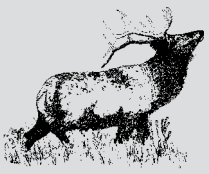

Appendix C.2. Big Game Winter Range

This section contains information about the recommended subdivision design standards for big game winter range. These standards are designed to apply to the following native ungulate species: white-tailed deer, mule deer, elk, antelope (also known as pronghorn), bighorn sheep, moose, and mountain goat.

Habitat Descriptions and Locations

Big game winter range represents the area where deer, elk, antelope, bighorn sheep, moose, and mountain goat spend the snowy, cold months of the winter. This habitat exists when elevation, slope, aspect, and vegetation combine to produce an area that provides animals with food, protection from harsh weather conditions, and security. Consequently, winter range is limited in size. "Animals that may have occupied thousands of acres of summer/fall range can be seasonally confined to relatively restricted geographic areas on which forage is limited and environmental conditions can cause physiological stress" (Youmans 1999, p. 6.3). This limited habitat area is generally found at lower elevations (mountain foothills and valley floors) (Vore 2012).

Winter range can shift locations in different years, depending on the weather and other factors, "including annual variations in habitat quality, animal population fluctuations, and winter severity that concentrates animals differently from year to year . . ." (Vore 2012, p. 4). This shifting helps ensure that during the most severe winters, critical winter range areas have not been degraded by concentrated use year after year.

Big game animals can travel long distances to reach their winter range. Although many animals migrate less than 30 miles to reach winter range, some big game animals travel 100 miles or more. For example, antelope have been known to migrate over 250 miles from Canada to reach winter range in north-central Montana. Consequently, it is important to maintain connectivity between areas used during different seasons of the year. If the winter is severe, big game animals can be concentrated on small, core winter range areas. If a winter is mild, animals can be spread out across the landscape (Vore 2012).

Winter range varies in different parts of Montana and from species to species; the following general descriptions and maps characterize big game winter range in Montana according to species and region. However, it should be noted that "[t]here are, of course, exceptions to these broad generalizations, which underscores the importance of area-specific surveys and analyses" (Vore 2012, p. 3).

Figures C.2-1 through C.2-7 (below) depict the general and winter/general ranges of the state's big game animals. General range refers to areas predictably occupied by the species for part or all of its year-long range. Winter/general range indicates that populations of this species tend to concentrate in these areas during the winter season; however, these areas are also considered part of the General Range. Weather extremes can have a large influence on winter distribution in any given year (Online FWP GIS Data 2012).

Legend for Figures C.2-1 through C.2-7.	**General Range** **Winter/General Range**	**NOTE: Wildlife distribution is not delineated by MT Fish, Wildlife & Parks within Indian Reservations and National Parks.**

Elk and Deer

- Southwestern Montana.
  - o Elk. Winter range typically occurs on south- and west-facing, low-elevation grasslands (see Figure C.2-1). Elk generally prefer areas with adjacent timber, which is used for bedding (Vore 2012).
  - o Mule deer. Winter range is similar to that used by elk, but it usually has a stronger shrub component, such as sagebrush, bitterbrush, or mountain mahogany (Vore 2012) (see Figure C.2-2).

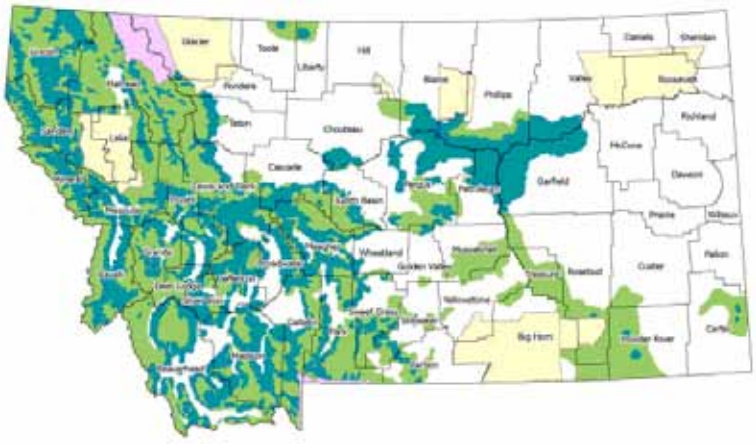

Figure C.2-1. *Map showing general range and winter/general range of* ***Elk*** *in Montana (FWP GIS 2012).*

  - o White-tailed deer. Winter range is typically associated with low-elevation agricultural lands (see Figure C.2-3). In addition, these deer use valley bottoms with associated brush and trees for cover. They may also use dense forests with a canopy cover that provides shelter from deep snow (Vore 2012).

- Northwestern Montana. In the forested northwestern part of the state, elk and deer winter range typically has a conifer overstory and shrubby understory, and is located below 5,000 feet in elevation.

- Eastern Montana.
  - o Elk prefer winter range in the more rugged breaks habitat, where junipers

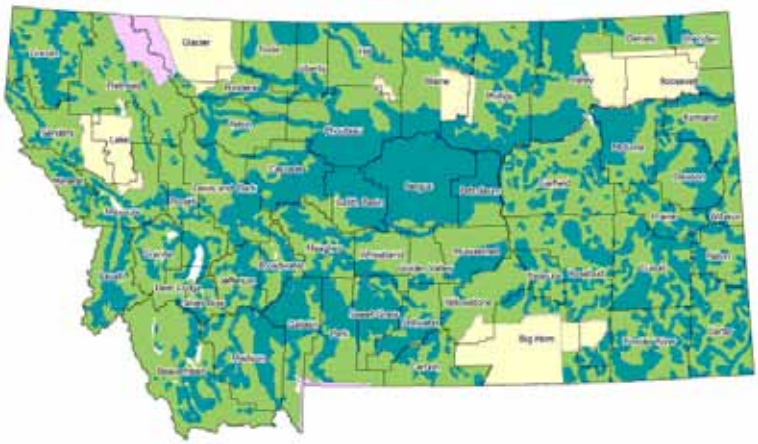

Figure C.2-2. *Map showing general range and winter/general range of* ***Mule Deer*** *in Montana (FWP GIS 2012).*

and ponderosa pines offer vegetative cover (Vore 2012).

