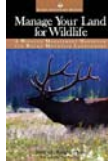


Elk Management for Montana Landowners Dr. Jim Knight, Extension Wildlife Specialist

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LIFE HISTORY

A Rocky Mountain elk (*Cervus elaphus*) is an impressive animal. Mature bulls average 700 pounds while cow elk weigh in at about 500 pounds. The majestic antlers of a bull elk can weigh more than 40 pounds. Elk calves are born in late May or June after a gestation period of about 250 days or approximately eight months. A newborn calf weighs almost 30 pounds and is usually a single. The birth of twins occurs less than one percent of the time.

Cow elk can be productive breeders from the ages of 2 to 14, and sometimes beyond this age. Yearling cows do not usually breed, but when they do the calf survival rate is lower than in older cows. A cow hides her newborn calf for 2 to 3 weeks as the calf eats, sleeps and gains strength. During this period, the calf avoids predators by remaining absolutely motionless, even when danger is just a step away. This strategy is quite effective due to the calf's mottled coloration and its lack of scent. Odors from the birthing area can attract predators so the cow tries to remove them by consuming the placenta and birth membranes, as well as the dirt and vegetation that was soaked by birth fluids. The cow also ingests the urine and feces produced by the calf. After a few weeks, the cow and calf join other mother-child pairs, forming large herds on summer ranges. During this time, bulls are solitary or live in small groups, usually spending their time eating and loafing on windy or breezy knolls or ridges where they can protect their growing antlers and minimize bothersome flies.

In August, antlers finish growing and the bulls begin thrashing them against trees to remove the velvet. The bulls also begin sparring, and by late August dominance is being established. By the time bugling and harem formation begins, a bull's priority is to keep less dominant bulls away from his harem of cows. The continuous attempts of younger or less dominant bulls to steal cows creates a constant preoccupation for the "herd" or dominant bulls. There is no doubt that the "satellite" bulls breed some cows when the dominant bull is away chasing intruders or rounding up drifting cows.

In the Rockies, the peak of the rut, or breeding season, is in early October. Because the calving period is usually spread over approximately 22 days in late spring, it follows that almost all cows are bred within a three-week period around early October. During the rut, cows and calves continue feeding to build their bodies' condition for the upcoming demands of winter.

By early fall, calves could survive independent of their mothers but they continue to stay with the herd. Although the bull seems to control the herd during the rut, it is an older cow that decides when and where the herd goes to avoid real or perceived danger. By mid-October, most of the rut activity declines and bulls begin to drift off and become solitary. During this period, bulls must regain condition lost during the rut and put on fat reserves for the coming winter. The depth and condition of snow seems to trigger the elk migration to winter areas. Deep, settled or crusting snow conditions make it difficult for elk to get to grass, and the cows, calves and younger bulls move toward traditional wintering areas. Many older bulls spend the winter in areas where snow is in excess of four feet and at elevations much higher than the cow herds. This is apparently a strategy to avoid predation.

Elk have evolved in the presence of predators, such as wolves, that use a culling strategy to detect the prey easiest to kill. If bulls, weakened by the rigors of the rut, are seen by predators as being less active, slow or lingering, they will become the predators' preferred targets. Mature bulls use three strategies during winter to avoid predators like wolves and, to a lesser degree, coyotes and mountain lions:

- They stay away from cow herds, which attract predators.
- They avoid areas where predators are likely to be, such as open valleys.
- They favor deep snow and other conditions, which are difficult for and have little attraction to predators.

Indeed, the more physical condition a bull lost during the rut, the more it is to his advantage to stay away from larger herds, where predators watch and wait, even if it means depending on already depleted fat reserves in poor foraging situations. As winter snow recedes and spring vegetation greens, elk usually move to higher elevations. In many situations, calving occurs in the upper reaches of winter range. Here, brush and shrubs provide the habitat needed to conceal calves during and after birth.

