APPENDIX M
COORDINATING ELK AND TIMBER MANAGEMENT RECOMMENDATIONS FROM THE FINAL REPORT OF THE MONTANA COOPERATIVE ELK-LOGGING STUDY 1970-1985

SECURITY DURING LOGGING OPERATIONS

Recommendation

Preparation of timber sales in elk summer range should include planning to attain minimum losses in habitat security during the period of road construction and logging.

Findings and Discussion

Entry to an area occupied by elk, for any purpose, reduces the security of the habitat in that area. Research in four different studies compared elk responses to situations ranging from large scale logging operations with all roads continuously accessible to small operations in which roads were only open to the logging contractor. Elk responses to road building and logging demonstrated that significant losses in security can be minimized when appropriate restrictions are used by the land manager. The degree of security loss is directly related to the number of acres disturbed, to the length of time the disturbance continues, and to the timing of field operations.

Displacement of elk was detected as far as four miles from the cutting units in large timber sales in which roads were open to nonlogging traffic. In one study, herd displacement was to an adjacent drainage and then beyond that drainage when the ridgeline was disturbed. In another investigation, displacement was down a ridgeline for two miles through undisturbed timber and over a point. In both cases, topographic features provided line-of-sight barriers between elk and the logging activity. Conversely, during relatively small timber sales, and particularly when roads were only open to the logging contractor, displacement of elk was generally less than one-half mile from the center of logging activities. In all studies, the time required for elk to return to the disturbed habitat was directly related to the distance they were displaced.

Security for elk can be satisfied by any habitat in which animals do not feel threatened or a habitat in which they will remain in the face of disturbance. There are a variety of ways in which the manager can reduce the distance moved by elk and simultaneously increase the probability of immediate return by animals displaced:

> Disturbance by heavy equipment can be completed in the shortest possible time, and, if possible, during periods of the year when elk are not present. It has been shown, for example, that individual elk tend to use more level ground in early summer and move to steeper ground in the late summer and fall.
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> Adjacent drainages or areas into which elk might be expected to move can be made more secure by road closures.
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> Logging activity can be confined to a single drainage at a time and all work completed in the shortest possible time frame. Intensive activity over a single season has far less influence on elk than a low level of intensity continued over several seasons.
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> Displacement of elk is significantly reduced where access to the timber sale area is limited and nonlogging traffic is controlled. Recreational use of firearms by anyone working within an area closed to the general public should be prohibited.

REDISTRIBUTION OF ELK

Recommendation

Timber sales should be planned in a manner that minimizes potential problems arising from temporal redistribution of elk onto adjacent or other nearby property.

Findings and Discussion

In all four of the areas in which elk response to timber sales was studied, some movement away from the sale area was recorded. On these areas, movement by elk created no specific problems because there was adequate space available. Nevertheless, timber sales may result in local modification of the way elk utilize their home ranges. Such modifications sometimes result in increased use of nearby private lands or public lands not normally used by elk. It is usually possible to achieve greater compatibility in land use if sale planning recognizes and attempts to minimize potential problems involving increased elk use on adjacent properties where elk presence is undesirable. Knowledge of habitat use patterns by local elk herds and the availability of other nearby habitats will benefit the land manager; consultation with state and federal wildlife biologists will also be of considerable benefit in such assessments.

TRADITIONAL HOME RANGE USE BY ELK

Recommendation

Before timber sales are established and new roads are constructed, information should be obtained concerning traditional use patterns and distribution of elk harvest so that cutting can be timed and roads placed to have the least undesirable effect on both elk and elk hunting.

Findings and Discussion

Elk are very traditional in the way they distribute themselves over time and space. Home range size and shape vary considerably among individuals and areas, but there is comparatively little variation in the size and shape of home ranges used by the same animal from year to year. This is true for individuals and for herds as well. Data from frequent relocations of many elk over the course of several years has demonstrated annual home ranges varying from about 5 to nearly 200 square miles, but variations in the location of individual animals in consecutive seasons was very low. Individual elk usually use the same winter and summer areas from year to year throughout their lifetime; this traditional elk use of an area can override normal caution in an area rendered temporarily unsuitable by disturbance and habitat alteration.

Roading and logging of an area with high traditional elk use could lead to undesirable overharvest and a severe decline of the herd if hunting seasons and/or road closures are not adjusted to compensate for the reduction in habitat security. Studies of wildlife throughout the world have shown that habitat preference is learned as well as innate. This learned preference, called habitat imprinting, may be as important a consideration in elk habitat management as innate preferences. If, over several years, mortality of adult cows exceeds recruitment in a group of elk traditionally using a particular area, elk use of that area may decline to zero. Because elk are slow to pioneer and become established in a new area, local elimination may require many years before elk use is reestablished.

