands in northern Snohomish County between January 1998 and February 2000. No additional introductions have occurred since then.

No formal surveys to monitor the turkey population have been conducted. Opportunistic observations suggest the birds have survived and reproduced to some degree. However, the Pilchuck Tree Farm has never opened to hunting because the farm manager feels the population is too low to sustain a harvest.

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 were no new releases in 2001.

Management conclusions

Harvest and hunter numbers continue to increase. In 1994 the regulations were changed to allow the harvest of up to three turkeys per year (one from each subspecies). As turkey populations continue to expand in the Blue Mountains, northeast, and north-central Washington, additional opportunity may be provided.

Habitat enhancement activities for wild turkeys should focus on food improvements (especially winter foods) in terms of grain, clovers, fruiting shrub, and mast producing tree plantings. These types of plantings would be most helpful in the northern portions of Washington's turkey range and other forested areas where food sources may be limited, especially after winter snowstorms.

Populations of wild turkey in Region 1 continue to increase. Hunter interest and harvest have both increased over the last 10 years (Table 1). Releases of turkeys in Pend Orielle County are encouraging expansion of the population into new areas of suitable

habitat.

Spokane County is seeing an increase of turkeys despite the urban nature of the area. Other areas are currently under expansion of a naturally increasing wild population and trap and translocation efforts will continue as funding and opportunities arise. The Blue Mountains support excellent Rio Grande populations. Some hunting areas are becoming so popular that hunter crowding and safety are becoming a concern on opening day and weekends.

Turkey damage complaints are being received from areas of Region 1 and these turkeys are a continuing source of stock to initiate new and supplement existing populations (Table 2).

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. Even though deleterious competition between turkeys and other game birds in Washington has not been identified, any augmentation that could potentially put birds in existing sharp-tailed grouse habitat, should be avoided as a precautionary measure.

The turkey population in Chelan and eastern Kittitas counties is expected to continue to increase through both augmentation efforts and natural production. In 2002, an additional 12 turkeys will be radioed to help assess survival, production, and movements of released birds. Winter feeding will continue to help birds make it through difficult winters.

Several states have noted a positive correlation between the abundance and distribution of turkeys and the proportion of deer hunters that see turkeys during the fall deer season. Asking Washington deer hunter whether they see turkeys would enhance our information on turkey numbers and the extent of their distribution, particularly for recently established turkey populations.

Releases of Merriam's turkeys in Yakima and Kittitas counties will continue in 2000-01. Radiotracking will help determine success of translocations and future management direction. Winter feeding will probably be needed to sustain a huntable merriam's population. The potential of releasing Rio Grande turkeys will be explored.

In 1994, regulations were changed to allow the harvest of up to 3 turkeys/year (1 of each subspecies). However, methods to monitor both hunter numbers and harvest need to be refined. Harvest projections now used are based upon old assumptions about harvest report card compliance that may no longer be valid. With a point-of-sale licensing system soon to be implemented, at least the latter problem will be resolved.

Expanding density and distribution of the western Washington turkey population has been identified as a priority for turkey management. Research to determine limitations to dispersal and population expansion could better direct future efforts, but other issues have taken higher priority within the Upland Game Section.

Current information suggests that wild turkeys may be establishing viable populations in Region 6. However determining actual population trends for the established wild turkey population in this region are difficult. The augmentation of additional birds released within the region likely contribute to an increase in harvest and potentially to the population. Increases in turkey sightings throughout the year and away from release sites, in addition to gradual increases in harvest observed in recent years, all contribute to increased interest in hunting wild turkey. If populations continue to increase due to natural population growth and augmentation, so too will hunter interest and success. No changes in harvest are needed at this time.

Following releases of >600 eastern wild turkeys in western Washington since 1998, there are no plans for further translocations in the near future. Observations and analysis of data (e.g., percent young males in spring harvest) collected over the next several years should determine whether eastern wild turkeys will achieve viable population status.

There are currently 2 areas where forested habitat occurs in Washington that are not occupied by turkeys: parts of Spokane County and northwest Washington. Experimental releases along the east slope of the Cascades are being monitored to estimate habitat use, productivity, and limiting factors. These releases may eventually lead to successful population establishment.

PHEASANT STATUS AND TREND REPORT: REGION 1
Snake River Basin

PAT FOWLER, District Wildlife Biologist

Population objectives and guidelines

Pheasant management objectives are outlined in the Upland Bird Plan (WDFW 1988). The overall objective is to maintain well distributed populations and maximize recreational opportunity. Primary objectives include 1) Increase populations above the 1980-85 average. 2) Increase hunters recreation days to 338,000 statewide. 3) Maintain the statewide harvest at the 1980-85 level of 371,000 birds per year, at a hunter success rate of 4.5 birds per year.

Hunting seasons and harvest trends

The eastern Washington general pheasant season ran from October 7 to December 31, 2000. In addition, a juvenile season ran for two days in late September. The bag limit was 3 cocks per day.

The pheasant harvest in Region One was at its peak from 1946 to 69, with an average harvest of 107,100 pheasants per year. The harvest has continued on a downward trend for the last 30 years. Compared to the previous 24-year average, the harvest during the 1970s declined 23% to 82,687 pheasants\year, 26% in the 1980s to 79,639 pheasants\year, and 63% in the 1990's to 40,074 pheasants\year (Figure 1.). The Regional pheasant harvest in 2000 increased 14% over 1999, with a harvest of 55,741 pheasants.

Although hunter trend information is limited, from 1986-1997 the number of pheasant hunters in Region One has cycled from a high of 20,000 in 1986, to a low of 9,500 in 1995, to 19,172 hunters in 1997, and back down to 14,486 in 2000 (Fig. 2). Hunter participation is probably influenced by several factors, including pheasant abundance.

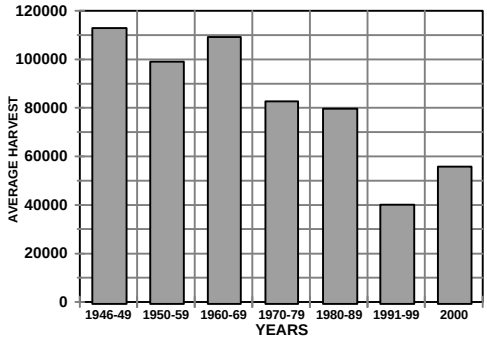


Figure 1. Region 1 pheasant harvest trend.

Hunter success in Region One varies from year to year. During the period 1986-89 and 1991-95, pheasant hunters averaged 2.9 and 2.7 birds/htr., respectively. From 1996-2000, pheasant hunters enjoyed increasing success with an average of 4.0 birds/htr. (Figure 3), slightly below the management objective of 4.5 birds/htr.

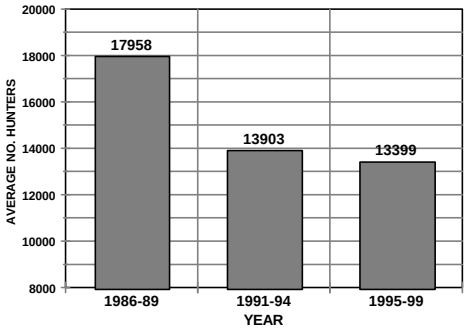


Figure 2. Region 1 pheasant hunter trend.

Surveys

Three types of pheasant surveys were conducted up until 1995; 1) Sex ratio counts in February and March, 2) Crow counts in late April and early May, 3) Production counts in late July and August. Spring surveys to determine sex ratios and broodstock carryover were discontinued in 1996. Time constraints, lack of personnel, and questionable value of the data have resulted in pheasant surveys being discontinued in Region One. In the past, pheasant crowing counts were conducted in late April and early May if weather conditions and time allow. Pheasant production surveys were conducted in late July and August. All surveys were conducted on established routes.

