

# CITY DEER VERSUS COUNTRY DEER

## IMPACTS OF URBANIZATION ON MULE DEER

**Urban developments** have usurped large tracts of the landscape throughout North America. The effects of these developments on wildlife are species-specific. **Some species benefit** from the abundant food sources and lack of native predators in urban areas, and their populations have soared as a result. For most species, however, urban developments are detrimental; **essential habitats are destroyed**, suitable habitats become more isolated from each other, and animals are at greater risk of disturbance or harassment.

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Whitetail deer is one species that has adapted to and can thrive in many man-altered environments, including urban areas (Swihart et al. 1995). Adaptability to such environments has undoubtedly contributed to the rapid growth of whitetail deer populations, whose numbers are now their highest in recorded history. Mule deer, on the other hand, have not enjoyed the same success as whitetail deer. Although mule deer have existed in urban areas for some time, and can even become tame around humans, there is currently no evidence that they can flourish in urban environments as do whitetail deer. As an explicit example of this, Vogel (1989) found that mule deer had declined while whitetail deer had increased as urban developments encroached into the Gallatin Valley of Montana.

#### **MULE DEER POPULATION TRENDS**

Overall, mule deer populations have experienced large fluctuations during the past century. In the early 1900s, mule deer were relatively scarce throughout much of western North America, presumably because of over-hunting. By the 1920s, mule deer were

making a comeback, and numbers swelled until the early 1960s. Restricted harvests, predator control, and land use practices associated with grazing and logging were all implicated as factors contributing to the resurgence of mule deer during this period.

Following the apex of abundance in the 1960s, mule deer populations started to dwindle. By the mid-1970s, this decline was acknowledged by western wildlife agencies throughout North America as a pervasive phenomenon. Connolly (1981) surmised that the decline of mule deer may have ceased by 1980, and that numbers may have, in fact, started to stabilize. At the 1995 Joint Deer and Elk Conference, however, 10 of the 11 western states reported continued declines in mule deer, indicating that population numbers have been on a downward trend for more than 30 years.

#### **URBAN DEVELOPMENT AS A DETRIMENTAL FACTOR**

During the 1950s and 1960s, many biologists believed that mule deer were overabundant, and that declines were imminent. Therefore, the initial drop in deer numbers during the

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1970s was not surprising. But the continued slump of mule deer populations has now become a significant concern of many western wildlife agencies. Given this concern, it is logical to seek out the underlying factors contributing to their demise.

Urban development on mule deer winter ranges may be one of

counters with predators or humans; shelter, so deer can find protection from harsh, energy-consuming weather conditions; and adequate forage so deer can supplement their energy reserves that they accumulated on summer ranges. When urban developments and road networks are built on mule deer winter ranges, the

have little influence on declining mule deer populations.

#### OUR STUDY

Urbanization in the valleys and foothills of the Intermountain and Rocky Mountain West is progressing at an accelerated rate. In many areas, it is reasonable to assume that in the future

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these contributing factors. Perhaps mule deer have difficulty adapting to urban environments, and the sprawl of urban areas in their historic wintering areas has concentrated them into the rural remnants of their former range. If so, the number of mule deer that can successfully over-winter in many areas may be declining as urbanization on winter ranges continues.

Winter range has long been considered a critical habitat for mule deer, and for good reason. Winter is an energetic bottleneck for mule deer living in most of North America, and winter range must provide three essential components: security cover, so deer can avoid energy-depleting en-

overall availability of traditional winter habitat is markedly reduced, the migratory corridors that allow deer to access alternative winter ranges are obstructed, and human-related disturbances during the critical winter period are likely to be more common.

Despite the potentially detrimental effects of urban development on mule deer, it is apparent that some mule deer can utilize certain urban areas as habitat. In these areas, it is possible that deer densities and reproductive output may be as high as deer living in neighboring rural areas. If this is true, the detrimental effects of urbanization may be exaggerated, and urban developments may

only those mule deer that have adapted to urban environments will persist as localized populations. Therefore, it is increasingly important to understand how development influences mule deer population dynamics. It is equally important to determine how mule deer are utilizing urban and suburban habitats.

In this study, funded in part by the Grants-In-Aid-Program of the Boone and Crockett Club, we compared the behavioral and population characteristics of mule deer living in urban areas to mule deer living in nearby rural (traditional winter range) areas of the Cache Valley. Our aim was to gain an improved understanding



of the effects of urbanization on mule deer.

