

# Washington State Elk Herd Plan

## NORTH RAINIER ELK HERD

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Wildlife Program  
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Date

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# NORTH RAINIER ELK HERD PLAN

## EXECUTIVE SUMMARY

The North Rainier Elk Herd is one of ten herds residing in the State. The elk herd range is north of Mt. Rainier, including Pierce and King counties. The core elk distribution is on the western slopes of the Cascade Mountain Range. Small satellite populations occur in the foothills and pockets of habitat near urban and suburban developments. It is an important resource that provides significant recreational, subsistence, cultural, aesthetic and economic benefits to Washington citizens and is a valued cultural, subsistence, and ceremonial resource to the Native American people of the area.

This plan's purpose is to provide direction for managing the North Rainier elk resource into the future. This is a five-year plan subject to amendment. Before the fifth year, this plan should be updated, reevaluated, amended and implemented for another 5-year period. It will be a valuable reference document and guideline for the Washington Department of Fish and Wildlife, Tribes, agency cooperators, landowners, and the general public. Priority management activities will be implemented as funding and resources become available.

Three primary goals guide the North Rainier Elk Herd Plan: (1) to manage the elk herd for a sustained yield; (2) to manage elk for a variety of recreational, educational, and aesthetic purposes including hunting, scientific study, cultural and ceremonial uses by Native Americans, wildlife viewing and photography; and (3) to manage and enhance elk and their habitats to ensure healthy, productive populations.

Specific elk herd and habitat management, objectives, problems, and strategies are identified in this plan. Priority objectives address specific problems in managing this elk herd, and a variety of strategies have been developed to solve these problems. The following objectives have been identified:

- Improve the collection of accurate scientific data to better manage this elk herd.
- Increase elk population numbers in the following units:
  - Snoqualmie (GMU 460), from 175 to 500 elk
  - Green River (GMU 485), from 150 to 500 elk
  - White River (GMU 653), from 600 to 900 elk, with fall index flights in Mt. Rainier National Park approaching 600 to 700 elk.
- Manage the North Rainier elk herd to ensure harvest does not exceed recruitment.
- Provide hunting opportunities while managing the herd for minimum post-season bull ratio that are consistent with statewide management plan objectives, currently 12 bulls per 100 cows.
- Provide for harvest opportunities of black bear and cougar consistent with population management objectives.
- Recognize and promote viewing and photographic opportunities that this elk herd provides.
- Work cooperatively with the Tribes to implement the North Rainier Elk Herd Plan.

- Develop partnership opportunities to increase the availability, quantity, and quality of elk habitat on important sites.

Spending priorities have been identified for the next five years. Achieving spending levels will be contingent upon available funds and the creation of partnerships. The recommended priority expenditures for the North Rainier elk herd are as follows:

<u>Spending Priorities</u>	<u>1<sup>st</sup> Year</u>	<u>5 Years</u>
• Population estimation using mark recapture surveys at three to five year intervals (cost-share with Tribes).	\$17,600.00	\$52,800.00
• Herd composition surveys (cost-share with Tribes).	\$11,500.00	\$57,500.00
• Monitor harvest and collect age data.	\$10,000.00	\$50,000.00
• Habitat enhancement on primary winter and summer ranges.	\$10,000.00	\$50,000.00
• Elk augmentation to the North Rainier herd area. (cost share with tribes)	\$48,400.00	\$96,800.00
• Elk research needs. (cost share with tribes)	<u>\$20,000.00</u>	<u>\$100,000.00</u>
<b>Total</b>	<b>\$117,500.00</b>	<b>\$407,100.00</b>

# NORTH RAINIER ELK HERD PLAN

## INTRODUCTION

### The Plan

The North Rainier Elk Herd Plan provides the historical background, current conditions and trends for this important natural resource. The plan is an assessment document that identifies management problems, develops solutions to overcome these problems, and sets direction. It outlines goals, objectives, problems and strategies and helps establish priorities to resolve management issues concerning the North Rainier elk herd. It also provides a readily accessible resource for biological information collected from the herd and identifies the current inadequacies of this scientific information.

This plan is one of ten elk herd plans under the umbrella of the Washington State Management Plan for Elk (Washington Department of Fish and Wildlife 1997) and the Environmental Impact Statement for Elk Management (Washington Department of Fish and Wildlife 1996). It is a five-year-planning document subject to annual review and amendment. Once approved, this plan will remain in effect as amended or until canceled. The Washington Department of Fish and Wildlife recognizes the sovereign status of federally recognized treaty tribes and the right to implement their own hunting regulations. This document recognizes a responsibility of the Washington Department of Fish and Wildlife to cooperate and collaborate with the Point Elliott and Medicine Creek Treaty Tribes. It also recognizes the pivotal role that private landowners and public land management agencies, notably the U.S. Forest Service, National Park Service and Washington Department of Natural Resources, play in assisting to manage and sustain this elk herd.

### The Herd

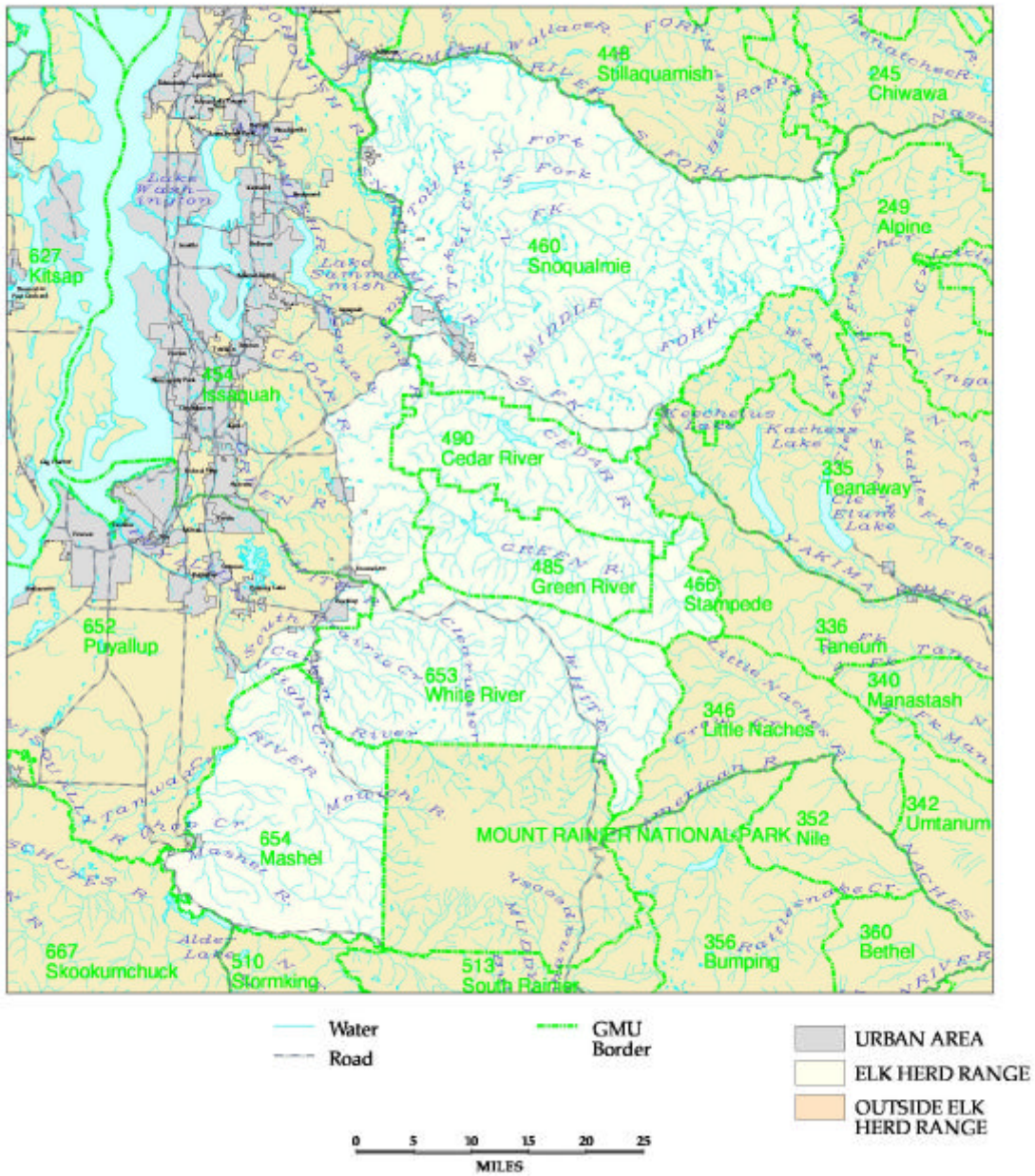
For management and administrative purposes the state has been divided into numerous game management units (GMUs). In this context, an elk herd is defined as a population within a recognized boundary as described by a combination of GMUs. The North Rainier elk herd includes the following GMUs: Issaquah (454), Snoqualmie (460), Stampede (466), Green River (485), Cedar River (490), Puyallup (652), White River (653), and Mashel (654) (Map 1).

## HERD AREA DESCRIPTION

### Location

The North Rainier elk herd range encompasses approximately 7,341 square kilometers (2,834 square miles) of habitat primarily in King and Pierce counties and small portions of Snohomish and Kittitas counties. The herd occupies the headwaters of the White and Clearwater rivers in the northern portion of Mount Rainier National Park and the greater Puyallup River drainage in the western portion of the park.

Map 1. North Rainier Elk Herd Area





The North Rainier elk herd area is described as follows: That portion of Pierce County east of Highway 161 from the Nisqually River to Eatonville, Orville Road from Eatonville to Highway 162 near Orting, Highway 162 from Orville Road junction to Highway 165, and Highway 165 to Highway 410 at Buckley to the White River, excluding Mount Rainier National Park. In King County east of Highway 410 from White River to Enumclaw, Highway 169 to Highway 18, Highway 18 to Interstate Highway 90, I-90 from Highway 18 junction to Preston, Preston-Fall City Road to Highway 203 and Highway 203 to the Snohomish County line, and King County south of Highway 2. In Snohomish County that portion east of Highway 203 and south of Highway 2. In Kittitas County that portion east of the Pacific Crest National Trail.

## Ownership

Land ownership in the herd area is a checkerboard of private, state, and federal holdings. The largest percentage is U. S. Forest Service land but industrial timber companies have large land holdings in the area. Private, state and federally owned lands are managed primarily to produce timber. U.S. Forest Service lands are managed for multiple uses, including timber, recreation and wildlife with a current emphasis on growing and managing old growth forests. The cities of Tacoma and Seattle each own and operate a municipal watershed in southeast King County totaling about 76,229 hectares (188,220 acres) that supplies the drinking water for their cities; one in the Green River drainage, the other in the Cedar River drainage. Mount Rainier National Park was established in 1899, and is administered by the National Park Service for conservation purposes. The densest private (urban and suburban) developments are found in the Issaquah (GMU 454) and Puyallup (GMU 652) units, while private agricultural holdings are primarily located in the northwestern part of the Snoqualmie (GMU 460) unit. Changes in ownership have occurred from land exchanges and sales involving private and federal lands.

## Topography

Physiographically, this area is part of the Southern Washington Cascade Province as described by Franklin and Dyrness (1973); only Snoqualmie (GMU 460) lies in the Northern Washington Cascade Province. Elevations in the elk herd area range from about 120 meters (400 feet) along the western boundary to about 4,265 meters (14,000 feet) at the summit of Mount Rainier. Elk occupy the majority of this elevation range and occur up to nearly 2,300 meters (7,500 feet) in the sub-alpine and alpine meadows of the national park during the summer and fall months. Most of the herd area, however, consists of low to mid-level mountainous and forested terrain. The steepest and least accessible parts include the higher snow-covered elevations in the park and along the Cascade Crest.

## Vegetation

Coniferous forests cover much of the area below timberline. Three major forest zones exist in the herd area, arranged along elevation and moisture gradients (Franklin and Dyrness 1973). These zones are named after the climax coniferous tree species, and are, in order of increasing elevation: the western hemlock (*Tsuga heterophylla*), Pacific silver fir (*Abies amabilis*), and mountain hemlock (*Tsuga mertensiana*) zones. Differences in soil type, moisture, elevation, aspect, and slope account for considerable habitat diversity even within the major forested zones. This is reflected in different aged forest timber stands with co-dominant tree species and various understory plant communities.

The Western Hemlock Zone is the most important for producing timber. In the southern Cascades it generally reaches its upper limit at about 1000 meters (3,300 feet). Major tree species here are Douglas fir (*Pseudotsuga menziesii*), western hemlock and, on moist sites, western red cedar (*Thuja plicata*). Dominant hardwood species include red alder (*Alnus rubra*) and big-leaf maple (*Acer macrophyllum*), occurring mainly as pioneers growing on recently disturbed sites or along streamsides. Species composition under the tree canopy varies, depending on moisture and soil. Hence, moist sites with better soils tend to be dominated by sword fern (*Polystichum miniatum*) communities while poorer, dry soils often support salal (*Gaultheria shallon*) understories. Most of this herd's winter ranges are located within the western hemlock zone.

The Pacific Silver Fir Zone occurs from about 600 to 1,300 meters (2,000-4,300 feet). Wetter and cooler than the lower western hemlock zone, it has significantly more winter snow and hence a shorter growing season. This zone is often important summer range for elk.

The Mountain Hemlock Zone is the highest elevation forest zone in the herd area, with heavy winter snow pack that often persist for six to eight months. This zone generally occurs between 1,300-1,700 meters (4,300-5,600 feet). It gradually changes structure from closed canopy forests at lower elevations to open parklands of a distinct subalpine character near its upper limit. These open parklands and subalpine open meadows are often intermixed with lakes, wetlands, and timber stands, combining to form a habitat mosaic that is important to elk for summer food and calving areas. These habitats are most abundant in Mt. Rainier National Park and provide the majority of summer and fall ranges for the White River (GMU 653) sub-herd.

## Human Influences

Timber harvesting operations, virtually all by clear cutting, have greatly changed the character and structure of most forests outside Mt. Rainier National Park. Originally, this herd area was mainly unbroken mature forest with scattered sparse openings, with a large-scale fire history occurring about every 434 years (Hemstrom and Franklin 1982). Native Americans may have maintained some of the higher elevation huckleberry fields using fire; this undoubtedly affected big game food sources and elk abundance. Now most areas are a patchwork of recently clear-cut and relatively young forests, the exception being some notable old growth acreage on U.S. Forest Service land.

## Other Related Species

The range of the North Rainier elk herd is also home to black-tailed deer (*Odocoileus hemionus*). Mountain goats (*Oreamnos americanus*) occupy high-elevation rugged terrain mainly found along the crest of the Cascade Range. Mountain goats and elk segregate most of the year, due to the mountain goat's preference for steep, rocky terrain. During summer, however, both species occupy high elevation meadows. Domestic livestock, primarily cattle and horses, use elk winter habitat.

## HERD DISTRIBUTION

### Historical Distribution

The entire North Rainier elk herd area is within the original range of the native Roosevelt elk (*Cervus elaphus roosevelti*) (Schwartz and Mitchell 1945). Although elk historically occurred in this area, they certainly were more limited in numbers and sporadically distributed than they are today. However, by the time Mt. Rainier National Park was established in 1899, elk were not one of the resident animals (Bradley 1982). It is impossible today to estimate the total number of Roosevelt elk remaining at the turn of the century; a few were probably still present. Factors contributing to their decline include: 1) a largely unbroken old growth forest that produced relatively little food; 2) a sparsely distributed population, concentrating in naturally burned sites, alpine meadows, and stream sides where food would have been more plentiful; and 3) the harvesting of elk by Native Americans and European settlers using firearms.

Whatever the actual status of the indigenous Roosevelt elk may have been, it is almost certain that the release of Rocky Mountain elk (*Cervus elaphus nelsoni*) near Enumclaw was a significant catalyst responsible for subsequent increases (Bradley 1982), (Washington Department of Fish and Wildlife 1996). This, coupled with changes on the land, such as clearing trees for agriculture and pastures, and harvesting timber, improved habitats and increased elk numbers.

Parsons (1967) gave the following account of elk transplants to the North Rainier herd area: *"In all, Henry Reif (County Game Warden), obtained 80 elk from Yellowstone National Park at Gardiner, Montana, on December 25, 1912. They were loaded in two Northern Pacific cattle cars, with the exception of one which broke its' back while loading. In transit from Gardiner to Enumclaw, the elk were unloaded and fed at stock pens twice, at Missoula and Pasco. The shipment arrived at White River Lumber Company on December 31, 1912, and 40 were placed in a corral near the mill at the base of Grass Mountain. The remaining 39 elk were trans-shipped to Snoqualmie, where they were placed in a corral on Meadowbrook Farm on January 1, 1913. The 80 elk cost King Count \$18.00 each for acquisition and transfer.*

*...During March 1913, thirty-six were released from each of the corrals at Snoqualmie and Enumclaw. All were adult animals one and one-half and two and one-half years old and the sex ratio was one bull to three cows.*

*...The Snoqualmie (North Bend) herd was in trouble right from the start. They stayed semi-domesticated on the Meadowbrook Farm and caused damage everywhere they went. Irate farmers and poachers whittled away at this herd until only 6 were left on Snoqualmie Island in 1923. Four Roosevelt elk from the Hoh River were released on the island that year to increase the band to 10 elk. Snoqualmie Island was surrounded by a mill pond and log boom in later years, isolating the animals on the 90-acre island. Between 1923 and 1946, the island band was a continual problem as it increased and then starved in alternate cycles. In 1946, nine elk were trapped and transplanted in Whatcom County. Three remaining elk, which couldn't be trapped, were eventually shot by Game Protectors over the next two years. Thus ended the saga of the Snoqualmie elk plant."*

*“While in distinctly more favorable circumstances the Enumclaw Herd to the south, gradually increased under protection from 1913 to 1929. King County established either-sex seasons in 1929 and 1930 during which 57 and 50 elk were killed. Twenty-nine bulls were killed during the 1931 season. Under protection, this herd continued to increase in the Grass Mountain area until 1947 when the first bull season, under State control, was held.”* He concluded by giving an elk population estimate for the “Enumclaw herd” at 1,500 in 1967.

The transplanted elk increased under legal protection from harvest, eventually expanding their distribution into adjacent areas. Fifty elk from Montana were released on January 20, 1913 near the Naches River in Yakima County (Pautzke et al. 1939). It is speculated that some of these elk moved onto Mount Rainier National Park based on early sightings on the eastern borders of the park (Mount Rainier National Park, chronological record of elk from observation card files).

## Current Distribution

The seasonal distribution of the North Rainier elk herd is shown in Map 2. The core herd area (where most of the elk spend the great majority of their time) includes all but the two westernmost units—Issaquah and Puyallup. This is because both units are greatly affected by suburban and urban development. Elk distribution there is limited and less contiguous with smaller satellite populations inhabiting agricultural, residential, and urban areas.

