

**Proceedings of the 1999
Western Association of Fish and Wildlife Agencies
DEER/ELK WORKSHOP**

March 3rd, 4th and 5th, 1999

Salt Lake City, Utah



Sponsored by the
Utah Division of Wildlife Resources

Publication 01-15

1:15 - 3:00 PM
(Continued)

Impacts of Disturbance Session

- Distribution and Spatial Partitioning of Mule Deer and Elk in Relation to Traffic
 - Michael J. Wisdom, U of Idaho
 - Norman J. Cimon, USFS
 - Bruce K. Johnson, ODF&W
 - Edward O. Garton, U of Idaho
 - Larry D. Bryant, USFS
- Reproductive Success of Elk Disturbed by Humans During Calving Season
 - Gregory E. Phillips, CSU
 - A. William Alldredge, CSU
- Behaviors and population characteristics of mule deer using urban winter ranges: Are urban habitats ecological traps?
 - Mark F. McClure, USU
 - Michael R. Conover, USU
 - John A. Bissonette, USU

3:00 - 3:20 PM
3:20 -4:00 PM

Break

Big Game Interactions Session

- Ecology of sympatric mule deer and elk in south-central Wyoming.
 - Brian L. DeBolt, U of Wyoming
 - Marc A. Porter, U of Wyoming
 - Fred G. Lindzey, U of Wyoming
- Ecology of sympatric mule and white-tailed deer in riparian communities.
 - Hall Sawyer, U of Wyoming
 - Fred Lindzey, U of Wyoming

4:00 - 5:00 PM

State and Province Deer and Elk Status reports

March 5

8:00 - 10:00 AM

Deer/Elk Population Parameters Session

- Estimating Deer and Elk Population Size by Reconstruction from Harvest Data and Herd Ratios
 - Louis C. Bender, WDF&W
- Estimating Elk densities in Colorado: Progress with Perplexities
 - David J. Freddy, CDOW
- The relationship of rainfall and drought on Arizona's mule deer male:female and young:female ratios: a retrospective analysis
 - Brian F. Wakeling, AG&FD

- Hardware Ranch Elk Data
 - Louis Cornicelli, UDWR
- Influence of Weather and Body Condition on Elk Reproductive Performance in Northern Utah
 - Rick E. Danvir, DLL
 - Robert A. Wharff, DLL
 - Kenneth Clegg
 - Robert C. Squibb
 - Michael L. Wolfe, USU

10:00 - 10:20 AM

Break

10:20 - 11:00 AM

Deer/Elk Population Parameters Session (cont)

- A Nationwide Evaluation of Deer Hunter Harvest Survey
 - Susan P. Rupp, TTU
 - Warren B. Ballard, TTU
 - Mark C. Wallace, TTU
- Elk Population Assessment Techniques for Western States and Provinces
 - Lance T. Vermeire, TTU
 - Mark C. Wallace, TTU

11:00AM - Noon

Utah's Predator Management Plans to Benefit Big Game

- Bill Bates, UDWR

Using the Internet to enhance public support for western mule deer management

- Jamey H. Anderson, USU
- Terry A. Messmer, USU
- Jim deVos, Jr., AG&FD

More ducks than bucks: a new paradigm in deer management

- J. C. DeVos, Jr., WAFWA Mule Deer Committee

Noon - 1:00 PM

Lunch

1:15 - 3:00 PM

WAFWA Mule Deer Working Group Discussion

- State and province representatives

3:00 - 3:20 PM

Break

3:20 -

Big Game Disease Session

- Eradication of Brucellosis in a Closed Elk Population
 - Tom Watts, Jicarilla G&FD
- Chronic Wasting Disease Update
- Update on Brucellosis Wyoming

growing "urbanization"
 growing commercialization
 farming
 ranching
 sales of permits
 sales of parts (trophy
 outfit act)

Who is a landowner
 " " " land manager
 " " " land user
 " " " wildlife manager.

"Principle, this doesn't teach"

States can effectively regulate how wildlife pops are used, but not effective in controlling prod. wildlife, ^{pop} they are both habitat + pop dependent
 Fed, state, + private land mgmt plans are not integrated

Never be enough money
 And it's people to trust you
 new theories don't necessarily work
 Significant problems we face cannot be solved at the same level of thinking that creates them

Don't
 pop
 get
 the
 traps

WESTERN ASSOCIATION OF FISH AND WILDLIFE AGENCIES
 DEER AND ELK WORKSHOP
 SALT LAKE CITY, UTAH
 MARCH 3, 4 and 5, 1999

*> Modification
 > what they do.
 > two vol report 1800 pp.
 on range comp
 chosen on WR.
 Snow, Anyhon SK
 & Elk.
 training
 & training
 Manning 5 yr Retal*

MARCH 3

5:00 - 8:00 PM Registration
 6:00 - 8:00 PM Icebreaker (Room 255 Salt Palace Convention Center, NE Corner)

MARCH 4

8:00 - 8:30 AM Registration
 8:30 - 9:00 AM Welcome
 - John Kimball, Director Utah Division of Wildlife Resources
 Utah's Cooperative Wildlife Management Unit Program
 - Wes Shields, UDWR, Terry Messmer, USU Wildlife Extension

10:00 - 10:15 AM Break

10:15 AM - Noon Habitat Session - John Fairchild
 - Range Trend and the management of Big-Game, should this be considered an Oxymoron?
 - Jim Davis, UDWR
 - Habitat Evaluation and Subsequent Improvements for Mule Deer in Wyoming
 - Dan Stroud, WGFED, WY RANGE
 - Status of Elk Habitat GIS Database
 - Kirk M. Horn, RMEF
 - Habitat Selection & Spatial Segregation of Elk & Mule Deer During Spring in Montane Environments
 - Bruce K. Johnson, ODF&W, - John Kern, WET, Inc.- Michael J. Wisdom, USFS, - Scott Findholt, ODF&W, John Kie, USFS

*Range boundaries started after 1900s NO
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 > Brown reports 1970s
 1970s reports not*

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Noon - 1:00 PM Lunch

1:15 - 3:00 PM Impacts of Disturbance Session - Jeff Grandison
 - Migrating Mule Deer and Automobiles: A promising alternative to a deadly combination
 - Terry A. Messmer, USU Wildlife Extension - Curtis W. Hendricks, USU - Paul W. Kilmack, USU
 - Distribution and Spatial Partitioning of Mule Deer and Elk in Relation to Traffic
 - Michael J. Wisdom, U of Idaho - Norman J. Cimon, USFS - Bruce K. Johnson, ODF&W- Edward O. Garton, U of Idaho- Larry D. Bryant, USFS
 - Reproductive Success of Elk Disturbed by Humans During Calving Season
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 - Mark F. McClure, USU - Michael R. Conover, USU - John A. Bissonette, USU

What is I-Sp Rel between elk + MO

3:00 - 3:15 PM Break

3:15 - 5:00 PM Big Game Interactions Session - Jim Karpowitz
 - Ecology of sympatric mule deer and elk in south-central Wyoming
 - Brian L. DeBolt, U of Wyoming - Marc A. Porter, U of Wyoming- Fred G. Lindzey, U of Wyoming
 - Ecology of sympatric mule and white-tailed deer in riparian communities.
 - Hall Sawyer, U of Wyoming- Fred Lindzey, U of Wyoming
 - The Name Odocoileus hemionus crooki is Invalid
 - James R. Hefflinger, AG&FD
 - Elk forage utilization on seasonal ranges- 3 case histories in northeastern Utah
 - Sherel Goodrich, USFS- Steve Strong, BLM- Dave Olsen, UDWR