We wished to address four specific questions: 1) Are deer that reside in urban areas available as harvestable game, or do their spatial and temporal patterns of migration (or lack thereof) exclude them from being hunted? 2) Can urban environments provide qual-

populations consist of mixed herds, with a migratory segment and a segment that remains on winter range the year-round. Although non-migratory behavior is generally less common, it is more likely to be observed where winter ranges provide quality, year-round habitat.

Mule deer that use urban

for mule deer. Most urban deer probably can better meet their nutritional and energy needs by migrating to summer range in the mountains, where they have access to abundant, high quality forage. Moreover, security cover in the urban area may be adequate during winter, but insufficient for parturition and fawn rearing dur-

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ity habitats for mule deer, or are these areas ecological traps? 3) How much social and reproductive interaction is there between deer living in urban areas and surrounding rural areas? 4) How do deer modify their spatial behaviors while living on urban winter ranges? Below, we discuss these questions in detail and present some of our key results.

### Question 1 — Patterns of Migration

Most mule deer in the Intermountain and Rocky Mountain West exhibit seasonal migrations between high elevation summer ranges and low elevation winter ranges.

habitats year-round are no longer available as harvestable game. In our study, we monitored the migratory patterns of urban deer for 3 consecutive years. Nearly all (92%) urban deer were migratory. That is, their only use of the urban area was in winter. For the remainder of the year, they occupied the mountainous regions of the Cache National Forest in northern Utah and southern Idaho, where they mixed with migratory rural deer. Because these regions are open to the public for hunting, urban deer are available for harvest while living there.

However, timing of fall migration could also influence the availability of urban mule deer as harvestable game. For instance, if deer migrate into urban areas early in the fall, they will have refuge from hunters during the hunting season. After monitoring the timing of migration of urban deer, our results suggest that this is indeed the case for deer in the Cache Valley. For three years, we documented that most deer (bucks and does) returned to their urban winter ranges early in the fall, long before the general hunting season commenced. This finding suggests that hunting seasons will need to be held earlier in the fall if urban deer are to be available to hunters.

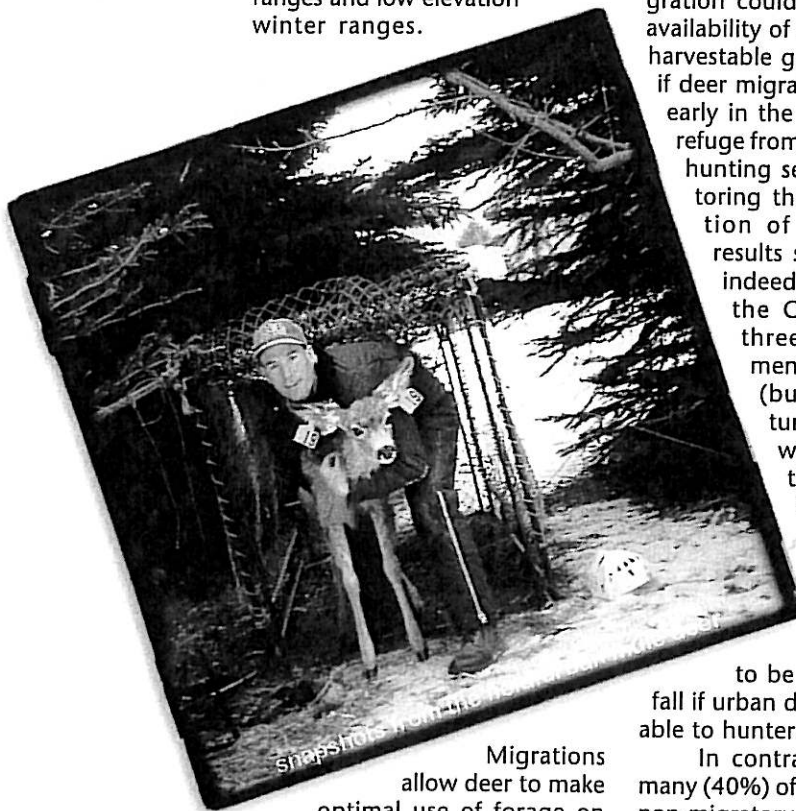
In contrast to urban deer, many (40%) of the rural deer were non-migratory, remaining on winter ranges the year-round. The difference in proportions of non-migratory deer in each study area implies that the urban area was inadequate as year-round habitat

ing summer. This notion was corroborated by our observations that none of the does that remained in the urban area during summer (albeit there were only a few of them) reared fawns.