LIMITING FACTORS

Limiting factors are influences that determine whether a wildlife population increases, decreases or remains stable. It is important to understand that there is seldom one factor that, by itself, causes a reduction or an increase in an elk population. It is usually the interaction of several factors that determine the fate of a population. For example, predation may seem to be a factor causing an elk population to decline when in fact restricted winter habitat, deep snow or the lack of alternate prey may be what allows predation to have a major impact.

Traditionally, we have looked at the concept of food, water, cover and space as the primary components that determine how suitable a habitat is for wildlife. While this is true, it oversimplifies our understanding of how various factors affect habitat. Several other factors may not be as important on their own, but when they are combined with the four primary habitat components, the value of the habitat may be immediately enhanced or reduced. For example, other land uses can greatly impact elk use of suitable range.

Although some elk herds have become accustomed to high levels of human activity, elk will generally choose areas with less disturbance by humans. When repeatedly disturbed, elk tend to avoid even quality habitat if they have an alternative. Urban sprawl in prime elk winter ranges has caused elk to overly concentrate on the remaining areas.

Food

Both forage quantity and quality are important limiting factors for elk. The availability of various types of forage under various kinds of conditions is equally important. Elk need forbs, as well as grasses, to achieve a nutritional level that allows them to grow and develop well. If snow cover or ice eliminates the availability of grass, the presence of woody browse becomes very important. An elk herd that does not have woody browse available and is dependent on grass will not do well during a winter with deep snow cover or freeze-thaw conditions. The availability of browse and grass is especially important to mature bulls wintering in marginal ranges away from main elk herds. The availability of small forest openings, grassy hillsides, exposed knobs and ground shrub or aspen growth will determine the survival of bulls stressed from the rigor of rut as well as severe winter conditions. The primary factor that limits the size of an elk herd is the winter food supply. Few landowners have enough land to provide year-round range for elk. This is especially true over a several year period when drought or extreme winter weather causes elk to use areas beyond their normal range. By looking at the entire "landscape," the landowner will better determine which forage needs can be best satisfied on their property and which are available on adjacent lands. Equally important to forage quantity is forage quality. There may be an abundance of grass available, but elk still will not do well if there are no forbs. Just because forage is present on elk range does not mean the forage will provide an adequate ration to maintain elk. There must be enough forage, and it must be of good quality.

Weather

Winter weather can be a limiting factor for an elk population even when habitat is good. Severe cold weather and very deep snow can reduce available forage. This is especially true when sudden, extreme snowfalls prevent elk from moving through passes to lower elevations. Weather can also indirectly affect elk by making them more vulnerable to predators. Deep or crusting snow will allow wolves, coyotes or mountain lions to more easily catch elk. A severe winter will also weaken elk, making them less wary, slower and less able to run great distances.

Disease

Disease is seldom a population-limiting factor in elk herds, but it can significantly affect small portions of populations. Normally, elk are healthy and able to withstand parasites and disease but occasionally they contract some sicknesses. Lethargy, limping or weakness resulting from some diseases make elk more vulnerable to predation.