ROAD CONSTRUCTION AND DESIGN

Recommendation

As a part of the location and design of transportation systems, existing habitat occupancy and movement patterns and probable elk crossing areas should be identified and provisions made to maintain security for unimpeded movement.

Findings and Discussion

Both the location and density of forest roads have been shown to be disturbing to elk security on most elk ranges in North America. On study areas in Montana, most of the elk use of sideslopes in moderate to large drainages occurred above the lower third of the slope. In drainage headwaters the lower third of the slope appeared to provide the most important habitat. Elk travel routes from one drainage to another crossed ridges through saddles and were often easy to identify. Road construction in these sites resulted in declines or elimination of elk use of such crossings. Elk have also exhibited a preference for crossing ridges in sections where visibility is low and security high, often where dense timber and/or topographic visual obstructions are present. Alteration of such crossing areas can be especially critical during the hunting season.

While any road constructed will tend to reduce the security level of existing elk habitat, losses in security can be significantly reduced if initial road designs and locations recognize existing elk behavior, habitat use, and probable response to new roads. A number of considerations can help to minimize the loss of habitat security:

Locate permanent and high volume traffic roads in those areas least used by elk.

Design secondary roads, in both construction and layout, to facilitate eventual closure. This is particularly important where roads enter drainage heads.

Maintain frequent dense cover areas adjacent to the road.

Avoid road construction in saddles or low divides frequented by elk in crossing ridges between drainages.

Construct roads to the lowest standard that will meet management objectives. In important elk range this usually implies a low-speed, single-track construction without large cut slopes, fills, or straight stretches.

Dispose of road right-of-way slash so it does not inhibit elk movement.

Locate roads, even temporary roads, to avoid disturbance of moist sites and other areas of concentrated use by elk.

Avoid areas of important elk winter range.

ROAD MANAGEMENT

Recommendation

Where maintenance of elk habitat quality and security is an important consideration, open road densities should be held to a low level, and every open road should be carefully evaluated to determine the possible consequences for elk.

Findings and Discussion

It has been repeatedly documented, in Montana and elsewhere throughout North American elk range, that vehicle traffic on forest roads evokes an avoidance response by elk. Even though the habitat near forest roads is fully available to elk, it cannot be effectively utilized. Declines in elk use have been detected as far as two miles from open roads, but significant reductions in habitat effectiveness are usually confined to an area within a half mile. The loss of habitat effectiveness has been shown to be greatest near primary roads and least near primitive roads, greatest where cover is poor and least where

cover is good, and greater during the hunting season than at any other time of the year. As a general average, habitat effectiveness can be expected to decline by one-fourth when open road densities are one mile per section and by one-half when road densities are two miles per section. Losses in habitat effectiveness for elk can be at least partially mitigated by imposing strict design and location standards during road construction. Losses can be greatly reduced through appropriate traffic control and road closures.

Roads, and the people and traffic associated with them, have a more significant influence on elk security than most other factors combined. Few considerations in forest management appear to provide a better opportunity for immediate mitigation in the management of elk habitat than road closures.

Some roads are needed for timber harvest, recreation, fire control, firewood cutting, and a variety of other purposes, including access by hunters. Where the maintenance of elk habitat security is an important consideration, requirements for public access should be identified prior to road design and construction, and all roads remaining open should be essential to an identified need.

Criteria for Road Closure Selections

Available data demonstrate that every road constructed in elk habitat is a potentially negative influence for elk. It is also clear that some roads are more disturbing than others. When choices are possible, the following criteria are suggested as guides for selection of roads to be closed in areas where elk habitat is an important consideration. As a general rule, yearlong closure is preferred to seasonal closure, but some specific advantages are possible with certain seasonal closures as noted. High priorities for closure include:

- roads in the heads of drainages, saddles, and low divides;
- roads through moist areas and wet meadows;
- loop roads that encourage through traffic;
- trunk roads with many dead-end side roads under one-half mile in length;
- midslope roads in the lower two-thirds of the drainages (especially in fall);
- roads in known calving areas (especially in spring);
- roads in winter range concentration areas (especially in winter); and
- roads in areas with poor cover (especially in fall).

AREA CLOSURES DURING THE HUNTING SEASON

Recommendation

Elk management goals and objectives should be clearly defined before imposing travel restrictions.

Findings and Discussion

Two studies in Montana involved area closures that restricted motor vehicles to a few selected roads during the general hunting season. Several other studies involved radio tracking of one or more elk during the hunting season.

The Judith Road Closure Study indicated that travel restrictions did not change elk distribution or temporal distribution of hunters. Apparently this area closure was not needed to "protect" elk where escape cover was adequate and well distributed (at least two-thirds cover to one-third open). Hunters spent more time walking; consequently they reported seeing and killing more elk under the restrictions than during the unrestricted control seasons. Their unsolicited comments showed a preference for limited access because of the "higher quality" hunt it afforded.