- Mule deer "prefer topography such as the coulees and more rugged terrain," where sagebrush is extremely important for food and cover (Vore 2012, p. 4).

Moose

Winter range is generally located in the western third of the state (see Figure C.2-4). Winter range is dominated by willow flats and mature coniferous forests. Besides willows, moose sustain themselves during the winter months on serviceberry, chokecherry, and red dossier dogwood. Of all Montana's ungulates, moose can most easily negotiate deep snow (MT Field Guide 2012).

Mountain Goat

Winter range is generally found on the steep, south-facing slopes of northwestern, west-central, southwestern, and south-central Montana mountains (see Figure C.2-5). Preferred winter terrain consists of cliffs, south-facing canyon walls, and windblown ridgetops with sparse snow cover. Goats will sometimes utilize subalpine forest (MT Field Guide 2012).

Bighorn Sheep

Winter range for this species is diverse and includes the badlands and breaks of eastern Montana, high alpine mountains of south-central Montana, lower foothills

Figure C.2-3. *Map showing general range and winter/general range of* ***White-tailed Deer*** *in Montana (FWP GIS 2012).*

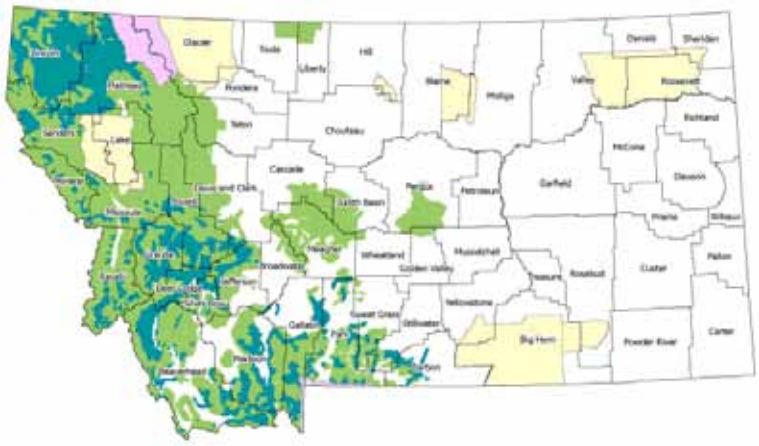

Figure C.2-4. *Map showing general range and winter/general range of* ***Moose*** *in Montana (FWP GIS 2012).*

Figure C.2-5. *Map showing general range and winter/general range of* ***Mountain Goat*** *in Montana (FWP GIS 2012).*

of southwestern Montana, and the intermountain valleys and higher elevations of northwestern Montana (see Figure C.2-6). Typical winter range is found on low-elevation, south-facing slopes that provide vegetative cover for escape in close proximity to foraging areas. The snowpack tends to be less than 25 cm (approximately 10 inches) (FWP Bighorn 2010).

Antelope (Pronghorn)

Antelope spend their winters predominantly in the open, rolling sagebrush and grasslands found east of the Front Range and, to a lesser degree, the intermountain valleys of southwestern Montana (see Figure C.2-7). Sensitive to snow depths, antelope seek areas with less snow accumulation and move south during severe winter weather (MT Field Guide 2012; Yoakum 2004; Vore 2012). In eastern Montana, sagebrush is an extremely important source of food and cover (Vore 2012).

Figure C.2-6. *Map showing general range and winter/general range of* ***Bighorn Sheep*** *in Montana (FWP GIS 2012).*

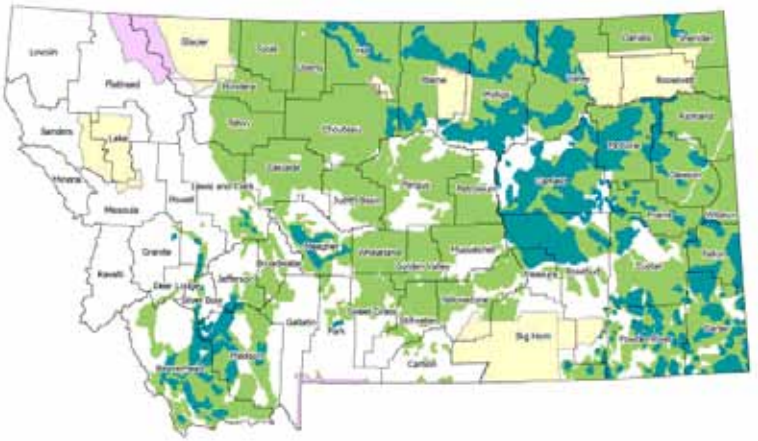

Figure C.2-7. *Map showing general range and winter/general range of* ***Antelope*** *in Montana (FWP GIS 2012).*

Objectives of Recommended Design Standards

- Minimize habitat fragmentation and loss of winter range.
- Maintain the ability of big game animals to travel freely within a winter range habitat patch, and between winter range habitat patches and other seasonal ranges.
- Maintain FWP's ability to manage wildlife effectively and as non-habituated herds.
- Minimize the potential for subdivisions to lead to problematic concentrations of big game.
- Minimize wildlife/human conflicts, including negative impacts on adjacent properties (e.g., game damage on agricultural lands).

