COLORADO
Parks and Wildlife
Department of Natural Resources

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July 21, 2016

Town of Avon
Community Development
ATTN: Matt Pielsticker
PO Box 975
Avon, CO 81620

RE: Town of Avon Recreational Trails Master Plan update

Dear Mr. Pielsticker,

The Colorado Parks and Wildlife (CPW) has reviewed this project and we offer the following comments and mitigations for your consideration.

For many years, winter ranges were considered the most limiting component of ungulate environments. However, as our knowledge of ungulate physiology and behavior has increased, it has become apparent that weight gains and nutritional contributions of high quality summer range may be of equal or greater importance in determining winter survival and reproductive success (Canfield et al 1999).

In the past 20 years off road recreation (hiking, mountain biking, horseback riding and ATV) has significantly increased especially on public lands in areas surrounding resort communities. Research on possible impacts to wildlife has been slow to catch up. The majority of these projects focus on ungulates but there are some that look at recreational impacts to birds (Miller, Knight, Miller. 2001. Wildlife Response to Pedestrians and Dogs). Due to the limited research available for other species we have not specifically addressed impacts to them. However it would be prudent to realize that increased recreational levels will have impacts to the other species using these areas.

To differing extents, human activities taking place where animals are present have an impact on those animals. The amount of impact differs based on the activity and a series of factors described by Geist and reiterated by Knight et al. It was suggested that harassment was most damaging when animals were in poor condition (Geist 1970) and when disturbance was frequent and unpredictable. Wildlife responses to disturbance are shaped by six factors: type of activity; predictability of the activity; frequency and magnitude of the activity; timing (e. g., breeding seasons); relative location (e.g., above versus below on a slope); and the type of animal including: size, specialized versus generalized niche, group size, sex and age (Knight and Cole 1995). For several ungulate species, the greatest negative responses to recreational activities (either motorized or non-motorized) were measured for unpredictable or erratic occurrences (Canfield et. al. 1999).

Many of the research projects were designed to assess possible impacts on wildlife from general public recreational use. Most of these projects did not assess the impacts from highly concentrated uses and the

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treatments were based on a set number of treatments twice in a day. While these research projects provide the baseline for documenting impacts to wildlife from off road recreation they often don't replicate the intense level of use observed on lands surrounding resort areas. The research studies also had clear constraints on what subjects could do during the treatments. The majority of the studies did not allow the subjects to stop to view or take pictures of wildlife nor were they allowed to follow wildlife. Due to these restrictions these studies may underestimate the actual impact to wildlife from off road recreation. In addition, there is a lack of information on impacts to wildlife from commercial or recreational race events or recreational activities at night.

Very often there is a misperception of what impacts to wildlife are. Most people would define an impact as the animal ran away. Unfortunately impacts to wildlife are often much less apparent. Several studies have been done using heart rate monitors or motion sensor within radio collars to detect travel, resting or feeding activity to determine at what point the animal starts to alert to the disturbance. All wildlife lives within a delicate balance of nutrition intake and energy output. Any additional activities that increase the energy output can have devastating impacts to the animal. When reviewing impacts to wildlife it is important to realize that subtle changes in time spent feeding, resting or travelling can have significant consequences for survival, growth and reproduction. Survival of both deer and elk is dependent upon non-activity. In studied wildlife populations, animals were in a resting state, lying down over 90% of their time. Energy expenditure, calories needed to survive, is conserved when animals utilize this strategy. The cost for a deer or elk to go from a lying position to a standing position is a 25% energy increase. This does not include any movement, just standing up. As common sense would dictate, there is a linear progression for increased energy consumption if that animal then walks up to a full running escape from the disturbance (Parker, et. Al. 1984 Energy Expenditures for locomotion for Mule Deer and Elk). Energy expended by elk increases significantly as they transition from lying to walking to running. Geist (1978) reported that energy expenditure caused by excitation can temporarily double the expenditure for maintenance. He offered as a rule, excitement increases an animal's metabolism about 25% more than that required for maintenance for long periods. Excited animals frequently also incur the cost of the locomotion if they leave the site of disturbance. Travel costs vary with distance moved, type of locomotion and amount of elevation gain. Hard running can exceed by 20 times the cost of basal metabolism, and climbing requires about 12 times more energy than travel over level terrain (Geist 1978). Energy costs of excitation and locomotion are very high compared to the relatively low daily food (energy) intake by ruminants, and exceedingly expensive if the fat stores are used to pay the cost of undue excitement. The undue excitement caused by human disturbance may be the difference between successful reproduction or not or between survival and death.