### Question 2 — Quality of Urban Area as Winter Habitat

Although the urban area may be a relatively poor summer habitat, as indicated by the differences in migratory behaviors of urban and rural deer, we wanted to know whether it provided quality winter habitat. Specifically, was the urban area as suitable as the rural area during winter, or was it actually an ecological trap, supporting lower densities of deer and deer with suppressed reproductive output? After analyzing three years of field data, we concluded that mule deer residing in the urban area fared much worse than deer living in the rural area. Specifically, we found that fawn:doe ratios of urban deer were 30-40% lower than those of rural deer, and that densities (deer per unit area) in the urban area were only half the densities in the rural area. Collectively, these results suggest that the urban area provided poorer quality habitat than the rural area during winter.

Several hypotheses can explain the relatively low fawn:doe ratios of urban deer. The most plausible of these is that urban does came through winter and entered the breeding season in poorer condition, and thus produced fewer young. This would occur if urban does had poorer nutrition during winter, or were forced to burn their energy reserves more rapidly as result of living on urban winter ranges. Poorer nutrition is possible, if 1) the quantity or quality of resources was less in urban areas, or 2) deer perceived the urban environment



Migrations allow deer to make optimal use of forage on seasonal ranges, and to minimize the energetic bottleneck faced during winter by avoiding deep snow and unfavorable thermal conditions. In some regions, mule deer

as risky, and thus minimized their mobility (and thus restricted their search effort for quality forage) to avoid the perils of life in the city. Similarly, urban deer may have been forced to burn their energy reserves more rapidly if frequent 'fright and flight' from humans and dogs increased their energy demands. It is probable that the effects of disturbance and inferior nutrition compounded each other.

The disparity between population densities of urban and rural deer also suggests that critical resources were less available in the urban area. Again, these resources may be more limiting in the urban area because 1) urban habitats do not have as many resources, or 2) deer can not access them because they choose to avoid risky areas.

### Question 3 – Social and Reproductive Isolation of Urban Deer

Like most ungulates, mule deer exhibit strong fidelity to their seasonal ranges. That is, deer use the same winter and summer ranges year after year. This behavior is believed to perpetuate itself through matrilineal association. Fawns learn migration routes and seasonal ranges from their dams, and maintain these routes throughout life. This behavior is particularly prominent with females; males tend to be more exploratory. The significance of this behavior is that it may constrain dispersal by mule deer, which in turn limits the social and reproductive interactions between different herds.

In our study, we observed that both urban and rural deer exhibited strong fidelity to their seasonal ranges. Specifically, we documented that urban and rural deer always returned to the same wintering areas year after year, and deer that were marked as fawns returned to the same areas as yearlings and adults. The result of this behavior was that although migratory urban and rural deer intermixed on a common summer range, they are actually two discrete populations, occupying non-overlapping winter ranges. Moreover, because urban deer migrated to winter ranges before rut, there was probably minimal reproductive interaction between urban and rural deer. Therefore, urban deer appear to represent a relatively isolated sub-population by

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virtue  
of their migratory  
traditions.

### Question 4 – Spatial Behaviors and Habitat Use

If urban habitats are truly different for deer living in them, it is logical to conclude that the spatial behaviors and habitat use patterns of deer will reveal these differences. We found this to be the case. For example, home range sizes of urban deer were only 1/4 those of rural deer; and within home ranges, urban deer tended to concentrate their movements around specific areas, whereas rural deer dispersed their movements more broadly. These data may be interpreted in several ways, but they strongly suggest that urban deer were restricted to specific areas. Rural deer, on the other hand, were able to make full use of their habitats.

### IMPLICATIONS FOR MULE DEER CONSERVATION AND MANAGEMENT

Our research has demonstrated that the behaviors and population characteristics of mule deer living in urban and rural areas of Cache Valley differ significantly. Collectively, these differences suggest that urban habitats are of poorer quality for the deer that have adapted to them. Moreover, even though urban deer may not

fare as well as their rural counterparts, migratory traditions and fidelity to seasonal ranges may predispose them to use these poorer habitats.

Most urban areas along the Wasatch Front and other Rocky Mountain regions are not occupied by deer. Therefore, our results stress that the conservation of traditional mule deer winter habitats throughout the mountainous regions of the West is crucial if mule deer populations are to be maintained.

Our results also show that most urban deer are migratory, using the urban area only as a winter range. Therefore, urban deer can be managed away from the city where traditional management techniques (i.e., hunting) are feasible. However, most deer return to urban areas before the general hunting season begins, suggesting that special hunting seasons will be required if deer migrating into urban areas are to be targeted. Moreover, because migratory urban and rural deer intermixed on a common summer range, the only option for selective management of urban deer may be to harvest them on transitional ranges during the brief periods of fall migration. ▲▲▲

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