- Arthritis in elk is usually caused by bacterial infections or injury. The obvious sign is joint swelling, which is sometimes accompanied by pus. Arthritic joint swelling is common in elk but only occasionally does it lead to a fatal condition in itself.
- Brucellosis is a bacterial disease spread from bison to elk in Montana, Wyoming and Idaho. Fortunately, this disease is currently restricted to the elk herds near Yellowstone National Park and is not present in other parts of the West. Characteristics of brucellosis are abortion and infertility. Brucellosis is contagious and spread by infected animals that shed the bacterial organisms for several years, especially through fetal membranes (including afterbirth), uterine secretions and milk. Brucellosis is likely spread in elk through contact with the aborted fetuses of bison or contact with bison fetal membranes. Other than at the winter feed grounds in Jackson Hole, Wyoming, elk have a low likelihood of coming in contact with aborted fetuses or fetal membranes of other elk because cow elk go off to be by themselves when calving. Bison, however, calve while staying within the herd. This makes contact with bison fetal materials more likely among members of a bison herd. It is interesting to note that in South Dakota's Wind Cave National Park, bison and elk were infected with brucellosis at a level similar to bison and elk in Yellowstone National Park. However, when brucellosis was eliminated from bison at Wind Cave through a program that removed bison testing positive for the disease, brucellosis disappeared from the elk herd. It is very likely that brucellosis could be eliminated from the northern Yellowstone elk herds if such a program were initiated there. Political and social objections will likely prevent this from happening.
- Another problem elk may encounter is necrotic stomatitis. This produces a variety of diseases in elk, including foot rot. The disease may cause pus-producing pneumonia or abscess formation in almost any body organ or joint cavity. The bacterial organism causes tissue destruction and many infected animals die. The disease is most common in elk living in poor ranges during winter, when wounds in the mouth are caused by abrasive woody vegetation, stems of hay, or seeds of some grasses. Because elk regurgitate and chew their cud, these wounds become infected by bacteria that occur as a normal part of the digestive tract. Most well-nourished elk have antibodies against the organism and will recover.
- Tuberculosis is another serious disease which has been reported in elk living in captivity or under semi-wild conditions. Fortunately, when deer or elk are infected, the disease progresses rapidly and the animal dies. Tuberculosis is probably self-limiting in free-roaming deer and elk.
- Elk, like other ruminants, are susceptible to bluetongue and epizootic hemorrhagic disease (EHD). Both are transmitted by biting midges. These viral diseases only occur in summer and fall. They disappear with a killing frost. Although deadly in deer, there are no reports of widespread mortality in elk herds.
- Chronic wasting disease (CWD) is a rare but possible disease elk may contract.

- Parasites are very common in elk. In healthy animals the infestations are not serious. When elk are weak or suffering from other ailments, the effect of parasites can further weaken the animals. There are two types of parasites: external and internal. Mites, ticks, flies, mosquitoes and lice are examples of external parasites. Internal parasites include the liver fluke, a concern only because it affects whether humans can consume the liver, and tapeworms, including one that migrates to the lungs, causing cysts, nematodes and roundworms.

Predation

Elk have always had to cope with predation. In general, a healthy elk population can withstand normal predation. Elk predators include bears, wolves and mountain lions. Black and grizzly bears can be a major cause of calf mortality. A three-year study in Idaho used radios to track newborn calves to determine mortality factors. About half of the calves were killed during the first three weeks of the study, mainly by black bears. When the cows and calves rejoined the larger herds, the predation stopped. Once elk pass the calf stage, the major predators are wolves and mountain lions. However, the low density of lions and their preference for deer as prey make them a problem only in localized areas. Currently, wolves have the potential to be major elk predators. Long ago, elk evolved with wolves and developed predator-avoidance strategies that normally allowed them to co-exist with wolves. However, the unnatural densities of wolves resulting from their reintroduction to Yellowstone National Park is having significant impacts on the elk herd in the Yellowstone area. In some years, elk herds in some drainages of south-central Montana had no calves surviving at the end of winter. Fortunately, when other herds have good survival rates, the overall elk population can be maintained. This example, however, does indicate the kind of pressure wolves can place on elk population recruitment.

When young elk fall to predators at a high rate, the consequences on the population is exaggerated because they are counted on for reproduction for many years to come. Wolves use a culling strategy when they hunt. They trot around the edges of, and sometimes within, an elk herd, trying to identify the easiest target. If they detect an elk that is somehow different, they will focus on that animal until they catch it or it escapes. The elk they select is usually young, but sometimes an older elk that is prime and healthy is targeted for some known or unknown reason. Wolves injure many elk. They bite and even drag down elk that eventually escape back to the main herd. Later, these sore or limping elk are the ones identified as weak or sick and are targeted by wolves looking to make a kill. The best defenses elk have against wolves are attempting to outrun them, escaping into water and slashing with their forelimbs. After repeated run-ins with wolves, elk eventually exhibit behavior and strategies that make them less vulnerable. These include forming smaller herds and dispersing to less-crowded areas so wolves must travel farther and work harder to locate them. In the future, elk will benefit if wolves regain some of the natural social behaviors they currently lack due to their forced reintroduction. Although unnatural, multiple females are currently breeding in wolf packs. Regaining natural behaviors would limit the