Although crowing counts were conducted for many years, habitat conditions have changed along most of the routes, as well as the hearing level of individuals that have historically run the same routes, which makes the value of the data suspect. Production surveys along established routes have provided information on the number of pheasants observed per survey (obs.-day), and the level of production for the year, but analysis of the data in Olympia indicated the statistical reliability of the data was highly suspect.

Population status and trend analysis

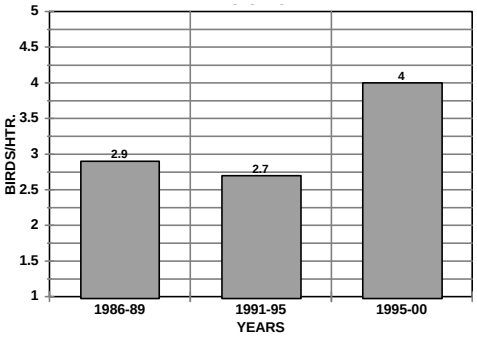


Figure 3. Region 1 pheasant hunter success.

Based on past surveys and harvest trends, pheasant populations have declined significantly over the last 30 years. The primary factor for the decline in pheasant populations is loss of habitat due to development and agricultural practices. In areas where alfalfa is a major crop, the first cutting usually occurs during the peak of nesting (mid-May) and results in a heavy loss of nests and young. Another factor that may have a significant impact on the pheasant population is the dramatic increase in predator populations, both numbers and species. Predation combined with fragmented habitat may be focusing negative factors on the pheasant population, which prevents a long-term increase. Agricultural chemicals may have an as yet undetermined influence on the health of upland bird populations.

Weather conditions during the nesting season are also a significant factor that impacts the annual pheasant population. Cold, wet conditions during the peak of hatch can result in very high mortality of young pheasants, decimating annual production. Production can be down in one area and up considerably in another area due to variations in weather patterns during the nesting season.

The 2001 nesting season was tough for upland bird production in most of southeast Washington, but populations in northern Garfield and Whitman counties seemed to do well. Wet, cold weather from late May to late June resulted in poor production in Walla Walla, Columbia, and eastern Asotin counties. Northern Garfield and the central counties experienced good production, which is the normal pattern during years of poor production in other areas of southeast Washington.

Habitat condition and trend

Habitat conditions over the past 30 years have declined due to land development, changing agricultural practices, noxious weed invasion. However, habitat for upland birds has improved in recent years with the advent of the Conservation Reserve Program (CRP). After the first CRP acreage expired, farmers had to reapply for CRP acreage in 1997 and many requests were rejected. The second sign-up period resulted in a significant amount of acreage being accepted into the program. In Region One, approximately 456,737 acres of agricultural lands have been converted to CRP. This program will provide large areas of suitable habitat near agricultural croplands, enhancing habitat conditions for pheasant, nongame and other species over the next 8-10 years.

Augmentation and habitat enhancement

The Upland Habitat Restoration Program has developed over 6700 acres of upland bird habitat in the southeast and central districts. The Conservation Reserve Program has made an enormous contribution to improving wildlife habitat in Region One.

Management conclusions

Pheasant populations in Region One are affected by numerous factors that hold the population below management objectives. Land development, changing agricultural practices, pesticides, noxious weed invasions, fragmentation of habitat, and conflicts with other species may prevent significant increases in the pheasant population in the foreseeable future.

PHEASANT STATUS AND TREND REPORT: REGION 2
Columbia River Basin

JIM TABOR, 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

Pheasant hunting seasons and bag limits in the Columbia Basin remained stable 1984-98 when seasons extended from the first Saturday after October 10 to December 31 with a daily bag limit of 3 cock pheasants and a possession limit of 15. In 1999, the season opened on October 9 and remained unchanged in other respects. In 2000, the season opened on Oct. 7. In Grant and Adams counties, the number of pheasant hunters declined 52% in the 9-year period from 1987 to 1995, increased slightly in 1996, and increased substantially in 1997 (Table 1). The number of hunters decreased 11% from 1998 to 1999 but increased (14%) in 2000. The trend in hunter numbers is very similar for both counties.

Even with the restriction of cock-only harvest, sex ratios in the Basin averaged 2.8 hens/rooster from 1993 through 1998. This low sex ratio indicates that cocks could be harvested at a higher rate without reducing breeding efficiency, productivity, or population growth.

Table 1. Pheasant hunters in Grant and Adams counties, Washington, 1987-00.

Year	Grant	Adams	Total
1987	11,948	4,099	16,047
1988	9,052	2,793	11,849
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

Hunting conditions appear to change only moderately from year to year or on a "short-term" basis. Type of crops grown, timing of harvest, crop residues left in the field, and amount of ground left untilled affects hunter use and success and has changed rather dramatically over the long term. Most pheasant hunting in Columbia Basin occurs on private farmland. The long-term trend shows 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 Area, private lands under agreement with WDFW's hunter access program, and on lands owned and/or managed by WDFW under Upland Wildlife Restoration Program (UWRP). The hunter access program in Grant and Adams counties included 170 cooperators with a total of 302,015 acres of hunting access in 2000. The UWRP manages 37 parcels totaling 1,717 acres available to hunters.

During the 17-year period from 1984 through 2000, harvest declined 75% from a high of 58,912 in 1984 to a low of 14,827 in 1995 (Table 2). In 2000, harvest decreased 23% from that of 1999 in Adams Co. and increased slightly in Grant Co., resulting in a combined decline of 14% (to 22,634). Harvest trends have been similar in both counties most years.

Pheasant hunter success (pheasants harvested /hunter day), in both counties combined, ranged from a high of 0.67 in 1996 to a low of 0.40 in 1991 with an average success rate of 0.55 from 1987 to 1999**.** In 2000, the success rate was 0.47 pheasants/hunter day, a 7% decrease from 1999 and a 14% decrease from the previous 13 year average.

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 and major short-term population changes. The production index is a good predictor of hunting prospects and may provide information useful in determining reasons for annual changes in population size.

The breeding season population index is based on one crowing count route. Data from the crowing count

Table 2. Pheasant harvest in Grant and Adams counties, Washington, 1984-00.

Year	Grant	Adams	Total
1984	43,921	14,991	58,912
1985	36,225	10,299	46,524
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

Table 3. Pheasant hunter success rate (pheasants harvested/hunter day), Grant and Adams counties, Washington 1986-00.

Year	Grant	Adams	Total
1986	0.57	0.69	0.63
1987	--	--	--
1988	0.57	0.66	0.62
1989	0.53	0.69	0.61
1990	--	--	--
1991	0.38	0.41	0.40
1992	0.53	0.58	0.56
1993	0.42	0.62	0.52
1994	0.46	0.52	0.49
1995	0.46	0.51	0.47
1996	0.53	0.87	0.67
1997	0.41	0.53	0.43
1998	0.64	0.62	0.63
1999	0.46	0.59	0.53
2000	0.46	0.53	0.47

route provides an index to the population size of roosters. The population index for hens (broodstock index) is derived from the rooster index and hen to rooster ratio.

Until 1997, 6 permanently established crowing count routes along farm roads and highways in Grant and Adams counties' irrigated farmland were surveyed twice annually (≥1 week between surveys) between April 25 and May 15. Only 1 route (Warden) has been surveyed since 1997. The index is presented as the mean number of crows per stop and is assumed to represent the number of roosters present.

Pheasant sex ratio surveys (counts) were made in farmland areas adjacent to 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 1997 to 1999 and 2001. This area was adjacent to the Warden crowing route. There were 2.5 hens/rooster in the spring of 2001 (Table 4).

The 2001 index to breeding population size of hens (brood stock index) decreased 74% from 1999 (Table 4).