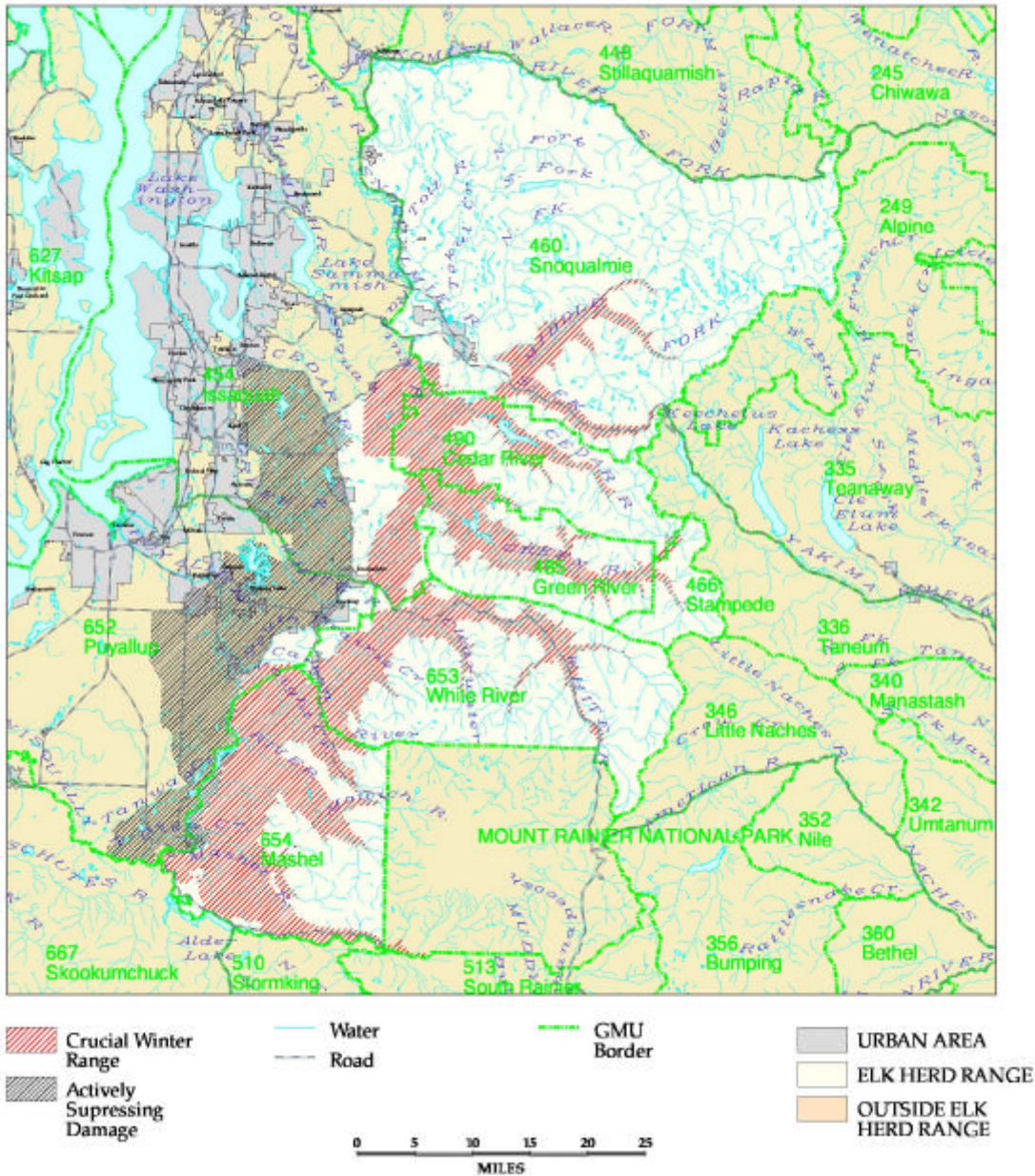
The largest number of elk reside in the White River unit (GMU 653). This sub-herd is a classic migrating population where approximately two-thirds of them spend the early spring to late fall in Mt. Rainier National Park’s high alpine meadows at 1,364 to 1,818 meters (4,500-6,000 feet). Then, following the rut and generally initiated by the first snowfall, the majority of elk move northward down to their winter range. Major migration corridors are the West Fork White River, Buck Creek, Haller Pass, and Huckleberry Creek. Elk also descend to this winter range from the upper Greenwater drainage and Crystal Mountain. Some migratory elk in this unit move as far west as the Federation Forest State Park, about 15 miles east of Enumclaw and the eastern Clearwater River drainage. Then in late spring, elk follow melting snow and move toward the south and up using the same major migration corridors. They inhabit the entire northern portion of the park up to about 2,195 meters (7,200 feet) in elevation.

Based on historical data from collared elk (WDFW unpublished data) about 15% of the elk were resident (i.e. did not migrate). More recently, studies conducted by the Muckleshoot Indian Tribe (1998), indicate that resident elk represent about one-third of the White River unit (GMU 653) total. While generally scattered throughout this unit, some elk concentrate in the Clearwater River and Three Sisters drainages, and Grass Mountain area. In the Clearwater River drainage the elk population may gradually increase as timber harvest creates more openings. Conversely, carrying capacity will likely decline in the vicinity of Huckleberry Ridge and Dalles Ridge in the White River and Greenwater River drainages, as the U.S. Forest Service continues to emphasize the creation and maintenance of old growth forests.

Stampede is the smallest unit (GMU 466), supporting a small elk population. Radio-collared elk tracked by the Muckleshoot Indian Tribe (1998) indicated that elk summering in the Tacoma

Pass area winter mainly on the eastside of the Cascade Crest. Studies indicate that elk in the rest of the Stampede unit spend most of each winter in the Green River unit (Muckleshoot Tribe and Washington Department of Fish and Wildlife, unpublished data). Some elk that winter in the Green River unit migrate to Stampede and the upper Cedar River unit during summer. Populations in both the Green and Cedar River units have declined substantially in recent years.

### Map 2-North Rainier Elk Herd Distribution



The Snoqualmie unit (GMU 460) includes the greater Snoqualmie River (north, middle, and south forks) and Skykomish River drainages. Elk likely colonized this area by dispersing from the Cedar River population. This is a relatively small but growing population, occurring in small groups mainly in the valleys of the Skykomish River and the north, south and middle fork of the Snoqualmie River. More recently, elk also have been observed in the North Fork Snoqualmie drainage.

### Proposed Distribution

Little or no change is anticipated in the overall distribution of the North Rainier elk herd. However, there is good potential for range expansion and population growth on commercial and recreational timberlands, such as in the North Fork Snoqualmie drainage in the GMU 460. Elk distribution in the most urban units (Issaquah and Puyallup) will continue to be negatively impacted by ongoing residential and commercial developments. This will further reduce usable elk habitat and increase elk-human conflicts leading to damage concerns and nuisance complaints.

## HERD MANAGEMENT

### History, Status and Management Activities

#### Estimated Population Size

The spring population of the North Rainier elk herd has declined from about 3,400 elk in 1989 to approximately 1,845 elk, a 46 percent decline (Table 1). Population declines have been documented in the Stampede, Green River, Cedar River, White River and Mashel units. There are no population survey or trend count information available for elk in the Issaquah, Snoqualmie or Puyallup units. Washington Department of Fish and Wildlife personnel base the latter population declines solely on anecdotal information. The main survey and management focus has been on the two largest sub-herds residing in the Green and White River units.

Table 1. Minimum spring population estimates and objective for the North Rainier Elk Herd.

Game Management Unit (GMU)	1989 Elk population estimate	2000 Elk population estimate	Elk population objective (*Increases)
Green River & Stampede (GMUs 485, 466)	800	195	525*
Cedar River (GMU 490)	450	100	100
White River (GMU 653)	950	600	900*
Mashel (GMU 654)	550	375	375
Snoqualmie (GMU 460)	125	175	500*
Issaquah (GMU 454)	250	200	200
Puyallup (GMU 652)	275	200	200
<b>Total Number of Elk</b>	<b>3,400</b>	<b>1,845</b>	<b>2,800</b>

The population objective is to increase the North Rainier elk herd to about 2,800 elk, as Table 1 shows. To do that, the White River unit needs to increase from around 600 to 900 animals, the Green River unit needs to grow from about 170 to 500 elk and the Snoqualmie unit needs to increase from about 175 to 500 animals. The Stampede and Cedar River units maintain current levels. The objective for the Issaquah and Puyallup units along the urban interface is to maintain their current population size at landowner tolerance levels.

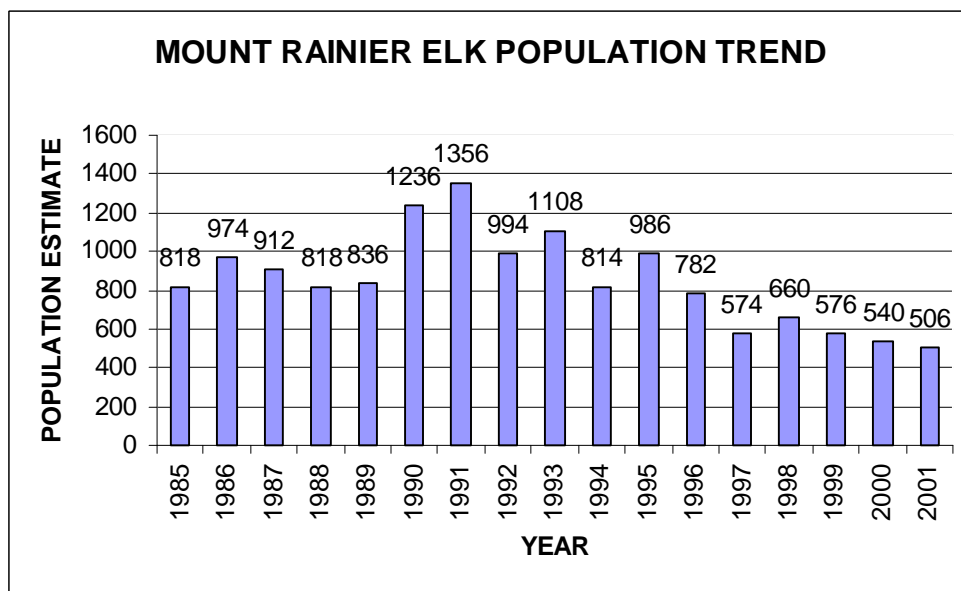
## Sub-herd Population History and Status

### White River Sub-herd

Bradley (1982) established a systematic fixed-wing aircraft survey in 1978 to assess elk numbers in Mt. Rainier National Park, including the White River sub-herd that mostly summers within its borders. Surveys were conducted to obtain greater uniformity of coverage by pooling data from a series of four flights during the peak of elk observability (August 1-September 15). Four estimators were developed to minimize potential bias due to the possibility of elk movements between range units surveyed. The fourth estimator was an average of three estimates (Bradley's E4 value) that were used to reflect total population. When the Park discontinued these fall population surveys in 1988 the Washington Department of Fish and Wildlife resumed these same survey routes, using a helicopter rather than a fixed-wing aircraft to classify elk. Since 1996, the Muckleshoot Indian Tribe has assisted in these flights.

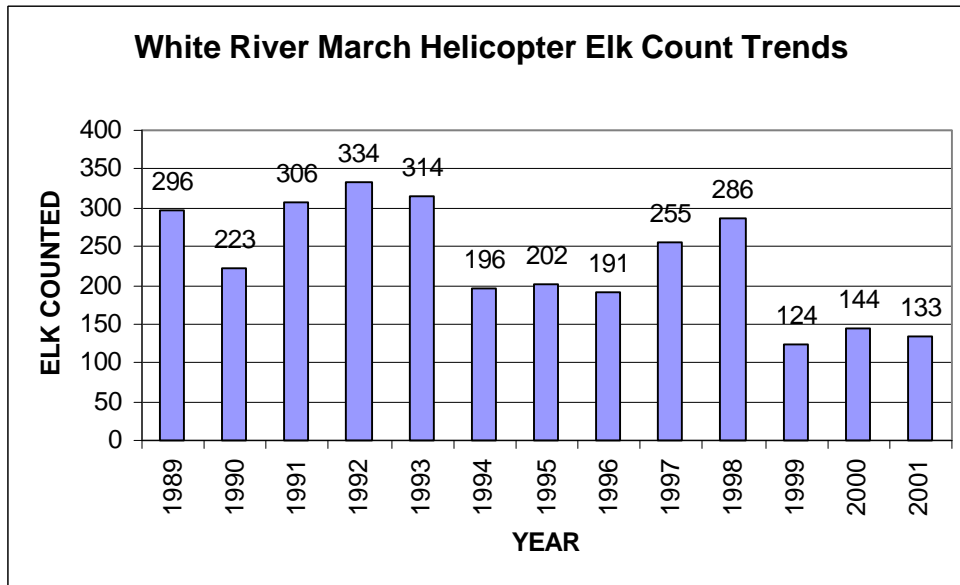
Fall population trend data collected in the national park from 1985 to 2001 indicate that the White River sub-herd peaked in 1991 at 1,300 elk, and has steadily declined since then (Spencer unpublished data) (Figure 1).

Figure 1. Mount Rainier National Park fall elk population estimates from aerial surveys.



From 1985 to 1989, surveys were flown from a fixed-wing aircraft rather than a helicopter. Biologists believe the lower numbers counted during the earlier fixed-wing surveys reflect a difference in survey method rather than showing a real population increase observed in 1990-1991. Past experience has demonstrated that helicopter surveys are much more accurate. Beginning in 1987, the Department began systematic spring helicopter composition and population index surveys for the entire White River sub-herd area (Figure 2). Results of the spring surveys correlate with the fall population estimates in Mount Rainier National Park (Figure 1), both showing a population decline since 1990-91.

Figure 2. Spring helicopter population counts for the White River sub-herd.



In March 1995, the Washington Department of Fish and Wildlife conducted a paintball mark-recapture survey of the White River sub-herd, providing a population estimate of 829 elk (range 693 to 966) (R. Spencer, Washington Department of Fish and Wildlife, unpublished data). The survey, repeated in March and April 2000, estimated only 434 elk (range 363 to 504), a 48 percent decline. This supports the trend observed in the fall population index and spring trend counts and confirms low calf survival to adulthood based on observed spike bulls.

In summary, the White River sub-herd’s 48 percent decline since 1995 can be attributed to high adult cow mortality primarily from hunting, but includes predator losses, poaching, human disturbance, road kills, low calf survival to adulthood, and negative changes in habitat quantity and quality. Eliminating state antlerless hunting and reducing tribal antlerless harvest has failed to reverse this decline. This sub-herd will likely continue its decline unless calf and cow survival improves.

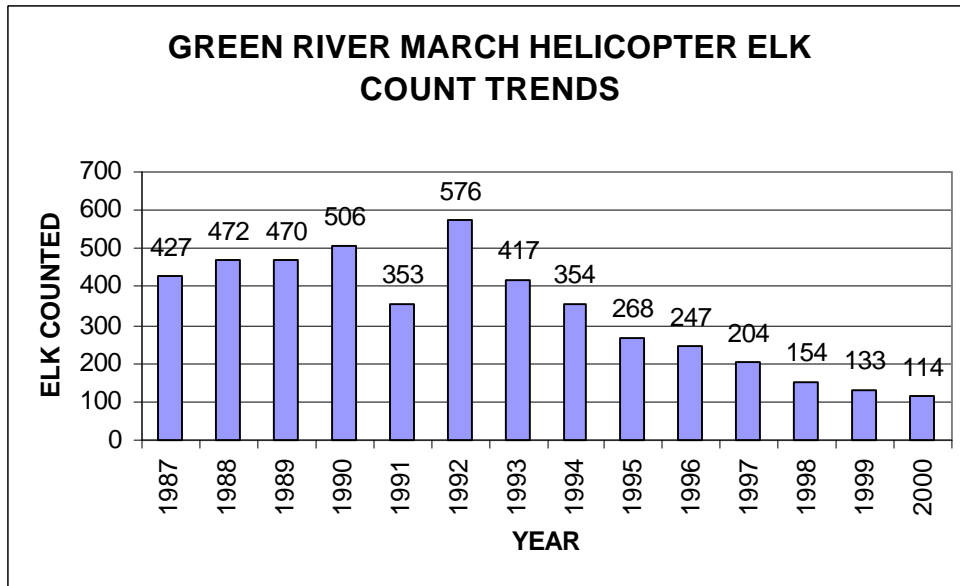
#### Green River and Stampede Sub-herds

Historical observations of collared elk (Spencer unpublished data) and the 1998 Muckleshoot Indian Tribe elk study documented that 15 of 39 marked elk spent time in both the Green River (GMU 485) and Stampede (GMU 466) units. Therefore, since the home range of these elk includes both units, they need to be managed as one sub-herd.



The Green River sub-herd probably started to decline in 1993. The total number of elk counted during March helicopter composition flights shows a decline from then through the year 2000 (Figure 3).

Figure 3. Total Green River sub-herd counts during March helicopter surveys.



In 1994, the Department conducted a paintball mark-recapture study to determine elk numbers. They estimated a population of 612 elk ( $\pm 68$  at 95% CI). In March and April 1997 another paintball mark-recapture estimate was made which concluded that there were only 227 elk ( $\pm 50$  at 95% CI), a decline of more than half. In 2001, the department conducted a third paintball mark-recapture survey and estimated 171 elk ( $\pm 64$  at 90% CI), a decline of an additional 25% since 1997 (R. Spencer, Washington Department of Fish and Wildlife, unpublished data).

A physical condition study of adult (cows and bulls) elk was started in 1999 as a joint effort between the Muckleshoot Indian Tribe, Washington Department of Fish and Wildlife, National Council for Air and Stream Improvement, City of Tacoma, Plum Creek Timber, Weyerhaeuser Company, Army Corps of Engineers and The Rocky Mountain Elk Foundation. Preliminary findings indicate that Green River elk have low body fat and are in poor nutritional condition. Habitat condition, lactation demand and the age of the cow ultimately determine cow elk body condition that can greatly affect pregnancy rates, calf in-utero survival, calf birth weight and survival, and adult survival. However, the pregnancy rates for adult cows two years and older in the Green River sub-herd are greater than 92 percent. The Muckleshoot Indian Tribe’s study on the Green River sub-herd has not yet documented adult mortality from malnutrition. While predation is the most immediate factor affecting these elk, habitat ultimately determines herd health and size.

In summary, the Green River-Stampede sub-herd has been negatively impacted by many factors concurrently such as: increased antlerless elk harvests, predation, low calf survival that has not replaced adult mortality, poor nutritional condition of cows, and an old age structure.

#### Cedar River Sub-herd

Historical population estimates for the Cedar River sub-herd are based on work done by D. Paige (per. com. 2000). Analysis of periodic, long-term trend count data of this and the adjacent Green River sub-herd, anecdotal information, and information from a 1999 mark-recapture project suggest that the Cedar River sub-herd declined significantly, to less than one-fourth of its 1989 size.

#### Mashel Sub-herd

The 32 percent decline in the Mashel sub-herd is based on analysis of long-term trend counts, analysis of antlerless elk harvest, population modeling, and a 1998 mark-recapture study on Rainier Timber Company, Kapowsin Tree Farm (R. Spencer unpublished data).

