

We will address these issues/sub-issues in this revised elk plan. Some issues/sub-issues are in areas for which FWP has no legal authority and FWP response is limited to an advisory capacity to other entities.

## **BACKGROUND INFORMATION FOR ELK PLAN**

### **History of Elk in Montana**

Elk were widely distributed across North America prior to the time Europeans first arrived (Bryant and Maser 1982). In Montana, elk were distributed throughout the lengths of the Missouri and Yellowstone River valleys at the time of the Lewis and Clark expedition in 1804 and 1805. However, observations of Lewis and Clark extended little beyond the vicinity of the major river valleys. By the early 1800s, subsistence, market, and hide hunting had almost eliminated elk east of the Mississippi River. This hunting continued to reduce elk in the western United States, and elk were gone from eastern Montana by the mid-1880s and were also heavily impacted in western Montana.

Elk probably reached a low point in numbers in North America about 1900-1910. In 1910, it was estimated that fewer than 50,000 elk existed in North America (Thomas and Lyon 1987). About half were associated with Yellowstone National Park (YNP), Jackson Hole, and the surrounding areas. The establishment of YNP in 1872 and its remoteness was a major factor in preserving elk in North America.

During the late teens and 1920s, local and national sentiment for protecting and expanding existing elk herds became stronger. Many local sportsmen's clubs were formed with a prime purpose of preserving elk. In 1910, the first transplant of elk from YNP was made to Fleecer Mountain near Butte, Montana. During the period from 1910 to 1940, a total of 1,753 elk from YNP, Jackson Hole, and the National Bison Range was transplanted to 31 sites in the National Forests of Montana (West 1941). In 1913, the Sun River Game Preserve was established and hunting season closures were established elsewhere.

In 1922, about 13,000 elk were estimated to occur in the National Forests of Montana and northern Idaho, exclusive of YNP (West 1941). Probably about 7,500-8,000 of these elk were in Montana. In 1928, an estimated 10,900 elk were in Montana (Raymer 1930). By 1940, the National Forests of Montana, excluding YNP, were estimated to contain 22,000 elk (West 1941). All these estimates are subject to question, but give a general, relative sense of elk numbers in Montana early in the 20<sup>th</sup> century.

The era of biological management began in 1940 according to Picton (1991). At that time there were only 7 major native elk herds in Montana and scattered elk at various transplant sites (West 1941, Figure 1). The first State Game Manager position was created in 1940, biologists began to be hired, and the first acquisition of land by the State for elk winter range also occurred in 1940.

Transplantation of elk continued, and from 1941 to 1970 an additional 4,140 elk were transplanted into Montana, mostly from YNP. As a result of these and earlier transplants and natural increases in distribution of existing elk, elk began to fill in much of their former habitat, including some areas of eastern Montana (Figure 2). By 1969, 10 Wildlife Management Areas (WMAs) totaling 63,000 acres had been purchased by the State for elk winter range. In 2003, 21 WMAs totaling 306,083 acres support about 17,500 wintering elk. Today, all timbered mountainous areas of western and central Montana contain elk (Figure 3). Additionally, huntable elk herds exist in isolated mountain ranges and timbered areas of eastern Montana (Figure 3). As an example, about 160 elk were transplanted into the Missouri River Breaks in 1951 and 1952. Today, that population totals over 5,000 elk.

Statewide, post-season elk numbers increased from an estimated 8,000 in 1922 to 22,000 in 1940, 40,000 in 1951, 55,000 in 1978, and an estimated 130,000 to 160,000 today.

### **Elk Harvest and Harvest Distribution**

Statewide trends in estimated elk harvest in Montana since 1962 (Figure 4) indicate substantial increases in both antlered and antlerless harvest since the early 1980s. The decline in antlerless elk harvest in the mid-1970s (Figure 4) occurred at the same time that conservative deer seasons were implemented after a decline in deer populations (Mackie et al. 1998). Concurrently, in substantial areas of the state, season-long either-sex (ES) seasons for elk were replaced by antlered bull (AB) regulations with limited permits for antlerless elk. This reduction in hunting pressure on antlerless elk likely was the prime cause of increasing elk populations by the early 1980s. The reduction in hunting pressure on antlerless elk also increased hunting pressure and mortality on bull elk, reducing post-season bull:100 cow ratios in some areas. In some areas, this coincided with increased logging and roads that decreased security for bull elk. Excluding the peak in bull elk harvest in 1991, when many migratory bulls from the Northern Yellowstone and Gallatin herds were harvested, bull harvest has recently fluctuated around 10-12,000 annually (Figure 4). However, the recent trend has been down, even considering fluctuations due to weather. We attribute part of this decline to recent increases in numbers of HDs with brow-tined bull (BTB) regulations. Starting in about 1984, antlerless elk harvest rose to the point that it has exceeded bull harvest each year since 1992. Again, annual variation in harvest due to weather conditions is evident in the high harvests of 1994, 1996, and 2000. For Region 3, especially, 1991 was another year with high harvests of antlerless elk.

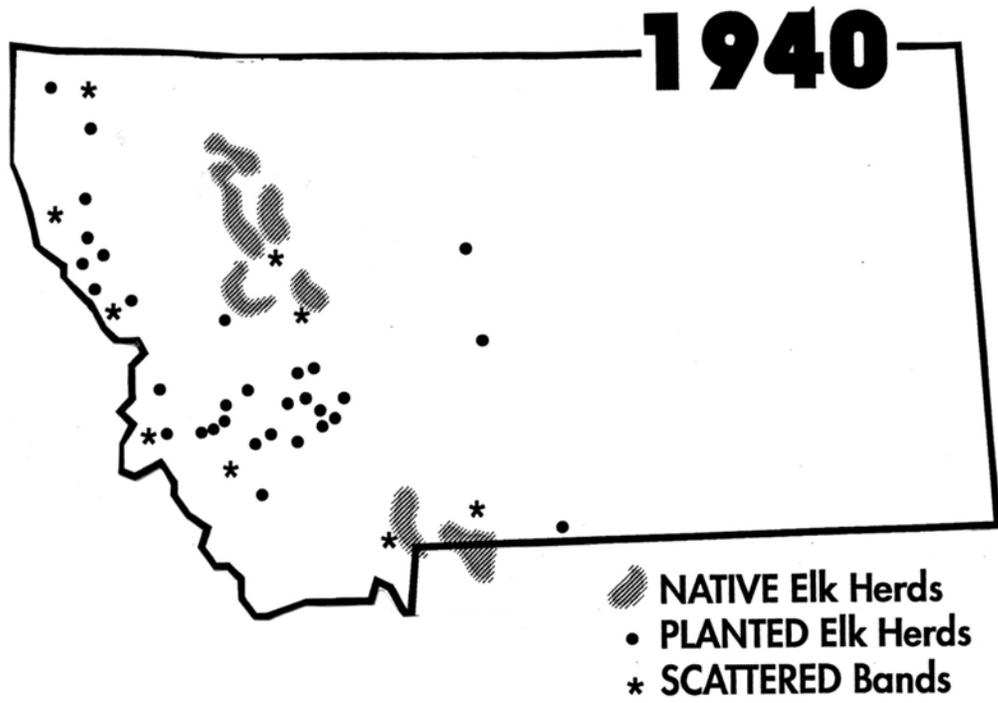


Figure 1. Distribution of elk in Montana during 1940 (from West 1941).

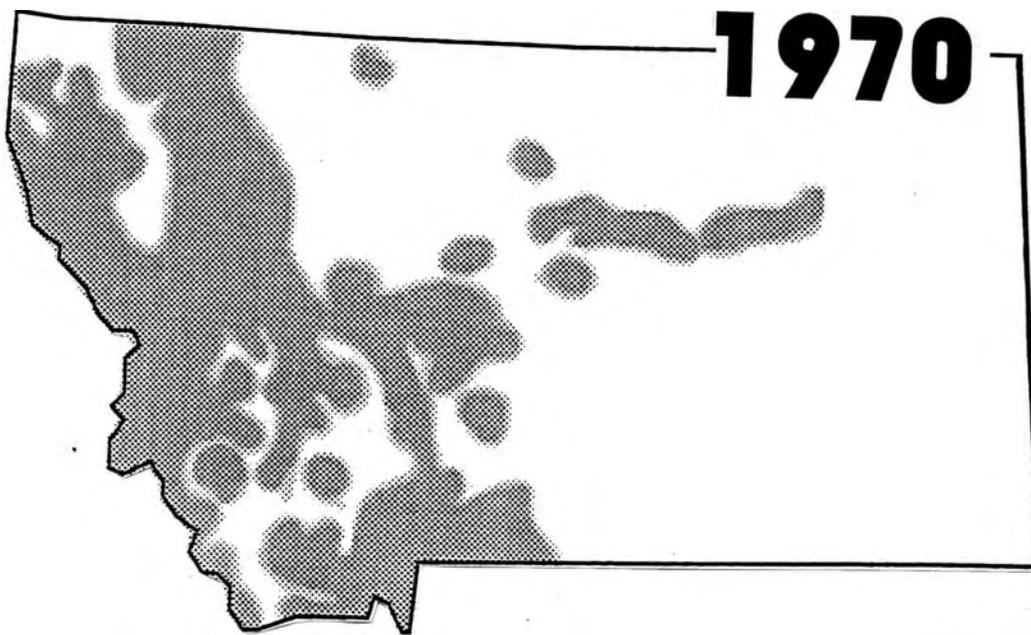


Figure 2. Distribution of elk in Montana during 1970 (from Rogrud and Janson 1971).



Figure 3. Distribution of elk in Montana during 1999.

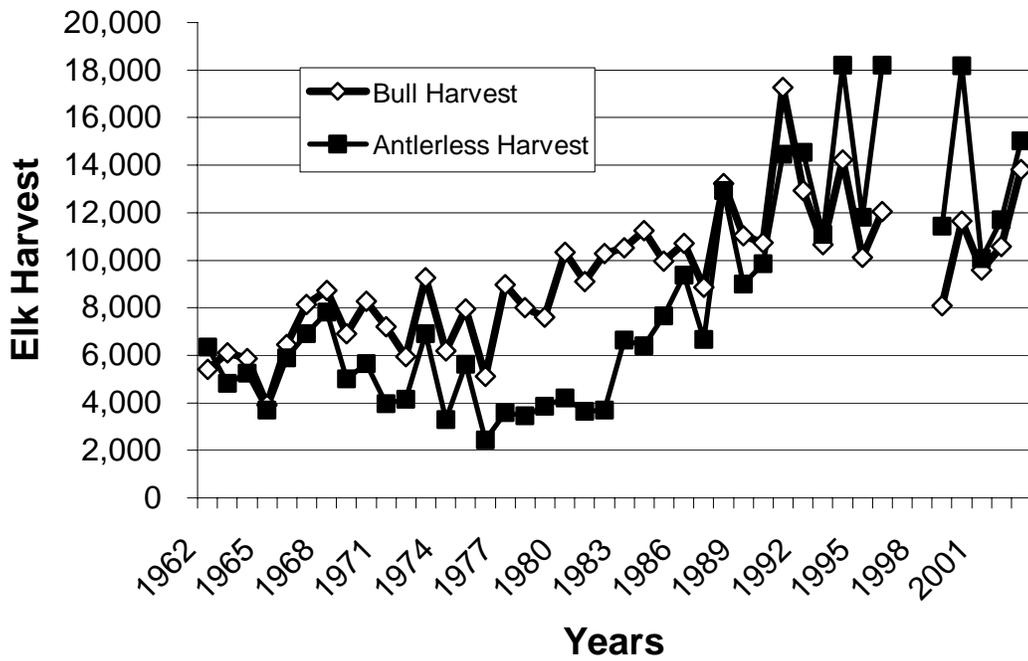


Figure 4. Annual elk harvest in Montana, 1962-2003.

Within the statewide pattern of increased elk harvest over the last 30 years, regional trends have varied. Bull elk harvest has generally always been the highest in FWP Administrative Region 3 (Figure 5) and the increase in numbers harvested has been greatest there. Bull harvests fluctuated annually and these fluctuations have increased recently (Figure 5). Generally, bull harvest in Region 3 averaged about 2,000 in the early 1960s, 3,000 in the late 1960s through the mid 1970s, about 4,500 in the 1980s, and about 6,000 bulls in the 1990s. The high harvest of 1991 was an anomaly because of the harvest of substantial numbers of bulls from Yellowstone National Park normally not accessible during the general season. Regional elk harvests have always been second highest in FWP Region 2. There, average bull harvests increased from about 1,500 in the early 1960s to about 2,500 in the 1990s, substantially less than in Region 3 (Figure 5). Similar to other Regions, a slight decline in average bull harvest may have occurred during 1999-2001. Although total number harvested has remained lower in Region 4 than Region 2, proportionally, bull harvest has increased more in Region 4 than in Region 2 (Figure 5). Bull harvests increased from an annual average of about 750 in the early 1960s to about 1,800-2,000 today. Bull harvest in Region 1 was generally stable at an annual average of about 1,100 bulls since the 1960s. However, since 1995, bull harvest has averaged about 750 annually. Bull harvest has steadily increased in Regions 5, 6, and 7 since 1960 (Figure 6). Although total numbers harvested are low compared to Regions 1, 2, 3, and 4, annual bull harvest in Region 5 is now approaching the level recorded in Region 1.

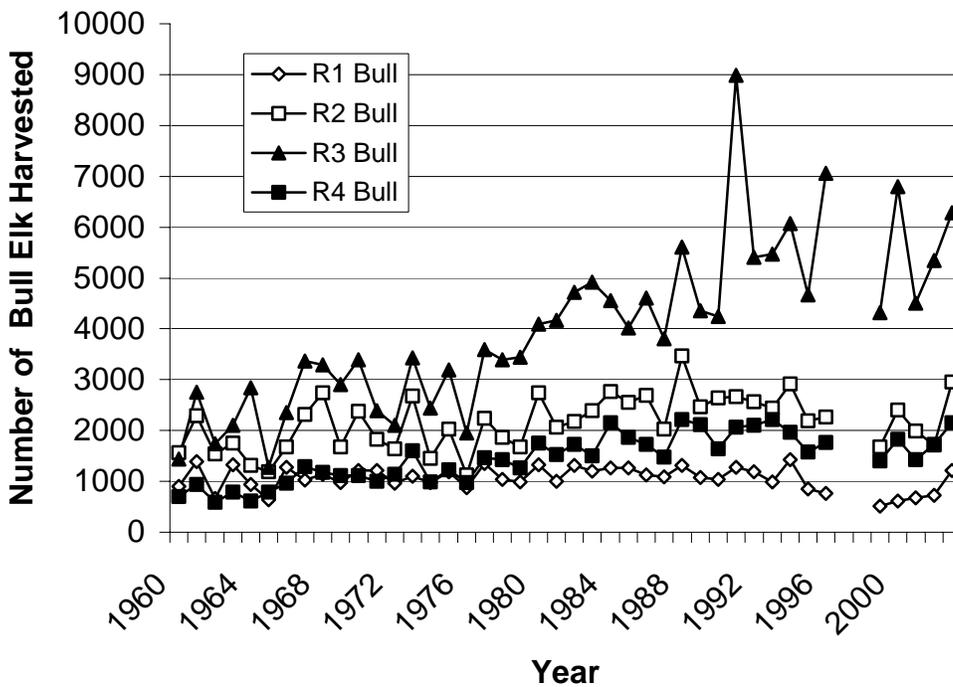


Figure 5. Annual bull elk harvest in Regions 1, 2, 3 and 4, Montana, 1960-2003.

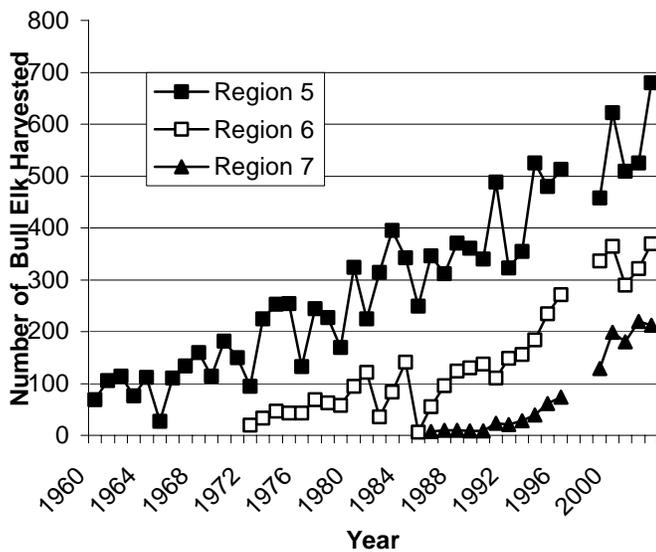


Figure 6. Annual Bull elk harvest in Regions 5, 6 and 7, Montana, 1960-2003.

Antlerless elk harvest shows a similar trend as bull harvests. Highest antlerless harvests are in Region 3 (Figure 7). There, antlerless harvest averaged about 1,800 annually during the 1960s, declined to about 1,000 during the late 1970s and early 1980s, then rapidly increased to a widely fluctuating range of 5,000 to 11,000 during the 1990s to 2001 (Figure 7). After being lower than in Region 2, antlerless harvest has increased since the early 1980s in Region 4 to be nearly equal to that of Region 2. In Region 2, antlerless harvest has increased only slightly from levels of the 1960s, when it was sometimes higher than in Region 3. By contrast, antlerless harvests in Region 4 have recently been about 3 times levels of 1960 – 1984. Similar to results for bull elk harvest, antlerless elk harvest in Region 1 has declined substantially since the 1960s (Figure 8). Antlerless elk harvests in Regions 5, 6, and 7 have increased substantially, following the same pattern as bull harvest (Figure 8).