Conservation Status

Winter range has traditionally been considered one of the most significant limiting factors for many big game species. This habitat type occupies a small percentage of each big game animal's home range, where forage is limited and environmental conditions can cause physiological stress. The importance of this habitat to big game animals cannot be overstated.

- "Wildlife biologists across Montana recognize the value of big game winter range; it is finite, biologically important, and likely to be lost without careful planning and resource management. In fact, there is no seasonal range more important to big game than winter range, and no bigger permanent threat to winter range—especially in western Montana—than housing development." (Vore 2012, p. 1)
- "In the final analysis there is one important point: *All* winter range is important to the long-term survival of big game populations." (Vore 2012, p. 4)
- "The threat of unplanned, unregulated development on ungulate winter range should be a real concern to managers, policy-makers, and the general public who appreciate and value native ungulates in the West . . . Though we cannot return these areas to pre-European settlement conditions, we can manage new growth to ensure that ungulates remain a significant part of the western landscape." (Polfus 2011, p. 94)

Impacts from Development

The main impacts to big game winter range from development include habitat fragmentation, creation of source-sink dynamics,[2] disruption of wildlife movements and migration, effects associated with roads, changes to the vegetation community that impact forage and cover, effects associated with domestic pets, impacts associated with recreation and other human-wildlife conflicts, and more (Glennon and Kretser 2005). Specific impacts of subdivisions and housing development on big game animals and their winter ranges are outlined below in more detail.

Big Game Generally

- "Development and subdivisions on big game winter range may render this critical habitat as unsuitable for big game use, unsuitable for big game management, or both. Such subdivisions often convert functional undeveloped winter range into a series of disconnected and unusable habitat fragments. Functional undeveloped winter ranges are large unfragmented landscapes of suitable habitat where big game can live in a natural wild state during the winter (generally November through April). The characteristics of functional winter range include the following factors: (1) animals can use the habitat undisturbed; (2) animals can move easily to and from summer range; (3) animals do not create conflicts with people and domesticated pets; (4) traditional human use and enjoyment of the animals is maintained; and (5) all options for effective

[2] The term "source-sink dynamics" refers to the link between the "source" and "sink" habitats of a species' population. "Source habitats occur where reproduction and recruitment are positive, and therefore new emigrants are produced, while sink habitats occur where within-habitat reproduction is insufficient to balance local mortality, and these populations therefore would not persist without influx of immigrants from source populations (Pulliam 1988). Without adequate dispersal between sources and sinks, populations in sink habitat can become locally extinct." (Glennon and Kretser 2005, p. 12)

big game management, including hunting with rifles, can be employed if desired" (Vore 2012, p. 11).

- "Subdivisions can affect the way that wintering big game uses habitat a mile or more away (McIntyre and Hobbs 1999; Sime 1999) . . . Houses, roads, people, dogs, and other human activity often limit or preclude big game use of winter range" (Vore 2012, p. 8).
- Pets are often associated with subdivisions. Loose dogs have been known to "chase, harass, injure, and kill big game, and can range up to three to five miles from the nearest house (Sime 1999; Sime and Schmidt 1999)." (Vore 2012, p. 8)
- "Because big game animals live significantly off their stored fat reserves during winter, if they are harassed or disturbed, they burn fat more quickly and have a lower chance of surviving the winter. The negative effect of disturbing big game on winter range is well known (Geist 1971; Lyon 1979; Parker et al. 1984; Cassirer et al. 1992), and is the primary reason winter ranges on MFWP wildlife management areas are closed during the winter . . . It may take many years and generations for animal populations to respond to development as individual animals die, find other areas, or adapt. As a result, the actual total impact of a development on winter range may not be fully realized for decades (McIntyre and Hobbs 1999; Hansen et al. 2005)" (Vore 2012, p. 8).
- "If given a choice, big game will avoid houses (Vogel 1989; Storm et al. 2007; Cleveland 2010). Consequently, where development is placed on winter range makes a significant difference (Duerkson et al. 1996). Subdivisions placed in unfragmented blocks of winter range and not adjacent to other development and infrastructure have a much greater negative impact on wildlife than do new houses situated next to existing development" (Vore 2012, pp. 8–9).
- "If big game populations are to be protected long-term in Montana, any evaluation of a proposed subdivision must consider likely future cumulative effects from future development on big game winter range (Odum 1982). Continued application of 'small decisions made singly' with regard to subdivisions and development eventually results in isolated relic winter range patches with little connectivity to other habitat and a generally highly modified matrix (Theobald et al. 1997; McIntyre and Hobbs 1999; Glennon and Kretser 2005; Hansen et al. 2005). Small populations of big game may still manage to survive, but often in conflict with humans and only if the remaining winter range is not developed further" (Vore 2012, p. 9).
- "When housing reaches the point when there are no 'undeveloped' areas left, big game can no longer choose to avoid houses and either must adapt or leave . . . One of the impacts of human development on big game is that these animals may habituate to people, and the habituation of wildlife creates new problems . . . Habituation of big game to development is a problem for at least six important reasons: "(1) it 'cheapens' people's perceptions of big game; (2) big game often come into conflict with people; (3) it can change the ecology and native habitat use of a big game population; (4) it can severely limit wildlife management options; (5) it can impact hunting and other wildlife-related recreational opportunities over a large area, including the big game's entire year-round home range; and (6) such negative interactions with wildlife may undermine people's attitudes toward conservation" (Vore 2012, p. 9).

