Rocky Mountain Elk (*Cervis elaphus nelsoni*)

Indicator Species Habitat

Rocky Mountain elk is a large North American ungulate that uses a variety of habitats. The Carson Forest Plan identifies elk as an indicator of general forest habitat type (USDA 1986a, p.97). Because elk have had a historically wide distribution, their preferred habitat also varies widely (Skovlin 1982). Populations in the mountainous West tend to inhabit coniferous forests associated with rugged, broken terrain or foothill ranges. Certain habitat types may temporarily be of limited value to this species due to environmental conditions such as snow depth, water availability and/or vegetation components. However, they are extremely adaptable to a wide variety of successional stages and vegetation types. During the summer, elk spend most of their time in high mountain meadows in the alpine or subalpine zones or in stream bottoms (Adams 1982). In the Pacific Northwest elk prefer the denser, coniferous rainforests, while Southwestern populations can be found in open scrublands. Studies of elk slope preferences indicate that elk use a variety of slope percents, although they choose slopes in the 15 to 30 percent class most frequently (Skovlin 1982).

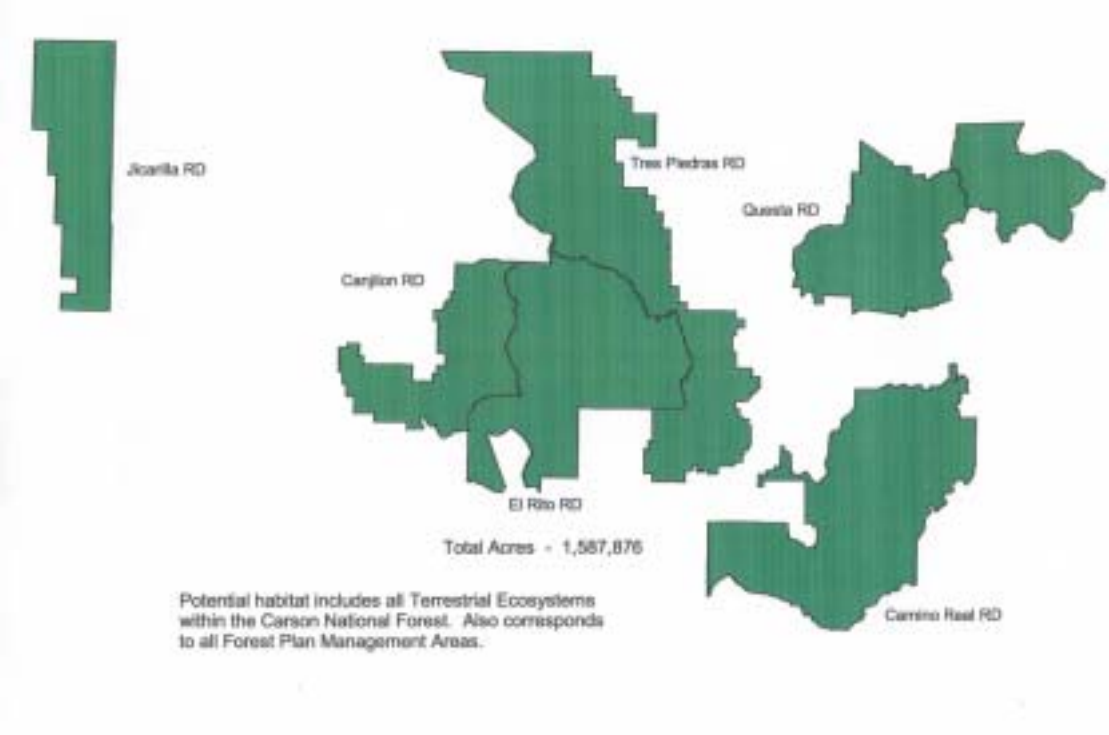
The summer months are particularly important for elk to build body condition and accumulate fat as an energy store for the winter. Nutritional demands during the summer months include lactation in cows, antler growth in bulls and growth in calves. Habitats favored by elk during the summer months are moist parks, meadows and riparian areas, offering succulent forage and bedding sites. During hot weather, elk seek shaded, cool habitats (Leege 1984). Elk remain on summer range until forced down to lower elevations by snow or severe weather (Edge et al. 1987, Leege 1984).

During the winter months, less forage is available, and its nutritional value and digestibility are at a minimum level, thus forage availability is a key factor to elk. Winter range usually consists of lower elevation, south-facing slopes and areas with good thermal cover nearby.

Elk need cover for protection against heat and extreme cold, as well as hiding and calving cover. Ideal cover is grasslands or meadows interspersed with forests that have large amounts of edge (Skovlin 1982). Elk use of open areas tends to decrease at 110 yards from cover. Calving cover requirements vary from place to place and within populations. Security or hiding cover is necessary in places of human disturbance (Peek et al. 1982). Elk may use more open areas during spring and summer because of earlier spring green-up (Edge 1987).