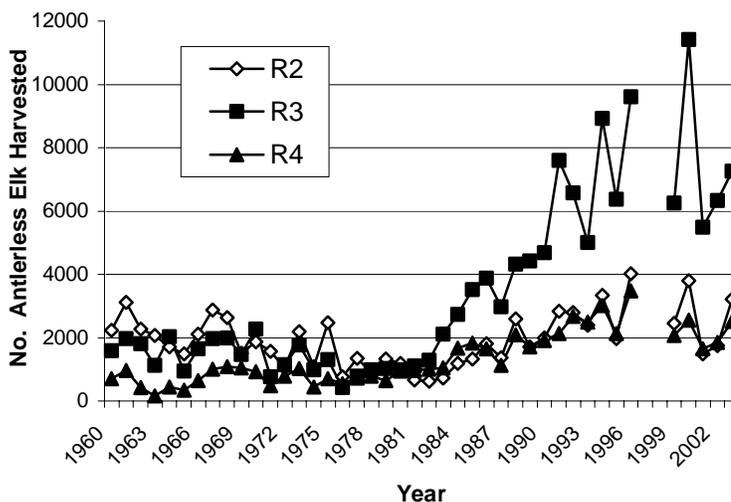


Figure 7. Annual antlerless elk harvest, Regions 2, 3 and 4, Montana, 1960-2003.

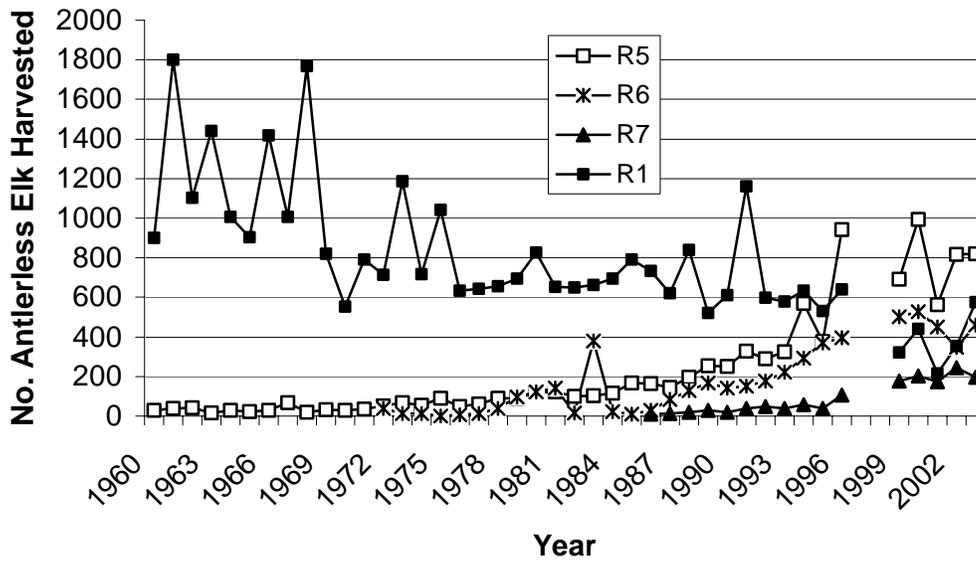


Figure 8. Annual antlerless elk harvest, Regions 1, 5, 6 and 7, Montana, 1960-2003.

Of elk kills where location was identified to either public or private land, about 65% of elk were killed on public lands and 35% on private lands during each year, 1992, 1993, and 1997 (Table 1). Harvest on public lands was highest in FWP Regions 1, 6, and 3. Harvest on private lands was highest in Regions 5, 4, and 7. Harvest by landownership in Region 2 was near the statewide average. To some extent, these figures are biased toward private lands because FWP has issued permits valid only on private lands (or outside the National Forests) for some areas with game damage.

Table 1. Distribution of elk kill identified to either public or private lands, 1992, 1993, and 1997.

Statewide	Regional	Public Land	Private Land
1992		65.5	34.5
1993		66.1	33.9
1997		64.1	35.9
1997	R1	84.0	16.0
1997	R2	61.2	38.8
1997	R3	72.7	27.3
1997	R4	48.6	51.4
1997	R5	36.5	63.5
1997	R6	76.2	23.8
1997	R7	58.5	41.5

Density distribution of bull elk harvest by HD, averaged for 1999-2001 (Figure 9), indicated that the highest harvest density was in southwestern and west central Montana. Density distribution of antlerless elk harvest for the same period was similar (Figure 10). Generally, highest harvest density distribution coincided with EMUs where observed elk numbers were above objectives, indicating the attempt by FWP to reduce elk numbers in those areas.

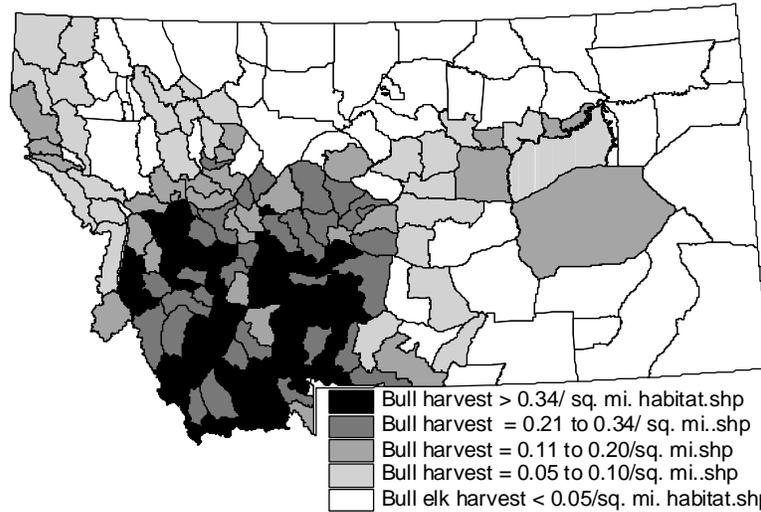


Figure 9. Density distribution of bull elk harvest in occupied habitat by hunting district, 1999-2001.

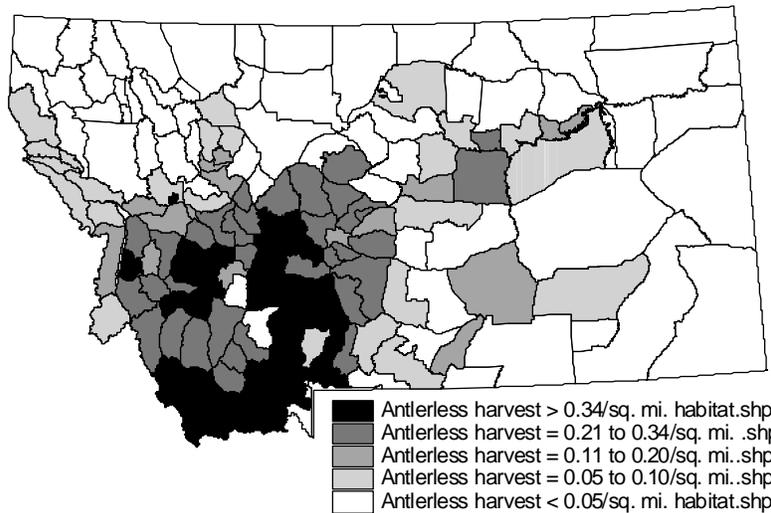


Figure 10. Density distribution of antlerless elk harvest in occupied habitat by hunting district, 1999-2001.

## Hunter Numbers and Distribution

Elk hunter numbers have approximately doubled since the 1950s, though they have been relatively stable at about 100,000 hunters on a statewide basis since 1985 (Figure 11). For 1999-2001, resident elk hunters averaged 88,353 (85.0%) annually and non-resident hunters averaged 15,641 (15.0%), for a total annual average of 103,994 elk hunters. Resident hunters accounted for 91.2% of antlerless harvest and 73.5% of bull harvest. Non-resident hunters accounted for 8.8% of antlerless harvest

and 26.5% of bull harvest. In Colorado, where a less expensive non-resident antlerless elk license is available, non-residents account for up to 20% of antlerless harvest (J. Ellenberger, personal communication). For 1999-2001, resident and non-resident elk hunters averaged about equal success rates on special permits, 34.8% and 34.4%, respectively. For the general elk license, non-residents averaged nearly twice the success rate (20.5%) of residents (10.7%). This was likely due, at least in part, to the much greater use of outfitters by non-resident elk hunters.

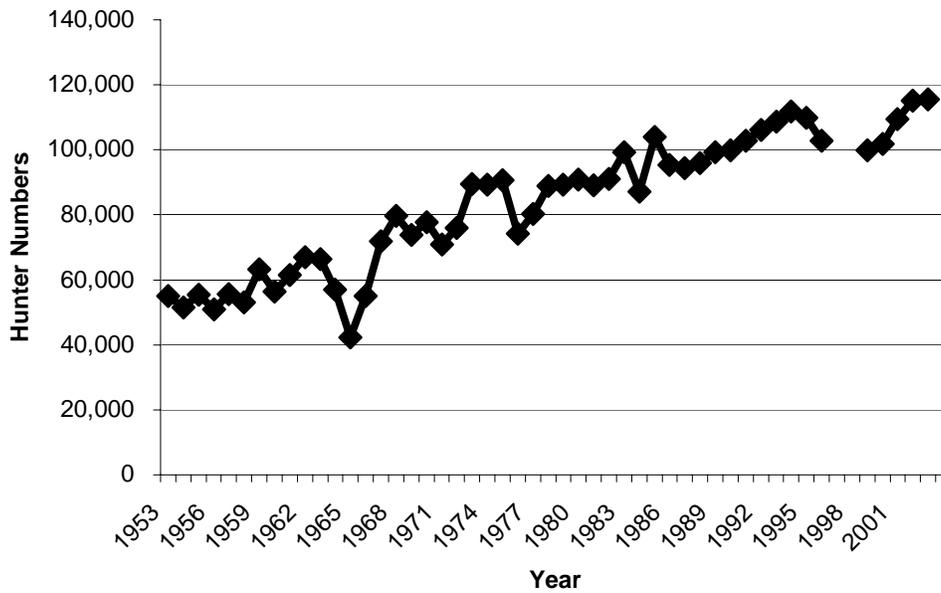


Figure 11. Annual number of elk hunters in Montana, 1953-2003.

Regional trends in hunter numbers (Figures 12 and 13) indicate that patterns have been different across the state. Note that because hunters may hunt in more than one Region, the sum of Regional numbers is greater than the statewide total of individual hunters. The greatest increase in hunter numbers occurred in Region 3, especially accelerating compared to other Regions since about 1977 (Figure 12). The relative increase for Region 3 became even more apparent after 1990 (Figure 12). By contrast, hunter numbers in Regions 1, 2, and 4 were relatively stable since the mid-1970s, declining slightly during 1999-2002, especially in Region 1 (Figure 12). In Regions 5, 6, and 7, hunter numbers increased steadily since the 1980s, but decreased in 2001 (Figure 13). The apparent declines in Regional hunters in 2001 (Figures 12 and 13) compared to the increase in statewide hunters that year (Figure 11) indicated that fewer hunters hunted multiple Regions that year. Average hunter density distribution by HD during 1999-2001 (Figure 14) indicated that generally, hunter density and elk harvest (Figures 9 and 10) coincided. However, northwestern Montana had relatively higher hunter density (Figure 14) than elk harvest (Figures 9 and 10). Increased hunter numbers in FWP Administrative Region 3 has led to recent complaints and concerns with hunter crowding, aesthetics, and ethics.

The age of the average resident hunter increased from 37 in 1988 to 42 in 1998 and remained stable at 42 in 2002 (King and Brooks 2001 and unpublished). Average age of non-resident hunters increased from 43 in 1988 to 47 in 1998 and was not measured in 2002.

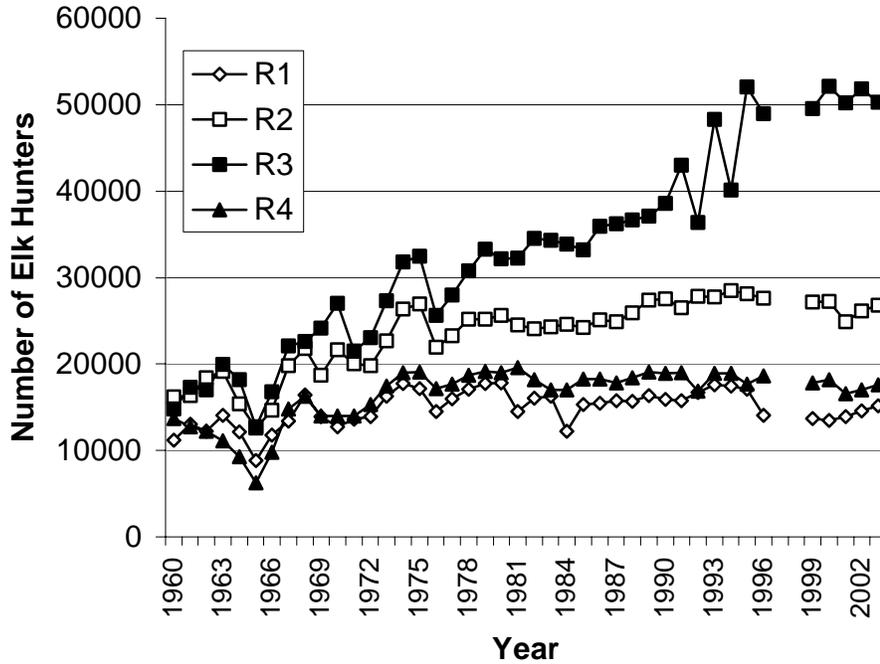


Figure 12. Annual number of Montana elk hunters, Regions 1, 2, 3 and 4, 1960-2003.

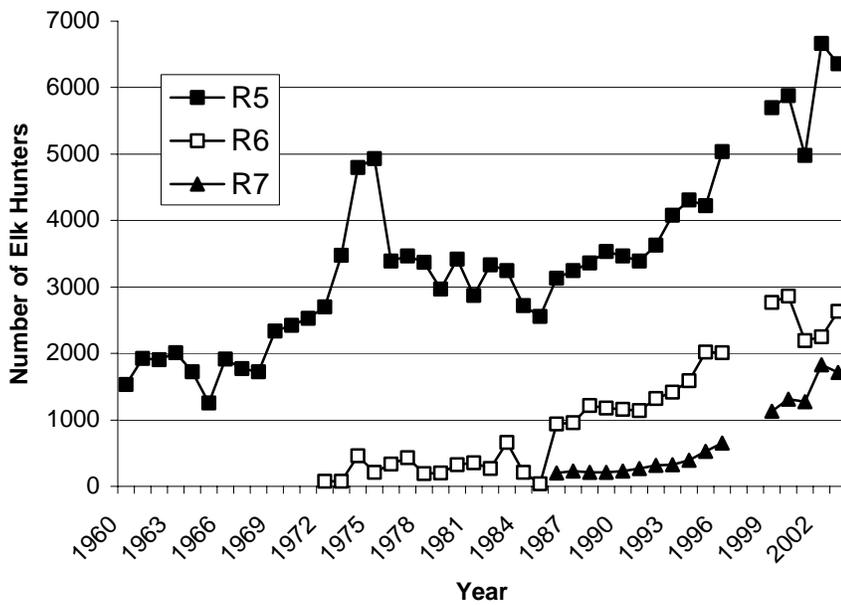


Figure 13. Annual number of Montana elk hunters, Regions 5, 6 and 7, 1960-2003.

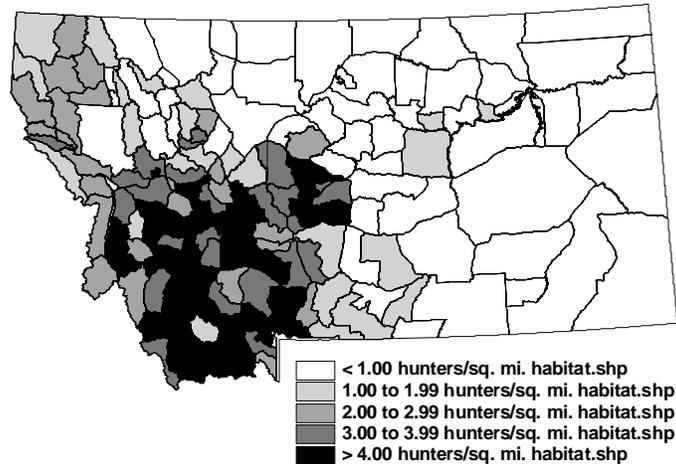


Figure 14. Density distribution of elk hunters in occupied habitat by hunting district, 1999-2001.

### Results of Elk Hunting Regulation Types

General elk hunting regulation types in Montana at selected intervals, 1963-2002 (Table 2), indicate that substantial changes have occurred. First, a 60% increase in the amount of occupied elk habitat has occurred since 1963. Although some of this increase has occurred in northwestern Montana, much of it has occurred in habitats in central and eastern Montana where lower natural habitat security dictates limited-entry (permit only) hunting. This has contributed to the increase in the amount of elk habitat with limited-entry (LE) hunting (Table 2). In 1963, 67% of occupied elk habitat had 5 weeks of either-sex (ES) elk hunting. This contributed to high antlerless/antlered ratios in the harvest in the 1960s (Figure 4) and relatively low and stable populations. By 1971, general hunting regulations for elk were more conservative with general antlered bull (AB) hunting and 66% of elk habitat had only 1 day to 2 weeks of ES hunting (Table 2). Although numbers of antlerless permits issued may have increased over the years, general ES hunting has declined, with only a slight increase from 1992 to 2002 (Table 2). Introduction of branch-antlered bull (BAB) regulations in 1984 and brow-tined bull (BTB) regulations in 1990 resulted in only 22% of elk habitat with AB regulations by 2002. In 2002, 50% of elk habitat had BTB general hunting regulations.

Table 2. Comparisons of general elk hunting regulation types in Montana, 1963-2002. Percentages may not add up to 100% because of overlap of bull and antlerless regulation types.