MARCH 5

8:00 - 10:00 AM

Deer/Elk Population Parameters Session - Annette Henry

- Estimating Deer & Elk Population Size by Reconstruction from Harvest Data & Herd Ratios
 - Louis C. Bender, WDF&W
- Estimating Elk densities in Colorado: Progress with Perplexities
 - David J. Freddy, CDOW
- The relationship of rainfall and drought on Arizona's mule deer male:female and young:female ratios: retrospective analysis
 - Brian F. Wakeling, AG&FD
- Effects of different management strategies on elk populations in Northern Utah
 - Louis Cornicelli, UDWR
- Influence of Weather & Body Condition on Elk Reproductive Performance in Northern Utah
 - Rick E. Danvir, DLL - Robert A. Wharff, DLL - Kenneth Clegg
 - Robert C. Squibb - Michael L. Wolfe, USU
- Performance of GPS radio-collars on mule deer
 - Hall Sawyer, U of Wyoming - Fred Lindzey, U of Wyoming

10:00 - 10:15 AM

Break

10:15 - 11:00 AM

Deer/Elk Population Parameters Session (cont)

- A Nationwide Evaluation of Deer Hunter Harvest Survey
 - Susan P. Rupp, TTU - Warren B. Ballard, TTU - Mark C. Wallace, TTU
- Elk Population Assessment Techniques for Western States and Provinces
 - Lance T. Vermeire, TTU - Mark C. Wallace, TTU

11:00AM - Noon

Big Game Disease Session - Lou Cornicelli

- Eradication of Brucellosis in a Closed Elk Population
 - Tom Watts, Jicarilla G&FD
- Chronic Wasting Disease Update
 - Walt Cook, DVM, WG&F
- Update on Brucellosis in Wyoming
 - Walt Cook, DVM, WG&F

Noon - 1:00 PM

Lunch (Wallmo Award)

1:15 - 3:00 PM

Mule Deer Session - Ray Lee

- Managing mule deer recovery through the use of predator management plans
 - Bill Bates, UDWR
- Using the Internet to enhance public support for western mule deer management
 - Jamey H. Anderson, USU - Terry A. Messmer, USU- Jim DeVos, Jr., AG&FD
- More ducks than bucks: a new paradigm in deer management
 - J. C. DeVos, Jr., WAFWA Mule Deer Committee

3:00 - 3:15 PM

Break

3:15 -

Mule Deer Working Group Discussion

- State and province representatives

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Cooperative Wildlife Management Unit Program

Session Chair: Wes Shields, Utah Division of Wildlife Resources

Utah Division of Wildlife Resources
Big Game Cooperative Wildlife Management Unit (CWMU) Program
Wes Shields, Utah Division of Wildlife Resources

In the late 1980s, Utah convened a *Private Lands/Public Wildlife Committee* in order to address issues relating to private lands used by wildlife, namely big game species which were impacting agricultural operations. The committee created the Cooperative Wildlife Management Unit (CWMU) (originally, Posted Hunting Unit) Program. The program's goals included: (1) sustaining or increasing wildlife populations, (2) providing incentive, i.e., deriving income from wildlife, for landowners; (3) providing public hunting access along with satisfying hunting experiences on private lands, and (4) providing some degree of liability protection for landowners who open their lands for hunting. The CWMU program began in 1990 as a three-year experiment and was adopted by the Utah Legislature in 1993 as a permanent program.

The main components of the CWMU program: (1) require landowners to be actively involved in the management of the private hunting unit, (2) require 10,000 contiguous acres of mostly private land, (3) require annual renewal by the Wildlife Board, (4) call for a management plan which agrees with the respective Division of Wildlife Resources plan, (5) define unit boundaries, (6) are specifically for deer, elk, pronghorn and moose; (7) guarantee private permits in exchange for free access to a specified number of public hunters, (8) require public hunting opportunities comparable with private client hunts, and (9) provide an expanded window of hunting time so CWMUs may spread-out their hunters.

There are 71 CWMUs in 1999 totalling of 1.25 million acres of land of which about 5 percent is public land incorporated to improve boundary identification and to better manage the respective big game species. In 1998, 60 percent or 2,339 of the CWMU big game permits were for private clients. Forty percent, or 1,550 permits were provided to public hunters who drew permits in the public drawing. The majority of the public permits are for antlerless animals.

Landowners are now more pleased because they may actively participate in managing wildlife on their lands. Transactions involving assignment of hunting permits to clients named by landowners provided a gross income to the CWMUs of \$7.25 million in 1998. While the program has developed cooperative planning efforts between the Division and landowners resulting in improved relationships, minimized depredation issues, optimized big game populations, and improved hunting access on private lands, it requires a significant investment of time and effort by Division employees. Lack of diligent maintenance of the program results in a difficult recovery process and can lead to very hard feelings among the participants.

Habitat Session

Session Chair: John Fairchild, Utah Division of Wildlife Resources

Range Trend and the Management of Big-Game, Should this be Considered an Oxymoron?

James N. Davis, Utah Division of Wildlife Resources

The use of data by the Utah Division of Wildlife Resources in the management of big-game has always been an integral part of management. After the massive deer losses during the severe winters of 1948-49 and 1951-52, the Division set up the Range Inventory project which has been in operation ever since (>40 years). The Utah Big Game Range Inventory Studies are now known as the Utah Big Game Range Trend Studies. Initially the program began as an inventory of the more important deer herd units of the state to provide information on areas where they were restricted during normal and severe winters. Specifically it was to determine the upper and lower elevational limits of critical deer winter range. This information has been instrumental in directing big-game management policy decisions. The studies then evolved to where the emphasis was directed toward browse species because of its importance to deer survival during critical winters. It was concluded in the late 1970's that the inventory studies did not provide adequate information for the determination of range trend. It was strongly believed that accurate long-term range condition and trend were critical for future management policies dealing with big-game in the state. However, this could only be accomplished if permanent transects were established and the methodologies being utilized would have to be improved and be acceptable to all concerned agencies. This and other special request data have been invaluable through the years in the management of wildlife. The following three examples illustrate how the data has been utilized. (1) This data allowed the cooperative big-game improvement projects (chaining p-j woodland of more than 900 acres) with the U.S. Forest Service to take place. The concerns of environmental groups and citizens were mitigated with the data which demonstrated how much less runoff (eight times less) and erosion (five times less) took place on the treated vs untreated paired pinyon-juniper woodland sites. (2) In the Book Cliffs, clipped paired plots and range trend data have helped in the defeat of a lawsuit brought against the Division, BLM, Rocky Mountain Elk Foundation, and Nature Conservancy, all partners in the Book Cliff Initiative Group by the Alameda Corporation. They claimed that elk were causing spring grazing problems and they were also excessively using the rested pastures during the summer. These data also showed that deer and elk were not affecting vegetative trend, therefore the Division could continue managing as currently directed by the management plan for the area. (3) The Paunsaugunt unit illustrates the historical perspective of how concerns and data were utilized to help in the management of the area. Much of the controversy for this unit began many years ago after the extensive deer die-offs of the 1970's. With public support, the unit was closed to hunting for five years. Since then hunting has been to limited entry permits only. The unit currently has good buck/doe ratios with a high proportion of large bucks in the population, but on average the unit usually has fairly poor fawn/doe ratios. Summer range is limiting on this unit, however the density of the principal browse species (sagebrush) on most of the winter range has been decreasing significantly through the last 15 years. Coupled with extended drought, these factors have limited the units recovery when compared to what it was in the past.