The production index has been derived from surveys of 6 permanently established pheasant brood routes located in the same general areas as past crowing count routes. Only four of the routes were surveyed in 2001. The production index is the number of broods or chicks seen per observation day. The pheasant production index for 2001, as measured by number of chicks observed/ day on 4 brood routes, decreased 30% from 2000 (Table 5). The decreased production of chicks was probably due to reduced nesting success and/or chick survival. The pheasant production index in 2001 was 49% below the 1990-2000 average and was the second lowest ever recorded.

Population status and trend analysis

The pheasant population in the Columbia Basin Irrigation Project has plummeted since the early 1980's. The decline has been dramatic with very few single-year hints of possible slowing of downward trend or possible recovery. In the early 1980's, the hen population at the beginning of nesting season was at a density of approximately 100/section. In the spring of 1996, hen density was approximately 10/section. For the first time since 1991, spring hen numbers increased in 1997. Hen numbers increased again in 1999, but declined again in 2001 (Table 4). Breeding season rooster density declined concurrently with hen density, but at a slower rate. Density in the early 1980's was approximately 20/section. In 2000, rooster density was about 4/section. In 2001, rooster density was 5.5/section

Habitat condition and trend

The winter of 2000-01 was relatively mild, but long in duration. Little snow fell and temperatures were above normal for most of the winter. Pheasant survival over-winter should have been good.

Weather during May and June 2001 was cooler than normal and appeared to have resulted in reduced nest success and chick survival. Eighty-nine percent of hens observed during summer brood counts in 2001 were accompanied by chicks compared to 84% in 2000. Decreased production likely resulted from poor chick survival. Number of chicks/brood was 3.3 in 2001 compared to 4.7 in 2000.

Loss of permanent cover (untilled land) in the

Table 4. Pheasant breeding population indices for Warden area, Columbia Basin Irrigation Project, Washington, 1996-00. (Data from only 1 crowing route and 1 sex ratio sampling area).

Index	Class	1997	1998	1999	2000	2001
Crows/Stop	Rooster	13.9	8.5	13.4	3.9	5.5
Hens/Rooster	Sex Ratio	3.1	3.0	4.0	--	2.5
Broodstock	Hen	40.5	25.8	53.6	--	13.8

irrigated part of the Basin continues. Conversion of small fields with fence rows, ditches, and other adjacent cover to large circle irrigated fields is probably the major loss of habitat. Another major loss of pheasant habitat is the construction of homes and farm buildings. This activity has greatly accelerated in recent years.

Increased acreage of alfalfa hay has replaced potentially beneficial agricultural crops. Management practices associated with alfalfa lead to increased mortality for pheasants, especially hens, chicks, and nests. Orchards and vineyards have also replaced potentially beneficial crops. Wheat stubble (and its associated waste grain) is now tilled under in summer shortly after the wheat is harvested. Farming practices appear to be constantly evolving and most changes have a negative impact on pheasants.

Augmentation and habitat enhancement

During 2000, UWRP managed and developed habitat on 18 properties consisting of 1,117 acres acquired since 1991 and 19 previously secured properties with 600 acres in Grant and Adams counties. In 2000, UWRP focused on installing guzzlers in conjunction with CRP; 128 guzzlers were installed. In the last two years, 359 guzzlers were installed on private land. In addition to guzzler installation, the UWRP planted 1000 shrubs, maintained existing habitat developments, installed a new irrigation system on one of the managed areas, conducted extensive weed control on the UWR sites, established food plots, maintained alfalfa nesting plots, and established and maintained grass cover plots. The program managed seven agricultural leases for share croping and habitat maintence.

In 2000, approximately 4,000 game farm rooster pheasants were released at 7 sites during autumn (5 release dates) in Grant and Adams counties. The intent of these releases was to provide increased hunting opportunity for pheasant hunters.

Management conclusions

Pheasant populations in the Columbia Basin have declined dramatically in recent years and remain at very low levels compared to the past. Documented causes of the decline do not exist. Speculation as to reasons for the decline is frequently voiced by the lay public and wildlife managers alike. In reality, very little objective information specific to identification of potential causes of the decline is available.

If the pheasant is to continue to be the primary upland game species hunted in the Columbia Basin, there is a need to conduct research to identify causes of the decline, or more specifically, current barriers to population increase. If barriers to population increase are identified, decisions concerning the feasibility of management can be made.

Table 5. Pheasant production index for the Columbia Basin Irrigation Project, 1990-2001.

Year	Broods/ Obs.Day	Chicks/ Obs./Day	Tot.Ph./ Obs/Day	Percent Juvenile	% hens w/ Brood
1990	3.2	12.1	18.6	65	63
1991	1.1	3.9	7.0	56	58
1992	2.5	11.3	14.9	77	81
1993	1.8	7.9	10.5	75	94
1994	3.0	13.3	16.9	79	94
1995	1.4	6.4	9.6	66	71
1996	2.8	13.6	16.6	82	89
1997	1.2	6.3	8.5	74	62
1998	3.8	21.8	25.4	86	95
1999	1.4	4.4	6.7	66	73
2000	1.5	6.9	9.2	75	84
2001	1.5	4.8	6.4	75	89

PHEASANT STATUS AND TREND REPORT: REGION 3
Yakima River Basin

DON LARSEN, District Wildlife Biologist

Population objectives and guidelines

The primary objective of pheasant management is to maintain well distributed populations and to provide appropriate levels of hunting recreation. Statewide objectives were last set in the 1988 Upland Bird Plan. Objectives in 1988 included: (1) increase hunter recreation days to 338,000 statewide; and (2) maintain the statewide harvest at the 1980-85 average level of 371,000 birds per year with a success rate of 4.5 birds per hunter per year. In 1986, there were 117,630 recreation days in Region 3. The 1980-85 harvest average in Region 3 was 100,000.

Hunting seasons and harvest trends

From 1999 to 2000 hunter numbers remained relatively stable (6% increase) but remained well below (-39%) the 10-year average (Figure 1). Effort of 50,783 recreation days was 5% below last year and 55% below the goal. Harvest decreased 8% (23,502 total in 2000) and was 76% below the goal of 100,000.

Hunter success, as measured in pheasants harvested per hunter, has ranged from a high of 0.68 in 1986 to a low of 0.41 in 1991 and 1993 (Figure 2). Hunter success remained relatively similar from 1999 to 2000 (-4%) and was 10% below the 10-year average.

Surveys

Brood count surveys were discontinued in Region 3 in 1999. The post-hunting season questionnaire mailer used to estimate harvest currently provides the best estimate of population status. Since the Pheasant Enhancement Program began in 1997**,** pen-raised roosters have been released and subsequently reported in the hunters' bag. By including pen-raised pheasants in the harvest, inferences made about population status are likely biased high and should be made with caution.

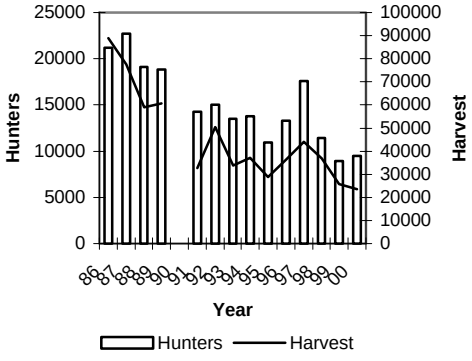


Figure 1. Pheasant hunters and harvest, 1986-2000.

Population status and trend analysis

Harvest data indicate the population has declined dramatically since the 1980s (Figure 1). In 2000 total pheasant harvest was the lowest on record. The reason for the decline is likely habitat loss due to changing agricultural practices and urban sprawl. The downward population trend is likely to continue along with the expected decline in habitat availability.