- "A subtle and often unrealized aspect of rural subdivisions is that they can change the year-round ecology of big game animals, causing animals over time to abandon nearby traditional winter ranges and become residents, potentially year-round residents, in and around subdivisions (Berger 2007; Haggerty and Travis 2006; Hebblewhite et al. 2006; Hurst and Porter 2008; Klopper et al. 2005; McClure and Bissonette 1996; Thompson and Henderson 1998; Whittaker and Knight 1998)." (Vore 2012, p. 10)
- "Some species (e.g., elk) avoid roads and roadside areas, thereby reducing available habitat. Other species are negatively affected by roads because of increased stress during critical periods (e.g., wintering deer)" (Knutson and Naef 1997, p. 108).
- The most effective tool for managing big game populations is hunting, particularly hunting with rifles. However, hunting with rifles, as well as archery hunting, is often not a viable option in and around subdivisions because of safety reasons. In addition, some subdivision residents may oppose hunting in general, and nearly all residents do not want hunted animals dying on or near their property (Thompson and Henderson 1998).

Deer

- "White-tailed deer populations have expanded in the last century and display high adaptability to human activity . . . deer often select high quality forage near residential structures and benefit from reduced predation rates and a lack of hunting by humans in close proximity to developments. White-tailed deer may display greater avoidance of human disturbance during sensitive biological seasons. In some situations, white-tailed deer habitat use has declined with increasing housing densities. Habituated white-tailed deer impact humans through the spread of diseases, increased deer-vehicle collisions, attacks on humans and alterations to plant structure and community composition. Human attitudes and perceptions of white-tailed deer in urban environments can limit wildlife management options such as hunting" (Polfus 2011, p. vii).
- "Mule deer populations in the West have declined in recent decades. Though research has not isolated the confounding factors involved in the declines, it is probable that residential development has played a significant role. Mule deer are known to display behavioral escape responses such as avoidance, decreased flight initiation distances, and other behavioral reactions to human activity and recreation. Studies indicate that mule deer often avoid roads and industrial infrastructure. In some cases, avoidance of human disturbance can increase energy expenditure and may impact individual survival during the winter. Because mule deer utilize flexible migration behaviors to maximize resources and decrease predation pressure, development in migration corridors can have significant consequences. Like white-tailed deer, mule deer can also become habituated to urban areas" (Polfus 2011, p. viii).
- "Studying white-tailed and mule deer in the Gallatin Valley, Vogel (1989, p. 410) found that in relation to an increase in density of housing and the associated increase in human activity, 'The most important response was decreased use of the developed area by deer.' Significantly, he also found (ibid.) 'a pronounced effect of houses at low housing densities,' with deer use falling precipitously as housing density increased from one house per 640 acres to one house per 60 acres. Deer use continued to decline at higher

housing densities, but at a lower rate" (Vore 2012, p. 7).

- The greatest threat to mule deer habitat and populations "comes from development on and adjacent to major winter ranges (Mackie and Pac 1980). Because mule deer distribute themselves and exhibit fidelity to specific sites, loss of these regions can have profound implications on mule deer occurrence in different areas and other seasons (Mackie and Pac 1980; McClure et al. 2005)." (Krausman et al. 2008, p. 87)

Elk

- "Elk initially respond to human disturbance with increased vigilance, flight responses and behavioral avoidance, all of which have the potential to increase winter energy expenditure. In northern climates, decreases in energy reserves during winter can lower survival. Therefore, development has potential to lead to severe population level declines in elk . . . large developments, such as ski areas, can alter elk distributions during sensitive periods such as fawning, leading to decreased reproductive success. Without direct negative pressure from humans, elk can and will habituate to human activity. Habituated elk are associated with crop depredation, overgrazing, property damage, injury to humans, disease transmission, and an eventual decline in migratory behavior. Elk also react to pressure from hunting by humans by moving to areas with hunting restrictions such as private lands. As hunter-friendly ranches are increasingly transformed into subdivisions, more land is available as a refuge for elk during the hunting season. This reduces the ability of managers to control elk populations, further escalating problems with habituation." (Polfus 2011, p. viii).
- "A number of studies have shown that elk change their distribution and habitat use more in response to humans than to wolves (Gude et al. 2006b; Proffitt et al. 2009; Proffitt et al. 2010). Cleveland (2010), studying elk use of a winter range in the Wildland/Urban Interface (WUI) near Missoula, found that elk preferred areas at least three-quarters of a mile from houses" (Vore 2012, p. 8).
- Montana FWP wildlife managers have identified several factors that accelerate the problem of elk habituation to human presence. These factors include situations where elk recognize and use areas of human presence as a sanctuary from hunting, and where humans occupy elk winter range (Thompson and Henderson 1998).

Bighorn Sheep

- "Historic declines in bighorn sheep are likely due to expansion of urban development, resource extraction, disease, competition with domestic livestock and habitat fragmentation . . . Mountain sheep are highly vigilant and exhibit a number of overt behavioral reactions in response to human disturbance. Where human development intersects sheep range, roads may act as a barrier to movement, especially when highways bisect migration routes or corridors to important seasonal mineral lick sites . . . Disease and parasite levels have also increased following human disturbance. Evidence of habituation to temporally and spatially predictable human activity has been documented in certain situations. Protection and maintenance of mountain sheep habitat is essential to prevent extirpations similar to those observed in the past century" (Polfus 2011, pp. viii–ix).