number of breeding individuals to one pair within a given pack. Regaining these natural behaviors would also increase the wolves' tendency to maintain greater distance between packs, which would reduce the number of wolves in a given area. Until these factors are in place, wolves will have an increasing and unnatural impact on elk in the West. The impact of wolves was demonstrated by the results of a study carried out in Jasper and Banff national parks. The study determined that packs consisting of five to six wolves killed three elk every two weeks, or a little more than one elk per wolf per month. If this rate of predation occurs in the northern Rocky Mountain States, the 650 wolves in the estimated 43 packs in this area kill about 700 elk per month, or about 8,500 elk per year. If wolf numbers exceed five wolves per 1,000 elk, elk reproduction will be suppressed and elk herds will decline.

ELK NUTRITION

Elk depend on their habitat for nourishment and production. The quality of an elk herd directly reflects the quality of its habitat. Competition among animals for scarce food may make it difficult for elk to make use of a high quality habitat. It is important to understand that competition occurs only when the commodity is limited. The mere presence of other animals does not mean competition is occurring; but, when other animals, both wild and domestic, are trying to get the same, scarce resource, none of the animals have the benefit of quality habitat. Elk are more selective feeders than cattle but less selective than deer. Cattle have broad, flat muzzles that allow them to clip large swaths of grass, while deer have pointed muzzles that allow them to pick selected forage. An elk muzzle falls in between. Elk eat grass, but they will select forbs if they are available. Montana studies have determined that elk summer diet is made up of 30 percent grasses and 64 percent forbs. One study of Montana elk showed a summer diet made up of 100 percent forbs. When forbs were not available, elk winter diet consisted of 84 percent grass and 16 percent shrubs, while elk fall diet consisted of 74 percent grass and 26 percent shrubs. On average, 6 to 9 percent of elk diet throughout the year consists of shrubs.

Elk are primarily grazers and secondarily browsers. Unlike most ruminant grazers, such as cattle, the nutritional needs of elk require that they have higher quality food than what they can obtain through non-selective grazing on grass or grasslike forage. Forbs are the diet component that best allow elk to address their nutritional needs. Elk are ruminants. They have a four-chambered stomach through which food passes during various stages of digestion. The first chamber, the rumen, contains great quantities of bacteria and protozoa (microflora) that reduce plant materials to nutritional materials. The microflora are very specialized; some break down one plant species while others break down another. These microflora are such specialists that if an elk changes its diet drastically, the new food may not be digested until the population of appropriate microflora builds up. That is why artificially fed elk are sometimes found dead on feed grounds even though their stomachs are full.

Protein

Protein is an important nutrient for animals. A lack of protein will negatively affect how cells develop for body maintenance, growth, reproduction and lactation. In ruminants like elk, the microflora in the rumen use nitrogen compounds to create the protein to meet the body's needs. Crude protein (approximately 6.25 x nitrogen) is normally used to describe the quality of the diet rather than the nitrogen content. Rumen microorganisms (the microflora) must have enough nitrogen to properly digest carbohydrates and fats. Elk need 6 to 7 percent crude protein in their diet for maintenance, 13 to 16 percent for growth and as much as 20 percent to maximize weight gain. Forbs are higher in crude protein than other kinds of forage.