Habitat condition and trend

Pheasant habitat has declined for decades and continues to do so. Changes in farming practices, particularly in irrigated agriculture, has been the main cause of habitat degradation. Grain, pasture, and alfalfa fields have been converted to high-value crops such as orchard, vineyard, and hops. Cleaner farming practices have removed cover bordering fields, riparian areas, and irrigation canals. Forbs, weed seeds, and insects benefit pheasant survival, but herbicides and pesticides are heavily used to keep crops free of weeds and insects. Removal or depression of the insect prey base has an especially deleterious effect on pheasant chick survival. Agricultural 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 the Yakima Basin. Homes have been built in areas that historically provided pheasant nesting and hunting opportunity. This trend is expected to continue as the state's human population continues to increase.

The federal Conservation Reserve Enhancement Program (CRP) has not benefitted pheasant habitat in the Yakima Basin as it has in other areas of the state. In Washington state the CRP has paid farmers to convert over 1 million acres of highly erodible dryland wheat fields to permanent grass, forb, and shrub cover. Because most agriculture in the Yakima Basin 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. 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 results in less weedy, riparian vegetation, and idle land, the pheasant population decline will continue.

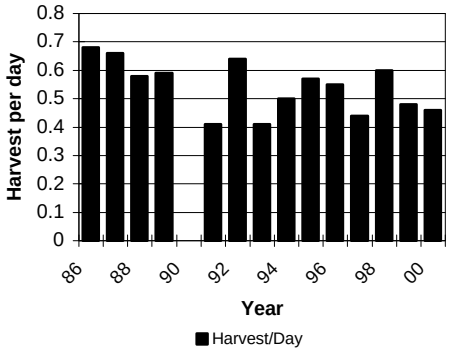


Figure 2. Pheasant harvest/day, 1996-2000.

Augmentation and habitat enhancement

The number of harvestable birds was augmented in 2000 with the releasing of several thousand 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.

The WDFW has acquired several parcels in Region 3 in recent years. The acquired lands contain pheasant habitat and/or the opportunity to enhance populations. The Upland Wildlife Restoration Program 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 is likely to continue. Enhancements on state and private lands through the Upland Restoration Program, CRP, and other programs are not likely to offset habitat degradation throughout the Region. Goals set in 1988 are not likely to be reached.

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.

As part of the Eastern Washington Pheasant Enhancement Program, several thousand pen-raised rooster pheasants will be released. While stocking rooster pheasants might help maintain an interest in pheasant hunting for some people, it also can shift some hunters' focus away from habitat and erode their enthusiasm and advocacy for habitat protection. To meet desires of various factions of the hunting public, birds should not be stocked where there is quality habitat and good wild production.

CHUKAR STATUS AND TREND REPORT: REGION 1
Snake River Basin

PAT FOWLER, District Wildlife Biologist

Population objectives and guidelines

The long term objective will be to increase chukar populations within Region One to historic levels that occurred in the late 1970's.

Hunting seasons and harvest trends

The chukar hunting season has varied in length over the years. During the 1960's and 70's, the chukar season was split into early and general seasons. The early season started in mid-late September and ran into early October. The general chukar season started at noon on the opening day of the general upland bird season, usually mid October, and continued to early-mid January. In 1997, the early-general season was eliminated in favor of a standardized season running from October 1 to mid- January.

The bag limit for chukar was reduced after the population crash in the early 1980's, from 10 birds\day to six.

The chukar harvest in Region One peaked in the 1970's at 66,681 birds\year, but declined at a steady rate during the 1980's and 1990's. During the 1980's, the annual chukar harvest ranged from 8,017 to 64,777 birds, and averaged 28,872 birds\year, a decline of 57% from the average harvest in the 1970's. The annual chukar harvest declined even more in the 1990's, ranging from 4,807 to 22,275 birds, and averaging 12,020 birds\year, a decline of 82% compared to the peak years of the 1970's, and 56% compared to the 1980's (Figure 1).

The Region One harvest improved slightly in 2000, increasing 27% from 7,073 in 1999 to 8,995 chukars (Table1).

Hunter participation in chukar hunting peaked in the late 1970's and early 1980's. After the population crash in 1982, hunter participation has declined significantly.

Surveys

Aerial surveys were started in 1987 and conducted annually through 1997. At present, no surveys are conducted to monitor chukar populations.

Population status and trend analysis

Chukar populations have declined dramatically since the early 1980's throughout Region One. The reason for the sudden and dramatic decline that occurred in 1982 is unknown. In southeast Washington, chukar populations have been plagued by habitat deterioration due to the spread of noxious weeds. Nesting chukar have been exposed to poor nesting conditions for many years consisting of drought or wet, cold weather during the nesting season. Both conditions contribute to poor nesting success and survival of young. Chukar population levels are highly dependent on the success of annual production.

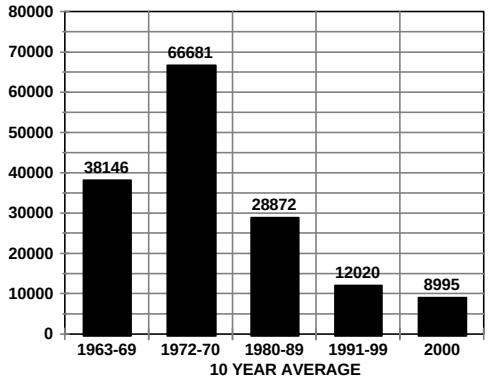


Figure 1. Region 1 chukar harvest trend.

Weather conditions for the 2001 nesting season were poor on the upper Snake River, but conditions were better along the lower Snake River breaks below Clarkston. Southeast Washington received continuous rainfall from late May through late June, almost every other day. As with other upland bird species, nesting success this year appears to vary from area to area. The lower Snake river breaks tend to lay in a rain shadow corridor, where upland birds occasionally have much better nesting success than other areas of southeast Washington. Field observations indicate production levels were good along the lower Snake River down stream from Clarkston, in Garfield and Whitman counties. During pre-season aerial deer surveys in this area, the number of chukar groups observed appeared to be fairly high, with groups of up to 40 birds. Upriver from Clarkston, chukar production did not fair as well, probably because of the poor weather conditions in that area during the nesting season.

Habitat condition and trend

Habitat conditions for chukar partridge are deteriorating in southeast Washington due to the

Table 1. Region One Chukar Harvest Summary 1991-2000.

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Asotin	12,310	5,096	3,734	4,742	2,790	6,781	5,111	5,006	3,547	4,788
Columbia	730	949	227	439	374	695	561	273	111	155
Ferry	0	0	0	0	0	0	0	0	0	0
Garfield	1,861	1,149	470	1,387	187	864	2,057	2,648	1,337	724
Walla	121	133	64	670	0	112	155	0	0	55
Whitman	6,698	2,914	1,461	994	1,082	1,531	1,075	2,319	1,875	2,953
Lincoln	121	166	162	0	229	807	77	135	148	174
Spokane	434	349	178	0	145	17	405	154	55	146
Stevens	0	0	0	0	0	0	0	0	0	0
Pend Ore	0	0	0	0	0	0	0	0	0	0
Total	24,266	12,748	8,289	10,226	6,802	12,803	11,438	12,533	9,072	10,995

expansion of yellow-star thistle and other noxious weeds. Although most counties are making an attempt to control yellow-star thistle, the acreage impacted by this species is increasing annually. Poor land management practices, current and historical, are contributing greatly to this problem. Chukar partridge thrive on lands that tend to be over-grazed and infested with cheatgrass (*Bromus tectorum*). However, the conditions that promote cheatgrass also provide the yellow-star thistle the opportunity to invade. Cheatgrass is a staple in 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-star thistle 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 reach historical levels since 1982.