- Residential and resort developments have had a major impact on some of the critical seasonal ranges of bighorn sheep, including winter and lambing ranges. Impacts include direct loss of habitat, fragmentation of habitats, and displacement of bighorns to less productive habitats. In addition, the potential for disease transmission becomes a management challenge when "hobby" farmers introduce domestic sheep in or adjacent to the wild sheep habitat (FWP Bighorn 2010).
- "When development occurs adjacent to and in mountain sheep habitat, sheep often decline and ultimately can become extinct" (Krausman et al. 2008, p. 109).

Antelope (also called Pronghorn)

- ". . . (R)esearch on the impacts of human disturbance on pronghorn indicates that pronghorn increase vigilance, flight responses and behavioral avoidance near human activity. Pronghorn need large contiguous areas with relatively few physical barriers to complete seasonal migrations. Energy development, transportation infrastructure, fencing and rural residential development are all threats to pronghorn migration. Mitigating the effects of residential development in critical migration bottlenecks should receive priority conservation. Pronghorn can habituate to certain levels of disturbance, especially when not hunted or harassed. During severe winters pronghorn may select agricultural lands which can reduce or eliminate migratory behavior . . . In general, pronghorn persistence is dependent on large-scale, multi-jurisdictional initiatives to protect critical migration corridors and winter ranges" (Polfus 2011, p. viii).

Recommended Approach to Subdivision Design

In designing the proposed subdivision, the subdivider is encouraged to follow the four steps outlined below. Local FWP wildlife biologists are encouraged, when contacted by the subdivider or the subdivider's representative, to make time for the consultation described in subsections b. and c. below.

a. Consult FWP's Crucial Areas Planning System (CAPS) and/or other publicly available sources of wildlife habitat information, for a preliminary indication of whether the property proposed for subdivision may be located in or adjacent to big game winter range.

b. Consult with the local FWP wildlife biologist, or other professionally trained biologist, to verify the preliminary assessment. If consulted, the FWP biologist should provide the subdivider with a written determination of whether or not the property proposed for subdivision is located in or adjacent to big game winter range.

c. If the biologist determines that the property proposed for subdivision is located wholly or partially within big game winter range, consult further with the biologist for site-specific information and recommendations on minimizing the impacts of the subdivision on big game species and big game winter range. FWP recommendations may include suggestions for avoiding or strictly limiting the placement of subdivision design features in winter range. Or, based upon site-specific conditions and the extent of existing development located adjacent to or near the proposed subdivision, FWP may recommend that strict restrictions on the location of subdivision design features are not necessary. In offering recommendations, the FWP biologist should take into

account the wildlife and habitat data compiled by the subdivider, any field reviews completed by other professionally trained biologists, FWP's own wildlife and habitat data, and any other applicable biological information.

d. Incorporate the biologist's recommendations into the design of the proposed subdivision.

Recommended Standards

Whether or not the subdivision design approach recommended above is completed, the following standards pertain to any subdivision development proposed on property that contains or lies adjacent to big game winter range:

a. Cluster the subdivision design features on as small a footprint as possible, as far from winter range as possible, and as close to existing development as possible (e.g., other houses, roads, residential utilities) (see Figure C.2-8).

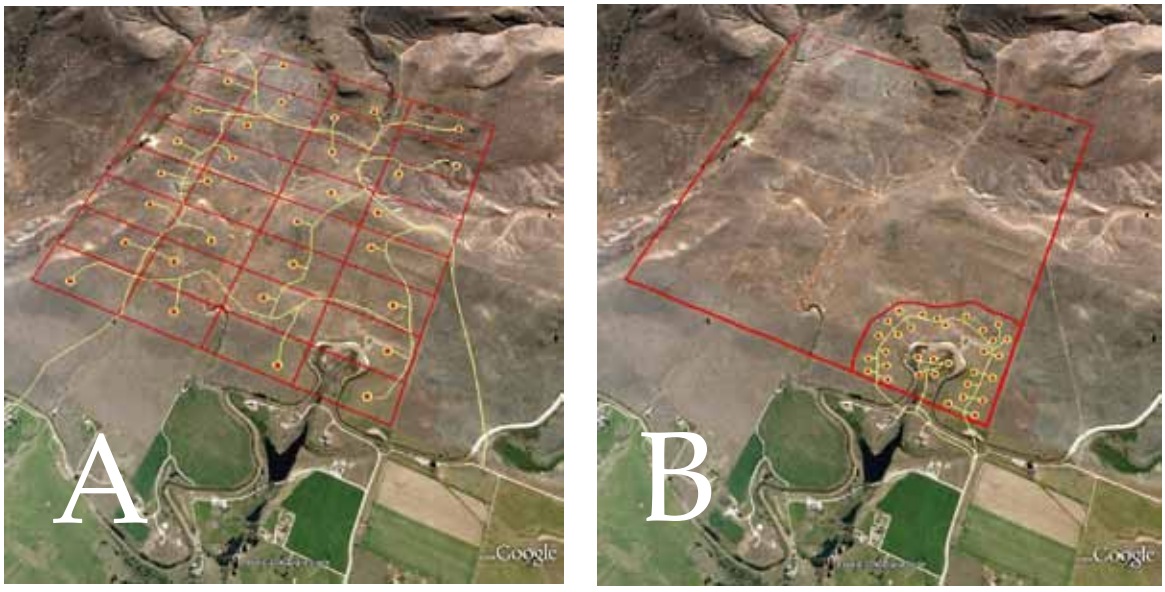

Figure C.2-8. *Examples of dispersed and clustered development on winter range.*

Example 'A' depicts development of thirty-two 20-acre lots spread across 640 acres of winter range. Example 'B' illustrates a "clustered" design of the same thirty-two houses on 2-acre lots on 10 percent of the property, or 64 acres, situated in a corner near existing development. Clustering homes as shown in example B obviously impacts winter range much less than the dispersed development found in example A.

b. Locate areas of proposed open space immediately adjacent to existing winter range or open space on adjacent lands, in order to maintain the functional connection with other open space and winter range on public and private lands.

c. Provide or maintain linkage within a winter range patch, between isolated patches of winter range, or between summer range (or other seasonal habitat) and winter range. Recommended linkage widths are a minimum of one (1) mile for elk and one-half (½) mile for other species. For white-tailed deer, mule deer, and moose, linkage should be along riparian corridors where present.