Elk are ruminant herbivores; their food habits are extremely variable throughout their range. Some elk populations prefer to graze, while others rely more heavily on browse. Grasses and forbs are preferred during spring and early summer, and woody shrubs and plants are preferred during winter. Elk browse conifers in areas where snow covers other forage.

As displayed on the following map, the entire Carson National Forest (>1.5 million acres) supports habitat for this species and elk are commonly observed throughout the Forest (USDA 1987).



Map 1. Rocky Mountain Elk Potential Habitat Distribution on the Carson National Forest (USDA 1987)

Management Activities or Natural Events That May Affect Habitat

Negative: Primarily related to long-term cumulative effects of dense forest conditions following heavy logging and long-term fire suppression. In addition, human disturbance from high road densities and growing private development in winter range.

Positive: Timber harvest, thinning, prescribed fire and wildfire.

Plans, Regulations and Guidelines Supporting, Maintaining or Improving Habitat

- *Carson National Forest Land and Resource Management Plan – Forest-wide Prescriptions* for Rocky Mountain elk are found in the *Wildlife and Fish* section of the Forest Plan described at the end of this section.
    - Management areas 1-9 and 11-14 all have desired conditions to provide quality habitat for elk.

Habitat Condition And Trend On The Carson National Forest

The Forest Plan EIS identifies 1,362,760 acres as occupied habitat for elk on the Carson National Forest (USDA 1986a, p.97). The EIS projected an improvement in elk habitat conditions as the number of structural improvements (e.g., water developments) and nonstructural improvements (e.g. aspen regeneration) increased on the Forest (USDA 1986a, pp. 98 & 152).

In reviewing the management areas identified in the Forest Plan, sagebrush is not included in the acres of occupied elk habitat (USDA 1986c). Elk are currently utilizing the majority of the sagebrush habitat type on the Carson National Forest. Elk are extensively using the piñon-juniper woodlands intermixed with sagebrush, and in doing so, are also dispersing into the adjacent sagebrush habitat type.

The current vegetation cover type data shows 81,752 acres of sagebrush on the Forest, with the majority being on the Tres Piedras Ranger District. The District Biologist estimates that elk regularly use at least 75 percent of this cover type for several months to year-round. In addition, elk use virtually all of the sagebrush on the Jicarilla Ranger District (~6,500 acres). Forest-wide, it is estimated that elk habitat on the Carson National Forest has increased by 61,314 acres (75% of total sagebrush habitat). **The trend for Rocky Mountain elk habitat from 1986 to 2002 is estimated to have increased from 1,362,760 to 1,424,074 acres or upward by almost four percent.**

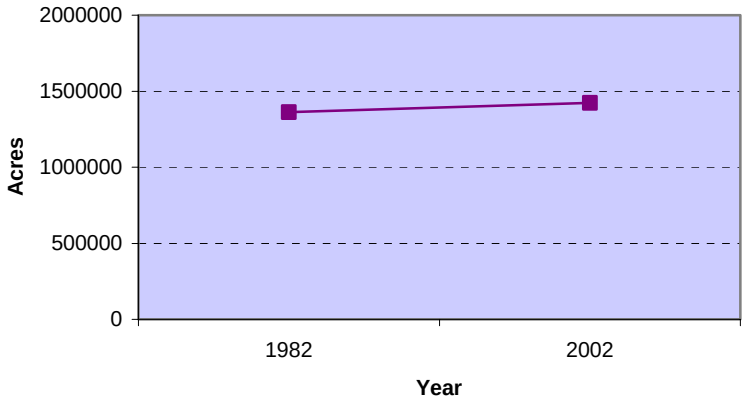


Figure 1. Changes in Elk Suitable Habitat on the Carson National Forest from 1986 to 2002.

Forest Management Activities

It is a general consensus among Forest biologists that the number of elk has steadily risen on the Forest since the inception of the Forest Plan in 1986. Increasing populations, however, do not necessarily translate to good habitat conditions. Logging, livestock grazing and fire suppression have all contributed to a considerable change in structural diversity on the Carson National Forest over the last 100 years -- including understory plants.

Over the past century many disturbance events, primarily wildfires, have not been allowed to run their natural courses. A disturbance regime of frequent, low-intensity fires has been replaced with one of stand-replacing, high intensity fires. Consequently, disturbance events have become less frequent but more severe. Forestry practices further reduced the spread of fires. Major logging efforts in the Southwest began with the harvest of railroad ties and other products for construction of the transcontinental railroad in the 1870s and 1880s (Schubert 1974) and continued through the 1980s (Dahms and Geils 1997). As the large ponderosa pine and Douglas-fir trees were harvested, they were replaced by numerous seedlings that were not thinned by fire as in the past.