Augmentation and habitat enhancement

Weed control programs have been implemented by the various counties within the Snake River Basin. These programs consist of aerial application of herbicide, with some biological control agents. However, these programs have failed to halt the spread of yellow-star thistle.

Management conclusions

Chukar populations in Region One are still quite low compared to the high levels experienced during the 1970's and early 1980's. Whitman, Garfield, and Asotin counties have always been the stronghold for chukar populations in Region One. Habitat deterioration and poor nesting conditions have prevented the chukar population from increasing to historical levels in these counties.

The future outlook for the chukar in southeast Washington is poor on the upper Snake River basin in Asotin county. If the expansion of yellow-star thistle and other noxious weeds is not halted or reversed, chukar populations will continue to decline, and will have little chance of returning to historic population levels that occurred in the 1970's.

CHUKAR STATUS AND TREND REPORT: REGION 2
Upper Columbia River Basin

TOM McCALL, Wildlife Biologist

Population objectives and guidelines

Management objectives for chukar are to maintain healthy, chukar populations in all suitable habitat within the Region and provide maximum recreational opportunities consistent with population management objectives.

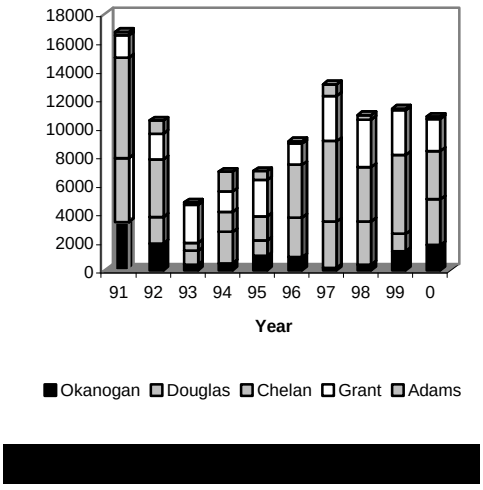
Hunting seasons and harvest trends

Since 1999, chukar season has opened October 1 and continued through the third weekend in January. Bag and possession limits for chukar are 6 and 18. These season and limit regulations allow more recreation for chukar hunters than previously available.

Approximately 40 percent of Washington's chukar harvest comes from Region 2. Chukar harvest in Region 2 reached a low point in 1993 (4,755), increased between 1993-1997

($\underline{r}$ = 0.94, $\underline{P}$ = 0.016, n = 5), and varied between 13,042 and 10,775 from 1997 to 2000 with no significant trend ($\underline{r}$ = -0.78, $\underline{P}$ = 0.216, n = 4) (Figure 1). From 1991 to 1999, chukar harvest in Region 2 has averaged 10,000 birds per year (range 4,755 to 16,735). In 2000, chukar harvest was estimated at 10,775 birds, which was 8% above average.

Since 1991, the number of chukar hunters in Region 2 has varied from about 1,800 to 4,400. According to the data represented in Figure 2, the number of days hunted has a stronger relationship to chukar harvest than does the number of hunters in a given year (r=0.86; P=0.001 and r=0.71; P=0.02 respectively).



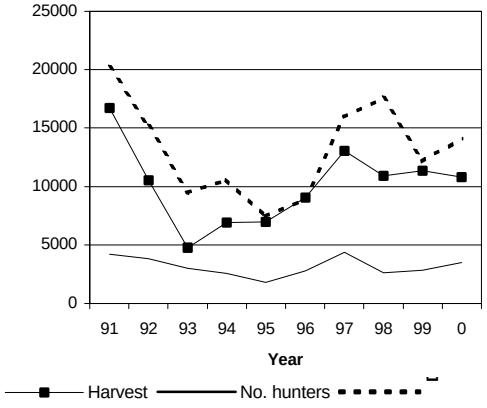


Figure 2. Chukar harvest, number of hunters, and hunter days, Region 2.

Surveys

In Region 2, we believe helicopter surveys provide our most reliable and efficient method of monitoring chukar populations. These aerial surveys were discontinued after 1997 because of lack of funding. As a substitute, we have driven 3 routes (Colockum-Tarpiscan, Swakane-Nahahum, and Chelan Butte) in July and early-August to monitor chukar populations. Each route is approximately 20 miles long. Fish and Wildlife personnel as well as volunteers count total chukar seen while driving these routes.

During July and August 2001, the 3 survey routes were each driven 3 times. In 2001, an average of 1.0 chukar was seen on each route compared to 7.0 per route in 2000 and 3.4 in 1999.

Population status and trend analysis

The number of chukar seen this year on survey routes as well as incidental observations suggest below average production of chukar throughout Region 2. May 2001, was cooler and wetter than average and drought conditions existed during summer, all of which may have reduced production. This year's harvest, number of hunters, and number of hunter days will probably decrease as a result of a relatively low chukar

population.

Habitat condition and trend

Chukar habitat is relatively stable in Region 2. Because of the precipitous habitat that chukar use, little has been influenced by human development.

Management conclusions

Chukar habitat appears stable. Populations and harvest of chukar will continue to fluctuate as a function of annual weather conditions.

CHUKAR STATUS AND TREND REPORT: REGION 3
Lower Columbia and Yakima River Basins

JEFFERY A. BERNATOWICZ, 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 impacting populations.

Hunting seasons and harvest trends

The 1990-1997 hunting season for Chukar 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. The season was extended to third Monday in January in 2000. The bag limit has remained at 6 birds per day.

A mailed hunter questionnaire indicated number of hunters in 2000 was nearly identical to 1998 and 1999, remaining approximately 20% below the previous 10-year average (Table 1). Total harvest has been variable and was 26% below the previous 10-year average in 2000. Harvest per hunter day increased 45% and was 40% above the previous 10-year average (Table 1).

Table 1. Chukar hunting statistics for Region 3.

Year	Harvest	Hunters	Harvest Per Hunter Day
86	4,554	2,947	0.65
87	13,821	4,439	0.60
88	9,040	2,958	0.60
89	10,034	3,164	0.43
91	9,498	3,302	0.47
92	8,675	3,101	0.47
93	3,976	2,731	0.55
94	7,402	2,349	0.54
95	6,433	1,905	--
96	15,421	3,152	--
97	7,572	3,316	--
98	10,050	2,135	0.99
99	5,514	2,132	0.58
00	6,162	2,168	0.84
1991-99 Avg	8,282	2,680	0.60

Surveys

Population surveys have not been conducted for 3 years. A post-season, 3-wave mail survey of hunters is used to estimate harvest and hunter effort. Incidental population information is collected during other surveys.

Population status and trend analysis

Harvest and incidental information indicate the chukar population has been below average the past 2 years. Chukar population cycles seem to be related to weather and insect populations. Consistent snow cover during the winters of 1992-93 and 1996-97 lead to rapid declines. Chukar populations rebounded quickly with favorable nesting and brood rearing conditions. In 1999, the spring was cold and dry. Insect production was late and poor, resulting in low brood success and overall bird numbers. The drought and poor insect production continued into 2000.

Augmentation

An experimental release of 150 wild chukar from Nevada was made in the Yakima Canyon in August 1997. Five-hundred game farm birds were raised and released by the Kittitas Field and Stream Club (KFSC) in August 1998 and 1999. All birds were banded and voluntary hunter registration boxes were installed.

Survival was roughly estimated by dividing the number of birds remaining by an estimated number released. The number of remaining birds was calculated by dividing the number of bands reported by an estimate of hunter mortality. Estimates of hunter mortality on chukar range from 4-25% (Christensen 1996). Twenty-five percent hunter mortality was used. For example, in 1999, 39 bands were reported from 500 birds released. The survival calculation is (39/0.25)/500=31%. This estimate is conservative as it assumes 100% of the harvested birds are reported and uses the highest estimate of hunter mortality. If only 90% of the bands are reported and hunting mortality is 15%, the estimate of survival would be 58%.