Energy

Elk expend energy to digest food, to move, grow and reproduce. They expend more energy during cold temperatures as they try to stay warm. To maintain their body condition, one day's worth of energy must be derived from one day's worth of food. When an elk does not eat enough food, such as during the rut or severe winter weather, most of the energy must come from body fat. Energy expenditure is measured in kilocalories. As an example, one ounce of sugar produces about 100 kilocalories. An elk cow needs 6,035 kilocalories each day during winter, 6,585 kilocalories during spring, 6,850 kilocalories during summer and 6,452 kilocalories during fall. This amount of energy is expended for routine activities, but elk will require more energy during migrations, gestation, lactation and when maintaining body heat during winter. Herbaceous vegetation (grass and forbs) provides more energy than browse and shrubs. Elk can get 1,300 kilocalories per pound (dry weight) from typical mid-July forage. Elk eat about 2 percent of their body weight per day, so an average cow weighing 500 pounds eats nearly 10 pounds of dry feed each day, which provides 13,000 kilocalories. High energy is needed during gestation and lactation. Gestation requires an additional 800 kilocalories per day during the final days. During lactation, a cow needs an additional 4,000 kilocalories per day to produce milk. During winter there are low reproductive demands, and energy expenditures for activities is at its lowest point. However, energy expended to maintain body temperature is very high. At 32 degrees F, a cow elk loses 5,342 kilocalories to heat loss each day, while a calf loses 2,771 and a bull loses 7,227. At zero degrees F, the expenditure for cows is 6,128 kilocalories, calves, 3,184 and bulls, 8,283 kilocalories. Standing in zero degrees F with a wind blowing at 14 miles per hour, elk expend nearly twice the energy they would at the same temperature with no wind. During extreme weather, more energy can be expended through activity and heat loss than can be acquired by foraging. During these times it is more efficient for elk to bed down in shelter and live off their body reserves. It is easy to see the importance of energy in an elk diet. When energy expenditure is greater than energy intake, stored fat must be used. For every 5,000 kilocalories of energy an elk gets from stored fat, one pound of body weight is lost. When fat reserves are depleted, elk lose weight even faster because energy then must come from protein (muscle). Protein contains only 60 percent as much energy as fat. Weight losses of one to one-and-one-half pounds per day are common during winter. High-energy foods, such as perennial herbaceous forage, will best satisfy the energy needs of elk.

Vitamin Requirements

Nutritional deficiencies encountered by elk may be traced to energy, nitrogen or minerals, but not usually to vitamins. Because they are ruminants, elk have no need for dietary vitamin C. Vitamin C is produced in tissue. Vitamin E is obtained through consumption of green forage and storage of the vitamin. Vitamin D is available in the body and is activated by the sun. Vitamin A, which is stored in fat, is plentiful through green vegetation in summer and browse in winter. All B complex vitamins and vitamin K are synthesized in the rumen of elk.

How Elk Meet Their Vitamin Requirements

Vitamin A: Stored in fat and liver. Plentiful in green vegetation and browse.

Vitamin B: B complex vitamins are synthesized in the rumen by the microbes.

Vitamin C: Not needed in the diet because it is synthesized in tissue.

Vitamin D: Present in muscle and fat and activated by the sun.

Vitamin E: Obtained in green forage and stored in the liver.

Vitamin K: Synthesized in the rumen by the microbes.

Mineral Requirements

Numerous minerals are necessary for elk to grow, develop and metabolize well. Several of them are discussed below.

- Both phosphorus and calcium are important for strong bones and teeth. Phosphorus is also important for reproduction, red blood cells and transporting nutrients throughout the body. Nutritional problems arise when high calcium levels combine with low phosphorus levels. Phosphorus levels should be about 0.23 percent of the diet. Calcium should be no more than five times the phosphorus level or a phosphorus deficiency can occur. In some parts of the Rocky Mountains, phosphorus may be lacking in range vegetation either seasonally or year round. Analysis of vegetation is required to determine if a phosphorus deficiency exists. Your county extension agent can show you how to do this. Forbs are an important source of calcium and phosphorus in the elk's diet.
- Elk also need some sodium in their diet. Among other things, sodium affects the regulation of pH and plays a role in the transmission of nerve impulses. Elk may use salt blocks, natural salt licks or drink brackish water to meet their sodium needs. Most vegetation is low in sodium, but elk attraction to salt is usually a non-essential luxury.
- Selenium is often thought to enhance antlers in elk. However, selenium is required at very low dietary levels, and at high levels it can be toxic.
- Other minerals such as potassium, chlorine, magnesium, sulphur, iron, and iodine are very important but found at adequate levels in common range plants. Trace minerals such as copper, cobalt, zinc and manganese are also reportedly found at adequate levels in vegetation.