During the spring and summer deer and elk are trying to recover body condition from winter while still undergoing significant stress from lactation and antler development. Deer and elk must maximize feeding and resting periods to not only provide for their current needs but to also store sufficient fat to assist them in winter survival. Even such small detail of where the animal is in relation to the disturbance has an effect. Recreationists located above the wildlife elicited a stronger response than a recreationist located level with or below wildlife, (Taylor and Knight 2003).

When looking at wildlife impacts you must include behavioral changes. Wildlife behavior may take the form of avoidance, habituation or attraction (Knight and Temple1995). Disturbance may modify an animal's behavior either positively or negatively through five mechanisms: home range changes, altered movement patterns, altered reproductive success, altered escape response and altered physiological state (Tromulak and Frissell 2000). Behavioral responses may be of short duration (temporary displacement) or long-term, such as abandonment of preferred foraging areas (Geist 1978). Mammals may respond to disturbances by humans by reducing activity to areas, habitats, and times of day where encounters with humans are minimal (Geist 1971). Avoidance or abandonment of harassment-prone areas may subsequently reduce the range of the population (Geist 1978). Disturbance from recreation may have both immediate and long-term effects on wildlife. The immediate response of many animals to disturbance is a change in behavior, such as cessation of foraging, fleeing, or altering reproductive behavior (Knight and Cole 1991). Over time, energetic losses from flight, decreased foraging time, or increased stress levels come at the cost of energy resources needed for an individual's survival, growth, and reproduction (Geist 1978).

Most research studies look at an "area of influence". These areas are described as areas where "wildlife may be displaced from otherwise suitable habitat due to human activities" (Taylor and Knight 2003). This displacement may not only be from suitable habitat but my also displace wildlife from high quality habitat to poor quality habitat that results in an overall loss of body condition. These areas of influence can be different for each species and each activity. The effects of disturbance on ungulates can be inferred by quantifying behavioral states and changes in time devoted to specific activities. If a disturbance causes ungulates to reduce foraging time and/or increase energy expenditure by moving away from disturbances, or simply by moving more, then they experience a net energy deficit attributable to disturbance avoidance. Stankowich (2008) reviewed the extensive literature on flight responses of ungulates (including elk) following disturbance and found broad evidence that human activity consistently evokes avoidance behavior in this group.

Stress is not always something people consider as it relates to impacts on wildlife. Studies measuring the levels of glucocorticoids stress hormones produced by the adrenal gland have shown that wildlife does indeed react to stress. It would be wrong to assume that the most responsive animals are those that are most vulnerable to disturbance... an animal that shows no behavioral response (fleeing) is estimated to have an (energy) cost of zero but this animal is much more likely to suffer stress related impacts; therefore, the estimated energy cost based on behavior are underestimated and although the energy cost is low does not mean that the impact of the stimulus is low. Stress may have a greater impact than an immediate response to disturbance. (Beale et.al. 2007). In other words; if an animal does not show the behavior of fleeing this does not mean that there is not an impact to that animal of a higher degree than an animal that flees.

The loss of winter range within the Eagle Valley for both deer and elk has resulted in a decrease in population levels. When increased human population and recreational pressures are added to the loss of habitat, even trying to maintain the current deer and elk population is questionable.

The development of trails though intact habitat blocks does result in habitat fragmentation for many small mammals and birds. Trying to quantify these impacts is much more difficult. Whenever possible in areas that have already had significant fragmentation from housing development, roads and trails, any remaining blocks of intact habitat should be protected.

Few studies have examined how recreationists perceive their effects on wildlife, although this has implications for their behavior on public lands. A survey of 640 backcountry users on Antelope Island was completed to investigate their perceptions of the effects on recreation on wildlife. Approximately 50% of recreationists felt that recreation was not having a negative effect on wildlife. In general, survey respondents perceived that it was acceptable to approach wildlife more closely than our empirical data indicated wildlife would allow. Generally, recreationists held members of other user groups responsible for stress or negative impacts to wildlife rather than holding members of their own recreational user group responsible (Taylor and Knight 2003).