Habitat Evaluation and Subsequent Improvements for Mule Deer in Wyoming
Dan O. Stroud, Wyoming Game and Fish Department

In 1988 a habitat evaluation was conducted on a 175,550 acre mule deer winter range. This is one of 4 winter range complexes associated with the Wyoming Range Mule Deer and is located between Big Piney and LaBarge, Wyoming. The primary purpose of the evaluation was to document habitat conditions and identify habitat related projects which would enhance mule deer winter range. The evaluation focused on the shrub components of the winter range. Findings indicated that the majority of sagebrush (*Artemisia tridentata wyomingensis*) stands in the area were monotypic, old-aged stands, with varying degrees of decadency, possessing little or no seedling regeneration. Other shrub communities evaluated including mountain mahogany (*Cercocarpus montanus*), winterfat (*Ceratoides lanata*), Gardner's saltbush (*Atriplex nuttallii*) and bitterbrush (*Purshia tridentata*). These were found to be in poorer condition than the sagebrush communities. Causes for these conditions cited in the study included fire suppression, overutilization by wildlife and livestock, energy-related habitat loss, overabundance of mule deer and drought conditions. The study identified the need for a habitat improvement program and targeted the treatment of approximately 10% of this winter range over a 10 year period. The primary goal of the treatments were to reduce sagebrush cover and stimulate understory and other shrub production. Unfortunately, only approximately 4800 acres have been treated since 1990. Preliminary results of these efforts appear to be successful in reducing shrub cover and providing for future shrub establishment. In the short term a greater diversity in the associated vegetative communities is expected. Maximum benefits to wintering mule deer from these treatments are not expected for 15-20 years. Benefits anticipated include greater shrub diversity relative to both species and age classes.

Using Data Collection/Research to Form Management Recommendations
Kirk M. Horn, Rocky Mountain Elk Foundation

A computerized demonstration of the Status of Elk Habitat GIS data base, its objectives, uses and status. The program will display, in part, North American elk habitat, subjective limiting factors and informational layers used to compose the GIS maps.

Habitat Selection of Elk and Mule Deer During Spring in Montane Environments

Bruce K. Johnson, John Kern , Mike Wisdom, Scott Findholt and John Kie

A hotly debated topic among ungulate biologists is whether interspecific competition occurs between elk (*Cervus elaphus*) and mule deer (*Odocoileus hemionus*) where the 2 species coexist in montane habitats. Clear understanding of patterns of habitat selection of elk and mule deer is necessary before this debate can be resolved and before spatially explicit models to predict effects of herbivory, model nutrient cycling, and allocate forage among competing species will be useful. We monitored distributions of 45 mule deer and 88 elk in spring 1993 – 1995 with an automated telemetry system (ATS) at the U. S. Forest Service Starkey Experimental Forest and Range (Starkey) in northeast Oregon and obtained 40,063 locations of mule deer and 72,931 locations of elk. We identified 15 continuous variables that were not highly correlated ($r < \pm 0.37$) to describe the habitat. For each species, we used logistic regression to identify the variables that were significant during foraging and nonforaging periods for each species. Elk and mule deer were spatially segregated during foraging and nonforaging periods. Our results will be useful for building spatially explicit models to allocate forage, model nutrient cycling, and estimate herbivory effects of ungulates in forest ecosystems. The strong evidence for a dichotomy in habitat selection between mule deer and elk on shared ranges suggest that interference competition may be functioning between the 2 species.

Impacts of Disturbance Session

Session Chair: Jeff Grandison, Utah Division of Wildlife Resources

**Migrating Mule Deer and Automobiles:
A Promising Alternative to Managing a Deadly Combination**
Terry A. Messmer, Curtis W. Hendricks, and Paul W. Klimack

It has been estimated that the over 700,000 deer-vehicle collisions (DVC's) occur annually. The property damage attributed to DVC's exceeds an estimated \$1.1 billion annually. Each year DVC's result in an estimated 29,000 human injuries and 211 human fatalities. The Federal Highway Administration places a monetary loss value of \$1.5 on each human fatality. Although many states have implemented diverse management strategies to address this issue, DVC's continue to increase. A review of >15,000 DVC's reports recorded in Utah by the Department of Transportation over a 5 year period (1992-1997) indicated that more DVC's occur during traditional migrations periods than at other times during the year. We report the results of a motorist behavior modification experiment conducted in Utah to reduce DVC's along a high traffic volume highway that bi-sects a mule deer's winter range. Based on these results, we provide management recommendations which may be used to reduce the risk of DVC's in areas where highways bisect mule deer and other big game population seasonal migration corridors.

**Behaviors and Population Characteristics of Mule Deer Using Urban Winter Ranges:
Are Urban Winter Habitats Ecological Traps?**
Mark F. McClure, Michael R. Conover and John Bissonette

Urban developments have preempted large tracts of mule deer winter range throughout the western United States. Overall, the large scale effects of these developments are presumed to be detrimental to mule deer. It is apparent, however, that some deer have adapted to and use specific urban areas at localized scales. To gain insight into how deer respond to and perform in these urban environments, we compared the spatial and temporal movement dynamics, as well as the population characteristics of urban and rural deer in Cache Valley, Utah. Our results revealed that relatively few urban deer (8%) were non-migratory compared to rural deer (40%). Of the migratory deer, urban deer departed winter ranges 2-3 weeks sooner than rural deer. During winter, urban deer home ranges were approximately 1/4 those of rural deer. Within winter home ranges, urban deer clustered their movements around clumps of hiding cover, whereas rural deer dispersed their movements more broadly, exploiting all resources. At the population level, urban deer fawn:doe ratios were 30-40% lower than those of rural deer. Moreover, densities of urban deer were 40% lower than rural deer densities. Overall, our results suggested that urban mule deer perceive their habitats as risky, and that their behaviors are geared to reduce these risks at a cost of lower energetic gains. These behaviors are manifested at the population level.

Distribution and Spatial Partitioning of Mule Deer and Elk in Relation to Traffic
Michael J. Wisdom, Norman J. Cimon, Bruce K. Johnson, Edward O. Garton, Larry D. Bryant,
Jack Ward Thomas and Jack G. Kie

We hypothesized that the rate of motorized traffic on forest roads would account for significant variation in distribution of Rocky Mountain Mule deer (*Odocoileus hemionus hemionus*) and Rocky Mountain elk (*Cervus elaphus nelsoni*) on spring and summer ranges shared by both species. We further hypothesized that deer and elk would select areas in a similar manner in relation to traffic. Addressing these hypotheses are important because of the large reduction in ungulate carrying capacity that may occur in areas near traffic and near traffic-related human activities. We tested our hypotheses during the spring-summer, 1993-1995, within the 7,762-ha main study area of the Starky Experimental Forest and Range (SEFR), northeast Oregon. The SEFR and areas within it are enclosed with ungulate-proof fence and contain known, managed populations of deer and elk. Road segments within the main study area were classified into 8 rates of traffic, based on counts of traffic enumerated from > 50 automated counters located along the roads. An automated telemetry system monitored the movements of 12-31 radio-collared females/species/season, generating > 160,000 locations. During all seasons and years, elk selected areas significantly farther ($P=0.0001$) from roads having daily rates of > 4 vehicles/12 hrs and night rates of > 1 vehicles/12 hrs. Deer selected areas significantly closer ($P= 0.0001$) to roads having these same rates. Discriminate analysis classified > 90% of deer and elk correctly based on a combination of traffic, road, vegetation, and topographic variables. Our results support the “disturbance competition” hypothesis, which postulates that elk displace deer on shared ranges when elk exist at moderate to high densities. Differences in distributions of deer and elk in relation to traffic should be considered in the management of motorized vehicles and traffic-related human activities on spring and summer ranges where both species occur.