The local FWP wildlife biologist may recommend the number of linkages needed to maintain wildlife movement, and whether or not site-specific circumstances justify a reduced linkage width (e.g., topography and/or natural vegetation may limit line of sight distances and sufficiently alleviate noise between linkage habitat and development activity to allow undisturbed movement of wildlife).

Substantial Evidence for Big Game Winter Range Recommendations

In order to more easily describe the rationale and scientific evidence for the big game winter range recommended standards, the standards have been divided into three provisions. Each provision is stated below, followed by the substantial evidence supporting that provision, including pertinent scientific studies and professional opinions.

Provision 1. Recommended Approach to Subdivision Design. In designing the proposed subdivision, the subdivider is encouraged to follow the four steps outlined below:

a. Consult FWP's Crucial Areas Planning System (CAPS) and/or other publicly available sources of wildlife habitat information, for a preliminary indication of whether the property proposed for subdivision may be located in or adjacent to winter range.

b. Consult with the local FWP wildlife biologist, or other professionally trained biologist, to verify the preliminary assessment.

c. If the biologist determines that the property proposed for subdivision is located wholly or partially within big game winter range, consult further with the biologist for site-specific information and recommendations on minimizing the impacts of the subdivision on big game species and big game winter range. FWP recommendations may include suggestions for avoiding or strictly limiting the placement of subdivision design features in winter range. Or, based upon site-specific conditions and the extent of existing development located adjacent to or near the proposed subdivision, FWP may recommend that strict restrictions on the location of subdivision design features are not necessary. In offering recommendations, the FWP biologist should take into account the wildlife and habitat data compiled by the subdivider, any field reviews completed by other professionally trained biologists, FWP's own wildlife and habitat data, and any other applicable biological information.

d. Incorporate the biologist's recommendations into the design of the proposed subdivision.

Substantial Evidence for Provision 1

- CAPS is an easy-to-use informational and early planning tool that subdividers can use to identify important habitats in a given area. CAPS helps developers begin early to consider the potential effects of a proposed subdivision on wildlife and wildlife habitat. This system is free and available to any person with Internet access. CAPS will provide useful, initial information about whether a property proposed for subdivision might be located in big game winter range. CAPS can also give developers a general idea about the impacts a subdivision might have on identified habitats and species. Additional data sources of value during the early stage of subdivision site planning

and design include FWP's individual GIS data layers, the *Montana Animal Field Guide,* and the *Ecological Systems Field Guide* (see Appendix A) (Online FWP CAPS 2012).

- However, "CAPS is not a substitute for a site-specific evaluation of fish, wildlife, and recreational resources. There is still no substitute for consulting with local FWP biologists to gain a better understanding of conditions and management challenges in a particular area of the state—but CAPS will help you start smart." An FWP biologist with knowledge of a property is the best authority for determining whether a property proposed for subdivision is located in big game winter range. FWP and other professionally trained biologists may also be familiar with whether or not a given property functions as habitat that supports one or more native grassland or native shrub species, especially Species of Concern (Online FWP CAPS 2012).

- "Early discussions with MFWP are important when developing in or near big game winter range. Before laying out any lot boundaries and designing other features for a subdivision proposed in big game winter range, the developer or landowner should consult with a local MFWP wildlife biologist to discuss the type, topography, vegetation, and other features of the particular winter range and a subdivision design that could minimize impacts" (Vore 2012, p. 11).

- "The direct and indirect effects of exurban development on ungulate winter range vary by region, ungulate and predator species, specific habitat type, and development structures" (Polfus 2011, p. 2). Such variations have pointed FWP wildlife managers toward taking a more site-specific approach to evaluating the opportunity to avoid or mitigate the impacts of a particular residential development proposal.

- "The effect of subdivision on big game winter range needs to be evaluated at the local level, not at the hunting district or larger level . . . Too often, the effects of a subdivision on big game are evaluated at too broad a scale to be relevant to the local herds" (Vore 2011, p. 11).

- "At the smaller site scale, [land use] guidelines suggest buffering development, reducing exotic species, reducing fencing and other barriers to movement, reducing noise and light disturbance, controlling domestic pets, maintaining connected patches of undeveloped land and *assessing site level habitat conditions* [italics emphasis added]" (Polfus 2011, p. ix).

Provision 2. Cluster the subdivision design features on as small a footprint as possible, as far from winter range as possible, and as close to existing development as possible (e.g., houses, roads, residential utilities). Also, locate areas of proposed open space immediately adjacent to existing winter range or open space on adjacent lands, in order to maintain the functional connection with other open space and winter range on public and private lands.