#### Snoqualmie, Issaquah and Puyallup Sub-herds

No formal population surveys are conducted in the Snoqualmie, Issaquah, and Puyallup sub-herds. From time to time general observations are made of elk in the area. The only formal data collection is of harvest data from the annual harvest questionnaire survey. Population estimates are based on anecdotal information, annual harvest trends, and observations of elk.

### Herd Composition

In western Washington, elk herd composition is determined prior to the fall hunting season (September) because the counts have the least amount of bias compared to other times of the year. However, fall bull/cow ratios are converted to spring (post-hunting season) counts in status reports so that data from herds across the state can be compared.

The Department has conducted fall and spring helicopter surveys since 1988, and cooperatively with the Muckleshoot Indian Tribe since 1996. During the fall, elk population index flights are conducted in Mount Rainier National Park. The spring herd composition data are collected from established routes on elk winter and spring ranges primarily to determine calf production and survival. Standardized September (pre-season) and March (post-season) surveys are conducted annually for the White River sub-herd (including Mount Rainier National Park), Green River sub-herd, and on the Kapowsin Tree Farm in the Mashel unit. Occasionally, survey data has been collected from the other units when resources became available or in conjunction with work on other species.

#### White River Sub-herd

The average (1994-2000) pre-season bull to cow ratio for the White River sub-herd is 29 per 100, respectively. Counts in 2 of the 7 years resulted in bull to cow ratios below this average (Table 2). However, the declining spike to cow and calf to cow ratios are a concern. While the spike to cow ratios fluctuate over the years, long-term averages indicate a decline from historic levels. From 1988 to 1993, fall and spring ratios averaged 8.3 and 8.9 spike bulls per 100 cows respectively. From 1994 to 2000, these ratios declined to 5.4 (fall) and 4.8 (spring) spike bulls per 100 cows, respectively. This is a decrease of about 36 percent in the fall and 42 percent in the spring.

In 1990, 1992, 1993 and 1995 March calf to cow ratios were similar or higher compared to September ratios. This is unusual because calves are expected to suffer some mortality during the over-winter period. It is speculated that this stable or increase in calf to cow ratios during these years is a result of a reduction in the number of cows between September and March counts.

Table 2. White River spring sub-herd bull and calf (per 100 cows) ratios, 1989-2001

Year	Spike bulls per 100 cows		Branched bulls per 100 cows		Total bulls per 100 cows		Calves per 100 cows	
	Sept.	March	Sept.	March	Sept.	March	Sept.	March
<b>1989</b>	7.7	7.5	14.0	3.8	21.7	11.3	39.0	28.0
<b>1990</b>	9.2	6.8	12.0	4.0	21.2	11.0	40.0	38.5
<b>1991</b>	8.0	12.5	16.5	1.3	24.5	13.8	35.0	35.0
<b>1992</b>	5.6	6.8	16.0	1.8	21.5	7.6	45.0	33.0
<b>1993</b>	13.0	10.6	21.0	7.3	34.0	18.0	42.0	41.5
<b>1994</b>	6.5	9.6	24.0	3.0	30.5	12.6	27.0	36.0
<b>Ave.</b>	<b>8.3</b>	<b>8.9</b>	<b>17.3</b>	<b>3.5</b>	<b>25.6</b>	<b>12.4</b>	<b>38</b>	<b>35</b>
<b>1995</b>	5.5	1.7	27.0	17.6	32.5	19.4	50.0	34.4
<b>1996</b>	8.2	5.0	18.0	9.0	20.2	14.0	35.5	42.0
<b>1997</b>	5.5	5.6	25.6	9.3	31.0	15.0	37.0	27.0
<b>1998</b>	7.0	9.6	23.0	18.8	30.0	28.4	38.0	26.7
<b>1999</b>	4.7	7.1	26.0	9.7	30.8	17.0	33.5	20.0
<b>2000</b>	3.0	2.4	25.4	9.2	28.4	11.5	29.0	13.8
<b>2001</b>	3.8	2.1	17.5	9.0	21.3	11.1	25.0	14.4
<b>Ave.</b>	<b>5.4</b>	<b>4.8</b>	<b>23.2</b>	<b>11.8</b>	<b>27.7</b>	<b>16.6</b>	<b>35.4</b>	<b>25.5</b>
<b>Change</b>	<b>-35%</b>	<b>-46%</b>	<b>+34%</b>	<b>+237%</b>	<b>+8%</b>	<b>+34%</b>	<b>-7%</b>	<b>-27%</b>

The September average calf to cow ratios declined seven percent between the two periods (from 38 to 35.4 calves per 100 cows). In contrast, the average spring calf survival ratios declined 27 percent (from 35 to 25.5 calves per 100 cows). The low spring calf ratios found in 1999-2001 are symptomatic of a declining population. Pregnancy data collected from the White River sub-herd in April 1998 and 2001 averaged 88 percent and does not appear to account for the observed low calf recruitment.

A study, initiated by the Muckleshoot Indian Tribe in 1998, documented this sub-herd's adult cow mortality rate at about 27 percent per year, based on a sample of 46 radio-marked elk (D. Vales, Muckleshoot Indian Tribe, personal communication). To balance this adult cow mortality, spring calf to cow ratios would have to be approximately 54 calves per 100 cows, which has not been recorded since consistent surveys were initiated in 1988. The population objectives for this sub-herd may not be met without changes in current management actions to address low cow and calf survival, substantial bull harvest and other mortality.

#### Green River Sub-herd

From 1984 to 1986 the Green River sub-herd composition data was gathered from ground surveys. Since 1986, Washington Department of Fish and Wildlife used standardized helicopter surveys as the primary method, supplemented with ground surveys. Bull to cow and calf to cow ratios are collected in September and March (Table 3).

The September branched bull ratios have generally increased since 1984 and remain relatively stable at about 29 bulls per 100 cows. The March branched bull ratios were highly variable from year to year and reflect the inadequacies (bulls are separated from herds during this period) of collecting these ratios during this season of the year. The fact that spring spike bull ratios from 1988 to 1990 are higher than the fall ratios probably reflects the combined effects of limiting the spike harvest and a slight increase in calf survival.

Table 3. Green River sub-herd bull and calf (per 100 cows) ratios, 1984-2000.

Year	Sample size		Spike bulls per 100 cows		Branched bulls per 100 cows		Total bulls per 100 cows		Calves per 100 cows	
	Sept.	March	Sept.	March	Sept.	March	Sept.	March	Sept.	March
1984	136	163	7.0	5.5	21.0	3.0	28.0	9.0	41.0	21.0
1985	232	376	8.0	6.0	12.0	4.0	20.0	10.0	36.0	30.0
1986	620	517	8.0	4.0	19.0	9.0	27.0	13.0	30.0	23.0
1987	305	427	13.0	5.0	14.5	5.0	27.5	10.0	22.0	15.0
1988	238	472	7.5	8.0	36.0	11.0	43.5	19.0	35.0	22.0
1989	209	470	5.3	6.0	28.0	12.0	33.3	18.0	28.0	21.0
1990	126	506	5.4	7.5	31.0	19.5	36.4	27.0	26.0	15.0
1991	74	353	7.5	7.4	26.0	23.0	34.0	30.0	15.0	14.0
1992	205	576	5.0	9.3	30.0	11.0	35.0	20.0	33.0	21.0
1993	367	417	3.0	3.4	26.0	18.5	29.0	22.0	20.0	12.0
1994	101	354	8.0	3.7	30.0	16.0	38.0	20.0	22.0	13.0
1995	101	268	11.0	4.3	29.0	9.2	40.0	13.5	26.0	10.0
1996	115	247	7.0	2.3	29.5	6.0	36.6	8.4	25.0	11.5
1997a	54	204	8.3	3.4	27.7	23.5	36.0	27.0	30.0	7.0
1998b		154	-	1.8	-	12.7	-	14.5	-	6.4
1999b		133	-	3.0	-	18.0	-	21.0	-	9.0
2000b		114	-	0.8	-	16.4	-	17.2	-	19.0

- a. Data provided by Muckleshoot Indian Tribe for March surveys.
- b. No September data was collected in 1998, 1999, and 2000 because of low population levels.

The September data showed a great variability in calf to cow ratios since 1984. Second-year results of a three-year (1998-2000) cooperative elk calf study by the Department and Muckleshoot Indian Tribe, showed an 81 percent average annual calf mortality rate in this sub-herd. This resulted in only 6 calves per 100 cows surviving through the following spring (March) 1998. Calf ratios averaged 7.5 during the period 1997-1999 compared to the 1984-1989 average of 22 calves per 100 cows. The 1997 to 1999 March composition counts show a continued low calf ratio that began in 1993, although it did increase notably (19/100 cows) in 2000.

## Harvest

The North Rainier herd state elk hunting regulations (Appendix A) were designed to provide maximum recreational opportunity, except for the Green River sub-herd (GMU 485) and more recently the Snoqualmie unit (GMU 460) where harvest has been managed to facilitate herd expansion. The Green River unit (GMU 485) has been a limited entry permit-only hunt area since 1984 where access is strictly controlled. In the Puyallup and Issaquah units, liberal elk hunting seasons and regulations are used to reduce the number of elk causing damage.

The Washington Department of Fish and Wildlife conducts a harvest questionnaire survey (10% sample) each year to determine the number of animals harvested, the number of hunters who participated and the days hunted (Table 4). In the Green River, all hunters (State and Tribal) must check in and out of the area, thus providing an accurate tally of harvest (Table 6).

Table 4. State and tribal elk harvest from the North Rainier herd, 1985-2000.

Year	State Hunters (questionnaire data)					Tribal Hunters (reports)		
	Antlered Elk	Antlerless Elk	Total Kill	Total Hunters	Total Days	Antlered Elk	Antlerless Elk	Total Kill (+unknown sex)
1985	491	118	609	10,830	44,619			
1986	390	100	499	7,077	31,680		No report	
1987	188	113	301	6,536	26,924			
1988	217	130	347	7,077	31,680	2	43	45
1989	244	102	346	6,337	25,958	6	21	37 (10)
1990	No Data Collected					18	36	72 (18)
1991	251	100	351	6,406	27,909	15	60	75
1992	270	143	413	6,260	27,055	38	85	123
1993	191	143	334	6,433	29,872	51	148	199
1994	159	128	287	6,460	28,239	50	110	160
1995	196	103	229	5,947	27,326	0	43	43
1996	117	79	196	4,503	20,172	4	9	13
1997	78	73	151	1,963	8,711	26	31	57
1998	134	82	216	3,930	18,552	31	11	42
1999	161	41	202	3,636	19,989	44	21	65
2000	136	56	192	1,776	6,787	43	12	55
<b>Total</b>	<b>3,223</b>	<b>1,520</b>	<b>4,673</b>	<b>85,171</b>	<b>37,5473</b>	<b>168</b>	<b>401</b>	<b>597</b>
<b>Average</b>	215	101	311	5,678	25,031	15	36	54

Each Tribe operates under their specific rules to collect elk harvest information from their hunters. Since 1997, the Northwest Indian Fisheries Commission has summarized tribal harvest data for the 17 western Washington Treaty Tribes (Northwest Indian Fisheries Commission 1997-2000). However, these reports do not provide which Tribes actually reported and are included in the report. Prior to 1997, the Department requested harvest data from each Tribe and compiled a tribal harvest report that listed the reporting Tribes.

#### White River Sub-herd

The number of elk harvested in the White River sub-herd (Table 5) has varied from year to year due to changes in hunting regulations, the number of hunters, and variable weather conditions. In mild winters and late snowfall years, most elk remain in Mt. Rainier National Park longer and are unavailable to hunters. In contrast, during years of heavy or early snowfall, such as was experienced in 1983 and 1984, elk move out of the Park earlier and are much more vulnerable to hunting mortality.

Prior to 1998, antlerless harvest was greater, which increased the cow mortality rate and was one of many factors that likely contributed to this sub-herd's decline. There was a short period from 1969 to 1973 when 50 either-sex state permits were issued annually. Either-sex archery seasons were initiated in 1985 and ended in 1997. Also in response to the declines, the Muckleshoot Indian Tribe, along with several other tribes, have ceased harvesting antlerless elk in the White River unit since 1998.

Table 5. State and tribal elk harvest from the White River sub-herd (GMU 653), 1985-2000.

Year	State Hunters (questionnaire data)*					Tribal Hunters (reports)**			
	Antlered Elk	Anterless Elk	Total Kill	Total Hunters	Total Days	Antlered Elk	Antlerless Elk	Total Kill (+ Unk.)	# Tribes Reported
1985	230	23	253	5880	26173				0
1986	153	7	160	4700	23802		No Report		0
1987	46	23	69	3073	12169				0
1988	86	36	120	3365	16151	1	42	43	12
1989	83	0	83	2618	10758	2	19	31	15
1990	No Data Collected					16	32	66	16
1991	86	0	86	2011	8408	14	53	67	10
1992	77	24	101	1853	7100	30	78	108	14
1993	43	15	58	2023	9028	39	78	117	17
1994	44	23	67	2208	9972	42	91	133	16
1995	28	10	38	1360	5963	0	17	17	11
1996	21	19	40	1250	5441	2	7	9	7
1997	15	0	15	344	2148	23	27	50	Not available
1998	48	0	48	1074	4624	28	8	36	Not available
1999	59	0	59	1213	5928	31	6	37	Not available
2000	27	0	27	793	3491	33	6	39	Not available

\* Washington Department of Fish and Wildlife, Game Harvest Reports 1985-2000.

\*\* From 1988 -1996 individual Tribes submitted reports voluntarily. Beginning in 1997 NWIFC summarized the harvest report for the western Washington Treaty Tribes.

Elk seasons for this sub-herd have generally restricted the state-authorized hunter to harvest only bull elk. The harvest mortality rate for adult bull elk in the White River sub-herd is approximately 64 percent. Following the 1999 hunting season the reported state and tribal harvest of 90 bulls and 6 cows exceeds the number of bulls estimated in the September population trend flights. This level of bull elk harvest mortality along with poor recruitment rates since 1998 indicates that the White River population is unable to meet the Department's current bull elk escapement objective of 12 bulls per 100 cows. The reported total harvest (State and Tribal) in GMU 653 has declined significantly between 1987 and 1999 (Table 5).

#### Green River Sub-herd

In 1984 the Green River unit (GMU 485) was created out of a larger Stampede unit (GMU 466). The Green River unit was opened to controlled hunting through an agreement between the Washington Department of Game and the City of Tacoma allowing limited hunter access to the Green River Watershed. The first elk-hunting season established a special 50-permit season for 3-point minimum bull or antlerless elk during a six-day hunt beginning on November 27 and ending on December 2, 1984 (Appendix B). Permitted hunters were required to enter and exit at one of two specified gates. In 1992, the Muckleshoot Indian Tribe was also granted access for a limited entry permit-only hunting season for tribal hunters. Annually, the Department, City of Tacoma, landowners, and Muckleshoot Tribe meet and agree upon the number and kinds of permit hunts, distribution of permits and season dates for the Green River Watershed (GMU 485).

Initially, in 1984, permitted state hunters targeted branched-antlered bulls. This resulted in a noticeable decline in the bull ratios the following year (Table 6). As a result, in 1985, two kinds of permits were available: 1) antlerless only or 2) 3 point minimum bull or antlerless. The intent of this change was to reduce bull harvest. Total elk harvest and kill composition remained consistent from 1984 to 1991, averaging 46 elk. The 1992-1994 average harvest increased to 54 elk, then dropped to 25 elk taken in 1996 without a change in permit level allocation.

Table 6. State and Tribal Harvest in GMU 485 (Green River) from gate check data

Year	State Hunters					Tribal Hunters					All
	Antlered		Antlerless		State	Antlered		Antlerless		Tribal	
	permit	harvest	permit	harvest	harvest	permit	harvest	permit	harvest	harvest	Total
1984	50 *	38	0	11	49						49
1985	30	17	20	29	46						46
1986	20	20	30	30	50						50
1987	20	10	30	33	43						43
1988	20	8	30	30	38						38
1989	20	14	30	31	45						45
1990	20	12	30	34	46						46
1991	20	14	30	31	45	Tribal hunting in GMU 485 began in 1992					45
1992	20	14	30	27	41	6	7	9	6	13	54
1993	20	10	30	28	38	7	4	9	10	14	52
1994	20	9	30	23	32	12	7	19	18	25	57
1995	14	9	43	13	22	8	2	35	15	17	39
1996	12	6	37	10	16	8	5	35	4	9	25
1997	Unit Closed in 1997-2001										

\* 50 total 3 pt. bull or antlerless permits.

The increase in antlerless harvest from 1992 to 1994, coupled with a decline in fall and spring calf survival, a decline in habitat quantity and quality, a change in cow age structure, and continued predation are believed to be the main contributing factors in the Green River sub-herd's population decline and inability to meet the current bull escapement objective. Hunter success in the Green River unit averaged 91% from 1984-1991. However, hunter success declined sharply from 80% in 1993, 50% in 1994 and only 27% in 1996. As a result of population declines and corresponding low hunter success, elk hunting in the Green River unit was closed in 1997.

As discussed previously, this sub-herd is closely linked with elk from the Stampede unit (GMU 466). The increased antlerless harvest during the time when the elk population was declining may have contributed to the crash of both populations (Table 7). There may also have been undocumented and unreported harvest in GMU 466 that would have contributed to the elk population decline during this period.

#### Mashel Sub-herd

Elk hunting occurs in the Mashel sub-herd under two distinct harvest management programs. Since 1992 the Kapowsin Tree Farm, totaling approximately 125,000 acres in size, is managed under the Private Lands Wildlife Management Area program with specific harvest management strategies unique to the area. The remainder of the Mashel sub-herd area harvest program is managed using traditional harvest strategies similar to the adjacent Game Management Units of the North Rainier herd area. The Kapowsin Private Lands Wildlife Management Area 401 is a fee access area with elk hunting currently limited to raffle or permit only elk hunting

Table 7. Antlerless elk harvest from GMU 466 and 485

Year	State GMU 466	State GMU 485*	Tribal GMU 485*	Tribal GMU 466	Total
1985	6	29			35
1986	15	30	No Reporting		45
1987	13	33			46
1988	12	30	0	0	42
1989	15	31	0	0	46
1990	No Data Collected		0	0	ND
1991	15	31	0	0	44
1992	14	27	6	1	48
1993	12	28	10	2	52
1994	5	23	18	0	46
1995	6	13	15	0	34
1996	0	10	4	0	14

\* State and Tribal harvest from GMU 485 based on checking station data from 1992-1996.

opportunities. Biologists for the Kapowsin Tree Farm (Eskow 1998) have monitored elk harvest since 1987 (Table 8).