Reproductive Success of Elk Disturbed by Humans During Calving Season

Gregory E. Phillips

Restricting human access to elk (*Cervus elaphus*) calving areas during calving season can be controversial because of increasing demand for recreational and other human uses in many areas where elk are found, and because little scientific evidence exists to evaluate elk vulnerability during calving season. We evaluated effects of human-induced disturbance on marked, radio-collared adult female elk at 2 different study areas (control and treatment) in central Colorado. Data were collected during 1 pretreatment year, and 2 treatment years. Treatment elk were repeatedly approached and displaced by people throughout a 3-4-wk period of peak calving during both treatment years. We observed marked elk on alpine summer ranges in July and August on both areas to estimate calf/cow proportions. Calf/cow proportions for the control area remained stable, but those for the treatment area declined each year (*area x year* interaction $P < 0.001$). Annual average number of treatments per elk per group effectively modeled variation in calf/cow proportions ($P = 0.015$), supporting treatment as the cause of declining calf/cow proportions. Average decrease in treatment-group calf/cow proportion was 0.225 calves/cow ($P = 0.024$). Modeling indicated that population growth could be reduced from 7% (unknown ambient disturbance levels) to no growth with approximately 10 additional disturbance events per cow. Our results support maintaining disturbance-free areas for elk during parturitional periods.

Big Game Interactions Session

Session Chair: Jim Karpowitz, Utah Division of Wildlife Resources

Ecology of Sympatric Mule Deer and Elk in South-Central Wyoming
DeBolt, Brian L., Marc A. Porter, and Frederick G. Lindzey

Many regions of western North America have experienced increasing elk (*Cervus elaphus*) numbers in areas that have historically supported mule deer (*Odocoileus hemionus*) leading to concerns about the effect of 1 species upon the other. We examined ecology of the 2 species in the Powder area of south-central Wyoming where elk apparently established following the severe winter of 1983-84. Data were collected from March 1996 through May 1998. Although primarily winter range for both species, small numbers of deer and elk remained on the Rim during the summer. Ecological separation of mule deer and elk was apparently provided by limited spatial segregation and differing winter diets. Home ranges and core areas of the 2 species overlapped seasonally, however core areas overlapped to a lesser extent suggesting each species tended to use sites less frequented by the other. Seasonal activity patterns and habitats included within home ranges and core areas did not differ between the species. Diets of the 2 species differed only during the winter months when food resources were most limited on the Rim.

Ecology of Sympatric Mule and White-tailed Deer in Riparian Communities
Hall Sawyer and Fred Lindzey

Since the early 1980's white-tailed deer (*Odocoileus virginianus*) distribution and abundance in Wyoming has dramatically increased, while mule deer (*O. hemionus*) populations have fluctuated or declined. Much of the white-tailed deer range expansion has occurred in areas historically dominated by mule deer, most often in riparian habitats. The close association of the 2 species has generated management concerns with the potential overlap of food resources and/or space and also hybridization. We examined morphological traits, population characteristics, spatial distribution, and habitat use patterns of radio-collared mule deer and white-tailed deer in the Deer Creek drainage of central-Wyoming. Preliminary results indicated seasonal home ranges of the 2 species were comparable in size and habitat composition. However, they appeared to minimize interactions by separating spatially and using the habitats within home ranges differently. Although annual survival rates of the species were similar, mule deer were less abundant and less productive than white-tailed deer.

Elk Forage Utilization on Seasonal Ranges - 3 Case Histories in Northeastern Utah

Sherel Goodrich, Steve Strong and Dave Olsen

Similar to many western locales, elk populations in Northeastern Utah have increased over the past three decades. Increased numbers often elicit concerns that elk forage utilization may create hardships for livestock permittees. In addition to forage removal, claims may allege that elk also cause deterioration in both range forage condition and trend. Three areas in Northeastern Utah received attention by Federal land and range management personnel. Studies have been established with cooperation of livestock operators and the Utah DWR. The case histories presented here provide information on 1. Spring-fall range located on Mosby Mountain of the Uinta Mountains south slope (USFS lands), 2. Winter range located on Anthro Mountain (USFS and BLM lands) and 3. Summer range in the Book Cliffs or East Tavaputs Plateau (BLM lands).

The Mosby Mountain spring-fall site has been monitored for 37 years (1962 - 1999). Elk forage utilization has been estimated between 20% and 40% of the standing crop. Elk frequent this site in fall after the livestock grazing season and in spring prior to permitted livestock grazing. Vegetation regrowth generally occurs prior to the livestock turn-on dates and little conflict for forage is documented. Vegetation and soil conditions have remained at high value concurrent with elk and livestock use. Also, a rapid upward trend in vegetative condition was documented following the Whiterocks wildfire of 1988. This upward trend was also concurrent with elk and livestock use.

The winter range forage utilization studies conducted on the Anthro Mountain site showed localized areas of high elk utilization. Depending on pasture turn-on dates, the impacts of forage removal by elk could create management complications for livestock permittees. While ample winter forage for both livestock and elk was considered available, in some winters and in some areas, early forage removal by elk could influence the length or cycle of the effective livestock grazing period. Although some conflict or competition for forage occurs, the forage base appears to remain productive and watershed values remain high.

Recently established summer-range forage utilization studies in the Book Cliffs showed little evidence of conflict between elk and domestic livestock. Elk use of existing forage was estimated between 0% and 20% for 17 different sites. Estimates of cattle use in the same areas were between 20% and 40%.

Objective forage monitoring is valuable in understanding use overlaps. In two of three sites monitored in Northeastern Utah, improved trust and cooperation has resulted. In the Book Cliffs, a highly charged, political and litigious atmosphere remains associated with one ranching enterprise. Forage study results are preliminary and yet to be included in the debate.

The Name *Odocoileus hemionus crooki* is Invalid
James R. Heffelfinger, Arizona Game and Fish Department

The present name of the desert mule deer (*Odocoileus hemionus crooki*) is based on a specimen collected in southwestern New Mexico near the Mexican border. Mearns (1897) described this specimen as a new species (*Dorcelaphus crooki*) of black-tailed deer, not as a mule deer, because of its many characteristics intermediate between mule deer and white-tailed deer. In the same publication, Mearns also described *Dorcelaphus hemionus eremicus* from western Sonora, Mexico, as a new subspecies of desert mule deer. Later, Merriam (1901) described *Odocoileus hemionus canus* from northern Chihuahua, Mexico. A number of mammalogists believed the type specimen of *crooki* to be a hybrid between desert mule deer and Coues white-tailed deer (*O. virginianus couesi*). Consequently they used the name *O. h. eremicus* for the subspecies from western Sonora and the name *O. h. canus* for the desert mule deer to the east in the southern U.S. and northern Mexico. Goldman and Kellogg (1939) and Hoffmeister (1962), concluding that the hybrid-like characteristics of the holotype of *crooki* represented extremes of normal variation, treated *crooki* as the valid name for the desert mule deer. Hoffmeister (1962, 1986) found mule deer from southern Arizona and northern Sonora within 80 km of the type locality of *O. h. eremicus* to be sufficiently similar to warrant treating *eremicus* as a synonym of *crooki*. I have reassessed the type specimen of *Dorcelaphus crooki* and reaffirm that it is a hybrid. Consequently, the oldest available valid name for the desert mule deer is *O. h. eremicus*.

Deer/Elk Population Parameters Session
Session Chair: Annette Henry, Utah Division of Wildlife Resources

Estimating Deer and Elk Population Size by Reconstruction From Harvest Data and Herd Ratios

Louis C. Bender, Washington Department of Fish and Wildlife

Population estimates are valuable management data, but are often difficult to develop, especially in habitats with dense cover. In Washington, population sizes are estimated by several methods, including mark/resight, sightability models, and population reconstruction. Of these, reconstruction from harvest numbers, sex and age ratios, and mortality estimates is the primary method for deer statewide and elk west of the Cascades. I demonstrate the use of reconstruction techniques for estimating deer and elk population sizes, including confidence intervals generated by parametric bootstrapping. Reconstruction estimates were corroborated with independent population estimates using mark/resight, minimum and total count, and aerial sightability methods. Population estimates from reconstruction did not differ from these other estimates and confidence interval widths (23-44% of mean estimates) were comparable to the other techniques (22-47%). Since harvest numbers and herd sex and age composition are commonly collected for elk population trend analysis, population estimation from these parameters can provide managers with a simple and useful tool to compliment other population assessment techniques.