Year	Season Length (General Season)	Season-long ES (either-sex) hunting	1 day –2 weeks ES Hunting	AB (antlered bull) hunting with or without antlerless permits	Bulls Permit Only (Limited Entry)	BAB (Branch-antlered Bull) hunting	BTB (Brow-tined bull) hunting with or without antlerless permits
1963	5-week	67% of habitat (34,062 mi <sup>2</sup> )	12% of habitat	21% of habitat	None	None	None
1971	6-week	7% of habitat (35,469 mi <sup>2</sup> )	66% of habitat	90% of habitat	3% of habitat	None	None
1985	5-week	1% of habitat (36,406 mi <sup>2</sup> )	32% of habitat	90% of habitat	6% of habitat	3% of habitat	None
1992	5-week	< 1% of habitat (41,992 mi <sup>2</sup> )	15% of habitat	50% of habitat	18% of habitat	None	24% of habitat
2002	5-week	< 1% of habitat (56,666 mi <sup>2</sup> )	18% of habitat	22% of habitat	25% of habitat	None	50% of habitat

The reduction in ES regulations led to a reduction in antlerless/antlered harvest ratios after 1968 (Fig. 4). Further reductions occurred after 1976 (Fig. 4), which led to increasing elk populations. Increased numbers of antlerless permits were issued after 1987, and antlerless/antlered harvest ratios have increased (Fig. 4), especially during years with weather favorable to hunting. Bull harvest has declined in recent years at least partially because of increased implementation of BTB regulations. Although antlerless harvests have increased, especially since 1994, total elk populations in some areas have not declined.

### Bull Hunting Regulation Types

As hunting pressure increased in areas with low habitat security, numbers and ages of bulls surviving the hunting season declined substantially under the AB regulation (Hamlin and Ross 2002). The BAB and BTB regulations were introduced to increase the total number of bulls surviving the hunting season. These regulations were intended to allow general hunting without restricting bull hunting to limited entry (permits). These seasons were not intended to increase the average age of harvested bulls more than the one year that protection of “spikes” allowed, and they did not (Hamlin and Ross 2002).

Actually, some decline in total reported legal bull harvest may have occurred because illegal mortality of “spike” bulls prevented “spikes” from reaching legal age (Hamlin and Ross 2002). In the Gravelly-Snowcrest Mountains, this illegal mortality averaged 15% of the yearling bulls under the BTB regulation. Some decline in average age of bulls 2-years or older may have occurred in areas with more secure habitat (Gallatin and Madison HDs) under the BAB and BTB seasons (Hamlin and Ross 2002). Preliminary information indicates similar results for northwestern Montana after BTB regulations were introduced in 1998. Several more years of information will be necessary to determine the effects of BTB regulations on total numbers of older bulls harvested in the more secure habitats of northwestern Montana. The BTB regulation has been successful in increasing total post-season bull:100 cow ratios in areas of insecure habitat and has become popular with many hunters. However, it did not increase the number of older ( $\geq 5$  years), trophy bulls harvested, nor did FWP expect this to occur. In areas with low bull survival, more breeding is accomplished by 2-year-old bulls rather than “spikes” under the BTB regulation. The benefits of this regulation in areas of more secure habitat where older bulls had remained in the breeding population under AB regulations have not yet been determined. However, it does not appear likely that the number of older ( $\geq 5$  years), trophy bulls harvested in more secure habitat will increase with BTB regulations. The number of yearling bulls in the harvest declines dramatically by regulation definition, and the number of 2-year-old bulls increases proportionally (minus the number of illegally shot yearling bulls). Illegal mortality may end up reducing total reported legal bull harvest at stable populations.

“Trophy management” in Montana is primarily limited to those areas where, because of insecure habitat, FWP must control hunter numbers by limited-entry (LE) permits. Additionally, some late-season opportunity to hunt “trophy” bulls is available by LE in HDs 313 and 310, near Gardiner and in the Gallatin Canyon, respectively. The number of HDs and area of habitat where bulls can only be harvested with LE permits has increased (Table 2). This has occurred primarily with expansion of elk into insecure habitats of central and eastern Montana. These areas of LE hunting have increased from 21 HDs with 545 ES permits and 11,178 applicants in 1992 to 26 HDs with 1,149 ES permits and 20,785 applicants in 2002. The demand for opportunity to hunt these areas is intense because of “trophy type management” and the presence of older, larger-antlered bulls. Some of these areas, particularly the Missouri River Breaks HDs, also experience substantial hunting pressure by archers. Additionally, opportunity to hunt for “trophy” bulls exists in some areas of Montana with general hunting that have secure habitat (unroaded to lightly roaded, rugged terrain, and substantial timber cover).

Another regulation type considered by some to be a “trophy” regulation is the general “spike” season with BTB (ES) on Limited entry permits. This regulation has been in place in the Elkhorn Mountains (HD 380) since 1987 and was implemented in HD 339 in 1996. Average age of bulls harvested on these permits in HD 380 had increased to over 6-years-of-age by 2000. About 84% of the annual bull harvest in HD 380 is “spikes” and 16% older bulls. This regulation type is popular in the areas where it occurs. Idaho implemented a similar regulation in the Centennial Mountains and just south in the Island Park Unit. BTB:100 cow ratios and ES permit levels are both relatively higher there than

in HD 380, however, their general spike season has been only 1 to 2 weeks (2 weeks currently) compared to 5 weeks in HD 380.

The opportunity to harvest bull elk during the rut with a rifle exists in HDs 150, 151, 280 and 316 (early backcountry hunt). Primarily because of safety concerns, hunting in some HDs or portions of HDs is limited to archery only or archery, shotgun, traditional handgun or muzzleloader only. Some areas in Region 3 have special limited general and late season opportunity for ES elk hunting for youth (12-14) and disabled hunters. This has partially addressed concerns with recruiting new hunters and reaching goals expressed in the “Crossing the Barriers” Program.

### Antlerless Hunting Regulation Types

We have already discussed the decline in season-long, either-sex (ES) elk hunting since the 1960s, which may have held elk populations stable at that time. There has been a slight increase in recent years (Table 2) in HDs with a week of ES or antlerless only hunting for either the first or last week of the season. However, antlerless elk management has primarily been by limited-entry (LE) antlerless or ES permits issued through a drawing since the mid-1970s. In some areas, this has included early or late extensions to the general season. In other areas, because of availability of elk due to migration or private land access, these hunts have been only late season hunts. Another antlerless elk management tool has been the A-7 license that restricts hunters to taking antlerless elk in certain areas (usually private lands) and time periods and denies them the opportunity to harvest bull elk anywhere in the state. Generally, the incentive for hunters to apply for these licenses is that the likelihood of harvesting an elk is greater, seasons may extend earlier and/or later than the general season, and there may be less hunting pressure than in some other areas.

With increasing numbers of elk and elk harvest, just issuing more antlerless permits appears to have reached the level of ineffectiveness for population control in some areas (Hamlin and Ross 2002). For example, in 1974, 275 antlerless elk permits were issued for the entire Gravelly-Snowcrest complex. By 1997, 5,200 antlerless permits were offered for the same area and there were only 3,549 first choice applicants. Also, average success rates appear to have declined, partially because many hunters may just use these permits as a “backup” in case they have not harvested a bull by late in the season. In any case, demand for antlerless harvest in this area appears to be below the level necessary to stabilize or reduce the population at current calf recruitment rates. This area may be an extreme example because demand for antlerless permits is still high in some areas. However, even on a statewide basis, demand for antlerless permits appears to be declining relative to permits available (Figure 15). This trend is also apparent within Region 2 (Figure 16) and Region 3 (Figure 17), the Regions with the largest elk populations and antlerless harvest.

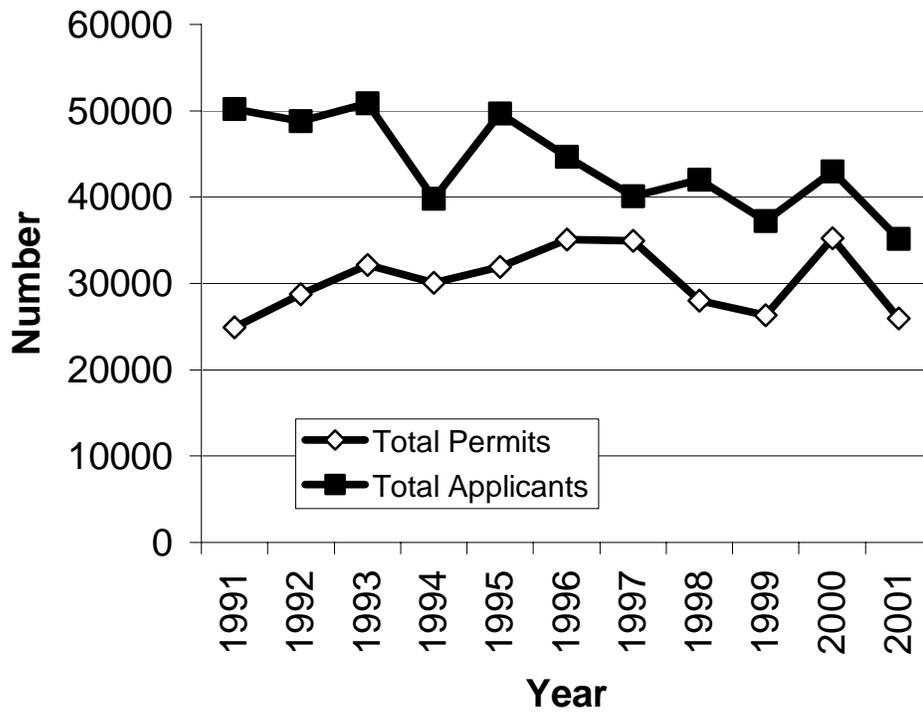


Figure 15. Total statewide antlerless (BTB/antlerless) elk permits offered and total number of first choice applicants for those permits.

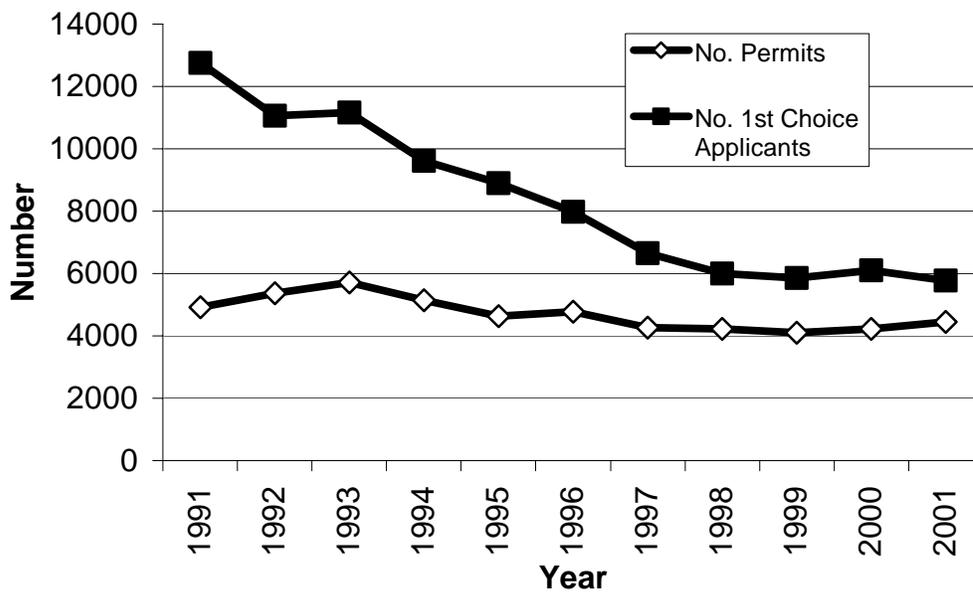


Figure 16. Number of antlerless (BTB/antlerless) elk permits offered and number of first choice applicants for those permits, Region 2.

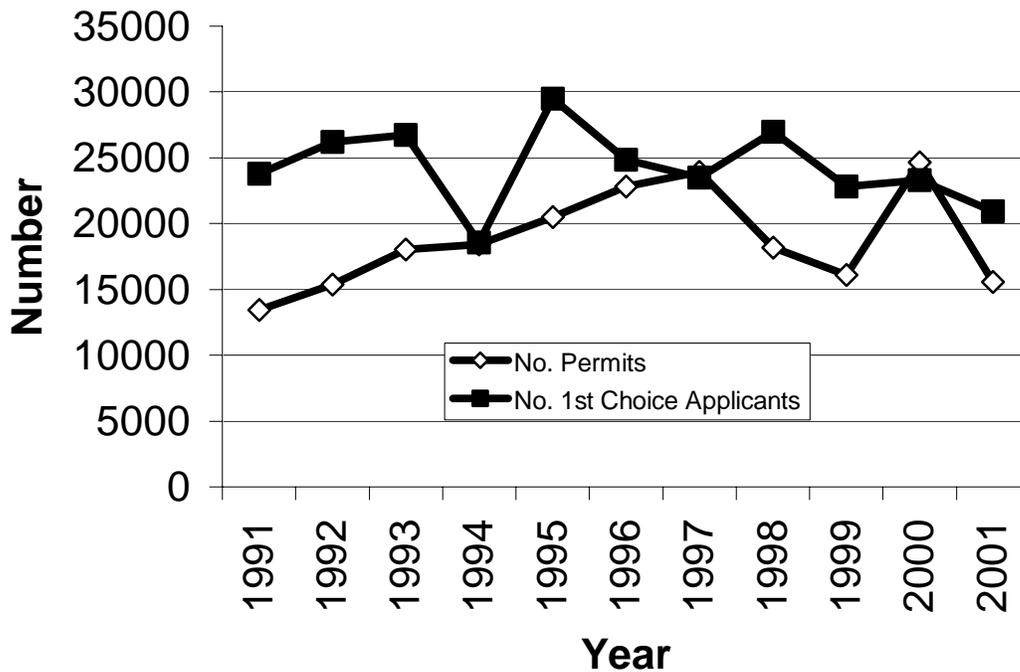


Figure 17. Number of antlerless (BTB/antlerless) elk permits offered and number of first choice applicants for those permits, Region 3.

The statewide trend in demand for antlerless permits has declined since 1991 (Figure 15). Although total numbers of available antlerless permits has fluctuated around 30,000 annually, the number of first choice applicants (demand) for these permits has declined from about 50,000 to about 35,000. The number of A-7 licenses for antlerless elk available increased from about 2,000 in 1991 to about 4,000 in 2001 (Figure 18). There were more than twice as many applicants for these licenses as licenses available in the early 1990s. Recently however, demand for these licenses has declined relative to availability, and they were actually under-subscribed in 2000 (Figure 18). Most of the elk, antlerless permits issued, and desire to reduce elk populations in some areas occurs in Regions 2 and 3. Demand for antlerless permits has either declined (Region 2, Figure 16) or remained relatively stable (Region 3, Figure 17). Even with relatively stable demand, the demand for antlerless permits in Region 3 has been either less than availability in some years (Figure 17) or less than numbers necessary to be issued to achieve desired results. This indicates that simply issuing more antlerless permits is unlikely to result in substantial increases in antlerless elk harvest.

Demand for A-7 licenses was about twice the “supply” in 1991 (Fig. 18), but has declined recently to equal the increasing number of A-7 licenses available. This convergence of supply/demand curves may indicate that, although still valuable as a local redistribution and population control technique, A-7 licenses may have limited effectiveness as a major population control technique. The majority of A-7 licenses are

issued in Regions 2 and 3 and harvest success rates are usually higher than for general antlerless permits in both areas. For example, averaged for 2000 and 2001, harvest success was 42% for general antlerless permits and 53% for A-7 licenses within the same HDs in Region 3. Demand for A-7 licenses has exceeded “supply” in Region 2 but A-7 licenses are usually under-subscribed in Region 3. The main reason for this appears to be that few unrestricted antlerless permits are available in surrounding areas of Region 2 but many unrestricted antlerless permits are available in surrounding areas of Region 3. Region 3 hunters will usually opt to retain their bull hunting opportunity and apply for unrestricted antlerless permits.

A combination of A-7 licenses valid outside the National Forest beginning 1 October through the general season and regular antlerless permits valid through 1 January outside the National Forest appears to have reduced elk populations in the Blackfoot area of Region 2 and reduced elk damage complaints by half. The combination of A-7 licenses, regular antlerless permits, and both early and late season extensions in the Blackfoot makes it impossible to separate out the relative effectiveness of individual management responses. For 6 HDs in Region 3, an average 37% of the antlerless harvest occurred with A-7 licenses during the 29% of the time represented by the 2-week season extension to 15 December.

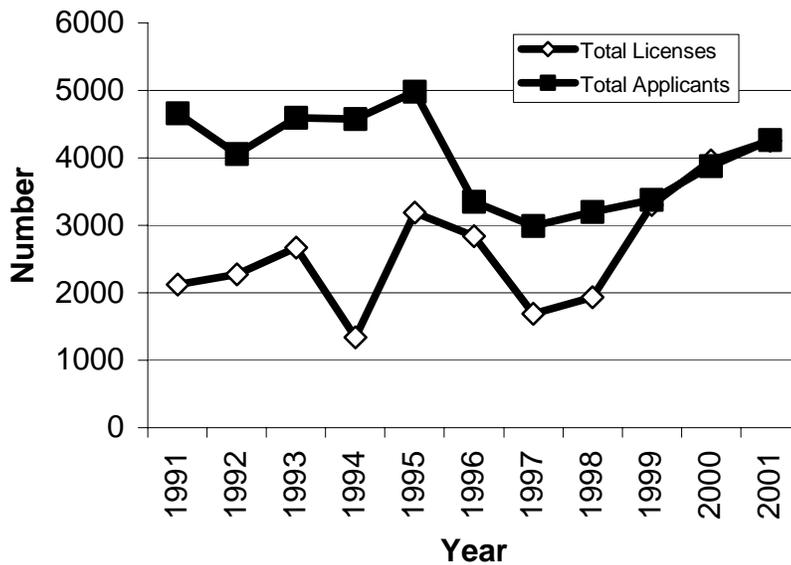


Figure 18. Total statewide A-7 licenses offered and number of applicants for those licenses.