Table 8. Elk Harvested on the Kapowsin Tree Farm from gate checks

Year	Bull Harvest	Antlerless Harvest	Total Harvest
1985	23	28	51
1986	39	35	74
1987	15	8	22
1988	26	12	38
1989	27	8	35
1990	34	10	44
1991	26	5	31
1992	23	21	44
1993	33	24	57
1994	17	16	32
1995	8	10	18
1996	7	10	17
1997	6	7	13
1998	3	2	5
1999	6	0	6

***Snoqualmie, Issaquah, Cedar River and Puyallup units***

The combined reported elk harvest from the Snoqualmie, Issaquah, Cedar River and Puyallup units show a decline in the bull harvest beginning in 1996, with a slight upturn in 1999, followed by the lowest bull harvest recorded since 1985 in 2000. Each of these units has maintained an average harvest of about 172 elk since 1985. The past 5 year harvest has averaged 131 animals annually (Table 9).



Table 9. State hunter reported harvest from questionnaire survey data.

Year	Issaquah GMU 454		Mashel GMU 654		Snoqualmie GMU 460		Puyallup GMU 652		Cedar River GMU 490		Total	
	Bull	Antls.	Bull	Antls.	Bull	Antls.	Bull	Antls.	Bull	Antls.	Bull	Antls.
1985	5	15	114	41	17	4	15	0	0	0	151	60
1986	13	17	87	37	10	0	18	3	0	0	128	57
1987	13	0	49	38	20	0	5	3	22	3	109	44
1988	32	2	38	36	15	7	12	2	7	5	104	52
1989	27	3	38	31	23	6	11	16	25	0	124	56
1991	22	0	21	3	49	0	26	51	20	0	138	54
1992	54	0	40	14	30	0	37	60	2	3	163	77
1993	27	10	49	34	17	5	27	39	3	0	123	88
1994	39	5	15	25	19	8	28	39	0	0	101	77
1995	41	6	38	28	17	13	44	27	6	0	146	74
1996	31	9	22	15	10	0	18	26	2	0	83	50
1997	11	32	26	3	16	3	16	33	0	0	69	71
1998	33	46	17	3	14	11	14	0	0	0	78	60
1999	29	38	41	0	19	3	14	3	0	0	103	44
2000	41	40	0	3	11	0	0	0	0	0	52	43

### Tribal Harvest

Individual tribes establish their own off-reservation hunting seasons and regulations within their treaty ceded area. Tribal hunting seasons typically start in August and run through January, but can extend to March. In addition, Tribes can also exercise their treaty right to harvest elk for ceremonial purposes outside of their established hunting season. These late hunting seasons are a concern to the Washington Department of Fish and Wildlife as they can disturb and stress elk when the animals are physically at their weakest and most vulnerable.

As discussed earlier the reported antlerless harvest in 1993 and 1994 likely contributed to the population decline in the White River sub-herd. The Muckleshoot Indian Tribe has suggested that past antlerless harvest for that sub-herd likely exceeded the rate of calves surviving to adulthood (D. Vales, Muckleshoot Indian Tribe, personal communication). Consequently, the Muckleshoot and several other tribes suspended antlerless hunting by rule in the White River unit in 1998.

### Nutrition

The nutritional status of the Green River and White River sub-herds is being investigated. Body condition scores and ultrasound measurements, collected from elk studies between 1998 and 2000, showed chronically low fat reserves (Cook, et al. unpublished data). This forecasts a lower than normal nutritional condition for adult cow elk, leading to reduced overall body condition. This effect may accumulate over time, leading to pauses in breeding and lower calf birth weights (J. Cook personal communication 2001). Calves with lower birth weights have a significantly lower survival rate. A Muckleshoot Indian Tribe adult cow study (1998) documented about an eight percent annual malnutrition related mortality in the White River population, but no detectable malnutrition in the Green River population. Between 1998 and 2001, pregnancy rates of elk more than two years old averaged 93 and 88 percent for the Green and White River sub-herds respectively.

## Natural Predators

Both cougar and black bear prey on the North Rainier elk herd. Although the Washington Department of Fish and Wildlife does not conduct population surveys of cougar and black bear in this area, it does monitor damage complaints and harvest rates. Over the past ten years both bear and cougar populations appear to have increased. Damage complaints and total harvest have also increased. Hunters were allowed to use hounds to hunt cougar and bear until 1996, when a voter initiative removed that option. The number of cougars harvested by hunters from 1985 through 1989 and 1991 through 1996 averaged 5 cougars a year, and for 1997 and 2000 the harvest averaged 14 animals per year including damage and public safety removal. About 43 percent (6 of 14) of the cougar harvested in 2000 was from depredation and public safety removal.

Cougars kill both adults and calves, while black bear take calves almost exclusively (R. Spencer, Washington Department of Fish and Wildlife, unpublished data; D. Vales, Muckleshoot Indian Tribe, unpublished data; J. Smith et al. 1994). In addition, black bear scavenging the buried remains of cougar kills may force cougars to kill more elk to make up for this loss. This in turn may increase the cougar predation rate. Therefore, an increasing black bear population could further increase the rate of cougar predation on elk.

Based on the results of monitoring radio-equipped cows in the White River sub-herd, cougar predation accounts for about 31 percent (8 of 26) of total mortality and is the leading cause of death for adult cow elk (Table 10). A similar study of the Green River sub-herd showed cougar predation is again the leading cause of mortality, accounting for 80 percent (16 of 20) of all adult cow deaths (D. Vales, Muckleshoot Indian Tribe, unpublished data).

Table 10. Mortality sources for cow elk in the White River sub-herd.

Cows marked	Cows Dead	Cougar	Road kill	Mal-nutrition	Malnutrition and cougar	Wound cougar	Poached	Hunt	Unk
58	26	8	2	2	5	1	3	3	1

Cougar predation accounts for 66 percent (42 of 64) of the total calf deaths in the Green River sub-herd (Table 11). Unknown predators, likely including, cougar, bear, and to a lesser degree coyote, and bobcat, accounted for about 14 percent (9 of 64) elk calf deaths (Washington Dept. of Fish and Wildlife and Muckleshoot Indian Tribe, unpublished data).

Table 11. Mortality sources for antlerless elk in the Green River sub-herd.

Cow/calf	Elk marked	Elk dead	Cougar	Road kill	Mal-nutrition	Malnutrition and cougar	Wound/cougar	Poached	Hunting/poached	Hunt	Unk
Cow	49	20	16	0	0	0	0	0	0	3	1
	Elk marked	Elk dead	Cougar	Bear	Unknown predation	Hunting	Poached	Accident	Natural/Disease		
Calf	69	64	42	7	9	1	2	2	1		

## Other Mortality Sources

Based on preliminary results of the continuing antlerless elk study by the Muckleshoot Indian Tribe, elk die from a variety of causes. Predation by cougar is a significant source of mortality to these populations. However, hunting and hunting related activities and road kills are also important sources of mortality (Tables 10 and 11), (D. Vales, Muckleshoot Indian Tribe, unpublished data).

Smith et al. (1994) found elk in Washington died from a variety of sources: 59 percent hunting, 15 percent poaching, 15 percent natural causes (of which 76 percent was malnutrition and 16 percent from cougar predation), and seven percent wounding loss. We expect a higher hunting and poaching related mortality in the White River sub-herd area because of longer hunting seasons than that documented by Smith et al. (1994). We are uncertain of the potential impacts to other sub-herds, but suspect wounding loss to be higher during prolonged hunting seasons.

## Social and Economic Values

### The Number of Elk Hunters and Elk Hunter Days

The number of hunters and days of effort information from the North Rainier elk herd is found in Table 4. Since 1985, there has been a decline of 84 percent in elk hunter participation in the North Rainier elk herd area from 10,830 hunters to 1,776 hunters in 2000. In the Stampede, Puyallup, White River and Issaquah units, declines in both the number of hunters and hunter days are notable, ranging from 39% to 58%. Much of this decline can be attributed to reduced elk numbers and forced reductions in hunter participation through more stringent hunting seasons and regulations.

In 2000, only 1,776 state-authorized hunters spent an estimated 6,787 days afield hunting for North Rainier elk. Hunting pressure since 1985 has averaged 5,678 hunters (Table 4). The overall trend in state hunter effort has been in serious decline since 1995 with the year 2000 having the lowest number of hunters since 1985. That year also saw the lowest number of elk hunter days, one-third of the previous year's count.

The revenue generated by elk hunters provides a significant economic boost to the local communities within the North Rainier elk herd's range. The value of elk to the state and local economy is estimated to be as high as \$1,945 per harvested elk in the Blue Mountains (Meyers 1999). The *1996 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation* reported that trip and equipment expenditures for big game hunting in 1996 averaged \$860 per hunter (U.S. Department of Interior et al. 1996). Using this \$860 average expenditure per hunter from the national survey, North Rainier elk hunters added \$1,527,360 to the local and state economy in 2000. This, however, is a 72 percent decline from the average number of hunters seen from 1991 to 1994 (6,390 hunters). Again, using the \$860 cost per hunter, this decline in hunter numbers represents an annual loss of \$3,968,040 in revenue to local and state economies.

## **Harvest Strategies**

Specific harvest strategy recommendations are made every three years as a part of the current Washington Fish and Wildlife Commission's policy of adopting hunting seasons for a three-year period and annually establishing permit seasons and necessary amendments to manage populations or control damage. The three-year hunting package is the state's harvest plan. Tribal participation in formulating specific recommendations and harvest strategies begins at the regional level. The Washington Department of Fish and Wildlife's regional staff and field personnel meet with tribal representatives periodically to coordinate harvest strategies, share harvest data and discuss other elk management activities such as habitat enhancements.

Historically, harvest strategies have varied by individual game management unit (Appendix A). From 1970 to 2001, different strategies have been used to maximize recreational opportunity and at the same time control or manage the number and type of elk removed. The following strategies have all been used at some time: (1) general seasons with legal animal descriptions ranging from either-sex to any bull to spike-only to 3-5 point antler minimums, (2) general seasons in combination with permit-only opportunities, and (3) permit-only seasons that provide quality hunting opportunities.

More liberal season structures may be applied in units where elk damage is a concern and where hunter access is limited. Conversely, more conservative seasons may be applied in units where an elk population has declined, shows poor survival to adulthood, or where bull to cow ratios are below management objectives. Season length and timing have also been used to regulate harvest. Resource allocation among user groups, initiated in 1984, requires state hunters to choose their hunting weapon (modern firearm, muzzleloader or bow and arrow). Individual tribes set their hunting seasons and regulations and may use different harvest strategies. The Washington Department of Fish and Wildlife considers tribal harvest prior to adopting state hunting seasons and regulations.

### ***White River Sub-herd***

In the early 1970s general elk hunting season rules allowed state hunters to take any bull. In addition, 50 either-sex permits were available annually from 1969 to 1973. In 1988, the bull elk hunt was replaced by a 3point or better antler restriction, in an attempt to increase spring bull to cow ratios. In 1992, the harvest regulation changed to spike-only hunting; branch-antlered bull hunting by permit. In 1997, the hunting season changed to permit-only for all non-tribal hunters. Public pressure resulted in a return to general season 3-point or better bull hunting in 1998. In general, state-authorized hunters have not shown support for permit-only elk hunting in this unit.

### ***Green River Sub-herd***

The harvest management objective for this sub-herd, established in 1984, was to provide a quality opportunity to hunt mature bulls and yet maintain high success rates for spike bull and antlerless elk hunting. Despite its small size, the Green River unit gained a reputation for quality hunting and was one of the most popular permit hunts in Washington State. The demand for hunting permits far exceeded the supply and the odds of being drawn were consistently low, about one chance in 30. However, due to this sub-herd's decline and the unusually low harvest rate of 27 percent in 1996, this hunt has been closed to state hunters since 1997.

## Damage

The Washington Department of Fish and Wildlife is required under RCW 77.12.070 and 77.12.280, to respond and compensate landowners for damage caused by elk (Appendix C). Methods to control elk damage include general seasons, permit seasons, hot spot hunts, landowner permits, hazing, trapping and transplanting, fencing and lethal removal. In western Washington, hazing or harassing elk with cracker shells and other noisy devices has not proven effective because elk quickly get used to the disturbance. While elk-proof fencing has been used to protect highly valuable crops and orchards in eastern Washington, it has not been used extensively on the west side. Due to financial and logistical concerns, trapping and transplanting damage-causing elk has not been a practical solution either.

Lethal removal has proven to be the most effective tool. Currently, the department is assessing the efficacy of specific damage area hunts versus landowner preference or kill permits. It is of utmost importance that the methods used specifically target and reduce only damage-causing elk. In some parts of their range, North Rainier elk are declining where they are wanted and increasing where they are not wanted.

Further complicating the damage issues are the varying public perceptions concerning the role and place of elk in the ecosystem. Farmers, Christmas tree growers and residential homeowners all have differing attitudes towards elk. For instance, some elk have habituated to humans and human developments in and around Crystal Village and the community of Greenwater. Local residents often feed these elk during the winter and early spring and the department receives virtually no complaints about damage here.

Elk damage is a concern, however, in the Mashel unit near the towns of Eatonville and Graham. Hot spot hunts historically have been used to control elk numbers and reduce damage there. Liberal hunting seasons in the Issaquah and Puyallup units are designed to reduce chronic elk damage concerns. A late season permit-only hunt for antlerless elk during the 2000 hunting season was designated in parts of these two units to address this damage. Except for occasional damage issues on two golf courses, elk damage complaints are seldom received in the Snoqualmie unit, despite elk occurring within the city limits of both Snoqualmie and North Bend.

## Tribal Hunting

Native American tribes that retain treaty rights to hunt within the North Rainier elk herd's range include signatories to the Medicine Creek Treaty and Point Elliot Treaty. The Muckleshoot, Nisqually, Puyallup and Squaxin Island Tribes are included in the Medicine Creek Treaty and the Lummi, Nooksack, Muckleshoot, Upper Skagit, Sauk-Suiattle, Stillaguamish, Swinomish, Suquamish, and Tulalip Tribes are signatories to the Point Elliot Treaty. Coordinating management objectives between the state and these tribes regarding elk population levels, habitat and harvest will be in the best interest of future elk recovery and management.

## Non-consumptive Uses

This elk herd provides substantial viewing opportunities, especially in the White River unit, where elk summer in Mt. Rainier National Park. The Park and adjacent areas provide one of the state's most accessible opportunities to watch elk, particularly during the calving and rutting seasons. This elk herd is also spiritually and culturally important to Native Americans.

Elk along the urban interface are increasingly affected by development, causing nuisance and damage related problems. However, they should continue to receive management attention primarily for their aesthetic and wild values. This is a viewpoint increasingly held and expressed by many urban citizens, who recognize the unique circumstance of seeing elk in remaining natural habitats along stream corridors, small-forested wood lots and parks. Elk use in this environment also helps to define the value of open space in urban neighborhoods.

## HABITAT MANAGEMENT

At this time, it is believed that the North Rainier elk herd's population size is limited by the declining quantity and quality of existing habitat. Elk habitat includes all features of the landscape necessary to support a viable elk herd. The maximum number of elk that can exist in any habitat is generally controlled by food. Important components of elk habitat are the availability of food, and its location, quantity and quality of food, and distance from escape cover

In general the North Rainier elk herd's summer range is in fair to good condition and, the winter range is in poor condition due to a number of factors. Essential winter habitats below 732 meters (2,400 feet) on U.S. Forest Service lands are continually declining as they are being managed for old growth forest. This in turn can change or restrict the quality and quantity of food available for elk. In addition, this elk herd's range suffers from road densities in excess of prescribed levels, high levels of human disturbance year round and declining forage quality and quantity on U. S. Forest Service and private forest timber lands.

### Elk Winter Range

In 1984, Mt. Rainier National Park contracted with the University of Washington to determine the long-range winter carrying capacity of forested lands outside the park boundaries. A computer simulation model was developed to predict how elk populations would respond to changes in the forest, based on historical and projected forest management. Elk habitat was measured by determining how different changes in a forest affected its capacity to support elk (Raedeke and Lemkuhl 1984).

Assuming 1980 forest management practices as the baseline, the computer model indicated a decline in carrying capacity of about 15 percent by the year 2030 on all lands in the White River sub-herd area (Raedake and Lemkuhl 1984). On U.S. Forest Service lands, the decline was projected to be even more dramatic, nearly 40 percent less carrying capacity for elk by the year 2030.

In another study, Jenkins and Starkey (1990) assessed elk winter range use and projected future habitat trends on forested lands north of the national park. Their model was similar to Raedake and Lemkuhl's and their results supported the earlier conclusions, predicting similar elk population declines in response to forest management.

Jenkins and Starkey (1990) also predicted that food values on elk winter ranges would decline steadily well into the future. This decline reflects a loss of created openings and clearcuts, where the majority of the elk's preferred food plants grow. Another consideration recognized by these two researchers is the important role that mature/old growth forests play in sustaining elk populations during severe winters. During periods of significant snow accumulation food is available in mature/old growth forests because the trees form an umbrella affect. They concluded that a mosaic of immature and old age forest is optimal habitat for elk.

However, logging has removed the majority of mature forest vegetation on elk winter and spring ranges in the North Rainier elk herd area. For example in the White River sub-herd, between 1950 and 1969, the majority (90 percent) of elk winter range was logged, leaving only two percent of original old growth forest (Jenkins and Starkey 1990). The U.S. Forest Service implemented its Northwest Forest Plan in 1998 to protect old-growth forest species and wildlife diversity. As a result, much of the Forest Service acreage in the White River unit, including important elk winter range, has been designated as an old growth reserve, meaning no timber will be harvested.

Consequently, much of the current food base for elk on Forest Service land will be reduced to what is available in older, shadier forests. These forests will provide good shelter and snow intercept, but at a reduced capacity to produce forage compared to early successional forest stands. However, the old growth forest will provide more forage than currently available from 30–70 year old timber stands. Under this no-cut policy, a more rapid decline in the quantity and quality of elk food is predicted.

Many of the elk in the North Rainier elk herd area summer at high elevations and their descent to winter range is triggered by the first snowfall, generally in early October. Elevation limits used to delineate total winter range and essential winter range is presented in Table 12. All available data suggest a decline in the carrying capacity of the White River sub-herd's winter range since the early to mid-1980s.

Table 12. Approximate acreage of winter range in the White River unit.

<b>Drainage</b>	<b>Drainage Hectares (Acres)</b>	<b>Unusable Winter Range Baseline 732 m (2,400') South facing slopes 854m (2,800')</b>	<b>Essential Winter Range Baseline 671m (2,200') South facing slopes 732m (2,400')</b>
<b>Greenwater</b>	18,590 (45,900)	3,860 (9,530)	1,175 (2,900)
<b>Huckleberry</b>	10,044 (24,800)	2,827 (6,980)	522 (1,290)
<b>White River</b>	33,008 (81,500)	21,830 (53,900)	14,266 (35,225)
<b>Total</b>	61,641 (152,200)	28,516 (70,410)	15,963 (39,415)

The availability of winter habitat and potential carrying capacity for elk in the Green River unit was determined using the same computer simulation model as for the White River unit (Raedeke 1995). He proposed four timber harvest options, evaluated the change in potential carrying capacity for elk and concluded that since around 1955 there has been about a 20 percent decline in elk habitat carrying capacity on the Green River unit.