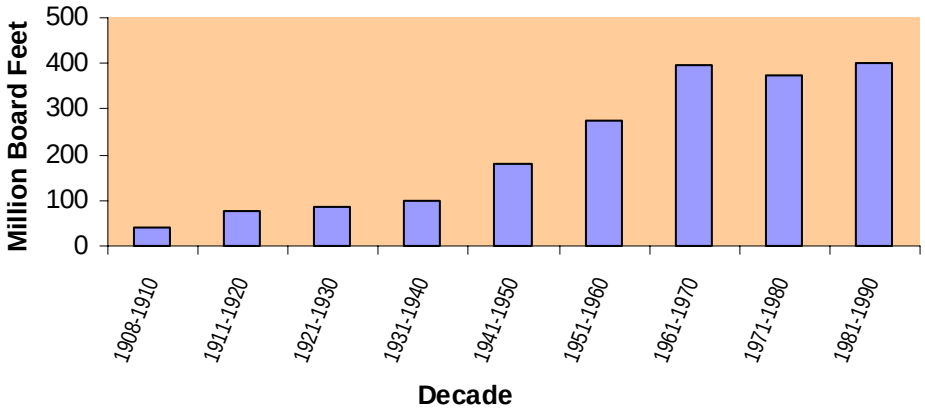


Figure 2. Average Annual Volume Cut in the Southwest 1908 - 1990 (MMBF)

Suppression of natural disturbances and the removal of some late seral communities through logging have resulted in an artificial overabundance of mid-seral communities (Dahms and Geils 1997). Dense thickets of sapling and pole stands have replaced the open structure of historic forests in the Southwest (Harrington and Sackett 1990). Expanding coniferous thickets have suppressed understory plants.

In addition to fire suppression and heavy logging, intense livestock grazing not only removed the fine fuels needed to carry a fire, but shifted the competitive advantage from the herbaceous understory to tree seedlings. This also increased tree density within the forest and allowed tree expansion into meadows. Over large areas, important components of structural diversity, namely meadows, open-canopy and old growth forests, have been converted to pine and fir thickets (Moir and Fletcher 1996).

Changes in disturbance regimes and other forest processes have resulted in a transformation of forest conditions such as structure and composition. On the Carson National Forest, forage has decreased as a result of fire suppression and fewer vegetation management activities, such as thinning and group selections, which create small openings and transient range. In contrast, cover has increased as trees encroach on forage areas.

The relationship between overstory density and understory productivity has been documented in numerous studies (Dahms and Geils 1997). Moore and Deiter (1992) report on the relation between stand density index[1] and understory productivity in a ponderosa pine forest on the Kaibab Plateau. Productivity of grasses, sedges, forbs and shrubs decreased with stand density index.

[1] A relative measure of competition in a forest stand based on number of trees per unit area and average tree size.

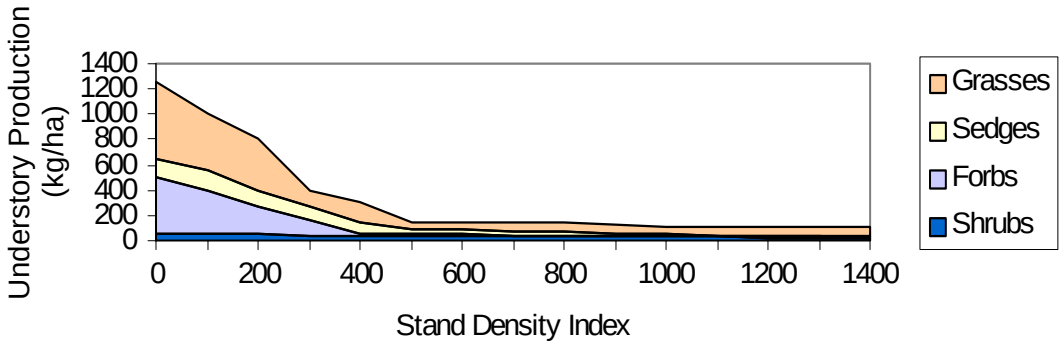


Figure 3. Understory Productivity by Stand Density Index of Ponderosa Pine on the Kaibab Plateau, AZ (redrawn from Moore and Deiter 1992).

On the Carson, the majority of elk habitat is in a mid-seral condition with a lack of widely distributed understory forage in the forested types. This results in increased competition between numerous species of wildlife and livestock in key pastures. Most livestock allocations were made during the period of heavy timber harvest, which created transient range and provided for much higher levels of forage production for all ungulates. Increasing elk populations have contributed to higher utilization levels on important foraging areas such as meadows and riparian areas. The same sites are also key livestock grazing areas. With the decline in timber practices on the Forest and continued fire suppression, canopy closure and duff layers are increasing, thus reducing understory forage production in the forested types.