Substantial Evidence for Provision 2

- ". . . Clustered developments decrease fragmentation and perforation of habitats due to roads and houses, leaving the remainder of the landscape in a condition more suitable for wildlife sensitive to elevated human densities . . . The case for clustering is made by

numerous researchers (Arendt 1997; Theobald et al. 1997; Maestas et al. 2001; Odell and Knight 2001; Glennon 2002; Hansen et al. 2002; Odell et al. 2003; Glennon and Porter 2005)." (Glennon and Kretser 2005, pp. 29–30)

- "Exurban lands are traditionally developed by subdividing them into a grid of parcels ranging from 5 to 40 acres. From an ecological perspective, this dispersed type of development effectively maximizes the individual influence of each home on the land (Lenth et al. 2006) . . . [A] single house situated in the wrong place can have a greater impact than several houses clustered together so that houses are within the 'zone of influence' of each other and the entire cluster is placed thoughtfully on the landscape . . . If development is planned on or near big game winter range, the best option for wildlife is to build the houses and roads on a small portion of the landscape near and adjacent to existing development and leave as much land as possible undisturbed, unfragmented, and protected" (Vore 2012, p. 12).

- "*All* winter range is important to the long-term survival of big game populations . . .[W]e have already lost a significant amount of the functional winter range that was present when Europeans first arrived" (Vore 2012, pp. 4–5).

- ". . . In areas with significant resources, where low densities are appropriate, the development impact of, for example, five homes on 200 acres should be minimized by establishing maximum lot sizes of one to two acres, leaving the remaining 190–195 acres intact" (Glennon and Kretzer 2005, p. 30).

- In their study of the cumulative effects of seven different hypothetical subdivision designs on wildlife habitat, Theobald et al. (1997) found that "[T]he overall subdivision pattern is often a stronger indicator of total disturbance zone area than density . . . [A] clustered subdivision design (25% developed area), even with a density four times higher than the dispersed design, results in a substantially lower total disturbance zone area than a dispersed regular patterned subdivision" (Glennon and Kretser 2005, p. 27).

- McIntyre and Hobbs (1999) describe wildlife habitat, including big game winter range, as a continuum of landscape alteration, with "intact" habitat characterized as "more than 90 percent of original habitat remaining, high connectivity, and low modification of remaining habitat" (Vore 2012, p. 13).

- "By clustering homes in a small area, conservation development reduces the overall footprint by minimizing the influence of each house on the ecosystem. Thus, large-scale impacts on open spaces and agricultural lands can be mitigated. However, there is growing concern that these strategies may neglect important high quality wildlife habitat. New research indicates that the configuration of development (i.e., where clustered development occurs on the landscape) is at least as important, if not more important, than simply conserving open space.

  Land use guidelines can help facilitate the development of policies and regulations needed to guide decisions on how to design developments and regulate their influence

on wildlife . . . At the smaller site scale, guidelines suggest buffering development, reducing exotic species, reducing fencing and other barriers to movement, reducing noise and light disturbance, controlling domestic pets, maintaining connected patches of undeveloped land and assessing site level habitat conditions . . . To protect winter range, development should be clustered in areas near existing development to leave as much high quality winter range undeveloped as possible" (Polfus 2011, p. ix).

- "A study on the effects of housing on mule deer and white-tailed deer in the Gallatin Valley of Montana showed a sharp decline in the mule deer population at low housing densities and little further impact on the population as the houses became more dense (Vogel (1989) . . . Vogel recommended increasing the density of housing in already developed areas, as opposed to low-density development in new areas" (Glennon and Kretzer 2005, p. 25).

- "Developers may describe the designation of 'open space' within a proposed subdivision as suitable wildlife habitat. However, often these are areas between houses or are developed for recreational uses such as golf courses, trail systems, and other activities. Because of their small size and location, such open spaces are seldom functional winter range . . . Big game winter range is particularly vulnerable to the impacts of exurban development because big game animals need large, contiguous blocks of unfragmented habitat" (Vore 2012, p. 7).

- "If given a choice, big game will avoid houses (Vogel 1989; Storm et al. 2007; Cleveland 2010). Consequently, where development is placed on winter range makes a significant difference (Duerkson et al. 1996). Subdivisions placed in unfragmented blocks of winter range and not adjacent to other development and infrastructure have a much greater negative impact on wildlife than do new houses situated next to existing development" (Vore 2012, pp. 8–9).

- "Subdivisions can affect the way that wintering big game uses habitat a mile or more away (McIntyre and Hobbs 1999; Sime 1999) . . . Houses, roads, people, dogs, and other human activity often limit or preclude big game use of winter range" (Vore 2012, p. 8).

- Pets are often associated with subdivisions. Loose dogs have been known to "chase, harass, injure, and kill big game, and can range up to three to five miles from the nearest house (Sime 1999; Sime and Schmidt 1999)." (Vore 2012, p. 8)

Provision 3. Provide or maintain linkage within a winter range patch, between isolated patches of winter range, or between summer range (or other seasonal habitat) and winter range. Recommended linkage widths are a minimum of one (1) mile for elk and one-half (½) mile for other species. For white-tailed deer, mule deer, and moose, linkage should be along riparian corridors where present.

Substantial Evidence for Provision 3

- ". . . Many species that require large areas to maintain functional populations will need to move among remaining habitat patches to survive, whether many small patches or several large patches remain. The location of patches relative to one another and the

connectivity among patches will play a critical role in their survival. Isolation of habitat fragments from one another can ultimately lead to population declines" (Hilty et al. 2006, p. 38).

- "Many ungulate species move back and forth each year from montane summer habitat to valley winter habitat, sometimes passing through naturally constricted areas. Blockage of such passageways could eliminate a population from a region" (Hilty et al. 2006, p. 170).

- "A good deal of research supports the importance of continuous corridors as opposed to corridors that are bisected by roads or other activities . . ." (Hilty et al. 2006, p. 182).

- ". . . The preponderance of data indicates that wider corridors are generally more effective for maintaining connectivity" (Hilty et al., 2006, p. 189).