## Roads

Roads can have a negative impact on elk. Elk are vulnerable year round to harassment from a variety of recreational and other activities associated with motorized vehicles. A number of studies have shown that elk shy away from areas near roads (Thomas and Toweill 1982.). In response to high road densities, the Washington Department of Fish and Wildlife, Weyerhaeuser Company, and the U.S. Forest Service entered into agreements in the early 1980's that closed some roads to protect elk on their winter ranges on the White and Greenwater river lowlands, Dalles Ridge and Buck Creek between December 15 and April 1. Road closures were also implemented during state established hunting seasons to protect elk migrating out of the National Park. Hunters formed what essentially was a "firing line" that restricted elk movement to winter range. Another road management program was initiated in the mid 1980's in the Mashel unit on Washington Department of Natural Resources land east of Eatonville. This was designed to provide a quality walk-in opportunity for hunters as well as protect elk on their winter range.

## Enhancement and Improvement Projects/Ideas

Since 1990, many projects have been initiated to enhance elk carrying capacity, perform research and educate the public about elk, particularly in the Green and White river units. The Rocky Mountain Elk Foundation has helped fund many projects (Table 13).

## RESEARCH

Various research projects on this elk herd have been conducted since the 1970s—primarily in the White and Green river units—funded by the National Park Service, the Washington Department



Table 13. Rocky Mt. Elk Foundation funded projects in the North Rainier elk herd area.

Year	Enhancement project	Foundation funding	Cooperator	Total project funding
1990	Kapowsin winter range enhancement (seeding)	\$4,000.00	Champion Timber Company	\$26,977.00
1991	Pack Forest habitat improvement	\$4,000.00	University of Washington	\$9,930.00
1992	Greenwater drainage road Rehabilitation	\$3,750.00	Mt. Baker/ Snoqualmie National Forest	\$7,550.00
1994	White River elk viewing Signs	\$2,700.00	Mt. Baker/ Snoqualmie National Forest	\$4,200.00
1996	Kapowsin population estimate Study	\$0.00	Wash. Dept. of Fish & Wildlife, Champion Timber Company	\$6,230.00
1997	Green River elk calf mortality Study	\$4,500.00	Army Corps of Engineers, WDFW, Muckleshoot Tribe	\$56,382.00
1998	Green River elk population Study	\$10,000.00	WDFW, Plum Creek Timber Company, Muckleshoot Tribe	\$35,000.00
2000	Green River Power Line Habitat improvement	\$5,000.00	WDFW, Tacoma Public Utility, BPA, ACOE.	\$50,000.00
<b>Total</b>		<b>\$31,250.00</b>		<b>\$192,069.00</b>

of Fish and Wildlife and the Muckleshoot Indian Tribe. The following is a brief summary of those efforts.

### Past Research

1. White River unit - Bradley (1982) established a systematic population index trend survey in Mt. Rainier National Park. Spencer (Washington Department of Fish and Wildlife, unpublished data) revised and continued these index surveys in 1988 using a helicopter. Since 1996 these surveys have been conducted as a cooperative effort with the Muckleshoot Indian Tribe.
2. Green River, Mashel and White River units - (Spencer unpublished data 1994, 1995, 1997, 1998 and 2000) conducted elk paintball mark-recapture population estimates on winter/spring range.
3. Green and White river units – Muckleshoot biologist David Vales began research in 1998 on antlerless elk population sightability estimates, mortality sources, and habitat use areas.
4. Green (1998-2001) and White river (2001) units – Washington Department of Fish and Wildlife initiated elk calf mortality study in 1998 and the Muckleshoot Indian Tribe conducted calf mortality research on the Green River in 1999. Muckleshoot biologist David Vales began research on calf elk mortality on the White River in 2001.
5. Green (1998-2002) and White (2000) river units - Muckleshoot biologist David Vales began research on adult cow nutrition.

### **Habitat Assessment Studies**

White River unit - Mount Rainier National Park elk habitat impact assessments (1970s to mid 1980s)

White River unit - Radaeke and Lemkuhl (1984), and Jenkins and Starkey (1990)

White River unit - U.S. Forest Service concluded the Huckleberry land exchange, 2002.

Green River unit – Radaeke and Radaeke (1995)

### Present Needs

1) Conduct a bull elk mortality study in the White River unit to determine the types and degree of this mortality. Currently, extended hunting seasons are primarily focused on taking antlered elk. Documented population declines and current data suggest that statewide bull escapement goals are not being met.

2) Determine the type and degree of calf mortality in order to identify management actions to improve calf survival in those areas where calf recruitment is low. Determine elk calf survival from the sample of adult cows released under the augmentation proposal.

3) Consider reassessing and updating the Raedeke and Lemkuhl (1984) and Jenkins and Starkey (1990) habitat studies in the White River unit, using on-the-ground inventories at the landscape scale and making projections of the habitat's capability to support elk into the future. The Muckleshoot Indian Tribe will be investigating this for the next three years as well as evaluating habitat improvement projects using body condition indices of elk (D. Vales, Muckleshoot Indian Tribe, personal communication).

4) Determine if the condition of elk summer range inside the National Park is linked to nutrition related concerns for elk in the White River unit.

## **HERD MANAGEMENT GOALS**

The goals of the North Rainier Elk Herd Plan are to:

1. Manage the North Rainier elk herd for a sustained yield.
2. Manage elk for a variety of recreational, educational and aesthetic purposes including hunting, scientific study, cultural and ceremonial uses by Native Americans, wildlife viewing and photography.
3. Preserve, protect, perpetuate, manage and enhance elk and their habitats to ensure healthy, productive populations.

## **MANAGEMENT OBJECTIVES, PROBLEMS and STRATEGIES**

### **Herd Management**

#### **Objective #1**

**Improve the collection of accurate scientific data to better manage elk populations.**

**Problems:** Past harvest estimates have been based on hunter report cards and a random questionnaire survey of hunters. These estimates have had insufficient precision for use at the GMU level of resolution. Harvest data is not currently available from all tribes, compounding harvest data concerns. Accurate population estimates and harvest data collection are the basic building blocks for predicting a population's response to hunting and for making reliable, scientifically sound management recommendations.

### **Strategies**

1. Improve harvest data collection from state hunters by adopting mandatory hunter reporting for all hunters, whether successful or not.
2. Work cooperatively with all tribes to obtain complete tribal harvest data.
3. Continue cooperative population index and herd composition surveys.
4. Develop and maintain population models to predict population responses to harvest and other mortality sources, and to assist in management decision-making.
5. Ensure that management is dynamic and utilizes information collected from current and future studies.
6. Conduct research to ensure precise harvest and herd composition survey data is collected to reflect 90 percent confidence intervals.

### **Objective #2**

**Increase elk population numbers in the following game management units:**

**Snoqualmie (GMU 460), from 175 to 500 elk**

**Green River (GMU 485), from 150 to 500 elk**

**White River (GMU 653), from 600 to 900 elk, with fall index flights in Mt. Rainier National Park approaching 600 to 700 elk.**

**Problem:** Winter/spring habitat declines, nutritional limitations, high adult mortality that exceeds recruitment, low calf survival, and hunting mortality continue to be problematic for the short and long-term recovery of this elk herd. These units are all below population objectives.

### **Strategies**

1. Reduce adult and calf mortality by recognizing and managing mortality factors including harvest by hunters.
2. Increase enforcement emphasis to minimize poaching.
3. In cooperation with the Washington Department of Transportation, minimize elk deaths from vehicles along Highway 410.
4. Jointly and cooperatively with tribes, monitor antlerless elk harvest in sub-herds that show declining population or reproductive trends.
5. Maintain current road management programs and work cooperatively with landowners and user groups to identify additional winter range road closure opportunities that will benefit elk.
6. Cooperatively with Rainier Timber Company (Campbell Group) through the Private Lands Wildlife Management Area program agreement, manage for an increased elk population on the Kapowsin Tree Farm.
7. Improve winter/spring elk habitat areas where needed. Target food enhancement projects in selected natural and created openings that will benefit elk.

8. Augment elk where appropriate to bolster the population, and provide a younger herd to improve reproduction.
9. Work with the Tribes to recognize the potential impacts to elk from late season hunting.
10. Conduct calf elk mortality research studies to determine direct and indirect causes of mortality.

#### **Objective #3**

##### **Maintain hunter harvest below recruitment of calves surviving to adulthood.**

**Problem:** Currently, hunting mortality often adds to natural mortality, contributing to the population decline documented for this elk herd. Except where necessary to control damage, harvesting antlerless elk should be minimal if the population is below herd objectives.

##### **Strategies**

1. Use available mortality, population, and modeling estimates to set harvest limits for antlered elk and close hunting for antlerless elk if necessary.
2. Establish cooperative harvest strategies with tribes in response to documented declines in elk numbers. When necessary establish conservation closures or other measures to meet population goals and objectives.
3. With the tribes, cooperatively examine the biological considerations of the timeliness of hunts.

#### **Objective #4**

##### **Provide hunting opportunities and manage the elk herd for a minimum post-season bull ratio consistent with statewide management plan, currently 12 bulls per 100 cows.**

**Problems:** Currently elk hunting season is closed in the Green River unit due to a declining population. Post-season bull ratio objectives are currently below desired levels in the White River unit and unknown in other units.

##### **Strategies**

1. Explore options such as reducing hunting season length, applying antler restrictions, applying permit hunting, etc. to achieve bull/cow ratio objectives.
2. Track post-season bull ratios over time to determine trends and impacts from various harvest management strategies.
3. Conduct bull mortality studies to determine types and rates of mortality to ensure bull elk escapement objectives can be reached.

#### **Objective #5**

##### **Provide harvest of black bear and cougar consistent with population management objectives for elk, deer, black bear and cougar.**

**Problem:** High predator populations and low calf survival can make it difficult to achieve elk population objectives.

### *Strategies*

1. If other techniques (habitat improvement, augmentation) are not effective consider recommending an increased recreational harvest of black bear and cougar where high predator populations are related to poor calf survival and declining elk population trends.
2. Encourage cougar hunting by providing information to hunters on effective hunting techniques.

### **Objective #6**

#### **Recognize and promote viewing and photographic opportunities provided by this elk herd.**

**Problem:** Elk population declines may reduce recreational viewing and photographic opportunities.

### *Strategies*

1. Work with landowners and cooperators to designate and promote areas for publicly viewing elk on summer and winter ranges.
2. Select and designate appropriate winter range sites for food enhancement projects that will benefit elk and provide public-viewing opportunities, while not significantly affecting hunting objectives.
3. Consider purchase of lands for elk viewing opportunities.

### **Objective #7**

#### **Work cooperatively with Indian tribes to implement the North Rainier Elk Herd Plan.**

**Problem:** Cooperation and coordination with federally recognized Treaty Tribes has been challenging in the past.

### *Strategies*

1. Develop a framework of cooperation by meeting frequently and using open dialog to discuss management concerns for the North Rainier elk herd.
2. Maintain an atmosphere of mutual respect, trust, cooperation, and exchange of information.
3. Form partnerships for funding mutually acceptable projects to enhance and improve elk populations, habitat or advance research.

## Habitat Management

### **Objective #1**

**Increase and improve habitat where it is a limiting factor on survival and reproduction to meet the elk population objectives identified in the North Rainier Elk Herd Plan.**

***Problem:*** Winter/spring habitat declines and nutritional limitations continue to be problematic for this elk herd. Elk body condition information indicates a deficiency in the quality or quantity of food found on summer ranges. The reason for this is not clear.

#### ***Strategies***

1. Identify and select natural and created openings for elk forage enhancements on summer and winter/spring ranges receiving high elk use.
2. Together with landowners, identify key elk use areas; currently managed primarily for timber that could benefit from establishing and improving elk forage.
3. Assess and maintain effective road closures and work cooperatively to identify additional winter range road closures.
4. Reduce open road densities to one mile per square mile or less on elk winter ranges.
5. Explore controlled burns as a tool to enhance the quality of food for elk
6. Continue to assess the nutritional health of elk; especially those associated with habitat improvement and relocation projects, to determine measurable benefits in survival and/or calf recruitment to adulthood.
7. Conduct research to determine if the summer range condition (quantity and quality) in Mount Rainier National Park is currently adequate to support the population objective level.

### **Objective #2**

**Develop partnership opportunities to increase the availability of and improve the quantity and quality of elk habitat on important sites.**

***Problem:*** Past forest cutting practices that created open, young forests with foods important to elk have declined.

#### ***Strategies***

1. Identify and prioritize important winter habitats.
2. Work with landowners to secure long term protection of important winter habitat for elk through lease agreements, easements, landowner incentives, or fee purchase.
3. Improve elk forage availability, quantity, and quality through cooperative landowner agreements.
4. Control noxious and other undesirable plants on important elk feeding sites.

## HERD AUGMENTATION

Augmenting the North Rainier elk herd is proposed as a viable strategy to bolster its population and reverse the declining trend. The Washington Department of Fish and Wildlife supports elk herd augmentation; its top priority for augmentation is the Green River sub-herd.

Reasons for augmenting elk include: 1) Significant declines in the elk population; 2) populations that are being held at depressed levels due to predation; 3) cow age structure that is beyond prime age for productivity; 4) when cessation of hunting does not result in an increase in population; and 5) where habitat does not appear to be limiting or where limitations are being addressed.

The Green River elk sub-herd appears to meet these criteria:

- This elk population peaked in 1991 and has declined approximately 70 percent through 2000 (R. Spencer un. pub. data).
- The 2000 estimate of 170 elk is well below the management objective of approximately 500 elk for this sub-herd.
- Currently, predation is the leading immediate cause suppressing the Green River sub-herd's population. This has also contributed to poor recruitment, compounding the problem.
- Population modeling of the Green River sub-herd and preliminary information on female ages suggest this is an old population. Cows older than eight years may be less productive (Greer 1966, Cook personal communication) and produce lightweight calves. This older age structure of the female population is probably affecting recruitment. Augmenting this sub-herd would add younger, more productive females to the population.
- State and Tribal hunting has been curtailed since 1997 without an increase in the population.
- Ongoing habitat enhancement projects have improved important elk forage areas.

For these reasons, herd augmentation is proposed for the Green River sub-herd. For more details on this proposed augmentation see Appendix D.

## **SPENDING PRIORITIES**

The following priority investments are needed to implement the North Rainier Elk Herd Plan.

### **Priority # 1**

#### **Estimate populations using mark-recapture surveys**

Continue periodic independent population estimator studies on an 'as needed' basis for sub-herds in the North Rainier elk herd area. This should be supplemented with POP II computer modeling, sightability surveys and other techniques, if justified.

**Priority:** High

**Timeline:** Every 3 - 5 years, or on an 'as needed' basis

**Cost:** \$17,600/time and \$52,800 over five years

### **Priority # 2**

### **Conduct fall and spring herd composition surveys**

Continue pre-hunting season (fall) and post-hunting season (spring) herd composition flights in the White River unit along with the population index flights to monitor this sub-herd's population size. Expand composition flights to the Snoqualmie unit to start monitoring this sub-herd's population.

**Priority:** High

**Timeline:** Annually for the next five years

**Cost:** \$11,500/year (estimated 20 hours/year of helicopter flight time for fall and winter flights at \$525/hour)

Priority # 3

### **Monitor harvest**

Increase the precision and accuracy of harvest from the North Rainier Elk Herd.

**Priority:** High

**Timeline:** Ongoing for the next five years

**Cost:** Estimated \$10,000/year

Priority # 4

### **Enhance habitat on primary summer and winter range**

The key components and essential foundation to recover this elk herd are:

1. Inventory crucial and traditional elk winter range
2. Improve habitats through partnerships with appropriate landowners
3. Implement and monitor elk forage enhancement projects

**Priority:** High

**Timeline:** Ongoing for the next five years

**Cost:** \$10,000/year

Priority # 5

### **Augment the North Rainier elk herd**

Elk augmentation is proposed for the Green River sub-herd as a priority site to improve antlerless age structure and possibly increase recruitment. Other potential sub-herds that could also benefit from augmentation include Snoqualmie, and if necessary, White River.

**Priority:** High

**Timeline:** Start trapping in March 2002, and monitor released animals for approximately two years (see Appendix D for details)

**Cost:** \$48,400/year, \$96,800 total (dependent on partnership funding)



Priority # 6

Conduct research needs

To meet the objectives of this plan elk research is a critical component to address management problems. This plan has identified several research needs that should be addressed during the plan period.

**Priority:** High

**Timeline:** Complete two to three projects during the five-year period of the plan dependent on partnerships and funding

**Cost:** \$20,000/year, \$100,000 total

## PLAN REVIEW AND MAINTENANCE

The North Rainier Elk Herd Plan is a five-year document subject to annual review and amendment. As new information is gathered and conditions change, it will be necessary to track strategies and their impact on the plan's goals and objectives in order to re-evaluate and modify this plan as needed. A free exchange of information and open communication between the Washington Department of Fish and Wildlife, Tribes and cooperators will be key to this plan's success. An annual review meeting with delegates from the Point Elliot and Medicine Creek Treaty Tribes will be arranged through the Northwest Indian Fisheries Commission and the Department's Region 4 and 6 Wildlife Program Managers. Emergent issues can be addressed, as needed, either at the technical or policy level.

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All personal communications are referenced only in the text.