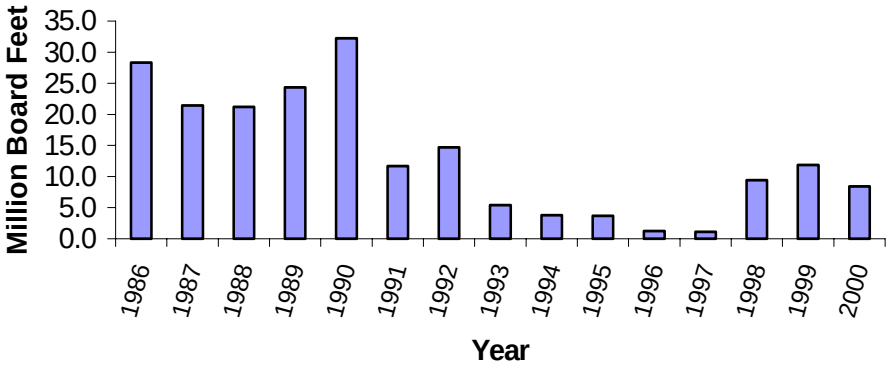


Figure 4. Timber Volume Harvested from the Carson National Forest

Elk now utilize and frequent virtually every habitat type found on the Forest. Recent habitat improvement projects such as water developments, prescribed burns, timber harvest, fuelwood sales and the clearing of piñon-juniper woodlands have helped to distribute use but have likely contributed to the expansion of existing herds into unoccupied habitats over the past couple of decades. Overall, habitat condition and trend for Rocky Mountain elk on the Carson National Forest is considered fair and stable. A downward trend is likely on high index sites, where there is rapid forest succession and recent project work such as thinning and prescribed burning have not been implemented.

In the long term, quality habitat for elk is dependent on projects specifically designed to provide understory forage recovery, away from streams and riparian vegetation, and to improve small parks and openings through meadow maintenance and thinning near these sites. A likely habitat-population relationship between aspen stands and elk numbers in the Valle Vidal area may require special study and management in order to retain aspen habitats in that area.

Population Trend And Viability

Elk are most abundantly distributed in the Intermountain West from mid-central British Columbia and Alberta south through the western states to mid-central Arizona and New Mexico. They are also found on the Coast of Washington, Oregon, and northern California, and in scattered transplanted populations in Canada and some eastern and midwestern states.

The *NatureServe* database (www.natureserve.org/explorer) documents that throughout its range, the elk is listed as "G5", (i.e., globally secure and common, widespread and abundant). Reasons given for the G5 ranking are its large range and that it is common in many areas and there is no evidence of large-scale declines. It is not vulnerable in most of its range. Species with this rank typically occur in more than 100 localities, and there are more than 10,000 individuals. Within the United States, elk is listed as "N5" (i.e., secure and common, widespread, and abundant).

Due to heavy unregulated hunting in the mid to late 1800's and early 1900's, elk were extirpated from New Mexico by 1909. The following year efforts to reintroduce elk into the state began. In 1911, 12 animals from Routt County, Colorado, were released near Raton and Las Vegas, and 50 animals from Yellowstone Park were released in San Miguel County and in the Pecos area (NMDGF 2001). In 1912 there were 60 elk in New Mexico; by 1923 the northeastern herd had grown to 750; by 1934 there were 3,500 to 4,000 elk state wide.

The present Central Carson elk herd was started with two small transplants on the Tres Piedras District in 1938 and 1939. The New Mexico Department of Game and Fish (NMDGF) transplanted fourteen mature elk in the Tusas Valley. Similar transplants have also occurred in southern Colorado. By 1967 the state herd was estimated at 11,000, and most of the former elk range, including that of Merriam's elk, was occupied (NMDGF 1967, Findley et al., 1975).

The population trend for Rocky Mountain elk on the Carson National Forest is up. The NMDGF has steadily increased hunting permits for elk, including a limited number of late season cow permits to help hold the population at desired levels and prevent depredation of hay fields on private lands. In the long term, however, good habitat for elk is dependent on projects specifically designed to provide understory forage recovery, away from streams and riparian vegetation, and to improve small parks and openings through meadow maintenance and thinning near these sites. Each wintering area should have a schedule established to conduct prescribed burning and maintenance.