An antlerless-only extension of the season to 15 December for general ES permit holders in HD 314 resulted in an average 54% of the antlerless kill for the season occurring during the 2-week extension during 2000 and 2001. Part of this increased harvest occurred because of increased availability of migrating elk, but perhaps increased access

allowed by private landowners during the time period that bulls were not legal to harvest (by their clients or others) was a major reason for the increase.

Having ES or antlerless-only hunting during the first or last week of the general season was used extensively in the past, is currently used in a few areas and has been proposed as a tool for increased antlerless harvest and population reduction in more HDs. For areas with limited numbers of antlerless permits, having the first week of the season valid for antlerless elk only or ES elk has taken a significant portion of the antlerless elk harvested. For example, prior to 1997 in Region 1, about 10 HDs had the first week as an antlerless elk hunting opportunity. Antlerless elk harvest averaged about 600 elk in Region 1 during 1994-1996. During 1999-2001, with antlerless elk hunting opportunity limited to a few special permits in some HDs, an average of about 300 antlerless elk were harvested per year. Although a high proportion of the Region 1 antlerless harvest occurred during the first week antlerless period, few total antlerless elk were harvested. Higher numbers of antlerless elk might be harvested in other portions of the state with greater numbers of elk. It is too early to determine results of this regulation type in some areas of southwestern Montana where it was introduced in 2002. During 2002, about 2 antlerless elk were harvested during the first week by general license holders or by Youth throughout the season for every 3 harvested by limited permits on the same areas. However, total numbers harvested were low and given the migratory nature of elk in these areas, the rugged terrain and difficult access, it is unlikely that high harvests of antlerless elk will occur during the first week of the general hunting season.

Most of the Little Belt-Castle EMU has had either-sex hunting for the last week of the general season for many years. There, about 3 antlerless elk are harvested on the general license during the last week for every 2 antlerless elk harvested by limited permits earlier in the season in the same areas. Although substantial numbers of antlerless elk are harvested, elk numbers in some HDs remain above population objectives. Similarly, the north portion of the Bridger EMU has had antlerless only elk hunting during the last week of the season since 1989. Starting in 2002, the south portion of the EMU has had BTB/antlerless hunting during the last week of the general season. This level of antlerless hunting has not been enough to control this elk population; it is one of the fastest growing elk populations in the state.

Thus far, except for northwestern Montana, one week of general antlerless elk hunting has not been sufficient to control or reduce elk populations where implemented. The effects might vary, depending on area, but hunter access to elk is a major factor controlling antlerless harvest. In the Little Belt, Castle, and Bridger EMUs, substantial numbers of elk are located on private lands with limited access during the last week of the season. For areas where most elk are on accessible public lands, more antlerless elk might be harvested with this regulation. However, potential results will vary depending on whether the antlerless hunting occurs during the first week or last week of the season and weather during the season. Generally, lighter harvests occur during the first week of the season when, on average, elk are more dispersed during milder weather, and many hunters are still “holding out” for a bull. Harvests could be high during the last week of the season if migrations have occurred, elk are concentrated on winter ranges due to

severe weather, and hunters have “given up” their attempt to shoot a bull or few bulls are left.

Starting in 2002, regulations allowed youths age 12-14 to hunt a legally defined bull or antlerless elk season-long in 7 HDs in R-1, 17 HDs in R-2, 38 HDs in R-3, 12 HDs in R-4 and 4 HDs in R-5. Preliminary results for 2002 indicate that harvest of antlerless elk was increased by no more than 10% as a result of Youth being able to harvest antlerless elk throughout the season. For example, in the Gravelly-Snowcrest Mountains where maximum results might be expected, an estimated 80 (8.0%) of 998 total antlerless elk killed were taken via the Youth regulation. In Region 1, we estimated 81 antlerless elk of a total of 353 might have been harvested via the Youth regulation.

Weather during the hunting season has a large impact on harvest of antlerless elk. About 1,000 more antlerless elk may have been harvested statewide in 2002 compared to 2001 with the added combination of the Youth hunt **and** more areas with a week of general season either-sex hunting. However, in 2000, without either of the opportunity enhancements, about 7,300 more antlerless elk were harvested than in either 2001 or 2002 because of “better” weather conditions during the hunting season. More than just a week of either-sex hunting might be required in many areas to reduce antlerless elk populations. During the “right” weather year, a substantial reduction could occur, however.

Another antlerless harvest technique has been late season permits. These are usually implemented where migrating elk are typically not available until after the general season or under some conditions where access by private landowners is not allowed until after the general season. The best-known and most successful example of this is the “Gardiner late hunt” in HD 313 and a portion of HD 314 that harvests elk from the Northern Yellowstone elk population. Other examples occur in HDs 310, 311, 360 and 362. For areas with substantial access controlled by private landowners, success varies with the amount of access allowed. For example, on the same piece of land in one HD, late season antlerless harvest averaged 269/year with landowner “A”’s ownership, zero with landowner “B”’s ownership and 85/year with landowner “C”’s ownership. Even under landowner “A”’s access program and hunter tolerance, a harvest of 269 antlerless elk per year only slowed the growth of the population. The elk population grew by approximately 50% after landowner “B” assumed ownership and ended late hunts.

In late 2004, the FWP Commission approved hunting season extension criteria for elk and deer. Extensions are intended to apply only where adequate public access existed during the 5-week general season among other criteria. The ARM Rule listing the criteria and process for hunting season extensions is listed below:

#### 12.9.810 HUNTING SEASONS EXTENSIONS

(1) The commission may determine that the extension of a hunting season may be an acceptable strategy to achieve deer or elk management objectives under the following conditions:

- (a) a liberal general season deer or elk management package has been in place for

- two consecutive years, including the year in which the extension is proposed. A liberal season package is established when populations observed in department surveys exceed management objectives. Season packages for deer and elk are numerically described in the department's current Deer and Elk Plans;
- (b) elk populations are 20% or more over the current department Elk Plan population objectives as determined by department survey, or deer populations are 20% - 30% over the current department Deer Plan population objectives as determined by department survey and as specifically identified in the five ecotypes described in the Deer Plan;
  - (c) public hunting access during the five-week general hunting season was at levels necessary to accomplish harvest management objectives, but management objectives were still not achieved; and
  - (d) mild weather conditions during the fall hunting season result in a harvest that is at least 25% below the five-year average for that check station.
- (2) Additionally, the commission may consider season extensions in the event of severe winter weather conditions, and these conditions create a situation where game damage complaints occur across multiple hunting districts.
- (3) A hunting season extension may begin the day after the close of the general fall hunting season and shall close no later than February 15. If direct harvest reaches levels that are projected to bring the deer and elk populations near population objectives, as indicated by one or more game checking stations located in the area of the hunting season extension, the commission shall close a season that it has extended.
- (4) When the commission determines that a season extension is appropriate, the extension must be applied on an aggregate of hunting districts or regional basis, and the hunt area must be large enough to prevent hunter overcrowding. Season extensions may not be applied in situations where individual properties or small portions of hunting districts are involved and where existing game damage procedures more appropriately apply.
- (5) The commission shall extend hunting seasons according to the following procedures:
- (a) at the end of the fourth week of the general big game hunting season, a regional committee, located within the pertinent administrative region and appointed by the respective regional supervisor, shall consider the criteria listed in (1)(a) through (1)(d) or (2) to determine whether or not season extensions are warranted;
  - (b) the committee shall present its recommendation to the regional supervisor for approval; and
  - (c) if the regional supervisor and director approve the hunting extension, the department shall present the recommendation to the local commissioner representing the area where the season extension is proposed for review and final approval. In the absence of the local commissioner, the department shall present the recommendation to the commission chair for review and final approval.

## Archery Hunting

Archery hunting has generally been considered to provide hunter recreation rather than population management. In Montana, the archery season has generally been 6-weeks long, beginning in early September and extending into mid-October, through the rut. In

1995, 15,769 archers harvested an estimated 1,268 elk in Montana comprised of 973 bulls (76.7%), 229 cows (18.1%) and 65 calves (5.1%). Sex and age composition is unavailable for recent years, but archers harvested similar totals for elk statewide in 1999 and 2000 (1,505 and 1,445, respectively). If sex and age composition were similar in 1999 and 2000 to that of 1995, archers would have harvested an average of 11.1% of bull elk and 2.3% of antlerless elk harvested in Montana during 1999 and 2000. Antlerless harvest by archers contributes little to antlerless population management, perhaps being important only where safety concerns dictate no rifle hunting. Recently, however, it has become apparent that archery harvest impacts management of bull elk, at least in some areas.

Archery harvest of elk (especially bulls) is disproportionately by non-resident hunters. Archery kills for 1999 and 2000 averaged 6.4% of the statewide elk harvest (Table 3) and made up a higher portion of non-resident (13.6%) than resident elk harvest (5.0%). Sex and age composition of the kill for these years is not available, but likely it was heavily skewed toward bulls as it was in 1995 (see above). Of total elk archery harvest in Montana, 34.1% was by non-resident hunters compared to 14.7% of total rifle kill of elk by non-residents (Table 3). Non-residents averaged about 15% of total elk hunters in Montana during 1999-2001.

Archery kill of elk is highest on a percentage basis in central and eastern Montana where the majority of general season elk hunting is by limited-entry (permit only) (Table 3). Numerically, archery harvest is highest in Region 3 where total elk harvest is highest, though on a percentage basis, it is lowest there (4.2%). Harvest of elk by archery is most important in the Missouri River Breaks (MRB) hunting districts where 25.9% of total elk harvest was by archery in 1999 and 2000. For 1998, when sex/age composition was available, 31.1% of bull harvest in MRB districts was by archery and 40.9% of this archery bull harvest was by non-resident hunters. Most of the non-resident kill of elk in these LE areas is by archery (Table 3).

Of new entries to the Montana Boone and Crockett and Pope and Young records for elk between 1990 and 2000, a disproportionate share of record class bulls were taken by archers. Fifteen (30.6%) of 49 new entries of bull elk in either book scoring  $\geq 360$  points Typical or  $\geq 370$  points Non-typical between 1990 and 2000 were taken by archers, who comprise about 15% of elk hunters. Archers may hunt every year in areas like the Missouri River Breaks and are also able to hunt during the rut.

Because some hunters expressed dissatisfaction about the elk archery season in the MRB hunting units, during 2000 an opinion survey was conducted of archers who hunted this area (Lewis and King 2001). The archers surveyed were asked to respond to 6 proposed management actions that addressed a perceived crowding/competition among hunters in MRB archery hunting units. Nearly 60% of respondents supported or strongly supported making NO changes to current season types/structures. About 70% of respondents opposed or strongly opposed changes that would prevent MRB archery hunters from also hunting elk in other parts of the state by either archery or rifle or to limit MRB archers to specific time periods that were less than the full archery season. The 2 most frequently

mentioned comments in open-ended responses were: 1.) make no changes to current season types/structure; and 2.) place some limit on the number of non-resident archery hunters (Lewis and King 2001). Only archers were surveyed; hunters that apply for general season permits that allow hunting by rifle in the MRB hunting units were not surveyed.

Table 3. Elk harvest statistics for archery and resident/non-residents averaged for 1999 and 2000 by Region in Montana and for the Missouri River Breaks hunting districts.

Area	% of total elk kill by archery	% of elk archery kill by non-residents	% of elk rifle kill by non-residents	% of non-resident elk kill by archery	% of resident elk kill by archery
Region 1	8.8	28.0	16.9	13.8	7.7
Region 2	5.3	18.0	8.7	10.4	4.8
Region 3	4.2	31.8	17.5	7.4	3.5
Region 4	9.4	35.5	14.3	20.4	7.2
Region 5	5.5	37.8	12.9	14.5	4.0
Region 6	29.3	47.9	4.2	82.7	18.4
Region 7	18.8	62.2	11.3	56.0	9.0
STATE	6.4	34.1	14.7	13.6	5.0
Missouri River Breaks Hunting Districts					
HD 410	25.6	39.9	2.9	82.5	17.6
HD 417	23.8	30.4	6.7	58.6	18.9
HD 621	42.5	37.0	5.8	66.7	17.3
HD 622	46.4	51.0	3.6	92.5	30.5
HD 631	34.3	21.3	5.6	66.7	30.3
HD 632	27.1	18.8	4.7	60.0	24.1
HD 700	13.8	65.3	8.9	54.2	5.8
Total MRB	25.9	40.6	5.0	74.1	17.9

### Hunting Access

The effectiveness of elk population management in Montana depends on public access to those elk during hunting seasons. Any elk hunting season or regulation, no matter how innovative, will not successfully achieve its intended harvest results without adequate hunter access to elk. In some cases for bull elk management, too much hunter access, leading to heavy harvest rates and low numbers of bulls in the population have posed problems. However, recent management problems more frequently deal with inadequate access to achieve the antlerless elk harvest necessary to control populations in some areas. FWP biologists estimate that up to 35% of Montana's elk may be on private lands that are inaccessible to the general public hunter during the 5-week general season. Most hunters may not have access because of no hunting allowed by anyone, outfitting, leasing, blocked access, or other factors. Some of these elk, however, are available to family and friends of landowners and outfitted clients, though few antlerless elk are harvested. See Table 9 on page 61 for a summary of "unavailable" elk by EMU.

## FWP Programs

For years, FWP has worked with private landowners to maintain hunter access to private lands to help achieve adequate harvests, reduce game damage, and provide recreation to hunters. More recently, these efforts have been formalized into three programs under Montana’s overall Hunting Access Enhancement Program (see “Keys to the Treasure” by Alan Charles, Montana Outdoors, November/December 2002, pages 7-10 for more information). This program received a funding boost in 1995 (effective 1996) with implementation of the variable-priced outfitter-sponsored nonresident elk and deer license. In 2001 (effective 2002) all hunters, including residents, were assessed a Hunting Access Enhancement Fee which will help increase the number and types of hunter access projects implemented.

The best-known hunting access program, Block Management (BM), has been formally in existence since 1985. Growth of the program since 1986 in terms of landowners, acres, hunter days and dollars spent has been more than 10-fold (Table 4). As of 2002, the amount of acreage in the Block Management Program is larger than the state of Maryland, is equal to 9.5% of the land area of Montana, and the private land component is slightly less than 12% of all private land in Montana. Of Block Management hunters surveyed in 2003 (Charles and Lewis 2004), 31% reported hunting for elk on BM lands.

Table 4. Landowners, acres, hunter days and costs of the Montana Block Management Program, 1986-2002.

Year	Number of Landowners	Acres	Hunter Days	Weed Mgmt. Costs	Total Contract Cost <sup>a</sup>
1986	86	799,360			\$30,418
1987	141	1,692,080			\$58,230
1988	188	2,550,000			\$82,550
1989	349	3,773,188			\$203,445
1990	443	5,177,764			\$238,000
1991	449	5,653,867			\$363,006
1992	521	5,023,516	175,577		\$156,335
1993	482	4,069,455	137,121		\$138,874
1994	501	5,011,722	222,455		\$185,917
1995	471	5,076,831	212,301		\$225,055
1996	882	7,130,119	345,896		\$2,757,103
1997	937	7,545,606	260,797		\$2,571,358
1998	923	7,273,723	248,314		\$2,541,863
1999	931	7,155,783	248,129		\$2,545,761
2000	1004	7,696,500	279,918		\$2,792,854
2001	1076	8,666,436	347,639	\$80,212	\$3,200,561
2002	1147	8,809,757	378,444	\$142,757	\$3,556,452

<sup>a</sup> Landowner Contract cost only. Does not include landowner/hunter services such as FWP patrollers, signs, materials, tabloids, maps, etc. In 2002, these costs were an additional \$1,007,890.00.

Substantial numbers of hunter days occur on BM lands in Regions 1-4, the primary Administrative Regions of elk harvest (Table 5). Although elk harvest from BM Areas as a percentage of total statewide harvest is unknown, some BM areas were created specifically to help reduce elk depredation and elk numbers in local areas.

Table 5. FWP Regional Block Management statistics for 2001.

Region	Number of Landowners	Acres	Hunter Days
1	12	782,388	46,989
2	126	497,153	23,543
3	86	720,678	46,002
4	177	1,274,609	51,508
5	129	889,806	31,480
6	237	1,152,654	59,010
7	308	3,350,809	89,474

Results of the 2003 survey (Charles and Lewis 2004) indicated that 93% of landowners and 89% of hunters were satisfied or very satisfied with the Block Management Program. Also, substantial majorities of landowners and hunters believed that the BM Program had improved or substantially improved landowner/hunter relationships. All of the figures reported above were increases from those reported in 1996.

Another FWP access program is Access Montana. This program was developed to help reduce land access conflicts and help maintain and improve access to the more than 35 million acres of **public** land in Montana. FWP works with public land management agencies and private landowners to establish access corridors across private land to reach inaccessible public land, mark public land boundaries, contribute to map production and document where public land access conflicts exist.

The Special Access Projects Program, the third formal program, focuses on regional species-specific hunting access needs. For example, in 2002, elk hunt coordinators were hired to help the public access lands associated with special elk reduction hunts. Additionally, this program has covered some costs of the Elkhorn Working Group, which is studying issues related to management of elk in the Elkhorn Mountains.

Two other FWP programs, although primarily related to providing habitat and habitat management for wildlife, including elk, also provide hunter access to elk. State-owned Wildlife Management Areas either purchased for elk range or having substantial elk usage currently total 21 areas with 306,083 acres. Conservation easements acquired with elk management in mind total 19 with 77,507 acres.