Band returns indicate at least 30% and 10% of birds from Nevada survived until fall 1997 and 1998. One Nevada bird was harvested in January 2001. Game farm birds had survival rates of 50% (1998) and 31% (1999), but were not seen in checks the second year.

KFSC has bought and released ~500 pen raised birds in fall 2000, but no attempt was made to estimate survival. Overall, there does not appear to be an increase in the chukar population in the Yakima Canyon.

Habitat condition and trend

Chukars generally inhabit arid areas with steep slopes, deep valleys, and rocky outcrops. The topography, combined with shallow soils, prohibits extensive agriculture or development. In Region 3, the

Washington Department of Fish and Wildlife (WDFW) and Department of Defense (DOD) manage the majority of chukar habitat. WDFW lands have not changed significantly in the last decade. In recent years 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. A drought from 1999 through 2000 has had a short-term negative impact.

Management conclusions

The chukar population in Region 3 apparently fluctuates with weather conditions and appears to be at a temporary low. Limited information from the Yakima Canyon indicates pen raised chukar have a higher survival than released pheasant, but may not contribute to the next years population. Despite the large number of birds released, there is no indication of an increase in chukar population in the Yakima Canyon.

Literature cited

Christensen, G.C. 1996. Chukar. No. 258 *in* A. Poole and F. Gill, editors. The birds of North America: Life histories for the 21st century. The Academy of Natural Sciences of Philadelphia.

QUAIL STATUS AND TREND REPORT: REGION 1
Snake River Basin

DINAH J. DEMERS, Regional Program Manager

Population objectives and guidelines

Management objectives for California quail (*Callipepla californica*) are to maintain healthy populations in all suitable habitats within the region and provide recreational hunting opportunities consistent with population management objectives.

Hunting seasons and harvest trends

The 2000 hunting season for California and bobwhite quail (*Colinus virginianus*) extended from October 7, 2000 to January 15, 2001. In addition, a youth hunting only season occurred for two days in late September (September 23-24, 2000). 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 because of extremely low population levels.

California quail harvest has declined dramatically 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.

Despite the long-term decline in harvest since the 1960's, quail harvest in Region 1 may have stabilized at a lower level, based on relatively consistent harvest levels over the last 20 years (Figure 2). Harvest increased over the past four years (Figure 2). The 2000 quail harvest in Region 1 was 38252 birds, 37% above the 1999 harvest of 27,861. Harvest was 27,263 in 1998, and 32,999 in 1997.

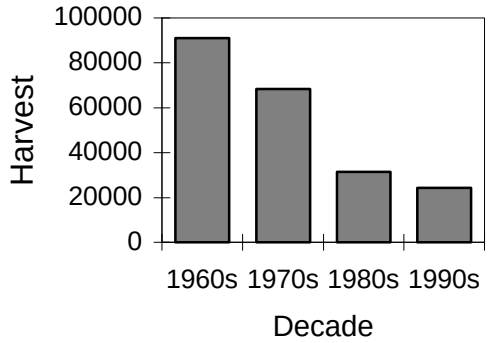


Figure 1. Mean annual quail harvest by decade, Region 1.

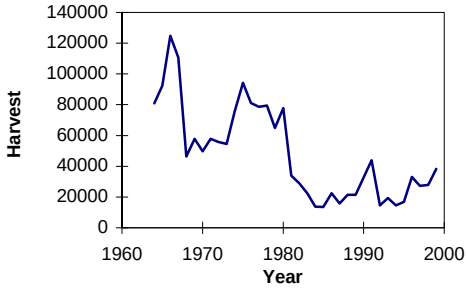


Figure 2. Region 1 quail harvest.

The Region 1 Hunter Access Program includes over 854,776 acres in various cooperative agreements with private landowners that help provide places to hunt. Many of these areas support California quail. These access agreements help balance the overall loss of hunting access which has occurred over the years, as human populations have increased and land use practices have changed.

Population status and trend analysis

California quail populations have declined significantly based on harvest data (Figure 2). However, recent harvest levels may indicate stabilization at a lower level than that of the 1960s and 1970s (Figure 1).

Quail production data has not been tabulated for approximately 10 years due to lack of sight frequency data and the relatively low priority of establishing new survey routes. However, incidental observations, combined with the increased quail harvest, indicate that quail production in 2000 was above average.

Weather conditions during the 2000 nesting season were favorable for quail. Precipitation was less than normal, and chick survival appeared to be high.

Very late hatches of quail were observed during August 2000. Quail were observed in marginal, as well as the better, quail areas of the Region. These observations lend support to the belief that quail production was above average in 2000, a hypothesis supported by the increased harvest documented in 2000.

Habitat condition and trend

Land development and agricultural practices have reduced habitat for upland game. The spread of noxious weeds also threatens existing habitat in some areas.

The Conservation Reserve Program 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. A second sign-up period resulted in a significant amount of acreage being accepted into the program. Within important game bird areas of Region 1, 217,171 acres are 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

The Upland Wildlife Restoration Program (UWRP) 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.

New acreage signed up under the CRP program will be planted with seed mixtures developed to enhance habitat for wildlife. Farmers will be required to replant 50% of existing CRP acreage with new wildlife mixtures.

No new CRP enrollment is scheduled for the next few years, but UWRP staff will be working on "continuous CRP sign-ups" for riparian buffers. Riparian buffers will enhance roosting and escape cover for quail.

Management conclusions

Acreage set aside under CRP and habitat enhancement projects implemented by the Upland Restoration Program 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. The Hunter Access Program in Region 1 may help offset losses of quail hunting areas to posting and leased hunting.

QUAIL STATUS AND TREND REPORT: REGION 2
Upper Columbia River Basin

JIM TABOR, 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 ran from the first Saturday after October 10 to early January with a daily bag limit of 10 quail through 1998. In 1999, the season opened on October 9, in 2000 it opened Oct. 7 and remained unchanged in other respects. There has been a slight difference (up to 8 days) in the closing date of the season annually.

Region 2 is one of the state's most popular quail hunting regions as 34% of all quail hunters hunted here in 2000. Hunter surveys showed that there were approximately 5,914 quail hunters in Region 2. This is a 33% increase from 1999 and is 21% higher than the 1992-99 average of 4,885 (Table 1).

During the 2000 season, 37% of the statewide quail harvest occurred in Region 2. Number of quail harvested in Region 2 during the last 9 years ranged from a high of 49,143 in 2000 to a low of 14,292 in 1993 (Table 2). The 2000 harvest of 49,143 was 38% above that of 1999 and 58% above the 1992-99 average of 31,052 birds. Okanogan and Chelan counties have yielded the largest harvest during most years and Adams County the smallest. Chelan County has shown the largest annual variation in harvest.

Table 1. Number of quail hunters in Region 2, Washington, 1992-2000.

Year	Adams	Douglas	Chelan	Grant	Okanogan	Total
1992	981	1,184	1,101	1,241	1290	5,797
1993	517	893	851	1,583	986	4,830
1994	579	1,007	966	1,635	980	4,735
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
Ave.	667	1,101	1,104	1,620	996	4,999

Surveys

A summer adult population index and a production index for California quail were developed annually through 1999. The population index was useful in determining population trends. The production index was a predictor of hunting prospects and provided information useful in determining reasons for annual changes in population size. No population/production surveys were conducted in the summers of 2000 or 2001.

Population status and trend analysis

No long-term population trend in Region 2 is apparent from existing data. Major annual declines usually follow severe winters with persistent snow cover when combined with poor production during the previous and/or subsequent summer.