Estimating Elk Densities in Colorado: Progress With Perplexities

David J. Freddy, Colorado Division of Wildlife

During winters 1994-1998, we evaluated helicopter survey methodologies to estimate elk densities in juniper-pinyon (*Juniperus osteosperma-Pinus edulis*) and oakbrush-mountain shrub (*Quercus gambelii-Amelanchier alnifolia*) habitats. We developed sighting bias correction models to correct for groups of elk not observed when counting elk on 2.59-km² (1-mi²) quadrats. Within a 350-km² area, we compared elk densities obtained from a stratified random quadrat sampling system corrected for sighting bias with independent estimates of densities obtained from mark-resight models using known numbers of radio-collared elk (120-137 elk) within the quadrat survey area. Although observers detected about 80% of the elk groups on quadrats during sighting bias trials and resulting sighting bias models increased estimated elk densities on quadrats by 10-12%, quadrat densities were $\geq 25\%$ lower than mark-resight densities. Estimated densities of elk ranged from 6-10 elk/km². We propose that errors in counting numbers of elk in a group may contribute more to underestimating elk densities than errors in detecting groups of elk.

Effects of Different Harvest Strategies on Elk Populations in Northern Utah

Lou Cornicelli Utah Division of Wildlife Resources

Since 1970 the Cache elk unit in Northern Utah has been managed under two different harvest scenarios. Between 1970 and 1991, the unit was managed as general season any bull. Beginning in 1992, the harvest strategy was changed to yearling bull (1992, 1993) and then spike bull (1994-present). Utah's elk management plans mandate that elk populations be managed at a minimum of 8 bulls:100 cows. Historically, the Cache unit has averaged less than five. The purpose of the 1992 management change was to attempt to increase the number of bulls in the overall population to become compliant with management plan objectives. Other perceived benefits were increases in calf:cow ratios and compressed timing of breeding activities and subsequent parturition dates. Based on data collected at Hardware Ranch, limiting hunters to spike only bull harvest has increased the percentage of bulls in the population. However, the ancillary benefits of increased calves or compressed calf sizes have not been realized.

Influence of Weather and Body Condition on Elk Reproductive Performance in Northern Utah

Rick E. Danvir, Robert A. Wharff, Kenneth Clegg, Ronald C. Squibb and Michael L. Wolfe

We observed significant between-year variation in elk (*Cervus elaphus*) calf production on the Desert Land and Livestock ranch 1988-98. Managed for mature bull harvest, this herd experienced low breeding season hunter density and high breeding season bull:cow ratios (>0.5). Following the 1988 drought, calf:cow ratios alternated between low (0.4) and high (0.7) values from one year to the next; monitoring the concurrent wet year- dry year rainfall pattern. Reproductive tracts and carcasses revealed that female elk generally bred at age 2.5, but did not reach maximum body weight until 5.5 years. Between-year variability in mean harvest weights of sexually mature cows (1.5 years) correlated positively with the April-October precipitation ($r^2=0.40$) Mean annual harvest weights of mature cows then correlated positively with mature cow pregnancy rates ($r^2=0.54$), correlated negatively with mean conception dates ($r^2=0.76$) and correlated positively with the following-year calf production ($r^2=0.38$). Mature cow pregnancy rates declined in years of below-average summer precipitation ($p<0.06$). Mean conception dates were significantly earlier in above-average than below-average rainfall years ($p<0.05$). In dry years, age-specific pregnancy rates declined (sub-adults in terms of weight) were unable to simultaneously lactate, gain body size and maintain body condition in dry years, therefore failed to conceive. Conversely, during the alternating wet summers these non-lactating younger and older cohorts apparently gained adequate body condition and conceived. Annual production ratios correlated negatively with prior-year production ($r^2=0.74$) as well as prior-year mature cow harvest weight. A multiple regression model using these two variables explained 87% of the observed variation in annual calf production ($r^2=0.87$, $p=0.0001$). This analysis suggests that elk reproductive performance may be influenced and predicted by weather, body condition and reproductive status.

Performance of GPS Radio-Collars on Mule Deer
Hall Sawyer and Fred Lindzey

We equipped 10 adult female mule deer with store-on-board GPS radio-collars in March, 1998. The GPS units were capable of storing 700 locations and specially programmed to obtain 3 locations per day during migratory time periods and 1 location per day the remainder of the year. In January 1999, we used helicopter net-gunning techniques to retrieve 7 of the 10 collars. Downloaded data indicated GPS units were 75-80% effective, obtaining 550-600 locations per animal. Problems and performance of GPS units will be discussed and preliminary data presented.

A Nationwide Evaluation of Deer Hunter Harvest Survey Techniques
Susan P. Rupp, Warren B. Ballard and Mark C. Wallace

Estimation of annual harvests of deer (*Odocoileus* spp.) is a major objective for all state wildlife agencies. We conducted a nationwide survey of state agencies to evaluate the efficiency of hunter harvest survey techniques. State agencies ($n = 47$, 94%) reported that they used check stations (57%, $n = 27$) mail questionnaires (55%, $n = 26$), report cards (17%, $n = 8$), telephone surveys (13%, $n = 6$), and toll-free telephone services (2%, $n = 1$) to estimate annual deer harvests. Response rates for mail questionnaires and report cards averaged 54%. Agencies have attempted to increase response rates with mixed results by increasing sample size, offering incentives, adding additional reporting options, redesigning forms, and increasing public relations efforts. Seventy-six % ($n = 38$) of state respondents used hunter survey data to estimate annual harvests, but only 40-44% of respondents used such data to track deer population trends, while >70% of respondents used survey data to establish hunting regulations. Each hunter harvest survey technique appeared to serve a specific function for each state. Annually, a minimum of \$3.5 million was spent assessing deer harvests.

Elk Population Assessment Techniques in Western States and Provinces
Lance T. Vermeire and Mark C. Wallace

Abstract: An 18-question mail survey was sent to 17 western states and provinces in the United States and Canada in October 1997 to determine current methods used by game management agencies to assess elk (*Cervus elaphus*) populations. Responses were received from 16 of the 17 organizations, representing 98.4 % of the estimated elk population in the United States and Canada. Reasons given for estimating population size included determination of harvest goals, herd health, effectiveness of habitat management, and crop depredation. All of the organizations use indices to derive population estimates and most are using incomplete counts and modeling. Surveys are typically conducted at least annually under conditions of snow cover with a mean

maximum sampling intensity of 59 and 60 % for elk populations and ranges, respectively. Desired mean maximum error was 17.5 %, but this level of accuracy is likely unattainable with the current sampling intensity and methodology.

The Relationship of Rainfall and Drought on Arizona's Mule Deer male:female and young:female Ratios: A Retrospective Analysis
Brian F. Wakeling, Arizona Game and Fish Department

Arizona has traditionally collected male:female and young:female ratio data by Game Management Unit (GMU) to monitor mule deer herd performance. I pooled raw data and recalculated ratio data by year across GMUs with similar habitats from 1957 to 1997. I then examined the relationship of ratio data with precipitation and Palmer drought severity index using a forward stepwise regression approach. Equation variables and fit varied among habitat types. Implications of this analysis will be discussed.

The following was a late submission to the workshop:

Does Airborne Thermal Infrared Sensing Improve Elk Counts?
William C. Dunn, J. Patrick Donnelly and William J. Krausmann

Airborne thermal infrared sensing has shown some promise in improving deer counts over standard aerial survey techniques. We tested its ability to detect elk during winter surveys in Arizona and New Mexico. In 3 areas, counts made with the aid of FLIR were not different than visual counts, but in two areas FLIR counts were lower than visual counts. In addition, small groups were detected with greater frequency during visual surveys. Airborne thermal infrared sensing was not effective in improving elk counts because elk were well insulated and did not emit sufficient thermal energy to be consistently detected, coniferous vegetation blocked the thermal emittance of elk, and thermal re-radiation from coniferous vegetation and bare ground masked the thermal image of elk.