The attached maps (Figure 1 - 4) show deer and elk habitats and the area of influence associated with both the species and the recreational activity. Deer areas of influences are from Taylor and Knight 2003. Elk areas of influences are from Wisdom et.al 2005.
Figure 1) Mule Deer 100 meters on both sides of the trail for mountain bike and pedestrian.
This is based on recreation activities being limited to on the trail only.
Figure 2) Mule Deer 390 meters on both sides of the trail. This is based on recreational activities that may leave the trail in locations.
Figure 3) Elk 500 meters on both sides of the trail for pedestrian.
Figure 4) Elk 1500 meters both sides of the trail for mountain bikes.
Figure 5) Chart showing the acres for each habitat type and also the area of influence for the recreational activity.

When you look at the overall available habitat within the Town of Avon there are three areas that stand out.

- The Village at Avon
- Private conservation property
- Metcalf Creek

These three areas provide the majority of the intact wildlife habitat remaining in the town limits. The Village at Avon is already approved for development, leaving just 2 remaining undeveloped parcels. The private conservation property has its own restrictions on development.

Metcalf Creek provides a significant block of intact wildlife habitat and a corridor from within the town out to the USFS boundary that allows wildlife to utilize this drainage without having to cross roads or developed home sites. Developing the proposed trails within the Metcalf Creek drainage would negatively impact wildlife habitat and the ability of wildlife to use it as a movement corridor. As shown in Figure 1, the map for mule deer using the 100 meter area of influence on each side of the trail shows that the entire lower drainage of Metcalf Creek is impacted by these trails. When you include Figures 3

and 4 for elk you see that the entire Metcalf Creek drainage is impacted. The West Avon Parcel has the same scenario; the current density of trails impacts the entire parcel.

The CPW would recommend the following.

- No trails (P1, P2, P3, P4, P5, P7) are developed within Metcalf Creek.
- No additional trails (P8) are developed within the West Avon Parcel.
- P6 be developed, no closure required.
- Trails M2 and M3 be developed but closed in for winter season Dec 1 to June 15.
- Trails M4-6 not be planned until the conservation easement for East Avon Preserve is completed. These trails may have limited wildlife impacts depending on the final development of the Village at Avon.
- Trails should avoid drainages and riparian areas whether the creek is year round or seasonal. These areas are natural movement corridors for wildlife and provide runoff filtration to prevent sediment loading in the creek.
- Complete a raptor survey to determine if there are active raptor nests within 100 meters of the trails. If raptor nests are located the trail should be closed until the young fledge.
- No commercial use
- No race events
- Use between sunrise and sunset; only

Mitigation measures:

Seasonal closures: These can be somewhat tailored to the area. The Avon trails are within deer and elk winter range and the deer migration corridor. The winter period has been in the past described as Nov 30 to April 15. Clearly this does not fit all winters and the occurrence of late spring storms can easily move animals back to winter range areas. These dates were based on a period when deer and elk would be expected to start moving to transitional range directly above the winter range areas. This was also prior to the dramatic increase in mud season recreational activities and development of western slope. In order for a seasonal closure to be effective it must extended until the adjoining transitional range is melted out enough to meet the nutritional requirements for wildlife. Since deer and elk are in their third trimester adequate nutrition is critical to provide the female with enough energy for not only her survival but also enough for the fawn/calf development and enough to start lactation at birth. Lactation is the most energetically expensive activity for any mammal. Having areas open during migration and fawning could increase fawn predation and impacts on nesting birds.

Because the proposed project is within the deer migration corridor it is important to consider the timing for the peak of spring migration. The peak of the deer migration thru the Mud Springs underpass at Dowd Jct is approximately May 26 to June 12. (Alldredge and Phillips 2000, unpublished report).

Based on the research studies documenting the importance of spring and summer nutrition, the impacts from change in behavior patterns we now are recommending winter closure dates of Dec1 to June 15.