The Private Land/Public Wildlife Council (PL/PW Council) is a group of 15 members appointed by the Governor who are charged with defining common goals, including, but not limited to: 1.) achieving optimum hunter access; 2.) protecting wildlife habitat; 3.) minimizing impacts on and inconvenience to landowners; 4.) encouraging continuance of a viable outfitting industry and; 5.) providing additional tangible benefits to landowners

who allow hunter access. The PL/PW Council provides recommendations to FWP regarding funding, modifications, or improvements necessary to achieve the objectives of the Hunting Access Enhancement Program. Composition of the membership includes 4 members representing landowner interests, 4 members representing outfitter interests, 4 members representing hunter interests, 2 legislators, and 1 FWP Commissioner (see <http://fwp.state.mt.us/hunting/plpw/default.asp>).

On 15 June 2004, the Council recommended re-authorizing the Hunting Access Enhancement Program by repealing sunset provisions and continuing the citizens' review committee. They also made 5 recommendations as possible new sources of additional funding for the Program and 5 recommendations for improvements to the existing Block Management Program.

### Community Working Groups

Community Working Groups (e.g., Devil's Kitchen, Elkhorn, Bears Paw, Madison Valley Ranchlands) have been formed to help solve a variety of elk management problems, including hunter access. Typically, these working groups are composed not only of landowners in the area and FWP, but also sportspersons and other members of the affected community. Issues such as appropriate elk population levels, hunter access to elk, habitat management, and other issues may be discussed. Success has varied, but positive results have been achieved and further success is anticipated as discussions continue.

These groups have much potential in some areas, however Community Working Groups will not work everywhere. For example, if a landowner purposefully creates a "refuge" for personal or leased hunting, they often have no desire to be a member of a "community" working to resolve the problem of excess numbers of elk on adjacent landowner's lands after the hunting season. They may only "live" in the area during hunting season. If all affected parties do not recognize and/or desire to solve a "problem" or consider themselves "members of a community", an effective Working Group cannot be formed.

### Private Hunting Ranches/Leased Hunting

Increasingly, hunting rights to private ranchlands have been leased to outfitters by the acre, animal harvested, per hunter, or a flat fee. Also, some landowners have become outfitters on their own lands. As the agricultural community has faced increasing economic difficulties, this option for extra income has become more attractive. Once established, the economic incentive for the landowner and outfitter is to maintain elk on their lands, at least during hunting season, with restricted hunting. If maintaining a livestock operation, the economic incentive is to have as few elk as possible on their lands at times other than during the hunting season.

In 1992, Duffield et al. (1993) conducted a survey of hunting outfitters in Montana. A subsample of 50 (12%) of 416 contacted outfitters leased or owned private lands for hunting. The size of 97 land tracts leased varied from 500 to 140,000 acres, averaging

27,262 acres for a total of 2,644,414 acres of private lands leased by outfitters for hunting in 1992. Ninety-seven percent were exclusive leases. Distribution of these leases was concentrated in FWP Region 3 (33.0%), Region 4 (26.8%), and Region 7 (16.5%).

Per acre charges were the most dominant (64%) form of payment to landowners; per animal, per hunter, flat yearly rate, and percent of gross were other methods of payment. However, an additional 31 parcels (55%) were owned by the outfitter/rancher and no fees were incurred. The key variables explaining lease rates were the presence of elk and the size of the leased area (Duffield et al. 1993). The average for deer/antelope or bird hunting leases was \$0.33/acre and the average for leases that included elk hunting was three times as high (\$0.99/acre). DNRC State lands are also leased to outfitters and although use may be exclusive to other outfitters, it is generally not exclusive of the public unless it is an isolated parcel within private lands.

In 2003, licensed hunting outfitters were authorized to operate on 6.1 million acres of private lands in Montana (Montana Board of Outfitters and FWP). This is a little more than twice the total estimated for 1992. Montana Board of Outfitters (MBO) does not record the species hunted on the “authorized for operation” private lands, so no estimate of the acreage used for elk hunting can be made. MBO would not authorize intersection of maps that could calculate distribution of these lands by FWP Region, however, a gross look at the map indicates that the largest increases in “private lands where outfitters are authorized to operate” were in FWP Regions 7, 5, and 6.

Another increasingly common occurrence is for wealthy hunters or groups of hunters to purchase or lease a ranch primarily as a “private hunting ranch”. Some real estate brokers are advertising certain ranches specifically for this purpose and further advising clients on how certain properties can block access to adjoining public lands, further enhancing landowner hunting/leasing opportunity (Hall & Hall website, Fall 2002 newsletter).

These situations often result in little or no harvest of antlerless elk during the 5-week general season. After the general hunting season, elk often graze on the lands of adjacent landowners who did allow public access. These landowners with “hunting ranches” may feel no obligation to contribute toward a general elk reduction that may benefit their neighbors. FWP has not successfully established effective Community Working Groups in these situations. See the Economics and Commerce section for further discussion of outfitting/leasing/commercial use of wildlife.

#### ORVs/Retrieval

The use of ORVs/ATVs (Off-Road/All Terrain Vehicles) has generated substantial controversy, and the public is relatively evenly split on this issue. Many are concerned about damage to habitat and disturbance to elk and hunters caused by these vehicles, including movement of elk to private land “refugia”. Others would like to be able to use ORVs/ATVs for retrieval of harvested game.

The majority of trails within Montana are on federal public land. FWP only has authority over trails on Department-owned lands such as Wildlife Management Areas. However, FWP can make recommendations to private landowners and land management agencies for motorized access options that might affect elk and elk hunting. Examples of this coordination include Forest Travel Plans/ maps and access agreements on Block Management Areas and conservation easement properties. FWP can also contribute toward responsible ATV use by educational materials. A brochure entitled “Off-Road Montana” that summarizes laws, regulations and ethical guidelines is available at FWP offices. Also, FWP contributed toward a publication summarizing known effects of recreation, including ORVs/ATVs, on wildlife. This publication is entitled: “Effects of Recreation on Rocky Mountain Wildlife: A Review for Montana” and is available at the following website: [www.montanatws.org](http://www.montanatws.org).

Some increased harvest of antlerless elk might be achieved by access options that allow some designated time period for retrieval by ORVs/ATVs. However, three areas of concern make this proposal problematic. Harvest rates for bull elk are already adequate or more than desirable and additional access or retrieval options that increase harvest of bulls are undesirable. Problems with enforcement of existing ORV/ATV regulations cause concern with any increase in use of these vehicles or enforcement of new regulations. In some areas, any ORV/ATV use appears to redistribute elk to adjacent private land “refuges”, reducing their availability to hunters on public lands.

### **Estimating Elk Population Parameters**

In November 2002 the Legislative Audit Division of the state of Montana reported on a performance audit of FWPs big game inventory and survey process (Legislative Audit Division, 02P-05, 2002). Conclusions and recommendations in the report included:

- The department employs game management methods that compare to accepted standards, but can improve its process.
- The current techniques used to assess game population status have evolved from compromise among needs for accuracy, financial restrictions, and personnel availability.
- The department could refine its techniques for all species to better incorporate strategies that relate to more thorough and objective analyses.

More specifically, “We recommend the department refine its survey and inventory techniques for all species to better incorporate the concepts of:

- A. Repetitive surveys of representative management areas;
- B. Standardized and documented protocol that is easily transferable;
- C. Use of visibility bias adjustments and required sample sizes;
- D. Tying survey results directly to management objectives and subsequent recommendations; and
- E. Understandable and concise presentation to the public based on objective analysis.

FWP concurs with the recommendation (1 November 2002 letter from FWP Director Hagener to Deputy Legislative Auditor Pellegrini). The letter further states: ...”Our concurrence is made with the understanding that full implementation of the recommendation is a long-term commitment. Implementing repetitive surveys to increase survey accuracy is costly and will require prioritization with other activities.”

Items B., D. and E. above will be implemented by adopting the proposed AHM approach in this revised Elk Plan. Items A. and C. will be discussed below and referenced in individual EMU plans where appropriate.

Attempting to estimate wildlife population numbers is one of the most difficult and expensive aspects of wildlife management. Seldom, except for in special research projects in certain areas, do wildlife agencies attempt other than very broad estimates of wildlife numbers. Rather, for important areas and populations, trend counts are conducted that attempt to determine the **relative** change in population numbers between years. It is known that these counts underestimate total numbers, but by trying to conduct the counts under the same conditions every year (or other period of count), we hope to determine if the population is up, down, or stable relative to the past year or trend count objective. By comparing these trend counts to population goals, we determine direction of population trend and whether the hunting regulation has been effective in maintaining the population goal or turning the population in the direction of that goal. If the regulation has been ineffective over a several year period, a new regulation should be tested. Recommended new regulations have not always been acceptable to the public and have not been implemented. The use of harvest estimates for prior years, an index of recruitment of new elk to the population (calf:100 cow ratios) and prior and current weather conditions are often used to try and predict future direction of the population trend. For example, a low level of calf recruitment (low calf:100 cow ratios) and heavy harvest the prior year indicates the population will likely decrease or be stable the next year. Conversely, high calf recruitment coupled with low harvests indicate the population will likely increase the next year. These predictions may also lead to recommendations for hunting regulation changes.

#### Aerial Surveys/Trend Counts

Trend counts are usually conducted by aerial survey, either by helicopter or fixed-wing aircraft, although in some areas counts may be conducted from the ground. Most flights are conducted on relatively open winter ranges. For parts of thickly timbered northwest Montana, aerial census or trend count flights are impractical. Data on calf:100 cow and bull:100 cow ratios may be recorded at the same time as counts on aerial surveys. However, for some areas, ratios may be determined by surveys from the ground, separate from aerial counts. In most areas, bulls counted are separated into “spikes” (yearlings) and brow-tined bulls (BTB). In some other areas, an attempt may be made to further separate BTB into 2-year-olds and bulls 3-years and older. Not all areas of the state containing elk can be surveyed. However, almost all significant winter concentrations are surveyed, possibly accounting for about 60-70% of the elk in Montana (Figure 19). For

most important areas, trend counts are conducted every year during early to late winter or early spring. In some areas, due to budget constraints and the availability of pilots, trend counts may be conducted every 2 or 3 years. Even where trend count flights are attempted every year, a variety of factors may result in flights not being completed.

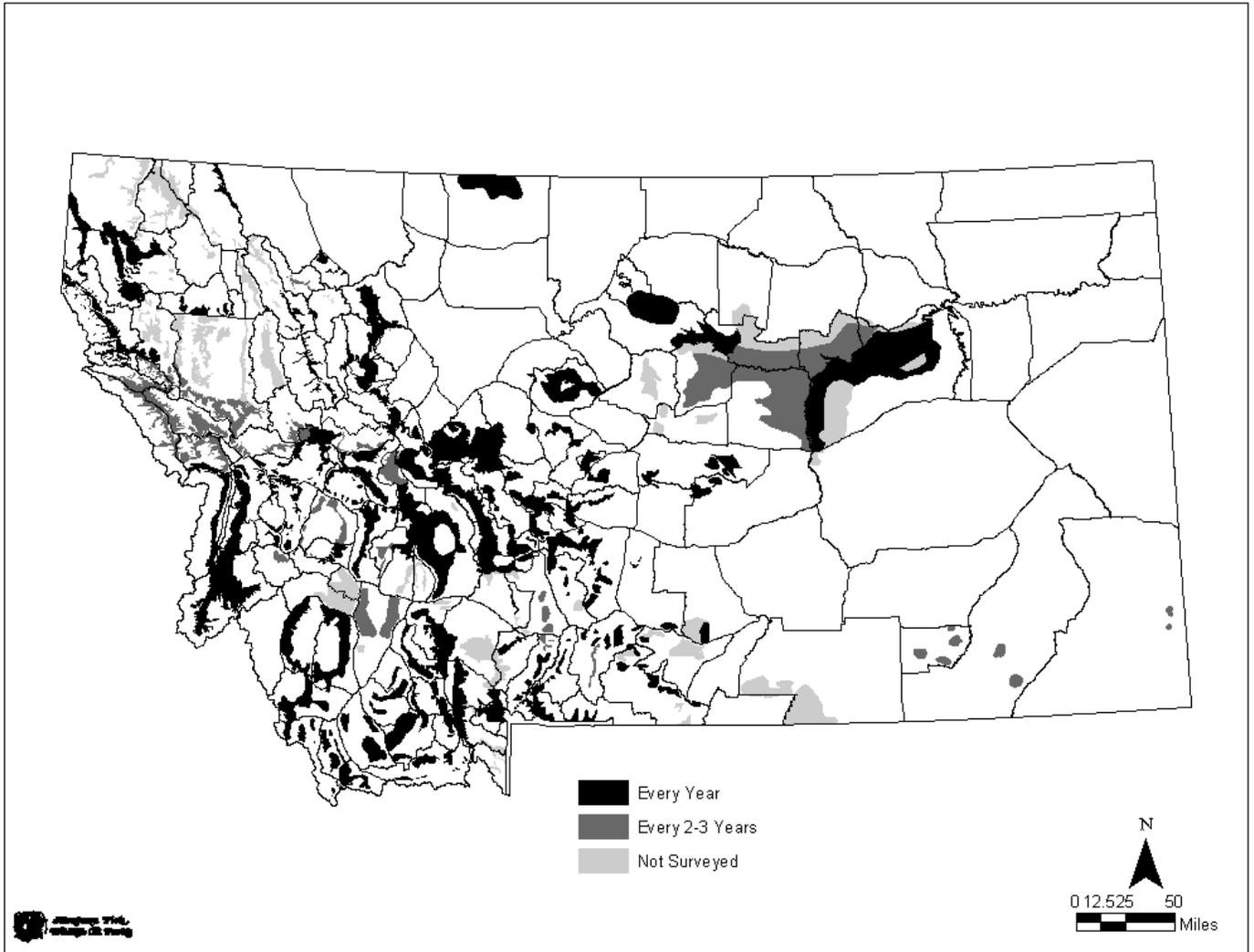


Figure 19. Location of post-season aerial elk survey areas and the frequency of surveys for elk in Montana.

Limited information is available for estimating total population size from counts obtained on trend count aerial surveys. Despite the difficulties of accomplishing estimates of total population sizes, ideally, they would be useful to compare with our estimates of total harvest.

Both mark-recapture (Rice and Harder 1977) and sightability (Samuel et al. 1987) estimates of elk population numbers were made on 2 heavily forested/shrubland winter ranges adjacent to Hungry Horse Reservoir in northwestern Montana (Casey and Malta 1993, Vore and Malta 1994). Results from the 2 sites were combined because they were almost identical, but conclusions are tentative pending final analysis. Biologists observed an average of 30.5% of marked elk known to be on the area during 11 mid to late winter census flights from fixed-wing aircraft. Range of observability was 19-45%, standard deviation (SD) was 8.9% and coefficient of variation (CV) was 29%, which is quite high. Average observability during 4 helicopter surveys was 33% (range, 22-46%), not much different than for the fixed-wing aircraft. Surprisingly, neither SD (10.8%) nor CV (32.5%) was lower when using the helicopter. These results indicated that in this heavily timbered northwest Montana environment an average of about 30% of total elk on the survey area were observed and counted during aerial trend counts. Unfortunately, the wide range of variation in observability among flights makes it difficult to detect all but substantial changes in population size among years. Estimates of sightability averaged 22% of elk groups over 5 years (Vore and Malta 1994). Most elk groups in this environment were very small, which substantially reduced sightability compared to more open habitats. This result is consistent with the observability figure of 30% because missing small groups of 1 or 2 elk does not substantially add to total numbers missed.

Census flights done with a helicopter on other timbered winter ranges in northwest Montana (Henderson, Sterling and Lemke 1993) indicated slightly higher rates of observability than for the Hungry Horse area. For 6 late winter flights flown over 2 years in HD 123, an average 45.8% of marked elk was observed. Range of observability was 25-67%, SD was 12.6% and CV was 27.5%. For 9 late winter flights flown over 3 years in HD 200, an average of 35% of marked elk was observed. Range of observability was 25-45%, SD was 6.5% and CV was 18%. These results are consistent with those of the Hungry Horse area and with the fact that winter ranges in HD 200 are more heavily timbered than in HD 123. Population estimates made with mark-recapture techniques (observability) averaged 19% higher than those made by sightability techniques in HD 123 and 18% higher in HD 200.

For more open winter ranges with larger elk groups in northwest Montana, sightability estimates were much higher. Observed elk were about 90% of total population estimated using a sightability model on the National Bison Range (Unsworth et al. 1990) and about 95% on the Blackfoot-Clearwater winter range (M. Thompson, unpublished data). However, Hamlin and Ross (2002) maintain that sightability models substantially overestimate the proportion of elk observed on open winter ranges where group sizes are commonly over 20 elk. Many replications are necessary to determine the "true" correction factor for large groups, and even then the "average" correction factor used results in errors for all years. Mark-recapture estimates were not made for either area. When a fire in fall 1991 and snow conditions in 1996-1997 resulted in elk distribution changes, elk counts in 1992 and 1997 on the Blackfoot-Clearwater winter range were 40% and 50%, respectively, below counts for the previous and following years of the survey.

Data from the large, open winter ranges of the Northern Yellowstone elk herd (Singer et al. 1997) indicated that over a 12 year period, aerial fixed-wing trend flights counted an average of 74% of the elk estimated to be present by population reconstruction. The range was 53-91%, SD was 13% and CV was 17%. Generally, the lower values were associated with flights known to be conducted under less than ideal conditions. During 5 years of the period 1986-1987 through 1991-1992, population estimates were also made by the sightability technique. In those years, 67% of the population estimated to be present by sightability corrections was counted (range 50-83%, SD 13% and CV 19%). For the same flights, an average 71.5% of the population estimated present by population reconstruction was counted (range 53-87%, SD 16% and CV 23%). When the 3 flights with known poor survey conditions were excluded, an average of 80% of the population estimated by population reconstruction was counted on trend flights.