**APPENDIX A. Elk Hunting Seasons in the North Rainier Elk Herd Area**

<b>YEAR</b>	<b>GMU # &amp; (Number of permits)</b>	<b>Dates</b>	<b>Days</b>	<b>Legal Animal</b>	<b>Hunt Description and Tag Type</b>
<b>2001</b>	454 407, 652, 654 460, 466, 653	09/01 - 09/14 09/01 - 09/14 09/01 - 09/14	14 14 14	Any elk Antlerless or 3 pt. min. 3 Pt. minimum	Early Archery General (WA)
	454 407 652	11/21 - 12/15 11/21 - 12/15 11/21 - 12/15	25 25 25	Any elk Antlerless or 3 pt. min. 3 pt. Minimum	Late Archery General (WA)
	454 460, 652, 654, 660	10/06 - 10/12 10/06 - 10/12	7 7	Any elk 3 Pt. minimum	Early Muzzleloader General (WM)
	454 652	11/21 - 12/15 11/21 - 12/15	25 25	Any elk 3 Pt. minimum	Late Muzzleloader General (WM)
	454 407, 460, 466, 652, 653, 654	11/03 - 11/11 11/03 - 11/11	9 9	Any bull 3 Pt. minimum	Modern Firearm General (WF)
	654 Kapowsin bull North (2) 654 Kapowsin bull Central (2) 654 Kapowsin bull South (2)	09/14 - 09/29 09/14 - 09/29 09/14 - 09/29	16 16 16	Any bull Any bull Any bull	PLWMA Auction/Raffle Hunt (Any Tag)
<b>2000</b>	454 407, 652, 654, 660 460, 466, 653	09/01 - 09/14 09/01 - 09/14 09/01 - 09/14	14 14 14	Any elk Antlerless or 3 pt. min. 3 Pt. minimum	Early Archery General (WA)
	407, 652 454	11/22 - 12/15 11/22 - 12/15	24 24	Antlerless or 3 pt. min. Any elk	Late Archery General (WA)
	454 460, 652, 654, 660	10/07 - 10/13 10/07 - 10/13	7 7	Any elk 3 Pt. minimum	Early Muzzleloader General (WM)
	454 484	11/22 - 12/15 11/22 - 12/15	24 24	Any elk 3 Pt. minimum	Late Muzzleloader General (WM)
	454 460, 466, 472, 478, 484, 490	11/04 - 11/12 11/04 - 11/14	9 9	Any bull 3 Pt. minimum	Modern Firearm General (WF)
	654 Kapowsin bull North (2) 654 Kapowsin bull Central (2) 654 Kapowsin bull South (2)	09/15 - 09/30 09/15 - 09/30 09/15 - 09/30	16 16 16	Any bull Any bull Any bull	PLWMA Auction/Raffle Hunt (Any Tag)
<b>1999</b>	454 460, 484, 490 466, 472, 478	09/01 - 09/14 09/01 - 09/14 09/01 - 09/14	14 14 14	Any elk Antlerless or 3 pt. min. 3 Pt. minimum	Early Archery General (WA)
	484 454	11/24 - 12/15 11/24 - 12/15	22 22	Antlerless 3 pt. min. Any elk	Late Archery General (WA)
	454 460, 478, 484	10/09 - 10/15 10/09 - 10/15	6 6	Any elk 3 Pt. minimum	Early Muzzleloader General (WM)
	454 484	11/24 - 12/15 11/24 - 12/15	22 22	Any elk 3 Pt. minimum	Late Muzzleloader General (WM)
	454 460, 466, 472, 478, 484, 490	11/06 - 11/14 11/06 - 11/14	9 9	Any bull 3 Pt. minimum	Modern Firearm General (WF)
	478 Kapowsin bull North (2) 478 Kapowsin bull Central (2) 478 Kapowsin bull South (2)	09/15 - 09/30 09/15 - 09/30 09/15 - 09/30	16 16 16	Any bull Any bull Any bull	PLWMA Auction/Raffle Hunt (Any Tag)

YEAR	GMU # & (Number of permits)	Dates	Days	Legal Animal	Hunt Description and Tag Type
1998	454 460, 466, 490 472, 478, 484 Champion PLWMA 401 (3)	09/01 - 09/14 09/01 - 09/14 09/01 - 09/14 08/28 - 09/10	14 14 14 14	Any elk Antlerless or 3 pt. min.  3 Pt. minimum Antlerless only	Early Archery General (WA)  Harvest quota of 3 in PLWMA 401
	454. 484	11/25 - 12/15 11/25 - 12/15	21 21	Any elk 3 Pt. minimum	Late Archery General (WA)
	454. 460, 484.	10/10 -10/16 10/10 -10/16	7 7	Any elk 3 Pt. minimum	Early Muzzleloader General ( WM)
	454. 484.	11/25 -12/15 11/25 -12/15	21 21	Any elk 3 Pt. minimum	Late Muzzleloader General (WM)
	454 460, 466, 472, 478, 484, 490	11/07 - 11/15 11/07 - 11/15	9 9	Any bull 3 Pt. minimum	Modern Firearm General (WG)
	478 Kapowsin bull North (2) 478 Kapowsin bull Central (2) 478 Kapowsin bull South (2)	09/15 - 09/30 09/15 - 09/30 09/15 - 09/30	16 16 16	Any bull Any bull Any bull	PLWMA Auction/Raffle Hunt (Any Tag)
1997	454, 484 460, 466, 478, 490	09/01 - 09/14 09/01 - 09/14	14 14	Any elk Antlerless or 3 pt. min.	Early Archery General (WA)
	454, 484	11/26 - 12/15	21	Spike or antlerless	Late Archery General (WA)
	454, 484 460, 478	10/04 - 10/10 10/04 - 10/10	6 6	Antlerless or spike bull 3 Pt. minimum	Early Muzzleloader General (WM)
	454, 484	11/26 - 12/15	22	Antlerless or spike bull	Late Muzzleloader General (WM)
	454, 484 460, 466, 478, 490	11/08 - 11/16 11/10 - 11/16 11/08 - 11/16 11/10 - 11/16	9 7 9 7	Spike bull only Spike bull only 3 Pt. minimum 3 Pt. minimum	Modern Firearm General (WG) Modern Firearm General (WP) Modern Firearm General (WG) Modern Firearm General (WP)
	478 Kapowsin bull North A (2)	09/13 - 09/24	12	Any bull	PLWMA Auction/Raffle Hunt (Any Tag)
	478 Kapowsin North C (10) 478 Kapowsin Central B (5) 478 Kapowsin South B (5)	11/24 - 12/08 11/24 - 12/08 11/24 - 12/08	14 14 14	Antlerless only Antlerless only Antlerless only	Muzzleloader Only PLWMA auction/raffle Hunt (WM)
	White River A (330) White River B (25) White River C (5)  White River D (102) White River E (11) White River F (67) White River G (26)	11/03 - 11/16 11/03 - 11/16 11/12 - 11/16  10/01 - 10/10 10/01 - 10/10 09/01 - 09/14 09/01 - 09/14	14 14 5  10 10 14 14	Spike only 3 Pt. minimum Antlerless only  Spike only 3 Pt. minimum Spike only 3 Pt. minimum	Modern Firearm Permit Only (WP) Modern Firearm Permit Only (WP) Modern Firearm Permit Only (WP or WM) Muzzleloader Permit Only (WM) Muzzleloader Permit Only (WM) Archery Permit Only (WA) Archery Permit Only (WA)
1996	454, 484 460, 466, 478, 490 472 Champion PLWMA 401	09/01 - 09/14 09/01 - 09/14 09/01 - 09/14 09/01 - 09/13	14 14 14 13	Either sex Antlerless or 3 pt. min. Antlerless or spike Antlerless or spike	Early Archery General (WA)  PLWMA 401 in GMU 478
	454, 484	11/27 - 12/15	19	Either sex	Late Archery General (WA)
	484 460	10/03 - 10/09 10/03 - 10/09	6 6	Either sex 3 Pt. minimum	Early Muzzleloader General (WM)
	484	11/27 - 12/15	21	Either sex	Late Muzzleloader General (WM)

YEAR	GMU # & (Number of permits)	Dates	Days	Legal Animal	Hunt Description and Tag Type
	454, 472*, 484	11/06 - 11/17 11/09 - 11/17	12 9	Antlered bull (except 472 Spike only).	Modern Firearm General (WG) Modern Firearm General (WP)
	460, 466, 478, 490	11/08 - 11/16 11/10 - 11/16	12 9	3 Pt. minimum 3 Pt. minimum	Modern Firearm General (WG) Modern Firearm General (WP)
	478 Kapowsin bull A (2) 478 Kapowsin bull B (1) 478 Kapowsin bull C (1)	Three seasons to match tag holders.	13 A 9 MF 11 MZ.	Any bull	PLWMA Auction/Raffle Hunt (Any Tag) Archery Sept. 1-13; Mod. F. Nov. 9-17; Muz. Nov.21-Dec. 1
	478 Kapowsin Spike D (1)	11/09 - 11/17	9	Spike bull	Champion Spike Bull Permit Only (WG & WP)
	478 Kapowsin Spike E (1)	11/09 - 11/17	9		Champion Spike Bull Permit Only (WG & WP)
	478 Kapowsin Spike F (1) 478 Kapowsin Spike G (1)	11/21 - 12/01 11/21 - 12/01	11 11		Champion Spike bull Permit Only (WM) Champion Spike bull Permit Only (WM)
	478 Kapowsin North A (10) 478 Kapowsin Central B (5) 478 Kapowsin South C (5)	11/24 - 12/08 11/24 - 12/08 11/24 - 12/08	14 14 14	Antlerless Only Antlerless Only Antlerless Only	Muzzleloader Only PLWMA auction/raffle Hunt (WM)
White River A (25) White River B (10) Green River Cow A (32) Green River Bull (11) Green River Spike (1) Green River Cow B (5)	11/06 - 11/17 09/01 - 09/14 11/09 - 11/13 11/09 - 11/13 11/09 - 11/13 11/01 - 11/13	12 14 5 5 5 5	Any Bull Either sex Antlerless only Antlerless or 3 pt. min. Antlerless or spike Antlerless only	M. Firearm Permit Only (WP or WM) Archery Permit Only (WA) M. Firearm Permit Only (WP or WM) M. Firearm Permit Only (WP or WM) M. Firearm Permit Only (WP or WM) Person of Disability Permit Only (Any Elk Tag)	
1995	454, 484 460, 466, 478, 490 472 Champion PLWMA 401	09/01 - 09/14 09/01 - 09/14 09/01 - 09/14 09/01 - 09/14	14 14 14 14	Either sex Antlerless or 3 pt. min. Antlerless or spike Antlerless or spike	Early Archery General (WA)  PLWMA 401 in GMU 478.
	454, 484	11/22 - 12/15	24	Either sex	Late Archery General (WA)
	484 460 478 Champion PLWMA	10/05 - 10/11 10/05 - 10/11	7 7	Either sex 3 Pt. minimum Spike bull	Early Muzzleloader General (WM)
	484	11/22 - 12/15	24	Either sex	Late Muzzleloader General (WM)
	454, 472*, 484	11/01 - 11/13 11/04 - 11/13	13 10	Antlered Bull (except 472 Spike only).	Modern Firearm General (WG) Modern Firearm General (WP)
	460, 466 478, 490, and Champion PLWMA	11/01 - 11/13 11/04 - 11/13	13 10	3 Pt. minimum (except PLWMA spike only.)	Modern Firearm General (WG) Modern Firearm General (WP)
	478 Kapowsin bull A (2) 478 Kapowsin bull B (2)	Three seasons to match tag holders.	13 A 9 MF 11 MZ	Any bull	PLWMA Permit Drawing(Raffle) Hunt (WA,WC,WM)Archery Sept. 1-14; Mod. F. Nov. 1-13; Muz. Nov.22-Dec. 5
	478 Kapowsin North A (10) 478 Kapowsin Central B (5) 478 Kapowsin South C (5)	11/22 - 12/05 11/22 - 12/05 11/22 - 12/05	14 14 14	Antlerless only Antlerless only Antlerless only	Muzzleloader Only PLWMA raffle Hunt (WM)
	White River A (25) White River B (10) Green River Cow A (38) Green River Bull (12) Green River Spike (2) Green River Cow B (5)	11/01 - 11/13 09/01 - 09/14 11/11 - 11/15 11/11 - 11/15 11/11 - 11/15 11/11 - 11/15	13 14 5 5 5 5	Any bull Either sex Antlerless only Antlerless or 3 pt. min. Antlerless or spike Antlerless only	M. Firearm Permit Only (WC or WM) Archery Permit Only (WA) M. Firearm Permit Only (WC or WM) M. Firearm Permit Only (WC or WM) M. Firearm Permit Only (WC or WM) Person of Disability Permit Only (WC or WM)

YEAR	GMU # & (Number of permits)	Dates	Days	Legal Animal	Hunt Description and Tag Type
1994	454, 484 460, 466, 478, 490 472 Champion PLWMA 401	09/01 - 09/14 09/01 - 09/14 09/01 - 09/14 09/01 - 09/14	14 14 14 14	Either sex Antlerless or 3 pt. min. Antlerless or spike Antlerless or spike	Early Archery General (WA)  PLWMA 401 in GMU 478.
	454, 484	11/23 - 12/15	23	Either sex	Late Archery General (WA)
	484 460	10/06 - 10/12 10/06 - 10/12	7 7	Either sex 3 Pt. minimum	Early Muzzleloader General (WM)
	484 478 Champion PLWMA	11/23 - 12/15 11/23 - 12/05	23 13	Either-sex Spike bull only	Late Muzzleloader General (WM)
	454, 472*, 484	11/02 - 11/13 11/05 - 11/13	12 09	Antlered bull (except 472 Spike only).	Modern Firearm General (WE) Modern Firearm General (WL)
	460, 466 478, 490 and Champion PLWMA	11/02 - 11/13 11/05 - 11/13	12 09	3 Pt. minimum, except PLWMA spike bull	Modern Firearm General (WE) Modern Firearm General (WL)
	478 Kapowsin bull A (2) 478 Kapowsin bull B (2)	Three seasons to match tag holders.	13 A 9 MF 11 MZ	Any bull	PLWMA Permit Drawing(Raffle) Hunt (WA,WL,WM) Archery Sept. 1-14; Mod. F. Nov. 1-13; Muz. Nov.22-Dec. 5
	478 Kapowsin North A (10) 478 Kapowsin Central B (5) 478 Kapowsin South C (5)	11/22 - 12/05 11/22 - 12/05 11/22 - 12/05	14 14 14	Antlerless only Antlerless only Antlerless only	Muzzleloader Only PLWMA raffle Hunt (WM)
White River A (25) White River B (10) Green River Cow A (25) Green River Bull (15) Green River Spike (5) Green River Cow B (5)	11/02 - 11/13 09/01 - 09/14 11/12 - 11/16 11/12 - 11/16 11/12 - 11/16 11/12 - 11/16	12 14 5 5 5 5	Any bull Either sex Antlerless only Antlerless or 3 pt. min. Antlerless or spike Antlerless only	M. Firearm Permit Only (WL or WM) Archery Permit Only (WA) M. Firearm Permit Only (WL or WM) M. Firearm Permit Only (WL or WM) M. Firearm Permit Only (WL or WM) Person of Disability Permit Only (WL or WM)	
1993	454 460, 466, 478, 490 472 Champion PLWMA 401	10/01 - 10/14 10/01 - 10/14 10/01 - 10/14 10/01 - 10/14	14 14 14 14	Either sex Antlerless or 3 pt. min. Antlerless or spike Antlerless or spike	Early Archery General (WA)  PLWMA 401 in GMU 478.
	454, 484	11/23 - 12/15	23	Either sex	Late Archery General (WA)
	484 460	10/08 - 10/14 10/08 - 10/14	7 7	Either sex 3 Pt. minimum	Early Muzzleloader General (WM)
	484 478 Champion PLWMA	11/24 - 12/15 11/24 - 12/05	22 12	Either sex Spike bull only	Late Muzzleloader General (WM)
	454, 472*, 484	11/03 - 11/14 11/06 - 11/14	12 09	Antlered bull (except 472 Spike only).	Modern Firearm General (WE) Modern Firearm General (WL)
	460, 466 478, 490 and Champion PLWMA	11/03 - 11/14 11/06 - 11/14	12 9	3 Pt. minimum, except PLWMA spike bull	Modern Firearm General (WE) Modern Firearm General (WL)
	478 Kapowsin North (60) 478 Kapowsin Central (25) 478 Kapowsin South (25)	11/24 - 12/05 11/24 - 12/05 11/24 - 12/05	12 14 14	Spike bull or antlerless	Muzzleloader Only PLWMA raffle Hunt (WM)

YEAR	GMU # & (Number of permits)	Dates	Days	Legal Animal	Hunt Description and Tag Type
	White River A (25) White River B (10) Green River Cow A (25) Green River Bull (15) Green River Spike (5) Green River Cow B (5)	11/03 - 11/14 10/01 - 10/14 11/13 - 11/17 11/13 - 11/17 11/13 - 11/17 11/13 - 11/17	12 14 5 5 5 5	Any bull Either-sex Antlerless only Antlerless or 3 pt. min. Antlerless or spike Antlerless only	M. Firearm Permit Only (WL or WM) Archery Permit Only (WA) M. Firearm Permit Only (WL or WM) M. Firearm Permit Only (WL or WM) M. Firearm Permit Only (WL or WM) Person of Disability Permit Only (WL or WM)
1992	454 460, 466, 478, 490 472	10/01 - 10/14 10/01 - 10/14 10/01 - 10/14	14 14 14	Either-sex Antlerless or 3 pt. min Antlerless or spike	Early Archery General (WA)
	454, 484	11/25 - 12/15	21	Either-sex	Late Archery General (WA)
	484 460	10/08 - 10/14 10/08 - 10/14	7 7	Either-sex 3 Pt. Minimum	Early Muzzleloader General (WM)
	484	11/25 - 12/15	21	Either-sex	Late Muzzleloader General (WM)
	454, 472*, 484	11/04 - 11/15 11/07 - 11/15	12 09	Antlered Bull (except 472 Spike only).	Modern Firearm General (WE) Modern Firearm General (WL)
	460, 466 478, 490	11/04 - 11/15 11/07 - 11/15	12 09	3 Pt. Minimum.	Modern Firearm General (WE) Modern Firearm General (WL)
	White River A (25) White River B (5) Green River Cow A (25) Green River Bull (15) Green River Spike (5) Green River Cow B (5)	11/04 - 11/15 10/01 - 10/14 11/14 - 11/18 11/14 - 11/18 11/14 - 11/18 11/14 - 11/18	12 14 5 5 5 5	Any bull Either-sex Antlerless only Antlerless or 3 pt. min. Antlerless or spike Antlerless only	M. Firearm Permit Only (WE or WM) Archery Permit Only (WA) M. Firearm Permit Only (WL or WM) M. Firearm Permit Only (WL or WM) M. Firearm Permit Only (WL or WM) Person of Disability Permit Only (WL or WM)
1991	454 460, 466, 478, 490 484 472	09/28 - 10/11 09/28 - 10/11 09/28 - 10/04 09/28 - 10/11	14 14 7 14	Either-sex Antlerless or 3 pt. min. Either-sex 3 pt. minimum	Early Archery General (WA)
	454, 484	11/27 - 12/15	19	Either-sex	Late Archery General (WA)
	484 460	10/05 - 10/11 10/05 - 10/11	7 7	Either-sex 3 Pt. minimum	Early Muzzleloader General (WM)
	484	11/27 - 12/15	19	Either-sex	Late Muzzleloader General (WM)
	454, 484	11/06 - 11/17 11/09 - 11/17	12 9	Antlered bull	Modern Firearm General (WE) Modern Firearm General (WL)
	460, 466, 472, 478, 490	11/06 - 11/17 11/09 - 11/17	12 9	3 Pt. Minimum.	Modern Firearm General (WE) Modern Firearm General (WL)
	Green River Cow A (30) Green River Bull (15) Green River Spike (5)	11/16 - 11/20 11/16 - 11/20 11/16 - 11/20	5 5 5	Antlerless only Antlerless or 3 pt. min. Antlerless or spike	M. Firearm Permit Only (WL or WM) M. Firearm Permit Only (WL or WM) M. Firearm Permit Only (WL or WM)
1990	454 460, 466, 478, 490 484 472	09/29 - 10/12 09/29 - 10/12 09/29 - 10/05 09/29 - 10/12	14 14 7 14	Either-sex Antlerless or 3 pt. min. Either-sex 3 pt. minimum	Early Archery General (WA)
	454, 484	11/21 - 12/09	19	Either-sex	Late Archery General (WA)
	484	10/06 - 10/12	7	Either-sex	Early Muzzleloader General (WM)
	484	11/21 - 12/09	19	Either-sex	Late Muzzleloader General (WM)