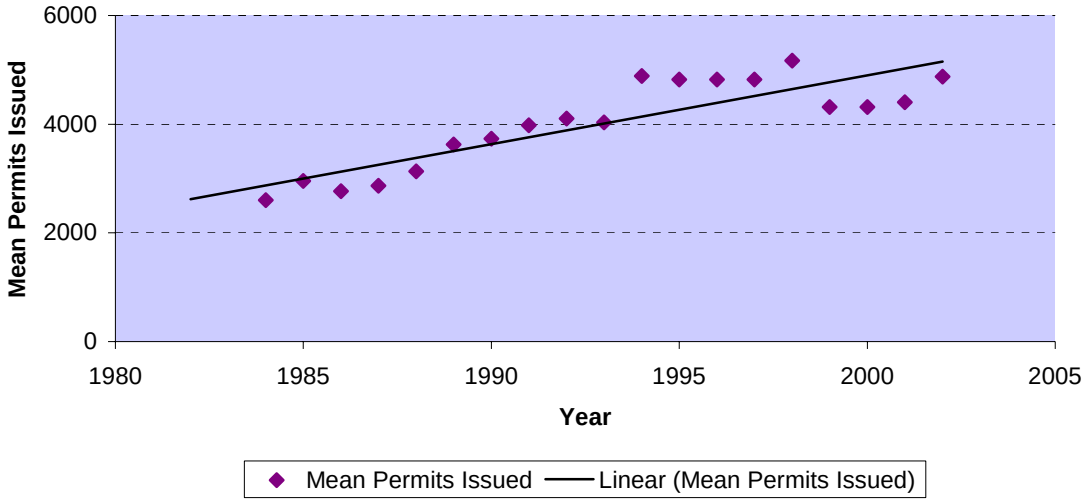


Figure 5. Elk Permits Issued All Carson National Forest Hunt Units

The drop in numbers after the 1998 season partially reflects a boundary change in unit 49. The trend in elk numbers may best be reflected by the increase in hunting permits issued during the period of the Forest Plan.

Over the last century, elk numbers on the Carson increased (Dunn et al. 1995, Catanach et al. 1995), however current observations of year-round elk use in piñon-juniper may be an indication that elk populations are reaching a "peak" or that populations are stabilizing. Winter range encroachment from private land development and hunting success also influence population trends.

The NM Department of Game and Fish has conducted flight counts for many years, but population estimates could not be determined due to the inability to see animals in the denser cover types. It was also unknown what percentage of animals was in the open areas and actually counted, and how many were under canopy cover. As a result, a sightability index survey (SIS) analysis was initiated in 1999 in selected locations to help estimate populations by Game Management Units (GMU).

Table 1. NMDGF Population Estimates for Elk on the Carson National Forest by Game Management Unit

Ranger District	Game Management Unit	Modeled Population January 2001	1999 SIS Population Estimate	2000 SIS Population Estimate	2001 SIS Population Estimate
Jicarilla	2	1000	-	-	
Camino Real	44/45	1350*	-	-	1421
Camino Real	49	500	-	-	405
TP, mostly on BLM	50	550	2270**	401	-
Canjilon & El Rito	51	750	554	887	-
Tres Piedras	52	3000	2799	2924	-
Questa	53	600	568	583	-
Questa	55 (Valle Vidal portion only)	-	-	2575	-

* Only about 10% on Carson NF, remainder on Santa Fe NF
** Unusually high numbers due to influx of winter migration

Taking into account the condition and trend of the elk's habitat on the Forest, existing data and continued increase in the number of hunting permits issued by the Department of Game and Fish, the Carson National Forest is sustaining viable populations of Rocky Mountain elk. Future implementation of prescribed burning, urban-interface fire projects, thinning, aspen regeneration, meadow maintenance, road closures and intensive livestock grazing management should improve elk foraging habitat. Subsequently, these forest activities will maintain elk populations.

References

Adams, Arthur W. 1982. Migration. In: Thomas, Jack Ward; Toweill, Dale E., eds. Elk of North America: ecology and management. Harrisburg, PA: Stackpole Books: 301-322.

Canfield, Jodie E.; Lyon, L. Jack; Hillis, J. Michael. 1986. The influence of viewing angle on elk hiding cover in young timber stands. Res. Pap. INT-371. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 5 p.

Catanach, M.H.; Weybright, D. 1995. Big game surveys: elk population trends, distribution and harvest information. Final Report, 1 April, 1989: NM W-093-R-37/Job 2/Segments 32-36. Santa Fe, NM: New Mexico Department of Game and Fish. 26 p.

Dahms, Cathy W.; Geils, Brian W., tech. Eds. 1997. An assessment of forest ecosystem health in the Southwest. General Technical Report RM-GTR-295. Fort Collins, CO: US Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 97 p.

Dunn, B.; Weybright, D. 1995. Big game surveys: data analysis and interpretation. Final Report, 8 August, 1994: NM W-093-R-36/Job 17/Segment 36. Santa Fe, NM: New Mexico of Game and Fish. 20 p.

Edge, W. Daniel; Marcum, C. Les; Olson-Edge, Sally L. 1987. Summer habitat selection by elk in western Montana: a multivariate approach. Journal of Wildlife Management. 51(4): 844-851.

Findley, J.A.; Harris A.H.; Wilson, D.E.; Jones, C. 1975. Mammals of New Mexico. Albuquerque, NM: Univ. of New Mexico Press: xxii + 360 p.

Harrington, M.G.; Sackett, S.S. 1990. Using fire as a management tool in southwestern ponderosa pine. Krammes, J.S., tech. coord. Effects of fire management of Southwestern natural resources; 1988 November 15-17; Tuscon, AZ. General Technical Report RM-191. Fort Collins, CO: US Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station: 122-133.

Leege, Thomas A., compiler. 1984. Guidelines for evaluating and managing summer elk habitat in northern Idaho. [Wildlife Bull. No. 11]. Boise, ID: Idaho Fish and Game. 37 p. [A cooperative effort. Financial support provided by the Idaho Department of Fish and Game Federal Aid Project W-160-R, U.S. Forest Service, Bureau of Land Management, Plum Creek Timber Company and Idaho Forest Industry Council].