Hamlin and Ross (2002) estimated percent of the elk population counted on trend flights in the Gravelly-Snowcrest Mountains by comparing counts with total population estimated by population reconstruction during 9 years. For the entire period, an average of 71% of the estimated population was observed on trend count flights. Range was 56-89%, SD was 11% and CV was 16%. For the 5 years of good to excellent flight conditions, an average of 80% of the estimated total population was counted (range 74-89%, SD 5.6% and CV 7.1%). For the 4 years of poor flying conditions an average of 60.5% of the estimated population was counted (range 56-64%, SD 3.3% and CV 5.5%). A large portion of the lower estimate for the years of poor flying conditions occurred because elk were widely dispersed and many were not on the areas counted (Hamlin and Ross 2002). The sightability correction factor for group size used on the Northern Yellowstone range (Singer and Garton 1994) applied to the Gravelly-Snowcrest flights would have produced an average sightability of 97%. Data were not available from the Gravelly-Snowcrest flights to correct for other factors such as cover and activity, but because winter ranges were very open, the additional correction would have been slight.

The literature and our experience indicated that animals in large groups are usually undercounted. Freddy (1998, 2000) considered this factor a major explanation of underestimation error in a Colorado elk population. Cogan and Diefenbach (1998) estimated that elk counts by helicopter in Pennsylvania undercounted elk that were observed by about 20%. This factor likely accounted for much of the average 20% undercounts during even good flying conditions on the open winter ranges of southwestern Montana. During years of poor flying conditions, some elk are missed because of lack of good snow background or poor light conditions, but most are likely missed because mild winter conditions result in widely dispersed elk of which many are not on the areas flown.

From the above, there is some information to generally categorize correction factors for trend counts in some areas of Montana. However, given the variability observed, even within areas, annual estimates of total population would only be “ballpark” estimates. Determining significant changes among years would be problematic. Increasing the rigor of elk census flights by adding more areas where we would determine observability estimates over a range of conditions and adding replicate flights similar to the mule deer

AHM program would be necessary to attempt estimates of “true” elk population numbers. An estimated \$1,000,000 or more would be necessary for developmental costs to establish observability estimates for additional areas. An estimated additional \$300,000 more than is currently expended (a little more than \$1.8 million in FY 2001-2002) would be necessary annually to fly increased numbers of aerial surveys. This would also increase the number of biologist days for flying and analysis by at least 280 days annually. As stated earlier, even given the money, it is unlikely that there are enough qualified pilots and good flying weather available during the census window of time (late December – mid-April) to totally accomplish a program for elk similar to that for mule deer.

Population objectives listed under individual EMU plans are for number of elk counted on trend counts, **NOT** for an estimated total population. At this stage of our knowledge and logistic and financial capabilities, estimating total elk populations for all EMUs would only introduce more uncertainty than currently exists into elk management in Montana. Use of consistent and rigorously collected trend count information will allow us to determine whether individual elk populations are at, above, or below objective levels.

#### Calf Recruitment

Determining the ratio of calves recruited in spring (calf:100 cow ratio) is an important parameter for management decisions. For example, if classification surveys found that 40 calves survived winter for every 100 cows in the population and half of the calves were females, then about 20 of 120 (100 cows + 20 new cows) or 16.7% of the cow population would have to die of hunting or natural causes over the course of a year for the population to remain stable. This percentage varies with the recruitment rate (calves:100 cows) each year and hunting prescriptions will vary with this figure, estimates of natural mortality, total population, hunter success rate, and population goals (stable, decrease or increase).

In the 1992 elk plan, FWP provided goals or minimum criteria for recruitment (35 calves:100 cows east of the continental divide and 20 calves:100 cows west of the continental divide). These criteria were based on past history for the 2 areas. Generally, with little natural mortality, about 60-70 calves:100 cows might be expected to be recruited. However, recruitment level is almost always below that because of predation, nutritional deficiencies, accidents, weather or other factors. The combination of these factors by area was such that traditionally, recruitment rates averaged lower in northwestern and western Montana than in southwestern and central Montana. Thus, 35 calves:100 cows in southwestern and central Montana and 20 calves:100 cows in northwestern and western Montana were at the lower end of expected average recruitment rates. Recruitment below these rates for any extended period could result in “overharvests” if standard hunting regulations for the respective areas were maintained. The 1992 elk plan called for “corrective action” when recruitment fell below these levels.

Traditionally, wildlife managers believed that the usual cause for lower than expected recruitment was poor nutrition related to high elk densities (too many elk for the available habitat/forage). The usual “corrective action” prescribed for low calf:100 cow ratios was to reduce elk numbers by increasing hunting pressure, thereby reducing competition for food. Poor calf recruitment related to poor nutrition because of too many elk can occur. However, factors other than density-related nutritional deficiencies can also result in low calf recruitment. Some weather conditions can result in nutritional deficiencies for elk and low calf survival regardless of numbers of elk. Similarly, under some conditions, predation can result in lower than average calf recruitment, unrelated to nutrition. Addition of another large predator (wolves) to ecosystems may reduce average recruitment rates from those traditionally observed. Reduction of total elk numbers will not increase calf recruitment if low calf recruitment is the result of non-nutritionally related predation or non-density related nutritional deficiencies. In these situations, the “corrective action” of reducing elk numbers will not increase calf recruitment rates.

We do not list “goals” for calf recruitment in this revision of the elk plan because in many or most cases, we can do little by management action to affect recruitment level. Also, restoration of wolves to Montana may change expected long-term average recruitment rates. It will be important to continue to monitor calf recruitment rates to determine if wolf restoration is contributing to lower recruitment rates through additive predation mortality or if recruitment is mainly affected by density-dependent (related to numbers of elk) or density-independent (such as weather) factors. Also, regardless of factors affecting recruitment rate, hunting season prescriptions must reflect recruitment rates in relation to the goal for total population numbers.

#### Numbers and Ages of Bulls

Some areas of Montana are managed for maximum sustained harvest, others are managed for diverse or older bull age structure, “trophy bull” harvest, quality hunting and viewing experiences and others are somewhere in between. Areas managed for older bulls are usually managed by limited entry permits. However, some areas with much secure hiding cover and/or difficult access provide “trophy” bull hunting with a 5-week general hunting season. Areas with poor hiding cover and/or excessive access by roads and trails usually provide a very young bull age structure and low total bull numbers if managed within a 5-week general hunting season.

FWP records bull:100 cow ratios or percent bulls in the population during aerial trend counts or classifications from the ground to monitor bull survival/mortality during the hunting season and expected numbers of bulls available during the next hunting season. Trends in these ratios or percentages over time help determine whether harvest rates are stable, declining or increasing and whether harvest regulations are meeting goals for hunting and viewing experiences. Ages of harvested bulls and antler characteristics are recorded at check stations to document age and size of bulls, relative change among years, and whether age-structure goals are being met.

Most older bulls tend to be distributed away from the cow/calf/spike groups during the time of the winter surveys. These bulls may occur as “bachelor groups” or as singles, or groups of 2 or 3 and are proportionally more often missed than the larger groups of mostly antlerless elk. Also, numbers and proportions of spikes recorded during aerial fixed-wing surveys of large groups tend to be lower than recorded during ground classifications (Hamlin and Ross 2002). Therefore, ratios and percentages of bulls recorded during surveys are usually minimum figures and “true” ratios/percentages of bulls are somewhat above those reported.

In a penned study, Noyes et al. (1996) found that significantly earlier conception dates occurred for cows bred by bulls  $\geq 3$  years of age than for cows bred by bulls  $\leq 2$  years old. These earlier born calves are more likely to survive than later born calves. Therefore, there is a biological reason to maintain some level of older bulls in the breeding population. However, in a wild population, Hamlin and Ross (2002) found no effects on calf survival with total post-season bull:100 cow ratios as low as 3:100 and BTB:100 cow ratios as low as 0.6:100. The probable reason for this was 2-fold. Even at these low ratios, because of the dominance of older bulls in the elk breeding system, adequate numbers of older bulls were present to accomplish the actual breeding. Also, as explained above, because the recorded ratios were minimal, especially for older bulls, more older breeding bulls were present in the breeding population than recorded during post-season aerial surveys. In areas of low habitat security and high access, the BTB regulation appears to maintain adequate breeding bulls in the population.

Despite the fact that high numbers of old bulls may not be necessary for population maintenance, Montana manages multiple areas for diverse bull age structure, older bulls, and aesthetic hunting and viewing experiences. FWP monitors success of regulation strategies and effects of habitat/access management by recording bull:100 cow ratios or percent bulls in the population during population surveys.

### Harvest Surveys

Montana resident hunters are surveyed primarily by telephone and non-resident hunters are surveyed by mail. FWP attempts to contact a stratified random sample of approximately 71% of resident elk license holders (83% of special license holders) and 69% of non-resident license holders (97% of special license holders). The usable response rate for residents in 2002 was 70% and for non-residents was 49%. Thus, the effective sample rate was 47% for residents and 34% for non-residents. Results from these surveys are multiplied by the appropriate expansion factor to represent the kill by 100% of elk hunters.

Some of the public have expressed distrust of the results of Montana’s harvest survey and prefer a mandatory report card. An independent investigation and analysis of the harvest survey methods of 12 western states (Bate et al. 1995) indicated that Montana, Colorado and Idaho (all using the telephone survey) had the most accurate, reliable and well-designed harvest survey methods. Mandatory report card systems were found to work well only in states such as Nevada where there were only a limited number of hunters and

all hunts were by limited entry (drawings for permits). A mandatory hunter report card system to estimate big game harvests would result in at least a 3-fold increase in costs to FWP and probably provide less reliable information (Bate et al. 1995). Hamlin and Erickson (1996) discussed a variety of other problems with mandatory report systems, including non-response bias, low compliance rates and enforcement. Despite results of the study by Bate et al. (1995), Idaho Department of Fish and Game was forced by the public to go to a mandatory report system in 2000. Response rates are low (must conduct telephone survey to estimate non-response bias), information is untimely (now not available prior to season-setting), and data is of poor quality (hunters reported harvest in over 2,200 hunting units – of only 90 actually present)(M. Hurley, personal communication).

## **Disease**

### Chronic Wasting Disease

Chronic Wasting Disease (CWD) is an always-fatal, contagious disease affecting elk, white-tailed deer and mule deer. The disease debilitates the nervous system. Other states have discovered that once the disease infects a wild population, it is difficult, if not impossible to eradicate. CWD appears to be a slow-moving disease and although more time is necessary to determine long-term impacts on wildlife populations, the disease does not appear to decimate entire populations.

There is no evidence that the disease can be transmitted to humans or livestock, but the public is concerned about the potential for cross-species transmission, including humans, as well as with the implications for wildlife populations and hunting.

FWP has tested 2,700 free-ranging deer and elk and 2,300 captive deer and elk associated with Montana's alternative livestock facilities (game farms) since 1996. FWP surveillance has not detected CWD in any of Montana's free-ranging deer or elk. CWD was detected in 1 captive elk at a game farm near Philipsburg in 1999. Infected herds of free-ranging cervids border Montana in South Dakota, Wyoming and Saskatchewan. It is reasonable to assume that the disease will eventually enter Montana or that a Montana deer or elk is infected but not yet detected.

Montana has prepared a draft CWD action plan for free-ranging wildlife. This plan includes 1.) surveillance and detection, 2.) control and management of CWD upon detection, 3.) a public information plan, 4.) research, and 5.) estimates for costs and funding of management action. The surveillance program emphasizes regular monitoring and testing of animals in high-risk zones adjacent to infected states and provinces. This includes the northern border with Saskatchewan and the southeastern border with South Dakota and Wyoming. Additionally, testing occurs among scattered locations throughout the remainder of Montana where hunter check station locations make collection cost effective and logistically feasible. Any symptomatic deer or elk observed by FWP personnel or the public is also tested. Coordination of efforts with other concerned states

also occurs. (Most information on CWD and Brucellosis provided by K. Aune, FWP Research and Technical Services supervisor).

## Brucellosis

Brucellosis is a contagious bacterial disease that affects free-ranging elk and bison in the Greater Yellowstone Area (GYA). The sero-prevalence and infection rates in free-ranging elk from Montana are less defined than for bison but are considerably lower (Rhyan et al. 1997). Although the risk for transmission is perceived to be very low, brucellosis is a threat to livestock and could impact the ability of cattle producers to market cattle if transmission does occur between elk and livestock.

FWP has conducted opportunistic serologic surveys on elk captured during research projects or harvested during hunting seasons since 1981. From January 1990 through February 2002, 36 of 3,721 (0.97%) individual elk tested throughout all of Montana indicated positive reactions for brucellosis. All 36 elk were from the Northern Yellowstone or Gallatin/Madison EMUs, near Yellowstone National Park. Within these EMUs, the 36 positive of 2,772 samples represents a 1.3% sero-prevalence rate. Tests of 913 elk captured in the Gravelly-Snowcrest Mountains during 1984-1995 indicated 4 (0.44%) sero-positive elk. Portions of this elk population are also associated with Yellowstone National Park. Sero-positive elk have not been found in portions of Montana other than these EMUs near Yellowstone National Park.

The Greater Yellowstone Interagency Brucellosis Committee (GYIBC) was formed in 1995 to coordinate management and control of brucellosis in the GYA. This Committee involves the states of Wyoming, Montana and Idaho as well as the Departments of Agriculture and Interior. Montana has completed an elk-brucellosis management plan as part of its obligations under the strategic plan of the GYIBC. This plan encompasses the Northern Yellowstone and Gallatin/Madison EMUs.

Because the sero-prevalence in Montana remains low and effective risk management strategies are currently limited, the Montana Brucellosis Management Plan for elk emphasizes an active surveillance program. The action plan assumes that brucellosis can not be maintained (a self-maintaining epidemiologic cycle) in a free-ranging elk population at an infection rate of less than 7%. At or above that level, the risk for transmission of brucellosis becomes a greater management concern. At the current low infection rates in Montana elk populations, we assume that infected animals are spill-over from infected YNP populations or Wyoming feedgrounds rather than indicating self-maintaining, infected Montana populations. For surveillance, statistically reliable samples will be collected on a three-year rotational basis at check stations near Gardiner, in the Gallatin River drainage and near Ennis, representing elk from the Northern Yellowstone and Gallatin/Madison EMUs. Should surveillance reveal a sero-prevalence greater than 5% in any year, an Epidemiologic Review Team will be convened to consider any actions that might be necessary.

Also, as part of the Brucellosis Management Program, FWP will encourage habitat management programs that emphasize healthy habitat, dispersion of elk, and minimal spatial-temporal overlap of elk and cattle. FWP will also maintain elk population densities at objectives described later in this Plan to help minimize transmission probabilities. Similarly, one of the intentions of the supplemental feeding policy of FWP (NO feeding) is to reduce the risk of disease transmission that occurs with artificially dense elk populations at feedgrounds (Weigand and Mackie 1985).

## **Game Damage**

The general hunting season is FWP's primary tool for regulating wildlife populations. However, hunter access, weather and other factors can reduce the effectiveness of the general season harvest in controlling wildlife populations in any year or series of years. Some areas may experience chronic wildlife damage to agricultural products regardless of elk population levels, but damage complaints may increase in other areas when elk populations have increased over several years.

Two Montana Supreme Court decisions have ruled that private landowners are expected to accommodate a certain amount of wildlife use of their lands. However, if a combination of circumstances result in wildlife use of private land at "unreasonable levels" that cause problems for landowners, the state, with some exceptions, assumes responsibility to help eliminate, prevent or resolve these problems. By law (87-1-225 MCA) FWP is required to respond to all big game damage complaints. MCA 87-1-225 states: (1) Subject to the provisions of subsection (2), a landowner is eligible for game damage assistance under subsection (3) if he:

- (a) allows public hunting during established hunting seasons; or
- (b) does not significantly reduce public hunting through imposed restrictions.

(2) The department may provide game damage assistance when public hunting on a landowner's property has been denied because of unique or special circumstances that have rendered public hunting inappropriate.

(3) Within 48 hours after receiving a request or complaint from any landholder or person in possession and having charge of any land in the state that wild animals of the state, protected by the fish and game laws and regulations, are doing damage to the property or crops thereon, the department shall investigate and arrange to study the situation with respect to damage and depredation. The department may then decide to open a special season on the game or, if the special season method be not feasible, the department may destroy the animals causing the damage. The department may authorize and grant the holders of said property permission to kill or destroy a specified number of the animals causing the damage. No wild ferocious animal damaging property or endangering life shall be covered by this section.

FWP Game Damage Policy states that the following definitions (A) and (B) shall be used to determine game damage assistance eligibility.

- (A) “allows public hunting” is defined as **“allows hunting without charge or consideration and without restrictions (as defined in (B)) to members of the general public during established seasons. For purposes of game damage assistance eligibility, hunting must be allowed for the species for which the complaint has been made.”**
- (B) “does not significantly reduce public hunting through imposed restrictions” is defined as **“does not impose restrictions which prevent the general public hunter harvest of the species for which the complaint is made. Such restrictions may include:**
- (1) species of animals hunters are allowed to hunt;**
  - (2) portion of land open to hunting;**
  - (3) time period during which land is open to hunting;**
  - (4) fees charged; or**
  - (5) other restrictions which render harvestable animals inaccessible.**

FWP Game Damage Policy further indicates that field personnel should respond quickly and effectively to game damage situations, employing game damage abatement activities on a progressive scale of intensity, from the least dangerous or harmful to the wildlife doing the damage up to and including lethal methods such as damage hunts and kill permits. Generally speaking, the progressive steps for the use of game damage techniques are:

- (1) Dispersal through the use of noise makers and repellants, or other activities agreed upon which would serve to haze animals away from an area;
- (2) Physical barriers such as snow fence, mesh wire, panels, permanent stackyards or electric fence used to protect harvested, stored crops; fence barriers will not be provided for protection of unharvested crops standing in the field;
- (3) Damage hunts during the periods of August 15<sup>th</sup> to the opening of fall Commission-established seasons and from the close of fall Commission-established seasons through February 15<sup>th</sup>;
- (4) Kill permits used by landowners or, in rare instances, department persons.