Big Game Disease Session

Session Chair: Lou Cornicelli, Utah Division of Wildlife Resources

Eradication of Brucellosis in a Closed Elk Population

Tom Watts and Tolani Francisco

Horse Lake Mesa Game Park (HLMGP), a 14,266 acre fenced enclosure, was constructed on the Jicarilla Apache Indian Reservation, New Mexico, and stocked with elk from Jackson Hole National Wildlife Refuge and Wind Cave National Park in the early 1970's. Serological testing of HLMGP elk in 1995 revealed an active brucellosis infection. A Memorandum of Understanding between the Jicarilla Apache Tribe and the United States Department of Agriculture, Animal Plant Health Inspection Services, Office of Veterinary Services approved a Herd Management Plan to address the brucellosis problem. The plan called for establishing a test herd of elk within a sub-enclosure of HLMGP and depopulating the remaining elk. A test herd of 167 elk was subjected to repeated serological testing from April 1995 to August 1997 to identify reactor animals. Comparisons were made between 5 different brucellosis test for their ability to accurately identify reactor elk. All reactors were identified and removed from the test herd after the second whole-herd test. Eight subsequent whole-herd tests revealed no additional reactors. The remaining HLMGP were depopulated by November 1997 using guided, client hunters and Jicarilla Game and Fish Department personnel. In October 1998 158 elk from the clean test herd were released into HLMGP to rebuild that population. This study provided recommendations for improving the serological testing protocol for elk. Historical transmission of brucellosis between elk, bison and cattle, in and around HLMGP, was inferred from examination of past test records.

Chronic Wasting Disease Update

Walt Cook, DVM, Wyoming Game and Fish

Chronic wasting disease is found in free ranging mule deer and elk in southeastern Wyoming and north-central Colorado. A handout titled "Chronic Wasting Disease" by Chris Madson with photography by Lee Kline, Tom Tietz, Jeff Vanuga and Beth Williams provides excellent information about chronic wasting disease.

Update on Brucellosis in Wyoming

Walt Cook, DVM, Wyoming Game and Fish

Brucellosis is found in free ranging elk and bison in Wyoming. Wyoming's elk feeding stations have the highest incidence of brucellosis. A handout titled "Beating Brucellosis" by Tom Thorne, Diane Abendroth, Steve Kilpatrick and Scott Smith with photography by Luray Parker provides excellent information about brucellosis in Wyoming.

Mule Deer Session

Session Chair: Ray Lee, Arizona Game and Fish Department

Managing Mule Deer Recovery Through the use of Predator Management Plans Bill Bates and Mike Welch

Mule deer populations in Utah suffered a severe decline in the early 1990's due to prolonged drought followed by a severe winter. The Utah Division of Wildlife Resources implement reduced harvest strategies, including a 54% reduction in the number of deer hunters, and an aggressive habitat enhancement program to aid in deer herd recovery. Earlier research had shown that coyote and black bear predation on fawns could be significant and slow recovery of an already depressed deer herd. Research also showed mule deer to be the principal prey item of cougar and suggested cougar predation could contribute to slow recovery of depressed prey populations.

In 1996, the Utah Wildlife Board passed a predator management policy to provide direction in managing predatory wildlife in order to assure their future values, and to limit conflicts with human enterprise and values. After considering prey base, habitat and other biological and social constraints, the policy allows predators populations to be reduced when plans: 1) are confined to specific treatment areas; 2) target specific species and the offending animal whenever practical; and 3) are initiated only after establishing goals and objectives and demonstrating why predator management is necessary and defining the expected outcome.

Predator management plans must be approved by the director. In addition to concerns for human safety, predator management plans may be implemented: 1) in localized areas where introductions or transplants of potentially vulnerable wildlife species have occurred or are imminent. Predator control should be of sufficient duration and intensity to allow populations to become established and self-sufficient; 2) situations where prey populations are unable to meet management goals due to predation; and 3) on wildlife management areas acquired for and managed for a specific species. Predator populations may be controlled by: 1) using sportsmen; 2) identifying a specific hunter to take a specified number of cougar in a selected area; and 3) using UDWR personnel. USDA-Wildlife Services personnel may also be utilized.

Predator management plans were implemented on 15 deer herd units in 1996. Cougar harvest was increased, and coyote control focused to remove adults on critical fawning areas prior to fawning. Cougar harvest increased on 9 units. Coyote removal averaged 54 per year on predator management units. Deer populations increased towards objective on 7 units. Post-season and spring fawn:100 adults increased on at least 11 units.

Increased precipitation the past 4 years undoubtedly contributed towards increased deer recruitment. Predator management may have had a positive effect as deer recruitment increased in units with increased cougar harvest and the number of coyotes removed exceeded 40 per year. Predator management plans improved management by requiring integrated management of deer and cougar and setting guidelines for implementing predator management plans, and when to cut back on increased predator harvest. The predator management policy, in concert with recently

completed mule deer and cougar management plans, should provide the basis for an integrated approach to managing functional predator and prey populations in the state.

More Ducks than Bucks: A New Paradigm in Deer Management
J. C. deVos, Jr.

Traditionally, mule deer (*Odocoileus hemionus*) management has been approached on an individual state-province basis. Survey data, management practices, harvest strategies, and communications have been largely provincial. This can result in widespread duplication of efforts, lack of building on the successful programs of others, and failures in meeting public expectations. In contrast, waterfowl management has been on the forefront in developing management programs that span many political boundaries. As a result, cooperative programs have been successful and waterfowl populations have increased substantially in recent times. This in turn has resulted in high level of constituency acceptance of waterfowl management practices and wildlife agencies. At the 1997 Deer-Elk Workshop, the state-province status reports suggest that widespread declines in mule deer populations had recently occurred. In response, the Western Association of Fish and Wildlife Agencies appointed a Mule Deer Working Group to develop management strategies, information documents, and improve communication mechanisms to aid management agencies in addressing the biological and social problems associated with low mule deer populations. We have identified and prioritized factors that we believe are related to the decline. These are: short- and long-term declines in habitat suitability; there is a relationship between climate, primarily rainfall, and mule deer populations; there may be adverse affects of hunting associated with population declines; and the nutritional plane available for mule deer has declined, and hence, fawn:doe ratios are affected. Products that the Mule Deer Workgroup is working on include a white paper on the effects of predation on mule deer, a West-wide strategic plan for mule deer management, and development of a webpage to enhance communications amongst mule deer interests. Philosophically, we believe that mule deer management can be enhanced by regional collaboration, and are in the process of identifying a regional joint-venture for mule deer.

**Muledeergroup.org: Using the Internet to Enhance Public Support for
Western Mule Deer Management**

Jamey H. Anderson, Terry A. Messmer and Jim DeVos Jr.

Public use of the Internet as a communication and information source has increased dramatically within the last 2 years. Unfortunately, the reliability of these information source is somewhat questionable. In addition, all state management agencies and private wildlife conservation groups have incorporated electronic communications as part of the way of doing business. This dramatic increase in the use of electronic communications can largely be attributed to improved technologies and their availability in more user friendly formats. We present a practical approach to using this technology to increase public support for western mule deer management. In addition, this approach offers managers an effective alternative to traditional means of communicating with their peers and the public. It also can provide an efficient means of obtaining recent peer-reviewed information that can assist managers in developing and implementing mule deer management programs.