Moir, W.H.; Fletcher, R.A. 1996 Forest diversity in New Mexico. New Mexico Journal of Science. 36: 232-254.

Moore, M.; Deiter, D. 1992. Stand density index as a predictor of forage production in northern Arizona pine forests. Journal of Range Management. 45: 267-271.

NatureServe Explorer: An online encyclopedia of life [web application]. 2001. Version 1.6. Arlington, Virginia, USA: NatureServe. Available: http://www.natureserve.org/explorer. (Accessed: April 11, 2002).

New Mexico Department of Game and Fish. 1967. Elk: New Mexico wildlife management. Santa Fe, New Mexico: 250 p.

New Mexico Department of Game and Fish. 1995. Long range plan for management of New Mexico's elk 1995-2002. New Mexico wildlife management. Santa Fe, New Mexico.

New Mexico Department of Game and Fish. 2001. BISON-M (Biota Information System of New Mexico): Biological database for New Mexico. NMDGF in cooperation with USDI BLM, USDI FWS, USDI Bureau of Reclamation, US Army Corps of Engineers, USDA Forest Service and University of New Mexico. http://nmnhp.unm.edu/bisonm

New Mexico Department of Game and Fish. 2000. 2000 elk and deer sightability index survey analysis. Federal aid in wildlife restoration grant W-93-R41, Projects 1.1.1 and 1.2.1. Santa Fe, New Mexico: NM Department of Game and Fish: 54 p.

Peek, James M.; Scott, Michael D.; Nelson, Louis J.; [and others}. 1982. Role of cover in habitat management for big game in northwestern United States. Transactions, 47th North American Wildlife and Natural Resources Conference. 47: 363-373.

Schubert, G.H. 1974. Silviculture of southwestern ponderosa pine: the status of our knowledge. Research Paper RM-123. Fort Collins, CO: US Department of Agriculture, Forest Service. 71 p.

Severson, Keith E.; Medina, Alvin L. 1983. Deer and elk management in the southwest. Journal of Range Management Monograph. No. 2: 64 p.

Skovlin, Jon M. 1982. Habitat requirements and evaluations. In: Thomas, Jack Ward; Toweill, Dale E., eds. Elk of North America: ecology and management. Harrisburg, PA: Stackpole Books: 369-414.

Temple, L.; Weybright, D. 1995. Big game surveys: Valle Vidal elk studies. Final Report, 1 April, 1989: NM W-093-R-36/Job 3/Segments 32-36. Santa Fe, NM: New Mexico of Game and Fish. 46 p.

USDA Forest Service. 1986b. Record of decision for the Carson National Forest land and resource management plan. Albuquerque, NM: US Department of Agriculture, Forest Service, Southwestern Region. 6 p.

USDA Forest Service. 1986c. Carson National Forest land and resource management plan. Albuquerque, NM: US Department of Agriculture, Forest Service, Southwestern Region.

USDA Forest Service. 1987. Terrestrial ecosystems survey of the Carson National Forest. Albuquerque, NM: US Department of Agriculture, Forest Service, Southwestern Region. 552 p.

USDA Forest Service. 1996. Record of decision for amendment of forest plans – Arizona and New Mexico. Albuquerque, NM: US Department of Agriculture, Forest Service, Southwestern Region. 96 p.

USDA Forest Service. 2002. Fire Effects Information System, [Online]. Available: http://www.fs.fed.us/database/feis/. Fort Collins, CO: US Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory.

Carson National Forest Management Plan Direction For Elk

The following is for Rocky Mountain elk taken from the Carson Forest Plan (USDA 1986c, Wildlife & Fish).

BIG GAME SUMMER RANGES… On big game summer ranges manage suitable timberlands to achieve a diversity of vegetative conditions by balancing timber age and canopy cover classes.

COVER NEEDS… On primary big game winter ranges and primary calving and fawning areas, manage to achieve identified cover requirements to meet big game population goals and objectives. The remaining suitable timberlands will be manage to provide habitat diversity.

EDGE CONTRAST… Maintain at least a medium amount of edge contrast between stands and cutting units created by even-age management. This means that cutting units prescribing regeneration cuts shall be placed at least 75 percent of the time adjacent to stands which will result in at least two age class difference after treatments, unless stands are being regenerated to manage aspen or to correct insect and disease or other natural catastrophes.

SUMMER BIG GAME COVER...
Diversity units dominated by forested vegetation types, including piñon-juniper will be managed so that no less than 40 percent summer big game cover will be maintained over time.

Diversity units dominated by non-forested vegetation types will be managed to minimize impacts to summer big game cover. The standards in Table 4 will apply.

Table 4. Wildlife Forage Cover Ratios

% of Unit with Forest Vegetation	% of Forested Area in Cover
35 -50%	At least 60%
20 -34%	At least 75%
Less than 20%	At least 90%

SUMMER BIG GAME THERMAL COVER… On suitable timberlands manage for no less than 10 percent summer big game thermal cover within each diversity unit. The allocation of thermal cover will be stands of at least 30 acres in the sapling-pole stage or older, with canopy closures of 70 percent or greater. Stands on north-facing aspects should receive priority in the allocation of thermal cover.