Habitat condition and trend

The winter of 2000-01 was moderate in the Columbia Basin, but was rather long in duration. Mild temperature and reduced snow cover were likely conducive to good over-winter survival. The adult quail population in summer of 2001 should be relatively large.

Most hunted populations of quail occur in shrub-steppe habitat near riparian zones. A significant percentage of the quail population in Region 2 occurs in cities and towns. Few quail occur in the irrigated farmland area of the Columbia Basin. In general, quail habitat in the region is relatively stable. Changes in habitat quality appear to result primarily from amount and timing of precipitation.

Augmentation and habitat enhancement

Upland Wildlife Restoration Program (UWRP) staff often trap and translocate quail. Quail are usually captured in urban and suburban areas of Okanogan County and released at acquisition sites and other habitat development areas throughout the region. In 2000, no quail were trapped and relocated.

Habitat enhancement for quail is conducted by UWRP staff on WDFW properties and private land through cooperative agreements and by Wildlife Area managers. In addition to vegetation management for food and cover, management activities usually include feeders for providing grain during winter and often include development of water sources including guzzlers. In 2000, UWRP maintained 28 winter quail

feeders.

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.

Table 2. Quail harvested in Region 2, Washington, 1992-2000.

Year	Adams	Douglas	Chelan	Grant	Okanogan	Total
1992	4,024	7,881	7,123	3,182	11,653	33,863
1993	839	2,348	2,142	3,856	5,107	14,292
1994	1,478	7,352	6,733	4,056	6,613	26,232
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
Mean	2,177	6,582	8,165	5,561	7,978	31,052

QUAIL STATUS AND TREND REPORT: REGION 3
Lower Columbia and Yakima River Basins

DON LARSEN, District Wildlife Biologist

Population objectives and guidelines

Objectives for California quail are to maintain healthy quail populations in all suitable habitat within the Region, and provide maximum recreational opportunities consistent with population management objectives.

Hunting seasons and harvest trends

In 2000 harvest and effort (total hunter days) were 16% and 17%, respectively, above 1999, (Figure 1), and 1% and 11% below the 10-year average. Hunter success, as measured in birds per hunter-day, was the same as in 1999 (Figure 2) and 10% above the 10-year average.

Surveys

Brood count surveys were discontinued in Region 3. The post-hunting season questionnaire mailer used to estimate harvest currently provides the best estimate of population status.

Population status and trend

Surveys conducted from 1947-76 indicate Region 3's quail population declined dramatically during the 1960s and 70s. Perceptions of biologists and hunters support the survey data, despite the fact that harvest increased from 51,000 to 129,770 during the 1970s. Although there can be large annual fluctuations in population numbers, like with most upland gamebirds, total harvest (Figure 1) and hunter success (Figure 2) suggest no trend in population numbers over the last 15 years. Total quail harvest, incidental observation, and biological opinion suggest that 2000 was an above average year for quail production in Region 3.

Habitat condition and trend

Like for many other agriculturally associated wildlife, quail habitat quantity and quality has declined for decades. The main degradation 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

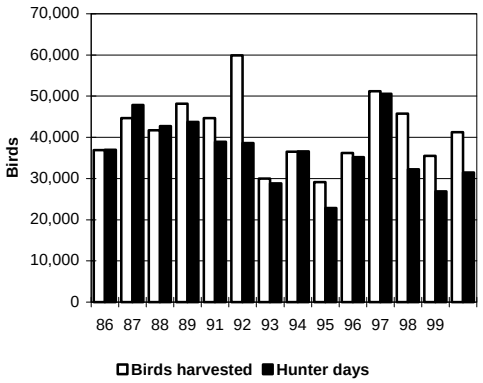


Figure 1. Quail harvest and hunter days, Region 3.

Region 3 are associated with Russian olive trees. Olive trees can provide nearly impenetrable, thorny cover often in areas where dense, brushy cover for quail was lacking.

A relatively unknown impact has been urbanization. Quail can adapt well to irrigated and landscaped neighborhoods. Residents often enjoy watching quail and feed them year round. In some areas urban quail populations with relatively high

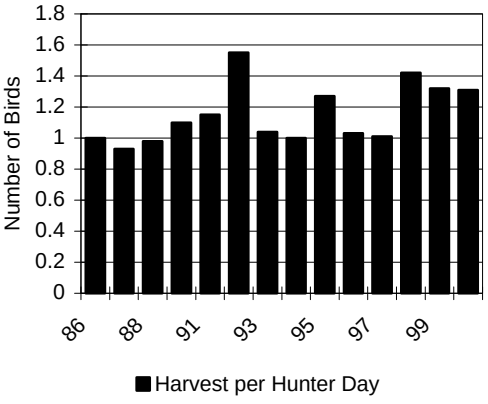


Figure 2. Quail hunter success for Region 3.

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 tremendous reproductive potential, relatively few birds are needed as brood stock for localized populations to recover on their own. With that in mind, Region 3 did not implement any translocation activities in 2000.

Management recommendations

In certain areas an emphasis could be placed on quail management on state-managed wildlife areas. If Russian olive trees are removed, the long-term goal should be to replace them with a diversity of native shrubs and trees such as rose, currant, sumac, and dogwood.

In region 3, quail management efforts should be focused on improving habitat. 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 STATUS AND TREND REPORT
Statewide

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Population objectives and guidelines

Forest grouse in Washington include blue (*Dendragapus obscurus*) and ruffed grouse (*Bonsa 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 to sustain well distributed populations and provide appropriate levels of harvest. Harvest levels of forest grouse are generally tied to annual production and are closely dependent on weather conditions. Current population levels are considered healthy and sufficient to meet hunter demand.

Brewer (1980) stated that ruffed grouse could sustain harvest of up to 50% of the fall population without threat of decline and our objective would be to avoid a take that exceeds that number. Our present harvest is thought to be well below 50% although neither exact population nor harvest level is known.

Hunting seasons and harvest trends

The statewide harvest questionnaire is the main technique currently used to monitor long term population trends. However, developing estimates of forest grouse hunter numbers and harvest are challenging because of the licensing structure that allows harvest with a big game license. Methods for forest grouse harvest survey were modified beginning with 1998 and 1999 harvest 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 for 1998-2000 should be done with some caution. Implementation of electronic licensing (WILD system) in 2001 should enhance the precision of harvest survey efforts for forest grouse and other upland species.

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 slowly declined from the late 1980's through 1997, but then fell sharply in 1998 and 1999 (Figure 1). Hunter numbers and forest grouse harvest both increased in 2000. Forest grouse harvest over the past 10 years has fluctuated yearly and is likely dependent on annual production (Figure 2).

Long-term harvest estimates indicate a decline from the 1960's and '70's to the 1990's. Some of that apparent decline may be attributed to a change in the method used to collect harvest data, beginning in 1984. It is more likely that harvest levels have declined at a slower rate over the past 30 years. Future harvest monitoring should provide comparable data that should provide a better understanding of harvest. Increases in areas affected by motorized travel restrictions may reduce participation by some grouse hunters as well as grouse harvest, particularly in western Washington.

Although grouse hunter and harvest estimates have varied substantially over time, perhaps in part due to sampling difficulties, estimates of annual harvest/hunter over the past 14 years have been relatively stabile with only 1 year changing more than 1 bird per hunter (Figure 3).

The estimated number of hunters annually

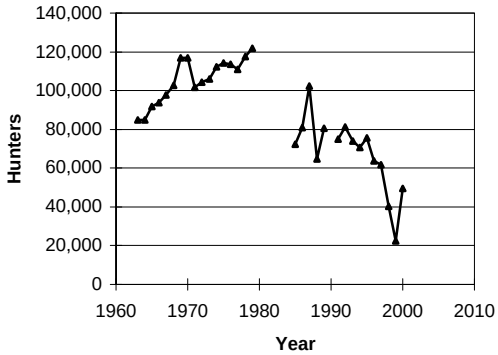

Figure 1. Long-term trend in gouse hunter numbers, 1963-2000.