Poster Presentations

The Role of Mountain Lions in Shaping Habitat Selection by Mule Deer

Becky M. Pierce, R. Terry Bowyer and Vern C. Bleich

Stands of bitterbrush (*Purshia tridentata*) in the Great Basin, USA, provide relatively greater cover than surrounding patches of rabbitbrush (*Chrysothamnus nauseosum*) or desert peach (*Prunus andersonii*). We hypothesized that mountain lions (*Puma concolor*), which stalk and ambush prey, would be more successful at killing mule deer (*Odocoileus hemionus*) in habitat with more concealment cover. Bitterbrush is critical forage for mule deer during winter. Consequently, mule deer that winter in the Great Basin may be confronted with a tradeoff between forage benefits and predation risks with respect to habitat selection. Logistic regression indicated that mule deer selected habitat at greater elevations ($P < 0.001$) with more bitterbrush ($P < 0.001$) and less rabbitbrush ($P = 0.033$) than random locations and also indicated that mountain lions killed deer in relatively open areas with more desert peach ($P < 0.001$) than locations in which deer foraged. Therefore, deer were not confronted with a tradeoff in terms of habitat selection on the winter range and minimized the ratio of predation risk:forage by selecting habitat with more bitterbrush. We further hypothesize that changes in diet among seasons, which occurs for herds of migratory deer, lead to individuals experiencing changing predation risk:forage ratios throughout the year. Hence, migratory populations of mule deer likely adopt different strategies of habitat selection among seasons.

“Management of Big Sage can be a Harrowing Experience”

Kreig Rasmussen, Larry Greenwood and Lisa Church

Treatment of big sage (*Artemisia tridentata*) on western rangelands for habitat improvement is an ongoing challenge for land managers. Sagebrush areas that are dominated with 30-50% cover, are prime target areas for some type of treatment. Once sagebrush densities reach climax densities, understory grasses and forbs suffer from competition for water and light. Trailing, trampling, and intense grazing of ungulates, also start to decrease the diversity of the sage community.

Enhancement methods for sagebrush can include fire, mechanical, and chemical. A mechanical treatment called the “Dixie Harrow” method, has proven to be an effective, cost efficient alternative to fire or chemical treatments in Central Utah. The “Dixie Harrow” method consists of a large spike tooth harrow drug by a 4-wheel drive tractor equipped with a broadcast seeder. The “Dixie Harrow” treatment method can offer “total control”, with results similar to fire. Factors such as treatment pattern, seed introduction, and timing can all be controlled. Deer and elk ranges can be treated differently. A “once over” method for deer range and a “twice over” method for elk range has different benefits. Mechanical treatment in sagebrush areas mixed with other browse plants, offers a stimulus for renewed growth by reducing the competition. A few passes with the harrow in sage grouse habitat can enhance patches or strips of new forbs and grasses.

We have found many benefits to improve big and small game habitat with the “Dixie Harrow”. We have treated approximately 4,000 acres on federal land in central Utah over the past five years. Treatment area study transects provide the following three year post application data: big sage decreased from 32.3% to 5.8%; grasses increased from 8.6% to 47.2%; forbs increased from 3.0% to 17.4%; bare ground decreased from 18.0% to 8.2%; litter decreased from 26.1% to 10.8%.

Appendices

Appendix 1 – AGENDA
Western Association of Fish and Wildlife Agencies
DEER AND ELK WORKSHOP
Salt Lake City, Utah
March 3, 4 and 5, 1999

MARCH 3

- 5:00 - 8:00 PM **Registration**
- 6:00 - 8:00 PM **Icebreaker (Room 255 Salt Palace Convention Center, NE Corner)**

MARCH 4

- 8:00 - 8:30 AM **Registration**
- 8:30 - 9:00 AM **Welcome**
- John Kimball, Director Utah Division of Wildlife Resources
- 9:00 - 10:00 AM **Utah's Cooperative Wildlife Management Unit Program**
- Wes Shields, UDWR; Terry Messmer, USU Wildlife Extension
- 10:00 - 10:15 AM **Break**
- 10:15 AM - Noon
- **Habitat Session - John Fairchild**
 - Range Trend and the management of Big-Game, should this be considered an Oxymoron?
 - Jim Davis, UDWR
 - Habitat Evaluation and Subsequent Improvements for Mule Deer in Wyoming
 - Dan Stroud, WG&FD,
 - Using Data Collection/Research to Form Management Recommendations
 - Kirk M. Horn, RMEF
 - Habitat Selection & Spatial Segregation of Elk & Mule Deer During Spring in Montane Environments
 - Bruce K. Johnson, ODF&W; John Kern, WET, Inc.; Michael J. Wisdom, USFS; Scott Findholt, ODF&W; John Kie, USFS
- Noon - 1:00 PM **Lunch**
- 1:15 - 3:00 PM
- **Impacts of Disturbance Session - Jeff Grandison**
 - Migrating Mule Deer and Automobiles: A promising alternative to a deadly combination
 - Terry A. Messmer, USU Wildlife Extension; Curtis W. Hendricks, USU; Paul W. Kilmack, USU
 - Distribution and Spatial Partitioning of Mule Deer and Elk in Relation to Traffic
 - Michael J. Wisdom, U of Idaho; Norman J. Cimon, USFS; Bruce K. Johnson, ODF&W; Edward O. Garton, U of Idaho; Larry D. Bryant, USFS
 - Reproductive Success of Elk Disturbed by Humans During Calving Season
 - Gregory E. Phillips, CSU; A. William Alldredge, CSU
 - Behaviors and population characteristics of mule deer using urban winter ranges: Are urban habitats ecological traps?
 - Mark F. McClure, USU; Michael R. Conover, USU; John A. Bissonette, USU

MARCH 4 (cont)

3:00 - 3:15 PM

Break

3:15 - 5:00 PM

Big Game Interactions Session - Jim Karpowitz

- Ecology of sympatric mule deer and elk in south-central Wyoming
 - Brian L. DeBolt, U of Wyoming; Marc A. Porter, U of Wyoming; Fred G. Lindzey, U of Wyoming
- Ecology of sympatric mule and white-tailed deer in riparian communities.
 - Hall Sawyer, U of Wyoming; Fred Lindzey, U of Wyoming
- The Name *Odocoileus hemionus crooki* is Invalid
 - James R. Heffelfinger, AG&FD
- Elk forage utilization on seasonal ranges- 3 case histories in northeastern Utah
 - Sherel Goodrich, USFS; Steve Strong, BLM; Dave Olsen, UDWR

MARCH 5

8:00 - 10:00 AM

Deer/Elk Population Parameters Session - Annette Henry

- Estimating Deer & Elk Population Size by Reconstruction from Harvest Data & Herd Ratios
 - Louis C. Bender, WDF&W
- Estimating Elk densities in Colorado: Progress with Perplexities
 - David J. Freddy, CDOW
- The relationship of rainfall and drought on Arizona's mule deer male:female and young:female ratios: retrospective analysis
 - Brian F. Wakeling, AG&FD
- Effects of different management strategies on elk populations in Northern Utah
 - Louis Cornicelli, UDWR
- Influence of Weather & Body Condition on Elk Reproductive Performance in Northern Utah
 - Rick E. Danvir, DLL; Robert A. Wharff, DLL; Kenneth Clegg; Robert C. Squibb; Michael L. Wolfe, USU
- Performance of GPS radio-collars on mule deer
 - Hall Sawyer, U of Wyoming; Fred Lindzey, U of Wyoming

10:00 - 10:15 AM

Break

10:15 - 11:00 AM

Deer/Elk Population Parameters Session (cont)

- A Nationwide Evaluation of Deer Hunter Harvest Survey
 - Susan P. Rupp, TTU; Warren B. Ballard, TTU; Mark C. Wallace, TTU
- Elk Population Assessment Techniques for Western States and Provinces
 - Lance T. Vermeire, TTU; Mark C. Wallace, TTU