SUMMER BIG GAME HIDING COVER...

- *Manage suitable timberlands, and piñon-juniper, so that no less than 10 percent hiding cover is maintained on big game summer ranges that occur within each diversity unit. Stands allocated for cover should have at least a 450-foot radius from the stand center to any point on the exterior perimeter (approximately 20 acres).*
- *In forested management areas, including piñon-juniper, the objective will be to maintain summer big game hiding cover on 60 percent or more of the perimeter of all natural and created openings, and along at least 75 percent of the edge of arterial and collector roads.*
- *Summer big game hiding cover will be maintained or improved adjacent to special features (seeps, springs, wet meadows, wallows, salt licks, water developments). The following standards will apply:*

o Timber cutting within a minimum radius of 300 feet of the feature will be accomplished only if big game cover can be maintained or improved.

- Cutting unit boundaries will be designed so that at least one third of the perimeter around the feature is contiguous to adjacent forest cover.
- Permanent roads will not be constructed within 200 feet of special features unless there is no feasible alternative to build the road in another location.
- Temporary roads will not be constructed within 100 feet of special features.
- Skidding equipment will be authorized to within 75 feet of the feature and logging debris removed from all trails leading to the feature.

- *Forested areas, including piñon-juniper, within at least 1200 feet of primary big game winter and calving and fawning forage areas, will be managed to maintain or improve the integrity of hiding and thermal cover.*

All other summer range cover standards and guidelines will apply to winter ranges and big game calving and fawning areas.

BIG GAME COVER... Big game cover requirements may be reduced temporarily during periods when stands are being regenerated to meet cover standards, to correct tree disease, to rejuvenate aspen stands, or where windthrow or wildfire has occurred.

BIG GAME HIDING AND THERMAL COVER LEVELS... In planning for the cover requirements of big game on each diversity unit utilize Table 5 *[Table not shown in this document]* in conjunction with available timber stand data. Refinement of the stand conditions suitable to meeting cover requirements will be made as a result of field verification on an individual stand basis. As specific information is developed on the Forest this table *[Table not shown in this document]* may be modified if needed to reflect the appropriate range of cover conditions.

TIMING, SIZE & PERIOD OF TIMBER MANAGEMENT ACTIVITIES:

DISPLACEMENT... Minimizing the displacement of big game and other sensitive wildlife, and providing sufficient security areas will be emphasized in the planning and implementation of the Forest-wide timber sale program.

ACTIVITIES NOT ADJACENT... The objective will be to arrange timber sales over time and space so that concurrent activities do not occur adjacent to one another. Manage adjacent areas at least as large as the affected area of activity for wildlife security habitat.

ACTIVITIES WITHIN DRAINAGES... When designing timber sales attempt to keep activity perimeters within one major drainage at a time. Utilize subdivision design and contract stipulations (such as requiring the completion of a block before beginning activities in another area of the sale) as necessary to minimize impacts on security habitat.

THREE YEAR LIMIT... Timber sales will be designed so that activity time frames will minimize displacement of wildlife. A primary objective will be to limit logging disturbance in an activity area to no more than three years whenever possible on each timber sale.

WINTER LOGGING... On big game summer ranges where winter logging operations are environmentally and economically feasible encourage operations during this period.

SEASON LIMITS...

- *On primary big game winter ranges timber management activities, including timber sale preparation, logging, timber stand improvement, and brush disposal will be authorized only during the period April 15 - December 15.*
- *Within identified turkey nesting areas timber management activities will not be authorized during the period April 15 - June 30.*

- *Within primary big game calving and fawning areas timber management activities will not be authorized during the period May 1 - July 25.*

ROAD MANAGEMENT/WILDLIFE INTEGRATION:

ROAD MANAGEMENT... Emphasize road management and resource/wildlife protection as a primary Forest policy. Focus media attention on road management at least biannually, especially management to provide wildlife security and reduce impacts to soil, water and fisheries.

MIGRATION ROUTES... Do not construct permanent roads across major big game migration routes unless no feasible alternative exists, as determined by interdisciplinary team review.

ROAD DENSITIES... Road management will provide for an environment relatively free from human disturbances to wildlife. Manage over time to achieve the following guidelines for maintaining or improving effective big game habitat:

Summer big game range: 60% habitat effectiveness (approximately 1.0 mile/square mile of roads open to public use).

Winter big game range: 75% habitat effectiveness (approximately .5 mile/square mile of roads open to public use during the period December 15 -April 15).

Primary winter big game forage and associated cover areas: 90% habitat effectiveness (approximately .1 mile/square mile of roads open to public use during the period December 15 -April 15).

EFFECTIVE CLOSURES... Whenever possible, design roads so they can be easily and effectively closed (either permanently or temporarily) at a low cost.