Water Requirements

Elk prefer habitats that are close to water. Studies have shown that 80 percent of elk summer habitat is within .25 to .5 mile of water. Lactating cows are especially dependent on a water source. During winter, elk satisfy their water requirement by consuming snow when open water is not available.

ELK HABITAT REQUIREMENTS

The needs of elk vary with conditions and the seasons. Typically, mountainous terrain with alpine meadows and lush valleys are considered to be ideal elk habitat. We also know there is excellent elk habitat in the breaks of the Missouri River and in the rolling foothills of many parts of the West. The best way to determine what type of elk habitat may be lacking on your land is to understand how each habitat component is used and then to apply this information to your land. It cannot be over-emphasized that management of elk habitat requires looking beyond your own land. A "landscape" vision is needed to understand what is available and what is needed. In some parts of the Rocky Mountains, elk remain in the same area year round because all their habitat needs are met. However, long movements often occur to address seasonal needs. In general, ideal elk habitat consists of 40 percent cover and 60 percent forage areas. Elk prefer moderately steep, south-facing slopes during winter because of the warmer temperatures and reduced snow pack. Forest stands interspersed with grassy openings provide food, thermal cover and travel lanes.

Components of Foraging Habitat

Elk diets vary according to the season. Consuming high-energy foods is the best way for elk to store reserves and minimize the need to deplete these reserves. Elk prefer foraging areas that are most attractive. In winter, this may be a south-facing slope. In summer, shade or a breeze that deter insects may be most attractive. The notion of attractiveness can also include seclusion, protection from wind or a combination of factors.

- Spring forage includes early-greening grasses and forbs that are highly palatable, succulent and nutritionally rich. Elk need a low fiber/high protein diet composed largely of grasses, sedges and early forbs. Green-up occurs first on south- and west-facing slopes, so elk tend to occupy these the most. Elk move to higher elevations following the growth of new, young forage to maximize their nutritional plane. In this way, they can best replenish body reserves and satisfy increased nutritional demands during gestation, lactation and antler growth.
- During summer, elk diet is composed of 60 to 100 percent forbs, if they are available. Preferred forbs include dandelion, geranium, asters, clovers and milkvetches. As forbs dry in late summer, elk utilize more grasses and shrubs.
- Fall begins a period when herbaceous (leafy) vegetation contains reduced protein but is still a good source of energy. Grass averages 73 percent of the fall diet and elk begin to use more shrubs.
- Grasses may make up as much as 84 percent of an elk's diet in winter. Elk do best on winter ranges where herbaceous vegetation is available rather than range that contains a lot of browse. This is, of course, not true if deep snow prevents access to the herbaceous forage. During times of deep snow, elk will seek out herbaceous forage on south- and west-facing slopes and wind-swept ridge tops. These areas often have shallow, dry soils and, although production is limited, forage quality is usually better than on adjacent sites with deeper soils. These plants usually have more protein and are more palatable. Browse plants are used more during winter than any other time of the year. Quaking aspen, mountain maple, serviceberry, ceanothus, chokecherry, red-osier dogwood,

mountain mahogany, willow and winterfat are choice browse species. Choice grass species include rough and Idaho fescue, bluebunch and western wheatgrass and sandberg bluegrass. West of the Continental Divide, browse is the primary winter food; grasses tend to be the primary winter food in areas east of the divide.

Cover Habitat

Cover is important to elk for security or escape and for protection from extreme weather. Elk use security cover most during calving and periods of disturbance, such as hunting season. Once calves are old enough to move with the herd, elk spend more time in the open. In areas that have significant hunting pressure, elk spend most of their time in, or near, large blocks of escape cover away from roads. A very important type of cover for elk is thermal cover. During summer, it provides shade; during winter, thermal cover reduces heat loss and wind velocities. A cover of dense conifers reduces heat loss, particularly on very cold nights with clear skies.