YEAR	GMU # & (Number of permits)	Dates	Days	Legal Animal	Hunt Description and Tag Type
	454, 484	10/31 - 11/11 11/03 - 11/11	12 9	Antlered bull	Modern Firearm General (WE) Modern Firearm General (WL)
	460, 466, 472, 478, 490	11/06 - 11/17 11/09 - 11/17	12 9	3 Pt. minimum.	Modern Firearm General (WE) Modern Firearm General (WL)
	485 Green River Cow (30)	11/10 - 11/14	5	Antlerless only	M. Firearm Permit Only (WL or WM)
	485 Green River Bull (15)	11/10 - 11/14	5	Antlerless or 3 pt. min.	M. Firearm Permit Only (WL or WM)
	485 Green River Spike (5)	11/10 - 11/14	5	Antlerless or spike	M. Firearm Permit Only (WL or WM)
1989	454	09/30 - 10/13	14	Either sex	Early Archery General (WA)
	460, 466, 478, 490	09/30 - 10/13	14	Antlerless or 3 pt. min.	
	484	09/30 - 10/06	7	Antlerless or 3 pt. min.	
	472	09/30 - 10/13	14	3 pt. minimum	
	484	11/22 - 12/15	24	Antlerless or 3 pt. min	Late Archery General (WA)
	484	10/07 - 10/13	7	Antlerless or 3 pt. min	Early Muzzleloader General (WM)
	484	11/22 - 12/10	19	Antlerless or 3 pt. min.	Late Muzzleloader General (WM)
	454, 484	11/01 - 11/12 11/04 - 11/12	12 9	Antlered bull	Modern Firearm General (WE) Modern Firearm General (WL)
	460, 466, 472, 478, 490	11/06 - 11/17 11/09 - 11/17	12 9	3 Pt. minimum.	Modern Firearm General (WE) Modern Firearm General (WL)
	485 Green River Cow A (30)	11/11 - 11/15	5	Antlerless only	M. Firearm Permit Only (WL or WM)
485 Green River Bull (15)	11/11 - 11/15	5	Antlerless or 3 pt. min.	M. Firearm Permit Only (WL or WM)	
485 Green River Spike (5)	11/11 - 11/15	5	Antlerless or spike	M. Firearm Permit Only (WL or WM)	
1988	454, 484	10/01 - 10/14	14	Either sex	Early Archery General (WA)
	460, 466, 472, 478, 490	10/01 - 10/14	14	Antlerless or 3 pt. min.	
	484	11/23 - 12/11	19	Either sex	Late Archery General (WA)
	484	10/07 - 10/13	7	Antlerless or 3 pt. min.	Early Muzzleloader General (WM)
	484	11/22 - 12/10	19	Antlerless or 3 pt. min.	Late Muzzleloader General (WM)
	454, 484	11/02 - 11/13 11/05 - 11/13	12 9	Antlered bull	Modern Firearm General (WE) Modern Firearm General (WL)
	460, 466, 472, 478, 490	11/06 - 11/17 11/09 - 11/17	12 9	3 Pt. minimum.	Modern Firearm General (WE) Modern Firearm General (WL)
485 Green River Cow (30)	11/12 - 11/16	5	Antlerless only	M. Firearm Permit Only (WL or WM)	
485 Green River Bull (15)	11/12 - 11/16	5	Either sex, 5 Pt. bull min.	M. Firearm Permit Only (WL or WM)	
485 Green River Spike (5)	11/12 - 11/16	5	Antlerless or spike	M. Firearm Permit Only (WL or WM)	
1987	454, 484	10/01 - 10/16	14	Either sex	Early Archery General (WA)
	460, 466, 472, 478, 490	10/01 - 10/16	14	Antlerless or 3 pt. min.	
	484	11/25 - 12/10	16	Either sex	Late Archery General (WA)
	454, 484	11/04 - 11/15 11/07 - 11/15	12 9	Antlered bull	Modern Firearm General (WE) Modern Firearm General (WL)
	460, 466, 472, 478, 490	11/04 - 11/15 11/07 - 11/15	12 9	3 Pt. minimum	Modern Firearm General (WE) Modern Firearm General (WL)

YEAR	GMU # & (Number of permits)	Dates	Days	Legal Animal	Hunt Description and Tag Type
	485 Green River Cow (30) 485 Green River Bull (20)	11/14 - 11/18 11/14 - 11/18	5 5	Antlerless only Antlerless or 3 pt. min.	Modern Firearm Permit Only (WL or WM) Modern Firearm Permit Only (WL or WM)
1986	454, 460, 466, 472, 478 484, 496.	09/03 - 09/07 09/08 - 09/17	5 10	Bull Only Either sex	Early Archery General
	454, 484, 496.	12/06 - 12/31	26	Either sex	Late Archery General
	472	11/05 - 11/16	12	Bull Only	Western Washington Muzzleloader
	454, 484	11/05 - 11/16 11/08 - 11/16	12 9	Either sex	Modern Firearm General (WE) Modern Firearm General (WL)
	460, 466, 472, 478, 490.	11/04 - 11/15 11/07 - 11/15	12 9	Antlered Bull	Modern Firearm General (WE) Modern Firearm General (WL)
	485 Green River Cow C (30) 485 Green River Bull E (20)	11/25 - 11/30 11/25 - 11/30	5 5	Antlerless Only Antlerless or 3 pt. min.	M. Firearm Permit Only (WL or WM) M. Firearm Permit Only (WL or WM)
1985	454, 460, 466, 472, 478 484, 496	09/04 - 09/08 09/09 - 09/18	5 10	Bull only Either sex	Early Archery General
	454, 484, 496	12/07 - 12/31	25	Either sex	Late Archery General
	472	11/06 - 11/17	12	Bull only	Western Washington Muzzleloader Season
	454, 484	11/09 - 11/17	12	Either sex	Modern Firearm General (WE)
	460, 466, 472, 478, 490	11/06 - 11/17 11/09 - 11/17	12 9	Antlered bull	Modern Firearm General (WE) Modern Firearm General (WL)
	485 Green River Cow C (20) 485 Green River Bull E (30) 496 Ohop (15)	11/26 - 12/01 11/26 - 12/01 11/30 - 12/08	6 6 9	Antlerless only Antlerless or 3 pt. min. Either sex	M. Firearm Permit Only (WL or WM) M. Firearm Permit Only (WL or WM) M. Firearm Permit Only (WL or WM)
1984	454, 460, 466*, 472*, 478 484, 496	09/05 - 09/09 09/10 - 09/19	5 10	Bull only Either sex, (except bull only in 466, 472)*	Early Archery General
	454, 484	12/08 - 12/31	245	Either sex	Late Archery General
	472	11/10 - 11/18	9	Bull only	Western Washington Muzzleloader Season
	454, 484	11/10 - 11/18	12	Either sex	Modern Firearm General (WE)
	460, 466, 472, 478, 490	11/07 - 11/18 11/10 - 11/18	12 9	Antlered bull	Modern Firearm General (WE) Modern Firearm General (WL)
	485 Green River (50)	11/27 - 12/02	6	Antlerless or 3 pt. min.	M. Firearm Permit Only (WL or WM)
1983	None				Early Archery General
	None				Late Archery General
	None				Western Washington Muzzleloader Season

YEAR	GMU # & (Number of permits)	Dates	Days	Legal Animal	Hunt Description and Tag Type
	454,484 460, 466, 472, 478	11/05 - 11/15 11/05 - 11/15	11 11	Either sex Bull / visible antlers	Modern Firearm General (W)
1982	454,484 460, 466, 472, 478	11/06 - 11/16 11/06 - 11/16	11 11	Either sex Bulls / visible antlers	Modern Firearm General (W)
1981	454,484 460, 466, 472, 478	11/07 - 11/17 11/07 - 11/17	11 11	Either sex Bulls / visible antlers	Modern Firearm General (W)
1980	454,484 460, 466, 472, 478.	11/09 - 11/19 11/09 - 11/19	11 11	Either sex Bulls / visible antlers	Modern Firearm General (W)
1979	454,484 460, 466, 472, 478.	11/11 - 11/25 11/11 - 11/25	11 11	Either sex Bulls / visible antlers	Modern Firearm General
1978	454,484 460, 466, 472, 478	11/06 - 11/19 11/06 - 11/19	14 14	Either sex Bulls / visible antlers	Modern Firearm General
1977	454,484 460, 466, 472, 478	10/31 - 11/13 10/31 - 11/13	14 14	Either sex Bulls / visible antlers	Modern Firearm General
1976	478	11/25 -11/26	2	Either sex	Muzzleloading Rifle Season
	454, 460, 484 460, 466, 472, 478	11/01 - 11/14 11/01 - 11/14	14 14	Either sex Bulls / visible antlers	Modern Firearm General
1975	478	11/275 -11/30	4	Either sex	Muzzleloading Rifle Season
	454, 460, 484 460, 466, 472, 478	11/03 - 11/16 11/03 - 11/16	14 14	Either sex Bulls / visible antlers	Modern Firearm General
1974	8D	11/28 -12/01	4	Either sex	Muzzleloading Rifle Season
	8A 7C, 7B, 7F, 8E, 8D	11/07 - 11/17 11/04 - 11/17	11 14	Either sex Bulls / visible antlers	Modern Firearm General
1973	Muzzleloader Area 7	12/15 -01/31	48	Either sex	Muzzleloading Rifle Season
	8A 7C, 7B, 7F, 8E, 8D	11/08 - 11/18 11/05 - 11/18	11 14	Either sex Bulls / visible antlers	Modern Firearm General
	7F (50) 8D (75) 8E (50)	11/10 - 11/18 11/10 - 11/18 11/10 - 11/18	9 9 9	Either sex Either sex Either sex	Either-sex Permit Controlled Seasons
1972	8A 7B, 7C 7F, 8E, 8D	11/02 - 11/12 10/30 - 11/12 10/30 - 11/12	11 13 13	Either sex Either sex Bulls / visible antlers	Modern Firearm General
	7F (50) 8D (50) 8E (50)	11/08 - 11/12 11/04 - 11/12 11/08 - 11/12	5 9 5	Either sex Either sex Either sex	Either-sex Permit Controlled Seasons

<b>YEAR</b>	<b>GMU # &amp; (Number of permits)</b>	<b>Dates</b>	<b>Days</b>	<b>Legal Animal</b>	<b>Hunt Description and Tag Type</b>
<b>1971</b>	8A	11/04 - 11/14	11	Either sex	Modern Firearm General
	7B, 7C	11/01 - 11/14	14	Either sex	
	7F, 8E, 8D	11/01 - 11/14	14	Bulls / visible antlers	
<b>1971</b>	7F (50)	11/06 - 11/14	9	Either sex	Either-sex Permit Controlled Seasons
	8D (50)	11/06 - 11/09	4	Either sex	
	8E (50)	11/06 - 11/14	9	Either sex	
<b>1970</b>	8A	11/12 - 11/22	11	Either sex	Modern Firearm General
	7B, 7C,	11/07 - 11/22	15	Either sex	
	7F, 8E, 8D	11/07 - 11/22	15	Bulls / visible antlers	
<b>1970</b>	7F (50)	11/07 - 11/22	15	Either sex	Either-sex Permit Controlled Seasons
	8E (50)	11/07 - 11/22	15	Either sex	

**APPENDIX B. Green River Unit (GMU 485) Permit Quota Distribution and Permit Type**

<b>Year</b>	<b>Permit distribution</b>	<b>Either-sex or 5 pt. min.</b>	<b>Branched antler bull</b>	<b>Antlerless or 3 pt. minimum</b>	<b>Spike bull only</b>	<b>Antlerless or spike bull</b>	<b>Antlerless Only</b>	<b>Total</b>
1983	CLOSED							
1984	<b>State</b>			<b>20</b>			<b>30</b>	<b>50</b>
1985	<b>State</b>			<b>20</b>			<b>30</b>	<b>50</b>
1986	<b>State</b>			<b>20</b>			<b>30</b>	<b>50</b>
1987	<b>State</b>			<b>20</b>			<b>30</b>	<b>50</b>
1988	<b>State</b>	<b>15</b>				<b>5</b>	<b>30</b>	<b>50</b>
1989	<b>State</b>			<b>15</b>		<b>5</b>	<b>30</b>	<b>50</b>
1990	<b>State</b>			<b>15</b>		<b>5</b>	<b>30</b>	<b>50</b>
1991	<b>State</b>			<b>15</b>		<b>5</b>	<b>30</b>	<b>50</b>
1992	State			15		5	30	50
	MIT				6		9	15
	<b>Year total</b>			<b>15</b>	<b>6</b>	<b>5</b>	<b>39</b>	<b>65</b>
1993	State			15		5	30	50
	MIT				6		9	15
	<b>Year total</b>			<b>15</b>	<b>6</b>	<b>5</b>	<b>39</b>	<b>65</b>
1994	State			15		5	30	50
	MIT		6		6		19	31
	<b>Year total</b>		<b>6</b>	<b>15</b>	<b>6</b>	<b>5</b>	<b>49</b>	<b>81</b>
1995	State			12		2	43	57
	MIT		2		6		35	43
	<b>Year total</b>		<b>2</b>	<b>12</b>	<b>6</b>	<b>2</b>	<b>78</b>	<b>100</b>
1996	State			11		1	37	49
	MIT		2		6		35	43
	<b>Year total</b>		<b>2</b>	<b>11</b>	<b>6</b>	<b>1</b>	<b>72</b>	<b>92</b>
1997	CLOSED							

## APPENDIX C. Management Authority For Controlling Elk Damage

RCW 77.36.005

**Findings. (Expires June 30, 2004.)**

The legislature finds that:

(1) As the number of people in the state grows and wildlife habitat is altered, people will encounter wildlife more frequently. As a result, conflicts between humans and wildlife will also increase. Wildlife is a public resource of significant value to the people of the state and the responsibility to minimize and resolve these conflicts is shared by all citizens of the state.

(2) In particular, the state recognizes the importance of commercial agricultural and horticultural crop production, rangeland suitable for grazing or browsing of domestic livestock, and the value of healthy deer and elk populations, which can damage such crops. The legislature further finds that damage prevention is key to maintaining healthy deer and elk populations, wildlife-related recreational opportunities, commercially productive agricultural and horticultural crops, and rangeland suitable for grazing or browsing of domestic livestock, and that the state, participants in wildlife recreation, and private landowners and tenants share the responsibility for damage prevention. Toward this end, the legislature encourages landowners and tenants to contribute through their land management practices to healthy wildlife populations and to provide access for related recreation. It is in the best interests of the state for the department of fish and wildlife to respond quickly to wildlife damage complaints and to work with these landowners and tenants to minimize and/or prevent damages and conflicts while maintaining deer and elk populations for enjoyment by all citizens of the state.

(3) A timely and simplified process for resolving claims for damages caused by deer and elk for commercial agricultural or horticultural products, and rangeland used for grazing or browsing of domestic livestock is beneficial to the claimant and the state.

[2001 c 274 § 1; 1996 c 54 § 1.]

### NOTES:

**Expiration date -- 2001 c 274 §§ 1-3:** "The following expire June 30, 2004:

- (1) Section 1, chapter 274, Laws of 2001;
- (2) Section 2, chapter 274, Laws of 2001; and
- (3) Section 3, chapter 274, Laws of 2001." [2001 c 274 § 5.]

**Effective date -- 2001 c 274:** "This act is necessary for the immediate preservation of the public peace, health, or safety, or support of the state government and its existing public institutions, and takes effect July 1, 2001." [2001 c 274 § 6.]

**RCW 77.36.005**

**Findings. (Effective June 30, 2004.)**

The legislature finds that:

(1) As the number of people in the state grows and wildlife habitat is altered, people will encounter wildlife more frequently. As a result, conflicts between humans and wildlife will also increase. Wildlife is a public resource of significant value to the people of the state and the responsibility to minimize and resolve these conflicts is shared by all citizens of the state.

(2) In particular, the state recognizes the importance of commercial agricultural and horticultural crop production and the value of healthy deer and elk populations, which can damage such crops. The legislature further finds that damage prevention is key to maintaining healthy deer and elk populations, wildlife-related recreational opportunities, and commercially productive agricultural and horticultural crops, and that the state, participants in wildlife recreation, and private landowners and tenants share the responsibility for damage prevention. Toward this end, the legislature encourages landowners and tenants to contribute through their land management practices to healthy wildlife populations and to provide access for related recreation. It is in the best interests of the state for the department of fish and wildlife to respond quickly to wildlife damage complaints and to work with these landowners and tenants to minimize and/or prevent damages and conflicts while maintaining deer and elk populations for enjoyment by all citizens of the state.

(3) A timely and simplified process for resolving claims for damages caused by deer and elk for commercial agricultural or horticultural products is beneficial to the claimant and the state.

[1996 c 54 § 1.]

**RCW 77.36.010**

**Definitions. (Expires June 30, 2004.)**

The definitions in this section apply throughout this chapter unless the context clearly requires otherwise.

(1) "Crop" means (a) a growing or harvested horticultural and/or agricultural product for commercial purposes; or (b) rangeland forage on privately owned land used for grazing or browsing of domestic livestock for at least a portion of the year for commercial purposes. For the purposes of this chapter all parts of horticultural trees shall be considered a crop and shall be eligible for claims.

(2) "Emergency" means an unforeseen circumstance beyond the control of the landowner or tenant that presents a real and immediate threat to crops, domestic animals, or fowl.

(3) "Immediate family member" means spouse, brother, sister, grandparent, parent, child, or grandchild.

[2001 c 274 § 2; 1996 c 54 § 2.]

**NOTES:**

**Expiration date -- 2001 c 274 §§ 1-3:** See note following RCW [77.36.005](#).

**Effective date -- 2001 c 274:** See note following RCW [77.36.005](#).

**RCW 77.36.010**

**Definitions. (Effective June 30, 2004.)**

Unless otherwise specified, the following definitions apply throughout this chapter:

(1) "Crop" means a commercially raised horticultural and/or agricultural product and includes growing or harvested product but does not include livestock. For the purposes of this chapter all parts of horticultural trees shall be considered a crop and shall be eligible for claims.

(2) "Emergency" means an unforeseen circumstance beyond the control of the landowner or tenant that presents a real and immediate threat to crops, domestic animals, or fowl.

(3) "Immediate family member" means spouse, brother, sister, grandparent, parent, child, or grandchild.

[1996 c 54 § 2.]

**RCW 77.36.020**

**Game damage control -- Special hunt.**

The department shall work closely with landowners and tenants suffering game damage problems to control damage without killing the animals when practical, to increase the harvest of damage-causing animals in hunting seasons, and to kill the animals when no other practical means of damage control is feasible.

If the department receives recurring complaints regarding property being damaged as described in this section or RCW [77.36.030](#) from the owner or tenant of real property, or receives such complaints from several such owners or tenants in a locale, the commission shall consider conducting a special hunt or special hunts to reduce the potential for such damage.

[1996 c 54 § 3.]