Most damage complaints related to elk occur in late summer/early fall and early winter, to haystacks, in FWP Regions 2 and 3, and the most common response is to supply panels/fences (Tables 6, 7 and 8). As might be expected, most damage complaints occur in the Regions with the most elk. Also, the fact that supplying panels/fencing is the most common FWP response is related to the prevalence of haystack damage. Ideally, FWP would prefer to reduce total elk numbers through regular season hunts in many of these areas. In some areas that solution has not been successful, and in other situations the damage is chronic and not related to total numbers of elk, but to location and situation.

Table 6. Elk game damage complaint summary by FWP Administrative Region, July 2000 through June 2001.

Month	R-1	R-2	R-3	R-4	R-5	R-6	R-7	Statewide
July		1	4	1	2	1		9
August		12	14		9	1	1	37
September		3	6		1			10
October		2	1	1	2			6
November		4	3		1			8
December	3	8	9	3	1		2	26
January	4	3	3		1			11
February	2	1	3	2	1			9
March	1			1				2
April								0
May	1	1	2					4
June		4	3	1		2	1	11
Total	11	39	48	9	18	4	4	133

Table 7. Type of elk game damage reported by FWP Administrative Region, July 2000 through June 2001.

MFWP Region	Haystack	Alfalfa/Other Crop	Pasture	Fence
1	10		1	
2	21	9	8	
3	21	6	9	7
4	8		1	
5	5	11	1	
6		1	3	
7	2	2		
Total	67	29	23	7

Table 8. FWP action related to elk game damage reports reported by FWP Administrative Region, July 2000 through June 2001.

Area	Panels/Fencing	Scare guns/cracker shells	Herding	Kill Permits	Hunting	None
R-1	6	3				2
R-2	19	6	10	5	5	
R-3	28	8	3	6	5	
R-4	6	2				
R-5	5	5	4	5		1
R-6		3	2			
R-7	2	3				
Total	66	30	19	16	10	3

Typically, A-7 licenses, early and late season extensions or hunts, and antlerless permits targeted to non-public lands have all been regulations that were an attempt to deal with game damage situations. In some cases, they were also proposed for general population reduction. The new authority for A-9/B-12 licenses (B-tags) may also be useful in game damage situations.

### **Elk Habitat**

Yearlong ranges of elk may encompass lands administered by several federal and state land management agencies and private and corporate landowners/managers. Some elk herd ranges also extend into other states and Canadian provinces. Thus, management of elk habitat, including conflicts with other resources, game damage, hunting access and competition for elk hunting opportunity is very complicated.

Management of elk habitat on public lands is under the authority of federal and state land management agencies, specifically the U. S. Forest Service (USFS), Bureau of Land Management (BLM), U. S. Fish and Wildlife Service (USFWS) and Montana Department of Natural Resources and Conservation (DNRC). The latter two agencies have more narrowly focused management mandates than the USFS or BLM. Management of elk habitat and hunter access by any of these agencies will not necessarily or usually consider elk as top priority. Habitat management on private and corporate lands is the prerogative of the landowner. FWP is directly involved in management of elk habitat only on FWP administered WMAs and on private and public lands included in cooperative habitat management programs or agreements such as conservation easements or grazing systems. Of total elk distribution in Montana, 45.3% is on lands managed by USFS, 37.3% by private/corporate owners, 7.1% by BLM, 4.3% by DNRC, 3.5% are Indian/Tribal lands, 1.8% by USFWS, and 0.6% by FWP.

Wildlife, including elk, are a product of the land, a renewable resource that depends on healthy habitat, including the basics of soil, water and vegetation. Thus, although the primary responsibility of FWP regarding elk is managing populations through designing and enforcing hunting regulations, we cannot ignore issues dealing with the habitat that supports and perpetuates elk populations. As FWP Director Hagener stated in the May/June 2003 issue of *Montana Outdoors*: "...should the (conservation) plans address land use, even though FWP has no authority over private property or other agencies' lands?" ... "FWP does not have authority over land use, but our ability to conserve Montana's fish and wildlife depends on habitat just as the species themselves do. That's why we constantly seek to involve those who do have authority over land – both private property owners and land management agencies – to join with us in our shared task of ensuring the future abundance of Montana's wildlife treasures." As part of their duties, FWP biologists provide technical assistance to land managers regarding elk habitat issues affecting elk populations and management. This will include providing input to Forest Management Plans, Allotment Management Plans, or other habitat management activity by land managers.

FWP concerns with habitat/land management relative to elk fall into 2 categories: 1.) preserving important wildlife habitats and maintaining/enhancing the basic productivity of the land – soil, water and vegetation and; 2.) land management activities that influence elk management prescriptions. Under the first category, FWP works with landowners/land management agencies to promote management that does not lead to erosion, deterioration of riparian habitat, or overuse of vegetation that leads to plant loss, or permanent loss of habitat through housing development. For direct FWP action, this may mean recommending hunting seasons intended to reduce elk numbers below levels where there is impact on vegetation health. FWP action might also include fee-title acquisition or purchase of a conservation easement. For domestic livestock, it may include promotion of grazing systems such as rest-rotation systems and exchange of use agreements. Any land management activity such as logging, grazing, burning, plowing, or housing development may have a variety of impacts (negative, positive, or neutral) on wildlife and the land that may vary by species and activity. Thus, FWP recommendations will vary on a case-by-case basis. Acceptance of any recommendations by FWP is entirely up to the land management agency, landowner or in some cases, city or county governments. Government land management agencies must balance recommendations by FWP with those of other groups or individuals and with their agency mandate/mission. Successful programs or agreements with private landowners must produce benefits for both parties. FWP will not support any habitat management that it perceives as detrimental to the long-term health of the soil, water and vegetation or that permanently reduces the amount of elk habitat.

Many habitat management recommendations by FWP are relative to actions that may not permanently affect productivity of the land, but could impact effects of hunting seasons and regulations. For example, relative to elk, land management activities that reduce the amount of hiding cover increases the likelihood of hunter harvest under a given hunting season type. Similarly, an increase or decrease in access related to roads or trails will also affect the likelihood of harvest. Much research has shown that there is a direct relationship between level of road access and bull elk mortality (Leptich and Zager 1991, Unsworth and Kuck 1991). In areas with substantial hiding cover, elk security can be controlled by road management alone (Unsworth et al. 1993). In areas with less hiding cover and relatively gentle terrain, the patch size, connectiveness and total amounts of hiding cover are very important components of elk security (Hillis et al 1991, Lyon and Canfield 1991, and Hamlin and Ross 2002). Road density is also important in these areas (Hamlin and Ross 2002) and hunter density and terrain ruggedness are important in all areas.

Montana has maintained the longest general elk-hunting season (5-weeks) of all western states and the fewest areas with restrictive limited-entry hunts. In survey after survey, Montana hunters indicate they wish to preserve this tradition. At some point, cumulative effects of cover reduction and/or increased roads and trails would make it unlikely that FWP could maintain a 5-week general bull elk hunting season and maintain objectives for post-season bull:100 cow ratios. Thus, to continue a 5-week general bull elk season popular among the hunting public, FWP biologists have generally recommended against or asked for mitigating actions or modifications to habitat management projects that

substantially or cumulatively reduce hiding cover or increase access to previously secure areas. A variety of current and proposed land management activities might not be beneficial for elk and elk hunting. FWP recognizes that elk considerations will not often be the primary deciding factor in habitat management prescriptions. However, FWP will recommend modifications that either benefit elk and elk hunting or that will reduce the harm done to elk and elk hunting by those habitat management prescriptions.

“The Healthy Forest Initiative”, emphasizing fire prevention and habitat manipulations at the urban interface, will have a variety of implications to elk management. This initiative may primarily affect elk winter range as written, but it’s application on the ground is yet to be determined. Some current proposals will affect yearlong elk habitat. Habitat manipulation projects related to this initiative may have potentially beneficial, neutral, or negative consequences for elk.

Housing development in some cases may not substantially reduce the amount of elk habitat. However, development may hinder effective harvest and population control, which contributes to overabundance and game damage. Also, rural subdivision development may adversely affect elk movement patterns and distribution. FWP will be very concerned with habitat developments or manipulations that hinder hunting as a population control technique or significantly change elk behavior.

#### FWP Habitat Plan

In 1987, the sportspeople of Montana proposed legislation to provide a stable, earmarked funding source for wildlife habitat acquisition. The law (HB 526) provided for an earmarking of a portion of hunting license dollars for protecting wildlife habitat. FWP had a wildlife habitat acquisition program since 1940 that had acquired important elk winter ranges, but funding was not stable. In 1991, the Montana legislature mandated a study of the FWP habitat program. As a result, in 1995, the FWP Commission as part of their Habitat Montana Policy adopted a Statewide Habitat Plan. Although fee-title acquisitions remained an option, much greater emphasis was placed on use of conservation easements, management agreements and leases. Because of the level of threat, a goal of conserving 10% of the intermountain grassland, shrub-grassland and riparian ecosystems was established. Criteria were also established for determining suitable projects and type of conservation action.

Through FWP, the state of Montana has acquired 21 Wildlife Management Areas (WMAs) totaling 306,083 acres (fee-title and leased) of elk habitat (primarily winter range). About 17,500 elk winter on these WMAs. Because of strategic location, acquisition of about 0.3% of Montana’s land supports about 18% of the elk counted in Montana during winter. Additionally, 77,507 acres of elk habitat have had housing development precluded, managed grazing systems implemented, and hunter access guaranteed through FWP acquisition of conservation easements. FWP has developed a policy for fencing specifications relative to elk and other wildlife on WMAs. These specifications can serve as recommendations for other lands with elk use.

## Habitat Monitoring

House Bill 42, passed by the 2003 Montana Legislature requires FWP “to manage elk, deer and antelope populations in a sustainable manner that keeps animal populations at a number that does not adversely affect Montana land”. Calculations of “sustainable numbers shall consider the specific concerns of private landowners” and “average carrying capacity and use generally accepted animal unit factors for each species in each commission region”.

FWP does not monitor vegetation on a widespread scale throughout elk habitat. However, FWP has vegetation-monitoring programs (permanent standard measurement plots and photo plots) established on some of its WMAs. These are monitored on a long-term basis to determine whether the plant community is stable, declining, or improving relative to time of purchase and to current elk numbers. FWP also has monitored condition of woody vegetation in wildlife habitat (Keigley and Frisina 1998, Thompson 2002). An option for FWP to explore is cooperation in design and monitoring of vegetation monitoring programs by land management agencies. Another potential habitat monitoring technique is the use of allantoin:creatinine ratios in elk urine in snow (Pils et al. 1999, Hamlin and Ross 2002) to monitor energy content of the elk diet over time. Short-term changes will relate to immediate conditions such as snow depth. Consistent deterioration over long periods, however, could indicate a decline in vegetation (forage) composition and condition.

Forage production and use is extremely variable across Montana among years. For example, elk forage production estimated for usable habitat on the Sun River WMA was 537 lbs/acre in 1989, 851 lbs/acre in 1990, 1,125 lbs/acre in 1991, 517 lbs/acre in 1992 and 844 lbs/acre in 1993, an increase of 2.1-fold from low to high (Jorgensen 1994). Production of forbs varied by 15.7-fold from low-to-high over 11 years from 1976 through 1986 in the Missouri River Breaks, grass production varied by 4.5-fold over the same period and shrub production varied 5.3-fold over 7 years, 1976-1982 (Hamlin and Mackie 1989). Quantity of forage was not a limiting factor there (Hamlin and Mackie 1989). These data indicate that “carrying capacity” based on forage varies substantially and unpredictably from year-to-year.

Nelson and Leege (1982) reported that adult elk consumed 1.5 to 2.5 lbs of air-dry weight forage per day per 100 lbs of body weight during winter. If we use 570 lbs for live weight of an average cow elk and 2.25 lbs of forage/100 lbs body weight (both figures at the high end), then an average cow elk would consume 12.8 lbs air-dry weight forage/day during winter. Over a 151-day winter period (December-April), the 7,139,104 lbs of forage produced in 1992 on the Sun River WMA would have supported 3,694 elk. During 1991, the high production year, enough forage was produced to support 8,035 elk. In recent years, 2000-2500 elk have used the Sun River WMA, with an objective of 2,000 observed elk. Thus, elk numbers were about 68% of forage capabilities during the worst year and 31% during the most productive year.

The vegetation data collected thus far at monitoring transects on WMAs do not indicate deteriorating range conditions, except possibly on portions of the SRWMA (B. Harrington, personal communication). Weight and condition data collected from harvested elk at check stations throughout Montana do not indicate that elk are in “poor” condition or facing nutritional deficits, even where elk are above objective numbers. Data for the energy content of elk diets on the Wall Creek WMA and the Hungry Horse elk herd during the severe winter of 1996-1997 (Pils et al. 1999, Hamlin and Ross 2002) indicated that diet quality was greater for these populations than for populations in Yellowstone National Park and equal to that of the artificially fed population on the National Elk Refuge in Wyoming. Limited data suggests that the quality of winter elk diets in the Gravelly-Snowcrest Mountains were even greater than those of the artificially fed population during milder winters (Hamlin and Ross 2002). Also, we have not observed “winter-kills” of elk in portions of Montana not associated with YNP that might be attributed to poor forage conditions.

The limited habitat/forage/elk condition information currently available to FWP indicates that “shall consider the specific concerns of private landowners” may be the most operative factor in determining “sustainable numbers” of elk at this time.

### **Wolves and Other Predators**

Wolves, grizzly bears, and mountain lions (cougars) can all be effective predators of adult elk. They, along with black bears and coyotes are also effective predators of newborn elk calves through their first few months of life. The hunting/foraging strategies of these predators differ. In Montana, bears are typically a major predator of newborn calves that are concentrated in predictable “calving areas, with wolves and lions becoming more important predators as calves become more mobile. Coyotes usually are minor but consistent predators of elk calves during the first few weeks of life. The fact that these predators do kill young and adult elk is not debatable. However, scientists, hunters and laypeople have debated the impact of this predation on elk population numbers and its influence on numbers of “hunnable animals” for many years. The restoration of wolves to the Greater Yellowstone Area, and the natural dispersal of wolves into northwestern Montana, have stimulated this debate to new heights and has resulted in the initiation of new studies of potential impacts of wolves on elk and other ungulate populations. Impacts of individual species of predators on prey have been studied in a variety of locations and situations, but the impact of a combination of large, effective predators will likely be greater.

The effects of wolves and other predators on elk populations was one of the top issues of concern to the public in our scoping for issues relative to this Elk Management Plan revision. A small amount of concern about this issue was evident during preparation of the 1992 Elk Management Plan, but it was not one of the top concerns that it is today. Tabulation of unsolicited comments by hunters interviewed for Montana’s Statewide Harvest Questionnaire telephone survey indicated that during the last 2 years, the issue of wolves and predation in general has reached a level beyond any other issue since records were kept beginning in 1996. In 2002, 81.1% of interviewers listed wolves as one of the

top 3 issues mentioned by hunters compared to 3.8% in 1996. No other issue was mentioned by more than 50% of interviewers since 1996. For the 2002 hunting season, 13.6% of hunters reported observing a wolf or wolves at one location and 8.9% reported observing multiple wolves at more than one location (Brooks, unpublished).

Wolves are currently managed by the U. S. Fish & Wildlife Service (USFWS) under the authority of the Endangered Species Act and wolves in southwestern Montana are managed under the rules of experimental population status. Effective 1 April 2003, wolves in the Western Distinct Population Segment (includes northwestern Montana) were down-listed from endangered to threatened status. The experimental population in southwestern Montana, Yellowstone National Park/Wyoming and central Idaho were unaffected by this ruling. The new threatened status for wolves in northern Montana allows wolf management very similar, but slightly more flexible than allowed in the experimental population areas. Currently, FWP and the state of Montana have no management authority for wolves. However, as of spring 2004, through a cooperative agreement with USFWS, Montana and FWP has "Designated Agent" status in northwestern Montana and "Cooperator" status for the experimental area. Thus, FWP can make wolf management decisions in northwestern Montana that are consistent with Federal guidelines. In the experimental area, FWP has no decision authority, but can assist the USFWS in wolf management.

Wolves in the experimental population area have met the numerical and distributional requirements necessary to be de-listed from management under the Endangered Species Act. The USFWS proposes to de-list wolves in this area and turn management over to the states upon completion of acceptable state wolf management plans by Montana, Idaho and Wyoming. When that process is completed, the state of Montana, through FWP, will manage wolves according to the recently completed Montana Gray Wolf Conservation and Management Plan. Under this plan, "FWP would manage gray wolves and ungulates in an integrated ecological manner and within the context of other environmental factors. If a local prey population were significantly impacted by wolf predation in conjunction with other environmental factors, FWP would consider reducing wolf pack size. If there were fewer than 15 breeding pairs (in Montana), relocation would be considered. If there are more than 15 breeding pairs, FWP will reduce pack size through liberal management tools, which could include regulated hunting or trapping. Wolf management actions would be paired with other corrective measures to reduce ungulate mortality or enhance recruitment such as decreasing hunter opportunity for antlerless animals."

When Montana receives management authority for wolves, management of wolves and elk could be somewhat integrated as described above. Currently, and throughout the period when FWP has no management authority for wolves, FWP will manage elk according to the prescriptions in this revised elk management plan. These management prescriptions consider any observed changes in elk population level and recruitment of new elk (calf:100 cow ratios). Should significant reductions in the above factors occur for any reason, including wolf predation, FWP will recommend restrictive regulation packages that generally include reduction or elimination of antlerless harvest if trend counts fall below objectives.