11:00AM - Noon

Big Game Disease Session - Lou Cornicelli

- Eradication of Brucellosis in a Closed Elk Population
 - Tom Watts, Jicarilla G&FD
- Chronic Wasting Disease Update
 - Walt Cook, DVM, WG&F
- Update on Brucellosis in Wyoming
 - Walt Cook, DVM, WG&F

MARCH 5 (cont)

Noon - 1:00 PM

Lunch (Wallmo Award)

1:15 - 3:00 PM

Mule Deer Session - Ray Lee

- Managing mule deer recovery through the use of predator management plans
 - Bill Bates, UDWR
- Using the Internet to enhance public support for western mule deer management
 - Jamey H. Anderson, USU; Terry A. Messmer, USU; Jim DeVos, Jr., AG&FD
- More ducks than bucks: a new paradigm in deer management
 - J. C. DeVos, Jr., WAFWA Mule Deer Committee

3:00 - 3:15 PM

Break

3:15 -

Mule Deer Working Group Discussion

- State and province representatives

POSTER PRESENTATIONS

- The Role of Mountain Lions in shaping Habitat selection by Mule Deer
 - Becky M. Pierce, U of AK; R. Terry Bowyer, U of AK; Vern C. Bleich, CA DF&G
- Management of Big Sage can be a Harrowing Experience
 - Kreig Rasmussen, USFS; Larry Greenwood, BLM; Lisa Church, USFS

Appendix 2
Status of Deer and Elk Populations by State
as Determined from a Questionnaire sent to Member States
 (See Appendix 3 for Sample Forms)

Summary of data provided by states on mule deer, black-tail deer, white-tail deer and elk populations, hunters and changes from 1996 to 1998 (in some cases 1997). The summary forms were provided by the Western States Mule Deer Working Group.

MULE DEER

State	Mule Deer '98 Pop. Est.	'96-'98 Percent Change	Hunters	Percent Change	Percent Nonresident
California*	616,510	-13	140,500	- 6	<5
Colorado**	516,458	- 6	173,254	1	42
Utah	310,000	7	125,000	n/c	5
Oregon	260,700	n/c	91,526	8	---
New Mexico	200,000	n/c	56,200	-10	11
Washington	145,000	n/c	160,132	-13	<1
Texas	144,000	+11	17,604	---	---
Nevada	135,530	+29	20,161	<1	11
Arizona	111,000***	n/a	29,173	-33	3
Montana**	No estimate	n/a	147,343	- 9	20
Idaho	No estimate	n/a	85,140	+32	13

* Mule deer plus black-tail deer

** Mule deer plus white-tail deer

*** 1996 estimate

BLACK-TAIL DEER

State	Black-tail Deer '98 Pop. Est.	'96-'98 Percent Change	Hunters	Percent Change	Percent Nonresident
Oregon	386,900	-13	153,540	3	n/a
Washington	170,000	n/c	n/a		

WHITE-TAIL DEER

State	White-tail Deer '98 Pop. Est.	'96-'98 Percent Change	Hunters	Percent Change	Percent Nonresident
Oregon	No Est.	---	n/a		
New Mexico	10,000	n/c	n/a		
Washington	80,000	n/c	n/a		
Texas	144,000	+11	17,604	---	---
Arizona	82,000*	n/a	20,914	- 7	3
Idaho	No estimate	n/a	55,345	-56	8

* 1996 estimate Coues deer

ELK*

State	Elk '98 Pop. Est.	'96-'98 Percent Change	Hunters	Percent Change	Percent Nonresident
Colorado	218,545	1	248,984	6	44
Idaho	128,000	n/a	53,830	-24	20
Oregon	125,100	5	145,712	6	---
Idaho	124,000	n/a	53,830	-24	19
Montana	99,627	7	103,345	n/a	n/a
New Mexico	70,000	1	31,402	6	23
Utah	61,000	2	35,000	n/c	<5
Washington	52,000	n/c	77,298	- 9	1
Arizona	26,000	n/c	19,018	-10	4
California	8,400	+10	330	+32	10
Nevada	4,812	+16	784	+35	2

* all elk combined

Appendix 3

This same form was utilized for black-tail deer, white-tail deer and elk

DATA SUMMARY – MULE DEER State-Province Status Report 1999 Deer/Elk Workshops

Parameter	1996	1998	Percent Change	Comments
Population estimate ¹				
Number Surveyed ²				
Harvest-antlered				
Harvest-antlerless				
Resident hunters				
Nonresident hunters				
Resident hunter days				
Nonresident hunter days				
Harvested by muzzleloader				
Harvested by archery				
Harvested by firearms				

¹ How is this estimate made? Are data pre or post-hunt? Is the estimate computer model based, density estimates, etc? Does the estimate represent adult only or adult:fawn estimates? Provide as much detail as possible.

² What methods are used to collect survey data? What time(s) of the year are surveys done and what is the primary method used?

In addition to the information above, there is a need to have information on any major changes that have occurred in the management of these species since the last Deer-Elk Workshop. Also, any other information you would like to highlight in the State-Province status reports should be included here.

Report provided by: _____
 State-Province: _____
 Address: _____
 Phone and E-mail Address: _____

Appendix 4
Past Deer and Elk Workshops

Mule Deer

- 1970 ~ Mule Deer Workshop – Blanca, Colorado (1st)
- 1972 ~ Mule Deer Workshop, January 11-12 – Elko, Nevada (2nd)
- 1973 ~ Mule Deer Workshop - Arizona (3rd)
- 1974 ~ Mule Deer Workshop, January 22-23 – Laramie, Wyoming (4th)
- 1975 ~ Mule Deer Workshop, February 18-20 – Silver City, New Mexico (5th)
- 1976 ~ Mule Deer Workshop, February 19-21 – Boise, Idaho (6th)
- 1976 ~ Mule Deer Decline in the West Symposium, April – Logan, Utah
- 1978 ~ Mule Deer Workshop, February 21-23 – Logan, Utah
- 1980 ~ Mule Deer Workshop, March 5-6 – Bend, Oregon
- 1983 ~ Western Deer Workshop, April 11-12 – Spokane, Washington
- 1985 ~ Western Deer Workshop, March 3-6 – Bozeman, Montana
- 1987 ~ Western Deer Workshop, August 4-7 – Pingree Park, Colorado
- 1989 ~ Western Deer Workshop, August 23-25 – Albuquerque, New Mexico
- 1991 ~ Western Deer Workshop, August 27-30 – Monterey, California
- 1993 ~ Western States and Provinces Deer Workshop, August 10-13 – Vancouver, British Columbia

Elk

- 1973 ~ Western States Elk Workshop, Feb 20-21 – Bozeman, Montana
- 1975 ~ Western States Elk Workshop – Boise, Idaho
- 1977 ~ Western States Elk Workshop, Jan 31-Feb 2 – Estes Park, Colorado
- 1980 ~ Western States Elk Workshop, Feb 27-28 – Cranbrook, British Columbia
- 1982 ~ Western States Elk Workshop, Feb 22-24 – Flagstaff, Arizona
- 1984 ~ Western States and Provinces Elk Workshop, April 17-19 – Edmonton, Alberta
- 1986 ~ Western States and Provinces Elk Workshop, March 17-19 – Coos Bay, Oregon
- 1988 ~ Western States and Provinces Elk Workshop, July 13-15 – Wenatchee, Washington
- 1990 ~ Western States and Provinces Elk Workshop, May 15-17 – Eureka, California
- 1993 ~ Western States and Provinces Elk Workshop, May 19-21 – Bozeman, Montana

Deer/Elk

- 1995 ~ Western States and Provinces Deer and Elk Workshop, May 23-25, 1995 – Sun Valley, Idaho
- 1997 ~ Western States and Provinces Deer and Elk Workshop, May 21-23, 1997 – Rio Rico, Arizona
- 1999 ~ Western States and Provinces Deer and Elk Workshop, March 3-5, 1999 – Salt Lake City, Utah