HABITAT ENHANCEMENT

Before undertaking any enhancement of elk habitat on your land, it is important to determine what kind of habitat is provided in adjacent areas. For example, it would be unnecessary for you to develop forage when ample year-round supplies are available nearby. After studying the habitat needs of elk, comparing those needs to what is available on and near your land and understanding the limitations of your location, you'll be prepared to undertake worthwhile habitat enhancement. If you are at a high elevation where winter snow is excessive, it will do little good to create winter forage because elk migrate to lower elevations. However, you might consider enhancing fall or spring habitat in order to help elk enter winter in better condition and recover from winter more rapidly. Some landowners will have the opportunity to improve winter elk range. For these people, it is possible to minimize winter deaths and maximize calving success by enhancing the production of high-energy foods. This must be done while ensuring that adequate thermal cover is available. If winter snows are not deep enough to prevent elk from using south- and west-facing slopes or wind-swept ridges, landowners can try to increase herbaceous forage production in these areas. Perennial vegetation is preferred because it cures with a higher protein content and is more dependable than annuals. **Fertilizing**

Fertilizing with nitrogen and phosphorus will generally increase productivity, protein and other nutrient content and palatability. Unfortunately, it will also reduce fiber content. If fertilizing is practical, it will result in greater quantities of high-energy, high-protein forage such as forbs. Be cautious when using fertilizer because undesirable plants may also benefit.

Burning

Prescribed burning can provide many of the benefits of fertilizing, usually with less expense. Burned areas result in increased yields of highly nutritious forage that greens up earlier in the spring, but the area will have reduced cover.

Grazing

Prescribed livestock grazing is another way to enhance elk habitat. Removing decadent grasses stimulates new growth and allows forbs to establish. The new

growth of forage that appears after cattle grazing is more palatable and more nutritious than ungrazed forage. It may be necessary to erect temporary electric fences to force cattle to use old grass stands, if this is practical for your herd. Studies in Montana have shown that old Idaho fescue stands must be 75 percent grazed by cattle for forbs to have increased production and improved palatability. You will have to observe the vegetation on your land to decide how many years' rest from grazing is necessary to maintain the benefits. Intensive grazing followed by one or two years rest seems to provide the best results for elk forage. The purpose of prescribed grazing is to set the grass stand back to an earlier stage of development, in a manner similar to what the great herds of bison did long ago. **Harvesting Timber**

Another way for landowners to impact the elk on their land is by harvesting timber. Elk habitat can be enhanced by including aspen management in the timber plan. Young to middle-aged stands of aspen interspersed with grassy openings and conifer clumps provide excellent foraging, loafing and thermal cover for summer, fall and early winter. Sprouting and regrowth of aspen can be stimulated by clear-cutting, bulldozing or burning five to 20 acre stands of existing aspen. Look at the natural boundaries of the aspen clone to develop irregular edges rather than squares or rectangles. Do this on a 20- to 30-year cycle to provide continuous availability of this habitat type. If you have several aspen stands, treat them in rotation to make sure that early growth stages are always available. Landowners should also consider clear-cutting patches to stimulate the growth of brush species and to create permanent forest openings for grass and forb production. If you have bull elk wintering on your property, you can enhance their survival by creating numerous half-acre grassy openings within dense timber stands. **Planting Food Plots**

Food plots are seldom a practical way to enhance elk habitat. The large herds they may attract will quickly deplete the crop, and a lack of natural forage growing in the area could lead to winter hardship. Mowing, flailing, burning or grazing existing vegetation and then fertilizing is a more realistic way to enhance large areas. A phosphorus fertilizer will favor the forb component over the grass component of the stand. Be cautious when using fertilizer because undesirable plants may also benefit.

Managing Brush

Chaining (dragging a large anchor chain between two tractors) or bulldozing sagebrush or other shrubs that have become too plentiful can create openings where grass and forbs can grow. Openings should be five to 20 acres and irregular in shape. If you plan to reseed, use a grass-forb mixture. Clovers, alfalfa, small burnet and orchardgrass are examples. Check with your local county extension agent for recommended varieties and seed sources in your area. Using herbicides can also create grassy openings in sagebrush or other dense shrub communities. Be sure to use herbicides that will not impact the forb component of the forage. Again, five to 20-acre openings with irregular shapes are ideal. Check with your county extension agent for recommendations on herbicides, rates, timing and follow-up treatments.