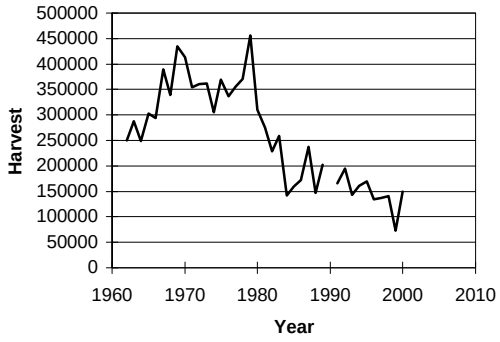

Figure 2. Long-term trend in grouse harvest, 1963-2000.

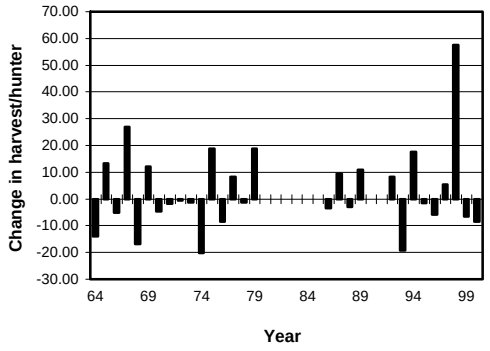

Figure 3. Yearly changes in grouse harvest per hunter, 1964-2000.

pursuing forest grouse in Region One has ranged from approximately 9,000 to 23,000 and averaged about 18,000 between 1991 and 2000. Estimated harvest of forest grouse within Region 1 has varied between approximately 35,000 and 65,000 and averaged just under 50,000 birds per year since 1991. In 2000, the estimated number of hunters pursuing grouse was 18,164 with an estimated 62042 grouse harvested. Generally the Hunter Questionnaire has 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 range restricted forest grouse in the region.

Table 1 presents the estimated number of hunters and 2000 harvest of forest grouse for each of the three Districts comprising Region One. The Northeast District (Pend Oreille, Stevens, and Ferry Counties) has, by far, the highest number of forest grouse hunters and birds harvested.

Staff at the Little Pend Oreille National Wildlife Refuge have collected grouse wings from hunters since 1997. Through the year 2000 hunting season, a total of 449 grouse wings have been collected including 405 identified as from Ruffed Grouse, 15 from Blue Grouse, and 29 from Spruce Grouse. Ruffed Grouse have dominated the hunter harvest by far on the Little Pend Oreille NWR each season since 1997. In the same way, harvest of juvenile Ruffed Grouse has consistently been higher than adult birds, occasionally by as much as six fold.

In 2000 total grouse harvest in Region 3 (9,567 birds) was 2% below the 5-year average, but 104% above last year (1999 had the lowest grouse harvest on record). The number of grouse hunters and hunter days increased 103% and 122% from last year, respectively. Hunter success, however, as measured in grouse harvest per day, decreased 8% from last year (0.35 grouse per day to 0.33).

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 harvest per hunter trend over the last 10 years appears to be relatively stable (Averaging 1.40 and ranging between 1.1 and 1.9 grouse per hunter). The number of grouse harvested per hunter in 2000 was 1.75.

The improved forest grouse survey methodology for the year 2000 has resulted in a substantial increase in participating hunters and forest grouse harvest for region #4. In 2000 the total forest grouse harvest was 6494 compared to 3048 in 1999. The 6494 harvest is 58% below the 1995-99 average of 11,170 forest grouse.

Active forest grouse hunters increased to 4469 from a low figure of 1,966 in 1999. Hunter participation is well below the 1990-1994 average of 12,051 and 2,170 below the 6,639 estimated hunters in the 1997 season. Forest grouse productivity for 2001 appears to have been very successful, producing an above average number of juvenile birds in Region 4.

In the 2000 hunting season, 10,392 hunters harvested 19,207 grouse in Region 5, or more than twice the 1999 harvest (n=8,918). Estimated harvest of forest grouse, number of grouse hunters, and amount of hunter effort had declined sharply from 1998 to 1999 in Region 5. However, harvest and number of hunters increased dramatically across Region 5 during the 2000 season. Harvest and hunter numbers in 2000 are more consistent with harvest and hunter trends over the past 5 years. Wahkiakum County in particular saw a

Table 1. Estimated number of forest grouse hunters and harvest by District within Region One in the 2000 Season.

District	Estimated No. of Hunters	Estimated Harvest
Northeast	13,416	48,107
Central	2,472	6,530
Southeast	2,276	7,405

remarkable increase in harvest with 9.5 times more grouse harvested in 2000 as compared to the 1999 season. This increase is unusual when compared to long term harvest trends for Wahkiakum County. Greater harvests in the 2000 season likely indicated that spring weather conditions provided for good recruitment of chicks into the harvestable population.

The combined year 2000 forest grouse harvest (ruffed and blue grouse) for Region 6 was estimated at 24,171 birds. This represents a 169% increase over the previous season although it is still 19 percent below the recent 5-year average (1995-1999). Among the 8 counties of Region 6, Grays Harbor continues to have the highest grouse harvest: 35 percent of forest grouse taken in Region 6 came from Grays Harbor County.

Surveys

No state-wide population surveys for forest grouse were conducted in 2000. Forest grouse wings were collected by placing barrels in strategic locations in north-central Washington where hunters voluntarily deposited one wing from each grouse killed. Wings were classified as to species, sex, and age.

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 that has resulted in forest grouse species being combined for current harvest survey purposes.

Population status and trend analysis

Based on long-term harvest trends, it appears that forest grouse harvest and 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 much over time. Since hunters are not able to accurately 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 by exposure and reducing insect populations at the time when young grouse need a high protein diet. Weather patterns in the spring are often a good predictor of fall harvest and population.

Habitat condition and trend

Timber harvest is the most significant issue statewide for influencing habitat condition and forest grouse population trends. In general timber harvest activities are beneficial for most species of forest grouse. Regeneration techniques certainly play a significant role in the degree to which timber harvest provides benefits. Future benefits from timber harvest will depend on the degree of intensity of regeneration practices.

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. This time frame should result in high blue grouse populations currently with a peak in ruffed grouse populations over the next ten to twenty years.

The rate of timber harvest in western Washington has slowed in the 1990's and should result in somewhat lower, but stable forest grouse populations over the long term. Population levels will greatly depend on forest practices. 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 less habitat benefits may negatively impact grouse populations. At the same time, a trend in reducing the length of timber stand rotation may benefit grouse populations.

Conditions are similar in eastern Washington, however recent timber market changes have resulted in some timber stands becoming more valuable than they were ten or twenty years ago. Specifically, lodgepole pine forests have increased in value so there is increased interest in harvesting the timber. In addition, mature lodgepole pine forests have become infested by pine beetles, killing the trees. Timber managers want to harvest those trees before they decay or burn in wild fires.

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 and direct 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 practice 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-firs 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

Past strategic plans often identified goals of increasing interest in hunting forest grouse. The rationale was that forest grouse, especially ruffed grouse were harvested at a very low rate and could withstand higher levels of harvest. Much of that rationale was based on previous ruffed grouse research in which proportions of forest grouse species harvested, as estimated by the harvest questionnaire, were assumed to be within ten percent. Recent wing collections have cast doubt on that assumption.

The main questions or concerns regarding forest grouse are:

1. spruce grouse population impacts as related to timber harvest trends and forest development.
2. hunter harvest rates on public lands, especially those managed for wildlife
3. long term population monitoring for each species of grouse
4. more accurately monitoring harvest of each species of grouse

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.