The Ruby Road Closure Study, on the other hand, showed that area closures can cause significant changes in elk distribution and hunter use of an area. This area was characterized by a relatively open, broken forest, with gentle terrain and easy access (one-third cover to two-thirds open). During seasons of restricted vehicle access, elk stayed in the restricted area longer and in greater numbers than during seasons of unrestricted access. This resulted in a more even distribution of hunting pressure, elk sightings, and elk harvest through the season, but did not increase total amounts. Hunters also spent more time walking during the restriction period. Most hunters interviewed believed that the area closure had increased the quality of their hunt.

Road density and pattern, including off-road travel, play an important role in determining the security level an area provides to elk during the hunting season. An area with sparse cover and low road densities may provide as much security as the same sized area with heavy cover and high road densities. In the Ruby portion of this study, the security level was significantly increased by reducing the number of open roads and eliminating off-road travel. Road density and cover quality are both important when considering adequate elk security during the hunting season. Managers should be especially cognizant of the following:

> Restrictions will increase the time hunters spend walking, and as a result increase the number of animals seen and possibly increase the kill. They also will generally be accepted as providing a higher quality hunt, make retrieval of downed animals more difficult, and require time and money for implementation and enforcement.

Where cover is poor (one-third or less of total area) and road densities are high (more than one-half mile of road per square mile), restrictions will likely reduce harrassment and emigration of elk and reduce the early elk harvest, but increase the uniformity of harvest throughout the season.

Where cover is good (at least two-thirds of total area) and open road densities are low (less than one-half mile of road per square mile), restrictions will probably have less influence on elk distribution and elk harvest. Where possible, elk will seek security at least a mile from open roads.

CLEARCUTS

Recommendation

In order to assure that forage produced in clearcuts is in fact available for use by elk, openings should satisfy the following criteria:

Slash cleanup inside the clearcuts should reduce average slash depths below 1.5 feet. Slash in excess of 1.5 feet will reduce elk use by more than 50 percent.

Openings should be small, even though openings up to 100 acres may be acceptable where the adjacent forest edge supplies adequate security.

In western Montana, some security cover is provided within openings by vegetation growth, and elk use increases in older cuttings. In central Montana, the younger openings are preferred by elk; security should be provided by designing clearcuts so that the best available cover occurs at the uncut edge. Thinning adjacent to clearcuts is not recommended.

Additional security, which will significantly increase elk use of clearcut openings, can be provided with appropriate road closures.

Findings and Discussion

Graphic analyses of the density of elk pellet groups inside clearcuts in central and western Montana have identified several variables that influence elk use of these openings. The relative importance of different variables depends on the environment available to elk and the behavioral patterns associated with their use of that environment.

In central Montana, large natural openings are a normal component of both summer and winter ranges. Elk inhabiting these areas are far more tolerant of large clearcuts than elk in western Montana where large natural openings are unusual. A preference for small openings was indicated, particularly in western Montana, but cutting units as large as 100 acres may be acceptable when the adjacent forest edge supplies adequate cover.

Throughout Montana elk ranges, slash within the opening was one of the most important determinants of elk use. There was no indicated preference among slash disposal methods as long as average slash depths were reduced below 1.5 feet. Broadcast burning, however, is considered preferable to mechanical methods.

Elk response to vegetation growth inside an opening differs between central and western Montana in a way clearly related to the habitual feeding behavior of elk in the respective areas. In the west, where new growth consists of both trees and shrubs and available forage is often browse plants, elk use of openings increases as vegetation height increases. Eastward, where new growth is mostly limited to trees, and available forage is primarily grasses and forbs, elk use of openings declines as tree heights increase and understory plants are shaded. Corollary to the indicated preference for openings lacking tall cover, central Montana elk require the greater security provided by good cover at the edge of the opening. These elk also demonstrate a positive response to openings without vehicle access.

Available data do not demonstrate that clearcuts in any configuration are clearly beneficial to elk, although it is known that forage production is increased in openings. Neither is it possible to show that clearcuts have detrimental effects if the opening can be developed without reducing overall habitat security for elk.

COVER TYPE

Recommendation

Management efforts for timber and elk should be coordinated to recognize the importance of cover type in addition to habitat type. Important or key areas for elk should be identified on a site-specific basis during the planning and implementation of silvicultural practices.

Findings and Discussion

Although various classification systems, such as habitat typing, give a reasonable description of forest community composition and ecological potential, the structural characteristics or cover types can vary considerably within the classifications over time. Elk use of cover types is often specific, changing in both space and time during summer and fall. For example, moist sites may be highly preferred from June through September but not necessarily sought out in October and November. Relatively advanced seral stages and more dense timber stands may not be as important June through August as in the fall months. Cover type is usually more important than habitat type in determining elk use during summer and fall.