**RCW 77.36.030**

**Trapping or killing wildlife causing damage -- Emergency situations.**

(1) Subject to the following limitations and conditions, the owner, the owner's immediate family member, the owner's documented employee, or a tenant of real property may trap or kill on that property, without the licenses required under RCW [77.32.010](#) or authorization from the director under RCW [77.12.240](#), wild animals or wild birds that are damaging crops, domestic animals, or fowl:

(a) Threatened or endangered species shall not be hunted, trapped, or killed;

(b) Except in an emergency situation, deer, elk, and protected wildlife shall not be killed without a permit issued and conditioned by the director or the director's designee. In an emergency, the department may give verbal permission followed by written permission to trap or kill any deer, elk, or protected wildlife that is damaging crops, domestic animals, or fowl; and



(c) On privately owned cattle ranching lands, the land owner or lessee may declare an emergency only when the department has not responded within forty-eight hours after having been contacted by the land owner or lessee regarding damage caused by wild animals or wild birds. In such an emergency, the owner or lessee may trap or kill any deer, elk, or other protected wildlife that is causing the damage but deer and elk may only be killed if such lands were open to public hunting during the previous hunting season, or the closure to public hunting was coordinated with the department to protect property and livestock.

(2) Except for coyotes and Columbian ground squirrels, wildlife trapped or killed under this section remain the property of the state, and the person trapping or killing the wildlife shall notify the department immediately. The department shall dispose of wildlife so taken within three days of receiving such a notification and in a manner determined by the director to be in the best interest of the state.

[1996 c 54 § 4.]

**RCW 77.36.040**

**Payment of claims for damages -- Procedure -- Limitations.**

(1) Pursuant to this section, the director or the director's designee may distribute money appropriated to pay claims for damages to crops caused by wild deer or elk in an amount of up to ten thousand dollars per claim. Damages payable under this section are limited to the value of such commercially raised horticultural or agricultural crops, whether growing or harvested, and shall be paid only to the owner of the crop at the time of damage, without assignment. Damages shall not include damage to other real or personal property including other vegetation or animals, damages caused by animals other than wild deer or elk, lost profits, consequential damages, or any other damages whatsoever. These damages shall comprise the exclusive remedy for claims against the state for damages caused by wildlife.

(2) The director may adopt rules for the form of affidavits or proof to be provided in claims under this section. The director may adopt rules to specify the time and method of assessing damage. The burden of proving damages shall be on the claimant. Payment of claims shall remain subject to the other conditions and limits of this chapter.

(3) If funds are limited, payments of claims shall be prioritized in the order that the claims are received. No claim may be processed if:

(a) The claimant did not notify the department within ten days of discovery of the damage. If the claimant intends to take steps that prevent determination of damages, such as harvest of damaged crops, then the claimant shall notify the department as soon as reasonably possible after discovery so that the department has an opportunity to document the damage and take steps to prevent additional damage; or

(b) The claimant did not present a complete, written claim within sixty days after the damage, or the last day of damaging if the damage was of a continuing nature.

(4) The director or the director's designee may examine and assess the damage upon notice. The department and claimant may agree to an assessment of damages by a neutral person or persons knowledgeable in horticultural or agricultural practices. The department and claimant shall share equally in the costs of such third party examination and assessment of damage.

(5) There shall be no payment for damages if:

(a) The crops are on lands leased from any public agency;

(b) The landowner or claimant failed to use or maintain applicable damage prevention materials or methods furnished by the department, or failed to comply with a wildlife damage prevention agreement under RCW [77.12.260](#);

(c) The director has expended all funds appropriated for payment of such claims for the current fiscal year; or

(d) The damages are covered by insurance. The claimant shall notify the department at the time of claim of insurance coverage in the manner required by the director. Insurance coverage shall cover all damages prior to any payment under this chapter.

(6) When there is a determination of claim by the director or the director's designee pursuant to this section, the claimant has sixty days to accept the claim or it is deemed rejected.

[1996 c 54 § 5.]

**RCW 77.36.050**

**Claimant refusal -- Excessive claims.**

If the claimant does not accept the director's decision under RCW [77.36.040](#), or if the claim exceeds ten thousand dollars, then the claim may be filed with the office of risk management under RCW [4.92.040](#)(5). The office of risk management shall recommend to the legislature whether the claim should be paid. If the legislature approves the claim, the director shall pay it from moneys appropriated for that purpose. No funds shall be expended for damages under this chapter except as appropriated by the legislature.

[1996 c 54 § 6.]

**RCW 77.36.060**

**Claim refused -- Posted property.**

The director may refuse to consider and pay claims of persons who have posted the property against hunting or who have not allowed public hunting during the season prior to the occurrence of the damages.

[1996 c 54 § 7.]

**RCW 77.36.070**

**Limit on total claims from wildlife fund per fiscal year.**

The department may pay no more than one hundred twenty thousand dollars per fiscal year from the wildlife fund for claims under RCW [77.36.040](#) and for assessment costs and compromise of claims. Such money shall be used to pay animal damage claims only if the claim meets the conditions of RCW [77.36.040](#) and the damage occurred in a place where the opportunity to hunt was not restricted or prohibited by a county, municipality, or other public entity during the season prior to the occurrence of the damage.

[1996 c 54 § 8.]

**RCW 77.36.080**

**Limit on total claims from general fund per fiscal year -- Emergency exceptions. (Expires June 30, 2004.)**

(1) The department may pay no more than thirty thousand dollars per fiscal year from the general fund for claims under RCW [77.36.040](#) and for assessment costs and compromise of claims unless the legislature declares an emergency. Such money shall be used to pay animal damage claims only if the claim meets the conditions of RCW [77.36.040](#) and the damage occurred in a place where the opportunity to hunt was restricted or prohibited by a county, municipality, or other public entity during the season prior to the occurrence of the damage.

(2) The legislature may declare an emergency, defined for the purposes of this section as any happening arising from weather, other natural conditions, or fire that causes unusually great damage by deer or elk to commercially raised agricultural or horticultural crops, or rangeland forage on privately owned land used for grazing or browsing of domestic livestock for at least a portion of the year. In an emergency, the department may pay as much as may be subsequently appropriated, in addition to the funds authorized under subsection (1) of this section, for claims under RCW [77.36.040](#) and for assessment and compromise of claims. Such money shall be used to pay animal damage claims only if the claim meets the conditions of RCW [77.36.040](#) and the department has expended all funds authorized under RCW [77.36.070](#) or subsection (1) of this section.

(3) Of the total funds available each fiscal year under subsection (1) of this section and RCW [77.36.070](#), no more than one-third of this total may be used to pay animal damage claims for rangeland forage on privately owned land.

(4) Of the total funds available each fiscal year under subsection (1) of this section and RCW [77.36.070](#) that remain unspent at the end of the fiscal year, fifty percent shall be utilized as matching grants to enhance habitat for deer and elk on public lands.

[2001 c 274 § 3; 1996 c 54 § 9.]

**NOTES:**

**Expiration date -- 2001 c 274 §§ 1-3:** See note following RCW [77.36.005](#).

**Effective date -- 2001 c 274:** See note following RCW [77.36.005](#).

**RCW 77.36.080**

**Limit on total claims from general fund per fiscal year -- Emergency exceptions. (Effective June 30, 2004.)**

(1) The department may pay no more than thirty thousand dollars per fiscal year from the general fund for claims under RCW [77.36.040](#) and for assessment costs and compromise of claims unless the legislature declares an emergency. Such money shall be used to pay animal damage claims only if the claim meets the conditions of RCW [77.36.040](#) and the damage occurred in a place where the opportunity to hunt was restricted or prohibited by a county, municipality, or other public entity during the season prior to the occurrence of the damage.

(2) The legislature may declare an emergency, defined for the purposes of this section as any happening arising from weather, other natural conditions, or fire that causes unusually great damage to commercially raised agricultural or horticultural crops by deer or elk. In an emergency, the department may pay as much as may be subsequently appropriated, in addition to the funds authorized under subsection (1) of this section, for claims under RCW [77.36.040](#) and for assessment and compromise of claims. Such money shall be used to pay animal damage claims only if the claim meets the conditions of RCW [77.36.040](#) and the department has expended all funds authorized under RCW [77.36.070](#) or subsection (1) of this section.

[1996 c 54 § 9.]

**RCW 77.36.900**

**Application -- 1996 c 54.**

Chapter 54, Laws of 1996 applies prospectively only and not retroactively. It applies only to claims that arise on or after July 1, 1996.

[1996 c 54 § 10.]

**RCW 77.36.901**

**Effective date -- 1996 c 54.**

Sections 1 through 12 of this act shall take effect July 1, 1996.

[1996 c 54 § 13.]

## **North Rainier Elk Herd Augmentation Plan (GMU 485s and 466)**

### **Introduction**

Augmenting the North Rainier Elk Herd is a viable strategy to bolster this population and meet the elk management plan's objectives. The objective is to rebuild the Green River sub-herd from its current size of about 150 elk to approximately 500 elk, mainly by augmentation to increase productive cow numbers and calf recruitment, but also through habitat improvements.

### **Cooperators and Coordination**

The primary organizations and landowners involved in this augmentation proposal are:

City of Tacoma

Eyes In The Woods

Giustina Timber Resources

Muckleshoot Indian Tribe

Plum Creek Timber

U.S. Forest Service

Washington Department of Fish and Wildlife

Washington Department of Natural Resources

Weyerhaeuser Company

Volunteers will be enlisted from wildlife conservation organizations including Eyes In The Woods, and individuals. In the past, members from both these organizations have volunteered their labor and personal stock trailers to capture and transport elk.

This project will be coordinated with all landowners within the Green River unit, the Muckleshoot Indian Tribe, and other tribes. We have received support for augmentation from all landowners in this unit. Access into the Green River watershed is controlled by the City of Tacoma and hunting is by permit only and closely monitored. Management of wildlife resources is by cooperative agreement with the City of Tacoma, Washington Department of Fish and Wildlife, and Muckleshoot Indian Tribe. There are about 57,000 hectares (142,000 acres) in the Green River unit; approximate landownership is presented in Table 1.

### **General Release Sites**

Paiges Flat

McDonald Field

Maywood

Green Canyon Creek

Official site clearance for elk augmentation will be obtained from the landowner prior to the release of any animals. The Washington Department of Fish and Wildlife will obtain approval of the proposal from the land management agencies within the Green River unit.

Table 1. Approximate land ownership and percent of total in the Green River unit.

Landowner	Hectares	Acreage	Percent of Total
Plum Creek Timber	21,362	52,746	37.0
U.S. Forest Service	12,386	30,582	21.5
Washington Department of Natural Resources	8,211	20,275	14.2
Giustina Timber Resources	6,203	15,315	10.8
City of Tacoma	6,122	15,115	10.6
Weyerhaeuser Company	3,388	8,365	5.9
<b>Total</b>	<b>57,672</b>	<b>142,398</b>	<b>100</b>

### Elk Capture and Transplanting

The Washington Department of Fish and Wildlife will be the lead agency in the capture and release operations. The goal is to capture a minimum of 75-100 Roosevelt elk by chemical immobilization, or with net-guns. The preferred source of transplant stock is from western Washington Roosevelt elk herds. The Olympic Peninsula is the priority area, followed by trap sites in the Willapa Hills, Julia Butler-Hanson Columbian White-tailed Deer Refuge, and Mount St. Helens.

There are three preferred source populations: GMU 660-Chehalis Valley (100-150 elk), GMU 663-Moxie/Chehalis (30-40 elk), and GMU 651-Matlock area (80 elk). Elk in these areas have increased beyond management objectives. Hunting opportunity has been expanded, however, elk numbers continue to increase because private landowners limit hunter access due to safety concerns. Despite liberalized seasons, current harvest is not sufficient to stabilize these populations. Hunting combined with capture and relocation is a valid option to manage these elk.

The genetic characterization of the Green River sub-herd is completed and indicates that this population is mainly composed of Rocky Mountain elk stock (Warheit personal communication). Historically, introductions of elk in this area were conducted using Rocky Mountain elk (*Cervus elaphus nelsoni*) and there is interchange with Rocky Mountain elk on the east side of the state. However, Roosevelt elk (*Cervus elaphus roosevelti*) were considered the indigenous sub-species in the western Cascade Mountains and will be used to supplement the Green River population. Roosevelt elk are thought to be better adapted to environmental conditions and food sources in western Washington.

## Disease Testing

The City of Tacoma's Public Utilities Department has to be assured that transplanted elk are free of disease and Giardia, since the Green River unit encompasses the city's main drinking water reservoir. Random disease testing will be conducted on approximately one third of the captured elk. Previous testing has demonstrated that Washington elk are relatively free of disease, so water quality should not be affected.

Serological samples will be sent to the State Department of Agriculture Laboratory for analysis. Disease testing will include Brucellosis, Leptospirosis, Epizootic Hemorrhagic Disease, Blue Tongue, Johnes disease and Anaplasmosis. In addition, fecal samples will be tested using fecal flotation and Baermann tests for Trichuris oocysts and lungworm larvae. Tests will also be conducted for the presence of Giardia.

A sample of captured elk may be examined (with ultrasonography) to evaluate their physical health, check for pregnancies and to determine their age and sex. Radio telemetry transmitters will be put on a minimum of 30 adult females. The remaining elk will be marked with plastic, color coded, numbered ear tags.

## Timeline

Initial augmentation is scheduled for February and March 2002. Following evaluation of the pilot project, future augmentations in 2003 and 2004 will be considered to meet population objectives. The release may involve 15-20 animals at a time over the designated release period or all animals may be captured and released at once.

## Monitoring Transplanted Elk

The Washington Department of Fish and Wildlife and Muckleshoot Indian Tribe will monitor released elk. Elk will be monitored primarily by ground surveys, but also from the air, particularly if animals disperse from the release areas. A detailed record of elk movements during the year will be maintained. All marked elk mortalities will be recorded and the cause of death determined.

Dispersal and mortality of transplanted elk is an expected event. Stussy et al (1994) reported a mean annual survival rate of 77 percent for relocated adult female elk in the northwest Oregon Cascades. The major cause of mortality was unknown; however, poaching was suspected. Because of limited public access and no recent elk hunting in the Green River unit, we estimate that survival will range between 80 to 85 percent for adult females. Transplanted elk will be able to acclimate to the area relatively free from disturbance. During and following the release, steep topography and snow at higher elevations will restrict elk movements until about April. We believe this will reduce dispersal and create a bond to this area as the transplanted animals mix with resident elk. The time of release should correspond to the spring green up, so animals will find early emerging vegetation to eat. The availability of this food may provide an additional incentive for the transplanted elk to stay put.

## Potential Damage by Transplanted Elk

Currently, there are no elk damage concerns expressed by timber landowners in the Green River unit. In the event that released elk do cause damage within or adjacent to this unit, we will haze or herd elk out of problem areas. Hazing elk may be accomplished on foot or by aircraft. Formal damage complaints resulting from augmentation will be handled as per Department policy and procedures. If serious chronic damage problems result from transplanted elk within this unit or elsewhere, they will be addressed with increased harvest strategies such as special damage hunts, hot spot hunts, special permit hunts, extended seasons, late seasons, or issuing kill permits.

## Estimated Cost

The estimated costs of capturing, transplanting and monitoring released elk is presented in Table 2. The costs of monitoring released elk will be borne by the Washington Department of Fish and Wildlife and Muckleshoot Indian Tribe. Seasoned and trained volunteers will be used where appropriate in the capture operation. During transport and release volunteers with their vehicles and trailers will be used where available.

**Table 2. Estimated costs of capturing, transplanting and monitoring elk.**

<b>Helicopter Immobilization (Excludes permanent personnel)</b>	<b>Costs</b>
<b>Helicopter/Drugs</b>	\$17,000.00
<b>Disease testing</b>	\$3,000.00
<b>Genetics</b>	\$3,000.00
<b>Labor trapping (volunteers)</b>	\$00.00
<b>Transport (mostly volunteers)</b>	\$2,000.00
<b>Radio transmitter collars</b>	MIT
<b>Monitoring</b>	\$15,000.00
<b>Total</b>	<b>\$40,000.00</b>

## Hunting Thresholds

The following thresholds will be used as guidelines to re-establish hunting seasons following elk herd augmentation and in cooperation with the Muckleshoot Indian Tribe.

### Established baseline criteria

1. Hunting season establishment will not be considered for a minimum of 1 year following elk augmentation.
2. A population level of \$350 elk in balance with the habitat.
3. Bull harvest criteria.
  - The spring total count based on 70-75 percent sightability (245-260 elk) is \$350 elk.
  - Elk population shows a 2-year positive growth trend.
  - The spring calf per cow ratio \$25 calves per 100 cows (assumes and requires \$88 percent female survival).
  - The spring bull per cow ratio approximately 20 per 100 cows consistent with sound biological principles and a quality management objective established for this herd in 1985.



4. Cow harvest criteria.
  - The spring total count based on 70-75 percent sightability (350-375 elk) is \$500 elk.
  - Elk population shows a 2-year positive growth trend.
  - The spring calf per cow ratio \$25 calves per 100 cows.
  - The spring bull per cow ratio approximately 20 per 100 cows consistent with sound biological principles and a quality management objective for this elk herd.
5. Continue habitat improvement projects (i.e. removal of scotch broom, creation of openings and maintaining meadows).
6. Use elk paintball mark-recapture and/or mark-recapture from collared elk to estimate populations every 3-5 years. Continue to conduct spring surveys and use calves per 100 cows ratio information to monitor population trends and establish hunt criteria and harvest numbers.

## **APPENDIX E. Muckleshoot Indian Tribe Wildlife Funding, 1996-2001**

*Note: Funding is for expenses actually incurred and excludes personnel expenses for two biologists and three enforcement officers, vehicles, and mileage.*

### 1996

Began co-funding fall composition surveys in Mt. Rainier National Park, \$2,000/year

### 1997

Cooperated and co-funded spring elk composition surveys in the Green and White River watersheds, approximately \$4,000/year

### 1998

- Initiated Green and White River adult elk studies by marking 60 adult cow elk, \$90,000
- Contributed towards Green River elk body condition recaptures, \$10,000
- Co-funded Green River elk calf studies, about \$16,000

### 1999

- Contributed towards Green River elk body condition recaptures, \$10,000 Co-funded Green River calf elk studies, about \$16,000
- Received funding from the Bureau of Indian Affairs to investigate elk sightability population estimation, \$25,000
- Received a \$300,000 Environmental Regulatory and Enhancement grant in the fall from the Department of Health and Human Services, Administration for Native Americans, to fund Green and White River elk, calf, deer, and cougar studies for two years. Some of the projects include:
  - Green River calf elk studies: in 2000-\$24,000 in 2001-\$32,000
  - Elk sightability model flights: \$10,000/year
  - Elk body condition recaptures: \$30,000/year
  - Elk recaptures, collars, capture supplies: \$20,000/year
  - Green River cougar population study: \$10,000 DNA + \$8,000 collars + \$5,000 capture costs
  - Deer studies: \$5,000/year
  - Aerial monitoring: \$10,000/year

### 2001

- Funded White River calf elk study, \$35,000
- City of Tacoma funded \$15,000, in cooperation with us and Washington Department of Fish and Wildlife to initiate a Green River deer study
- Recaptured all adult cow elk and replaced radio collars with four-year collars, showing commitment to continue studying these elk herds into the future
- Received a \$360,000 Environmental Regulatory and Enhancement grant from the Department of Health and Human Services, Administration for Native Americans, to investigate elk diets and habitat for three years (through fall of 2004).