- "Corridors . . . are intended to permit the direct spread of many or most taxa from one region to another . . . They should facilitate foraging movements, seasonal migrations, dispersal and recolonization, and escape from disturbance... In general, the wider the corridor, the better" (ELI 2003, p. 23).

- "Developers may describe the designation of 'open space' within a proposed subdivision as suitable wildlife habitat. However, often these are areas between houses or are developed for recreational uses such as golf courses, trail systems, and other activities. Because of their small size and location, such open spaces are seldom functional winter range . . . Big game winter range is particularly vulnerable to the impacts of exurban development because big game animals need large, contiguous blocks of unfragmented habitat" (Vore 2012, p. 7).

- Human disturbance within one-half (½) mile (800 meters) of bighorn sheep habitat, especially during the winter and through mid-June, contributes to displacement and population decline. A key habitat requirement is freedom from human disturbance; a buffer of one-half (½) mile to one mile between habitat and human disturbance factors is recommended (WA DOW 1991).

- A recent study of elk response to human activities *(North Hills, Missoula Valley)*, found that elk selected areas approximately one (1) mile (1,600 meters) from houses and moved quickly through areas approximately one-half (½) mile (800 meters) from houses. A "conservative minimum" of an 0.93-mile buffer (1,500 meters) was recommended between subdivisions to ensure movement corridors remain functional (Cleveland 2010).

- The following linkage width was recommended as a "best management practice" when incorporating a trail system, with people and their pets on leashes, into an area of wildlife linkage: "Each strand of the linkage design must be broad (typically 1–2 km [0.62 to 1.2 miles wide] for most of its length) to allow a designated trail system without compromising the usefulness of the linkage for wildlife" (Beier et al. 2008).

- ". . . Conserving and enhancing connectivity usually requires more than a single, minimum-size corridor" (Hilty et al. 2006, p. 196).

- "Riparian areas with dense and structurally diverse vegetation provide thermal and hiding cover for ungulates. Thermal cover is provided with a canopy of > 12 m (39 ft) in height and at least 70 percent tree canopy coverage. This cover is important year-round, especially during winter when riparian areas may be the only habitat where snow does not render the habitat unsuitable for ungulates such as deer, elk, and moose. These mammals also use riparian areas for fawning and calving. Deer and elk populations that migrate between summer and winter ranges commonly utilize riparian areas for these movements" (Knutson and Naef 1997, p. 38).

- The online *Montana Field Guide* (2012) identifies riparian areas as among the habitats important to white-tailed deer, mule deer, and moose:
    - White-tailed deer habitat. "River and creek bottoms; dense vegetation at higher elevations; sometimes open bitterbush hillsides in winter. In western MT, mature subclimax coniferous forest, cool sites, diversity, and moist sites important in summer (Leach 1982). In winter prefer dense canopy classes, moist habitat types, uncut areas, and low snow depths (Berner 1985)."
    - Mule deer habitat. "Grasslands interspersed with brushy coulees or breaks; riparian habitat along prairie rivers; open to dense montane and subalpine coniferous forests, aspen groves. Varies between areas and seasons. In prairie, uses breaks, badlands, and brushy draws. In mountain foothills, Mule Deer are widely distributed in summer in forest and subalpine. In winter use lower elevation open shrub-dominated slopes" (Pac 1976, Mackie et al. 1982).
    - Moose habitat. "Variable. In summer, mountain meadows, river valleys, swampy areas, clearcuts. In winter, willow flats or mature coniferous forests. Best ability of any Montana ungulate to negotiate deep snow. Coniferous cover, uneven plant age composition and willows important components. Some Moose may be yearlong willow flat residents (Stone 1971). Closed canopy stands may be important in late winter (Mattson 1985)."

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Appendix C.3. Public Hunting

As Montana's population grows, new or expanding subdivisions impact the hunting of wildlife and, consequently, wildlife and wildlife habitat. When a new subdivision is developed in an area where hunting has traditionally occurred, conflicts can arise. This section contains information about the recommended subdivision design standards pertaining to public hunting.

Description

Hunting is an important tradition in Montana, as well as an important management tool for certain wildlife populations (especially game animals). Hunting seasons are currently conducted in the state for most game animals (deer, elk, moose, antelope, mountain sheep, mountain goat, mountain lion, bear, and wild buffalo), migratory game birds (waterfowl, including wild ducks, geese, and swans; cranes; coots; common snipe; and mourning doves), and upland game birds (grouse, pheasant, gray partridge, wild turkey, and chukar). Montana Fish, Wildlife & Parks (FWP) manages all wildlife in the state, including the hunting of wildlife. More information on current hunting regulations and seasons can be found at: http://fwp.mt.gov/hunting/.

Location

Hunting takes place throughout Montana on public and private land, in uplands as well as along rivers and streams. Hunters need to have permission to hunt on private land. They do *not* need permission to hunt on most public land, including U.S. Forest Service, Bureau of Land Management, and state school trust lands. Migratory bird hunters also do not need permission to hunt on land below the high-water mark on rivers and streams.

Objectives of Recommended Design Standards

- Maintain FWP's ability to manage wildlife effectively.
- Maintain public hunting, including hunting with rifles, as an important tool for wildlife management.
- Maintain healthy wildlife populations.
- Minimize safety concerns of future lot owners.
- Avoid conflicts between different land uses (e.g., game damage on adjacent agricultural lands due to wildlife displacement or habituation; problematic concentrations of big game animals in the proposed subdivision due to landscaping, vegetable gardens, and the creation of a "safe haven" no-hunting zone; annoyances created by hunters and subdivision residents finding themselves in close proximity to one another).