Other predators of elk including grizzly bears, black bears, and mountain lions have completed species management plans. If predation on elk by black bear or mountain lions is considered excessive, adjustments in harvest regulations for these species could be made if considered in an ecological context. Revisions of the black bear and mountain lion management plans are scheduled after current research studies on these species are completed between 2007 and 2009. Grizzly bears are currently a federally protected species managed under the Endangered Species Act. Like wolves, grizzly bears are being considered for delisting by the USFWS. Montana has completed a grizzly bear management plan for southwestern Montana and is working on a management plan for the rest of the state.

HB 262, passed by the 2003 Montana Legislature establishes policy for FWP regarding management of large predators. That policy is as follows:

**Policy for management of large predators – legislative intent.**

- (1) In managing large predators, the primary goals of the department must be to:
  - (a) preserve citizens’ opportunities to hunt large game species;
  - (b) protect humans, livestock, and pets; and
  - (c) preserve and enhance the safety of the public during outdoor recreational and livelihood activities.
- (2) As used in this section:
  - (a) “large game species” means deer, elk, mountain sheep, moose, antelope, and mountain goats; and
  - (b) “large predators” means bears, mountain lions, and wolves.
- (3) With regard to large predators, it is the intent of the legislature that the specific provisions of this section concerning the management of large predators will control the general supervisory authority of the department regarding the management of all wildlife.

**Surveys of Hunter Attitude, Opinion, Preference, and Characteristics**

FWP has conducted a variety of statewide and more focused surveys of hunters for attitude, opinion, preference, and characteristics over the years through its Responsive Management Unit. Statewide samples of resident and non-resident hunters were surveyed in 1988 (Allen and FWP 1988), 1998 (King and Brooks 2001) and residents only in 2002 (Brooks, unpublished). We presented some results in earlier sections and will cover more general results here and within the following Economics and Commerce section.

Average age of all elk hunters increased from 38 years in 1988 to 46 years in 1998 and for residents only, remained stable at 42 years in 2002. In 1988, 5% of the sample was women, 6% in 1998, and 12% in 2002. Participation in archery hunting increased from 1% of the sample in 1988 to 15% in 1998. The percent of resident hunters that used an ATV increased from 4% in 1988, to 8% in 1998, and 9% in 2002. Non-resident hunter use of ATVs increased from 4% in 1988 to 11% in 1998. Resident hunter use of horses decreased from 22% in 1988, to 15% in 1998, and 14% in 2002. Non-resident hunter use of horses declined from 37% in 1988 to 26% in 1998.

Opinions of hunters on the use of roads for retrieval of elk did not change much in the 1988, 1998, and 2002 surveys. For 1988, 1998, and 2002, 53, 51%, and 47% respectively, of hunters said that only open roads should be used for vehicle retrieval of harvested elk. For the same years, 31%, 32%, and 37% said that closed roads should also be available for retrieval by vehicle. Similarly, 22%, 18%, and 17% said that hunters should be allowed to drive vehicles off-road for retrieval purposes.

In 1998, resident hunters were willing to pay about equal amounts more than current expenditures to double their chances of harvesting a 6-point or greater bull or see half as many hunters on their trip. Non-resident hunters were willing to pay about 50% more for the opportunity to harvest a 6-point or greater bull compared to the opportunity to see half as many hunters.

In 1998 and 2002, resident hunters were asked to choose among 3 bull elk regulation types: 1.) no permits required, hunt every year anywhere in the state, odds of harvesting a bull less than 1 in 10; 2.) unlimited permits, must choose hunting district, can hunt every year; and 3.) limited permits, may only receive permit 1 of 5 years, much better chance of harvesting a bull. Option 1 was favored by 39% of hunters in both 1988 and 2002, option 2 by 18% in 1988 and 17% in 2002, and option 3 by 10% in 1988 and 16% in 2002. Including the response of “do not favor, but would accept it”, 63% of resident hunters in 1988 and 57% in 2002 chose option 1, 50% and 44% option 2, and 28% and 31% option 3. These results indicate that resident hunters prefer the opportunity to hunt every year to an improved chance to harvest a bull when they do hunt. It also indicated that they prefer the opportunity to hunt in multiple locations in the state within a year to an increased opportunity to harvest a bull. In 1988, non-residents favored option 2 (unlimited permits by hunting district).

Resident hunters were also asked in 2002 to rank order 5 options (1 to 5) for increasing antlerless elk harvest where population reductions were necessary. A combined ranking of 1<sup>st</sup> or 2<sup>nd</sup> choice was: lengthen season – 55.0%; increase A-7/antlerless permits – 50.9%; use a quota and season remains open until quota is met – 43.7%; use a “B-tag” for a second antlerless elk – 28.9% and; temporarily open closed roads for retrieval – 28.4%. The last 2 options had high (61.0% and 57.7%, respectively) negative rankings (4 or 5). Lengthen the season had the lowest negative ranking (12.4%).

Of resident hunters surveyed in 2002, 42% had attempted to gain permission to hunt elk on private lands. Of those, 59.6% were successful in obtaining permission (25% of all resident hunters). Of those residents actually hunting elk on private lands, 5.1% paid for the privilege (2.1% of all resident hunters). Block Management lands were hunted for elk by 25.3% of resident hunters.

Resident elk hunters were also asked in 2002 to rank priorities for FWP spending if additional funding became available. The following categories were targeted for more money spent by FWP by a majority of respondents: Hunting Access – 71.4%; Habitat Improvement – 59.6%; Habitat Acquisition – 51.8%; and Predator Management – 50.1%.

## **Economics and Commerce**

Elk are well known for their cultural and aesthetic importance to Montana, but they are economically very important as well. In 2001, hunters spent an estimated \$237,605,000 in Montana (USDI, FWS and Dept. of Commerce, U.S. Census Bureau 2003). Of this, non-residents spent \$63,771,000. Big game hunting accounted for about 80% of this total. Wildlife watching activities resulted in an estimated expenditure of \$350,335,000 and \$157,750,000 of this was spent by non-residents. Thus hunting and wildlife watching accounted for an estimated \$587,940,000 in expenditures in Montana, of which \$221,521,000 (37.7%) was by non-residents. This expenditure was equivalent to about 1.6% of total economic output in Montana during 1999 (Minnesota IMPLAN Group 2002). Inclusion of expenditures for fishing (\$292,050,000) raises the total to about 2.3% of all economic output in Montana. Based on the USFWS survey, hunting and wildlife watching generated about 23% of the economic output that farming, ranching, and agricultural services combined produced in Montana during 1999. Similar percentages were 62% of the combined economic output of all mining, 38% of the output of the petroleum industry, and 32% of the combined output of forestry products, wood products, and pulp and paper.

Studies of the Net Economic Value of elk hunting in Montana (Duffield 1988, King and Brooks 2001, and Brooks unpublished 2004) estimated expenditures per day by resident elk hunters of \$40.50 in 1988, \$47.20 in 1998, and \$53.82 in 2002. For non-residents, the comparable figures were \$186.56 in 1988 and \$207.42 in 1998. Estimates for non-residents were not made in 2002, but if expenditures increased at the same rate as for residents, the equivalent figure for non-residents in 2002 would have been \$236.00. These figures are expenditures for food, travel, and equipment (purchased for that trip only) and exclusive of license fees. An estimate of \$38,088,898 in resident and \$29,622,956 in non-resident expenditures, or \$67,711,854 total elk hunting expenditures are derived when expenditures per day are multiplied by number of days hunted for elk in Montana in 2002.

In 2002, elk license sales to Montana residents generated \$1,861,925 in income to FWP and non-resident elk license sales generated \$11,715,222 in income to FWP. This total of \$13,577,147 was about 53% of all license fees received by FWP and equal to the entire budget for the Wildlife Division. It also accounts for a high proportion of FWP's discretionary spending because much other FWP funding is earmarked for specific purposes. This total does not include elk permit drawing fees, archery license fees, or conservation licenses fees not included in license packages. It also does not include a share of \$5.6 million in Federal Pittman-Robertson funds that could be attributed to elk hunting/hunters. Thus, elk and elk hunting are of major importance to FWP funding and conservation and management programs for much more than elk.

Outfitting is a major industry in Montana and outfitted elk hunting is an important part of that industry. The majority of clients are non-residents; only about 1.5% of resident elk hunters utilize the services of outfitters (King and Brooks 2001). Although outfitter

sponsored licenses form a stable base of income for outfitters, some holders of the non-resident big game combination non-sponsored license also use the services of outfitters. Statistics compiled by Sime (2003) for a sample of elk hunting counties (Lincoln, Flathead, Gallatin, Beaverhead, Sweetgrass, and Madison) indicated that during 1999-2001 non-sponsored license holders averaging 44% of the number of sponsored license holders used the services of outfitters. Numbers of non-sponsored license holders using outfitters may be a slightly lower percentage than the above figure because of multiple reporting of the same client for multiple species. Thus in subsequent calculations, we use 35% of sponsored licenses as a multiplier.

Websites of Montana Outfitters and Guides Association (MOGA) listing elk hunting and prices for services were surveyed (<http://www.moga-montana.org/guide.html>). Seventy-two different businesses provided information relevant to elk hunting and fees on their websites. Notation was made if the site specifically mentioned availability of owned or exclusively leased private land or special private land hunts. If fees were different for different types of hunts, 2 hunters – one guide, one hunter – one guide, wilderness, lodge, etc., they were recorded separately and later averaged. Thus, for example, one business could provide 4 different fees for averaging costs of an outfitted elk hunt in Montana. For 86 hunting fee options that did not specifically mention the availability of owned or leased private land, the average price for an elk hunt was \$3,183.14 (range: \$1,695 - \$4,200). For 21 hunting fee options that mentioned the availability of owned or leased private land, the average price for an elk hunt was \$4,657.14 (range: \$2,950 - \$11,000). Thus the availability of owned or leased private land with a lightly hunted bull population added an average of about \$1,500 or 46% to the price of an outfitted elk hunt. The average for all 107 different price options recorded was \$3,472.43 for an outfitted elk hunt.

During 2002, 4,359 non-resident big game combination outfitter sponsored licenses and 652 non-resident elk combination outfitter sponsored licenses (5,011 total) were sold. Addition of 35% (1,754 non-sponsored hunters – see above) to that total indicates that 6,765 hunters may have used the services of outfitters to hunt elk in Montana during 2002. At an average price of \$3,472 per elk hunt, 6,765 elk hunters may have provided about \$23,488,080 in income to Montana outfitters. Thus outfitting elk hunters contributes substantially to bringing income to Montana from outside the state.

Much income to the state provided by elk is “hidden” in the retail and real estate sectors, among others. Many real estate ads in Montana trumpet the presence of elk in or near the subdivision or ranch as a prime attractant. Many products use the image of elk as an attractant or are designed to improve elk hunting and viewing. The Rocky Mountain Elk Foundation has its international headquarters in Missoula, Montana. Although most of its \$34,935,891 expenditures in 2002 was outside Montana, likely much of the \$4,724,704 management, general, and fundraising expenditures were spent in Montana along with at least some on the ground expenditures for habitat acquisition and improvement, etc.

## **Research**

FWP recently completed a 12-year study of: “Effects of hunting regulation changes on elk and hunters in the Gravelly-Snowcrest Mountains, Montana” (Hamlin and Ross 2002). This study examined the effects of changing bull elk regulations from AB to BAB to BTB over the period. It also examined the effects of changing antlerless permit levels. Effects on elk sex and age structure, reproduction, mortality, habitat use, distribution, movements and hunter numbers, success and attitudes were reported.

Currently, FWP is involved in 2 research projects related to elk. The first is a cooperative study with Montana State University – Ecology Department, USFWS, and NPS-Yellowstone National Park. This study is a long-term project to examine effects of wolf restoration on ungulates (especially elk) in the Greater Yellowstone Area of southwestern Montana. The study areas include the Northern Yellowstone range, the Madison-Firehole area of YNP, and the Gallatin, Madison and Gravelly-Snowcrest Mountains. Our study approach allows for comparisons among demographics of elk herds subject to wolf predation, but no hunting, herds affected by both wolf predation and hunting, and elk herds affected by hunting, but little or no wolf predation. As time progresses, expansion of the study outside the GYA may be necessary to find areas with no impact by wolf predation. By working in areas with differing ecological characteristics, including wolf abundance, we can make comparisons to identify factors that most impact wolf-elk dynamics. Because of the historical data on elk, we can make pre- and post-wolf comparisons among sites.

FWP and the University of Montana initiated a multi-year study in 2002 to document rates and causes of mortality of newborn elk calves in the east half of HD 292 in the Garnet EMU. Initiation of this study was in response to observed declining calf:100 cow ratios across much of FWP Region 2. This study also allows coordination with FWP’s mountain lion research in the same area, following any changes in elk calf mortality coincident with known and manipulated changes in mountain lion densities. The study will also serve as an area without significant presence of grizzly bears or wolves for comparison with an elk calf mortality study on the Northern Yellowstone elk range where grizzly bears and wolves are a significant component of the elk predator complex.

## **The Elk Plan and Other Species**

Elk distribution and habitat requirements overlap those of a variety of other wildlife species and domestic livestock. Native predators may also influence elk population dynamics and management. Management objectives in this elk plan represent a balance with management objectives for other wildlife populations and landowner tolerance relative to domestic livestock operations and agricultural crops. To the extent possible, the needs of a variety of non-game and threatened and endangered species were also considered in formulation of management objectives for elk. FWP also considered the needs of plant species, habitat communities, soil, water and humans as individuals, groups and communities in this elk plan.

Management objectives for elk considered objectives in FWP species management plans for mule deer, black bear, mountain lion, grizzly bear in southwestern Montana and the Montana gray wolf conservation and management plan. A management plan for white-tailed deer is in preparation, a management plan for bighorn sheep is in the planning stage and updates of the black bear and mountain lion plans will be completed when current research projects are completed. As discussed earlier, HB 262 establishes FWP policy regarding managing large predators in relation to large game species.

### **Establishing Number Objectives for Elk**

The public questions how number objectives for elk populations and EMUs are established. For specific EMUs and populations, some believe the number objectives are too low and some believe they are too high. Without a firm biological basis for setting the objective, one opinion is as valid as another. In the 1950s, 1960s and early 1970s, specific number objectives were not set, but a biological based method was used to classify the elk population as too high, too low or “about right” based on forage use transects. After about 30 years, it became apparent that this method was not realistic. Subsequent elk population and forage changes have generally indicated that in many areas elk populations could be sustained at much higher numbers than our assumptions about forage indicated. We have not established alternative forage-based models.

An alternative model based on calf recruitment rates as a surrogate for the forage quantity/quality/nutrition model has also been followed, at least in some areas. The premise behind this model was that recruitment at levels below about 20 calves:100 cows west of the continental divide and 35 calves:100 cows east of the continental divide indicated nutritional deficiencies and overuse of the forage resource. Thus, at observed recruitment below these levels an elk population reduction was indicated to reduce competition for forage. Although in theory this model has potential, in practice, it has not been very predictive. Hindsight has shown that some early periods of low calf recruitment occurred at elk densities a quarter or half of later elk densities with much higher recruitment. With this model, low recruitment due to density-independent effects of weather and predation may often falsely indicate that long-term forage effects have occurred. Another problem with both models mentioned is that the substantial annual variation in forage production obscures potential elk number/forage relationships. Substantial reductions in elk numbers proposed for some areas in this elk plan revision would allow further testing of density effects on calf recruitment.

In practice, elk number objectives have been or will be established using the following considerations.

1. The history of long-term trend counts and discussions with landowners on many areas indicate to biologists at what count level and under what conditions agricultural damage complaints become more frequent or excessive. Objectives for number of elk counted will be established below levels of excessive damage problems. For other areas, especially on public lands in northwestern Montana, elk numbers are below levels sustained in the past. There, FWP objectives for elk numbers may be above current levels.

2. Input from sportspersons, public land managers, and the general public will also be considered.
3. Increasingly, in problem areas, Community Working Groups are formed to help all stakeholders come to consensus about objectives for elk numbers and potential solutions to elk management problems in the area.
4. FWP has come to recognize that in some areas and for some elk populations, demand for antlerless harvest with current regulations is less than is necessary to reduce the elk population from current levels to the objective. A substantially more liberal regulation package than traditionally used may be necessary to reduce the elk populations to objective levels. Once objective levels are met, regulations can be modified to maintain stable populations under average environmental conditions. These objective levels may be lower than ecological potential and driven more by sociological tolerance.
5. Elk populations in portions of some EMUs may be almost entirely inaccessible to hunters during the general hunting season or accessible to only a few hunters. To avoid over-harvest of accessible elk on public lands or private lands open to hunting, the inaccessible elk may not be included in objective numbers. Trend count number objectives may include only elk normally accessible to general hunting (if they are a distinct segment), though hunter access negotiations will continue. Elk occupying these “refuges” may be counted separately where practical (if they are a distinct segment) and sub-objectives established that could be operative if access negotiations are successful. If significant harvest of these “refuge” elk is possible with special management at some times and locations, they should be included in objective levels.

During winter and spring 2004, FWP biologists contacted many members of the public in various ways to discuss drafts of Elk Management (EMU) objective numbers for elk and proposed regulation packages. Comments received through these discussions were considered in writing the EMU Plans. EMU objectives and regulation packages were discussed at 54 meetings related to the 2004 season-setting process, with 18 Sportspersons Groups, with 7 Working Groups, with 45 individual sportspersons, with 23 outfitters, with 4 landowner/outfitters, and with 288 landowners in elk habitat.

It is apparent in many areas, especially with significant elk use of private land, that the ecological potential for elk numbers is substantially above the numbers sustainable based on landowner tolerance. For these areas, the expectations of private landowners will be an important component in establishing objectives for elk numbers.