AVOIDANCE AREAS... Permanent roads will be designed to avoid saddles, meadows, ridge tops, and riparian areas whenever economically and physically possible.

CLOSURES... Install gates or other effective closure methods at onset of road building activity when the objective is to prevent human use patterns from becoming established. Closures will be implemented during any period of inactivity exceeding 24 hours. During big game hunting seasons closures will be implemented full-time if necessary to provide additional wildlife security areas.

SIGNING... Include signs where appropriate on gates and other closure devices indicating the reasons for and dates of all road closures.

CLOSURE TIME FRAMES... All local terminal roads will be completely closed to public use by no later than two years following completion of a timber sale contract. All other temporary roads will be closed and/or obliterated upon completion of the activity.

BIG GAME WINTER RANGE & FORAGE/COVER AREAS... On big game winter ranges authorize new permanent road construction only if needed to meet priority objectives outside the winter range, as determined by interdisciplinary team review. Minimize impacts by locating roads outside of identified primary forage and cover areas.

CALVING AND FAWNING AREAS... Locate new arterial, collector and local service roads outside of primary big game calving and fawning areas. Close other roads as needed during periods of calving and fawning activity May 1 - July 25.

TRAVEL MANAGEMENT/WILDLIFE INTEGRATION:

The following wildlife-related criteria will be used to evaluate the need for future travel closures and restrictions including over-the-snow vehicles:

Habitat for threatened, endangered, or sensitive species is threatened. .

Meadows and other forage areas likely to be, or being damaged.

Key wildlife areas being threatened or damaged.

Areas important to wildlife reproduction, such as calving and nesting areas, where disturbance is causing, or likely to cause, significant stress and/or reduction of reproductive success.

Important seasonal security areas, such as big game winter ranges, where disturbance would result in significant displacement and/or loss of habitat values.

Riparian areas which are being threatened or damaged.

RANGE/WILDLIFE INTEGRATION:

RANGE MANAGEMENT PLANS... Design range management systems and plans with input from State and Federal wildlife biologists to minimize conflicts with fish and wildlife. Whenever possible design grazing systems to minimize domestic livestock impacts on important seasonal wildlife ranges such as primary calving and fawning areas, winter ranges, and primary turkey nesting areas.

SALT... Livestock salt shall not be placed in or adjacent to any riparian area or other identified key wildlife area where degradation of wildlife habitat would be likely to occur.

FORAGE ALLOCATION... Wildlife will be allocated forage on the basis of mutually agreed-upon population goals and objectives of the Forest Service and New Mexico Department of Game and Fish.

WATER... During summer months, where free water has been identified as limiting desired wildlife population levels, maintain water in livestock troughs for wildlife use after domestic animals have been removed from the grazing unit. In winter months on identified primary big game winter ranges, provide water where freezing will not damage existing facilities, or install bubblers or other devices to prevent freezing.

WILDLIFE/FENCE CONFLICTS... Install let down fences, top-rail fences, barbless bottom wire, or elk jumps wherever necessary to reduce wildlife/fence conflicts. On newly constructed fences the bottom wire will be at least 18 inches above the ground, and the top wire will be at least 38 inches, but no more than 42 inches above the ground. Do not construct new net wire fences on identified pronghorn ranges and modify existing fences as needed to provide for seasonal movement of pronghorn.

RIPARIAN WOODY VEGETATION... On wet meadows and other riparian areas, favor the establishment of woody riparian vegetation as defined in FSH 2509.23. Control livestock and wildlife grazing through management and/or fencing to allow for adequate establishment of vegetation and the elimination of overuse.

SEEDING FOR DIVERSE VEGETATION... Vegetative treatments which require seeding will utilize a mix of plant species which will result in increased plant cover and improved quality and diversity of forage for both wildlife and livestock.

OTHER WILDLIFE AND FISH PLANNING AND HABITAT IMPROVEMENT:

HABITAT IMPROVEMENT PROJECTS... Plan for, and include game/nongame wildlife and fish habitat improvement projects in sale area improvement plans for all timber sale areas including piñon-juniper, where there is a potential to improve wildlife and fish habitat conditions.

RECORDS... Identity and maintain records of important wildlife and fish habitats and integrate wildlife and fish requirements through interdisciplinary team review of all planned programs and activities occurring on National Forest System Lands.

WILDLIFE AND FISH OBJECTIVES... Provide wildlife and fish objectives and expected outputs throughout the integrated resource management process for commercial timber sales and other proposed management activities. Identity, on a diversity unit or herd unit basis, wildlife and fish habitats necessary to meeting identified objectives, as stated throughout Forest wide and management area standards and guidelines.

WATER IS LIMITING... Identify areas of the Forest where the lack of dependable water is a limiting factor. Determine priority areas and schedule wildlife water improvements including, but not limited to, spring developments, trick tanks, vertical and horizontal water wells, and earthen tanks. Wildlife water developments will be fenced if needed to exclude livestock and wild horse use. Top-rail fences will be installed as necessary to minimize wildlife injuries and to reduce the need for yearly maintenance.