MOIST SITES

Recommendation

Moist summer range sites, in combination with other habitat components which are heavily used by elk, should be identified and the overall integrity of these habitat components should be maintained.

Findings and Discussion

Findings from all study areas indicate that elk prefer moist sites during the summer months (June through September). Preferred elk summer range exists when these moist sites are interspersed with other necessary habitat components, including a diversity of timber types and densities, especially near drainage heads. Such sites are often found at the heads of drainages, bordering streams or marshy meadows, or occupying moist swales or benches. These sites are usually found within the *Abies lasiocarpa* habitat type series (USDA, FS 1977) both east and west of the Continental Divide. In central Montana, these sites are usually found within the Abla-Caca, Abla(Pial)-Vasc, Abla-Vasc (Thoc), and Abla-Luhi habitat types. In western Montana, moist sites are generally found within parts of the Abla-Luhi (Mefe), Abla-Clun, Abla-Mefe, Abla-Gatr, and Abla-Caca habitat types. Moist types in the *Picea engelmannii* series provide similar habitats.

Moist sites have been identified as a very important component of elk summer range, especially when they occur within the *Abies lasiocarpa* climax series. These habitats are primarily important because of their high forage production, good nutritional quality, diverse species composition, and high cover values when interspersed with trees. Because the forage is utilized after calving and prior to the breeding season, it may be important in both reproduction and winter survival.

Selective withdrawal from treatment, along with protection of peripheral zones to provide continuous cover with the uncut forest, will benefit elk. New or planned roads passing near these sites should be closed to summer and fall vehicular traffic except perhaps for light, intermittent administrative use. Roads that already occur near moist areas should be closely evaluated for travel restrictions.

Moist sites are more critical during dry summers when precipitation from the previous winter and early spring (October through May) approaches 25 percent below normal. During such years, elk will benefit if land managers shift human activities and/or livestock grazing away from moist sites, particularly in areas with little moist summer range.

ELK AND CATTLE RELATIONSHIPS

Recommendation

The effect of every proposed timber sale on elk and livestock management objectives should be evaluated. Allocation of area may be more practical and ecologically sound than allocation of forage. Cattle use of newly logged areas which have been previously used exclusively by elk should be discouraged.

Findings and Discussion

The presence and distribution of domestic cattle substantially influenced the distribution of elk on the study area which had summer range cattle allotments. Systematic observation revealed a significant tendency for elk to avoid cattle. In any habitat, the probability of elk use concurrent with cattle use was about one-half the probability of elk use in the absence of cattle.

Road construction and other associated timber harvest activities occasionally "open up" new areas for grazing or alter existing cattle grazing allotments on elk summer ranges. Such activities increase the potential for elk and cattle interactions.

WINTER RANGES

Recommendation

Timbered areas adjacent to primary winter foraging areas should be managed to maintain the integrity of cover for elk. Where timber harvest is acceptable, slash cleanup and logging should be scheduled outside the winter period.

Findings and Discussion

Elk on winter range in western Montana preferred dense timber stands and larger trees for bedding cover. Bedding sites were usually in close proximity to a feeding area such as a south facing slope with a good stand of browse or perennial grasses. Timbered areas that received moderate to heavy elk bedding use prior to logging were not used for bedding during winters following heavy selection logging. Elimination of preferred bedding sites subjected elk to decreased energy intake and increased energy output because of increased travel between suitable bedding and feeding sites.

Winter range conditions vary greatly across Montana. To the east, elk forage on grasslands and seek cover in adjacent timber stands. Snow depths are usually low to moderate, and elk wintering in these areas may venture far from timber cover when undisturbed. When snow does get deep, elk will seek cover. Logging adjacent to grassland winter ranges will normally be detrimental to elk. Forage conditions on these ranges may be improved by range rehabilitation, grazing management, or prescribed fire.

West of the Continental Divide, on important and already well-used browse ranges, the probability of improvement by logging is minimal. Where winter range quality is declining or is already poor, especially on shrub ranges, several management options offer possibilities for enhancing winter range. The presence of larger trees in a dense multistory stand is desirable. Where winter ranges are heavily forested and forage conditions are poor, the timber overstory can be removed in small patches to enhance forage production on south to west facing slopes. The design and layout openings should be planned so that adjacent forest cover on benches and finger ridges will provide thermal cover and bedding sites. Slash cleanup and logging should be scheduled outside the winter period.

Because of the relative importance of productive elk winter range and the narrow margin for error, any contemplated modification of timber stands should be planned on a site-by-site basis, with primary emphasis on maintaining adequate cover adjacent to productive forage areas. It is unlikely that winter ranges ever meet the nutritional needs of elk completely, so some winter weight loss will always be experienced. Elk productivity and, under severe conditions, survival will decrease as weight loss increases. Thus, conservation of stored energy as well as energy intake, is important to wintering elk.