Elk:
The impact from human disturbance during elk calving (Phillips, Alldredge, 2000, et. al.) has been documented. Closure periods for elk calving should be May 1 to June 30. Winter closure for elk should be December 1 to June 15

Thank you for the opportunity to provide these comments. The CPW looks forward to providing additional comments if this project proceeds. If you have questions please contact DWM Bill Andree at 970-328-6563.

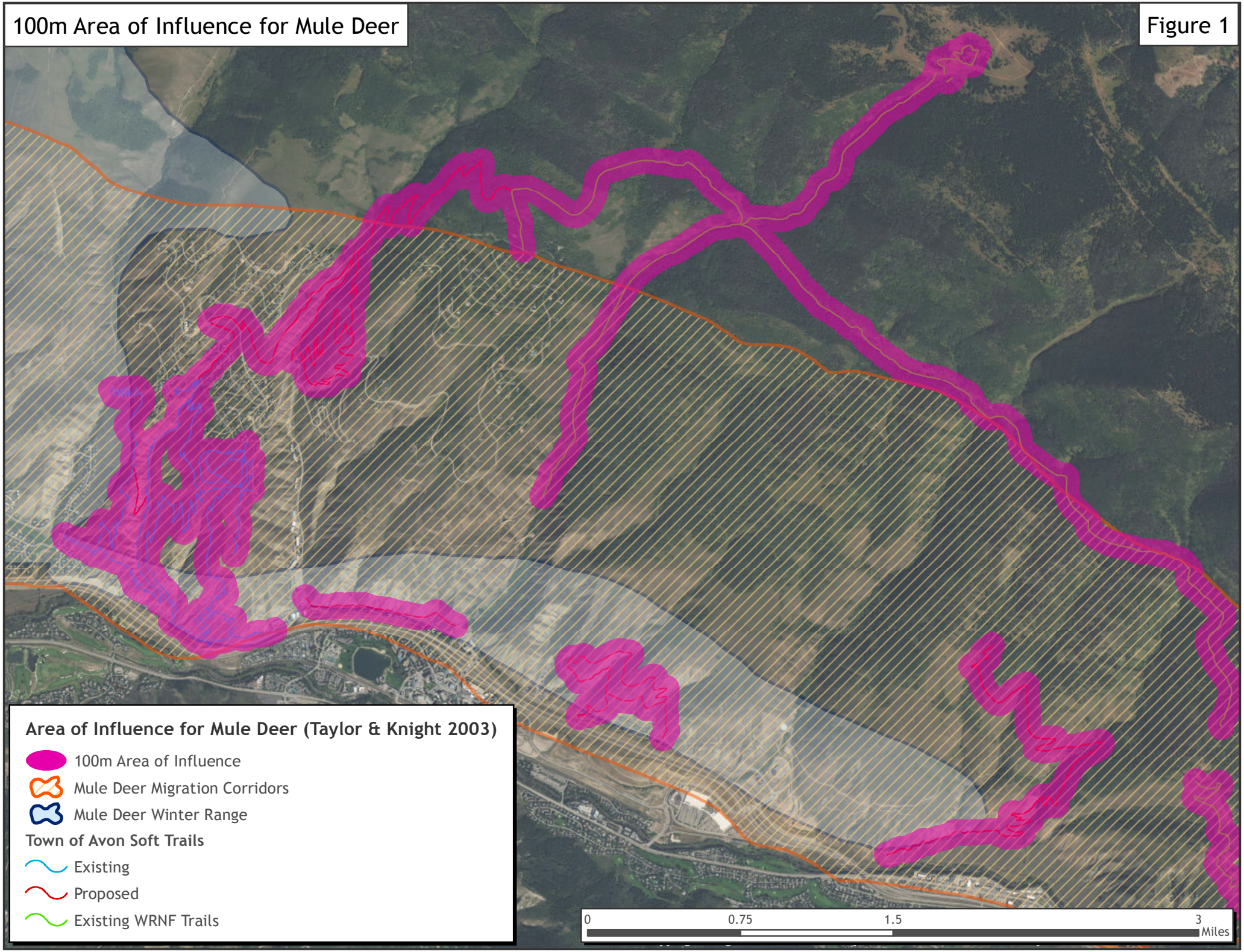
Sincerely,

Perry Will
Area Wildlife Manager

cc: R.Velarde, B.Andree, file

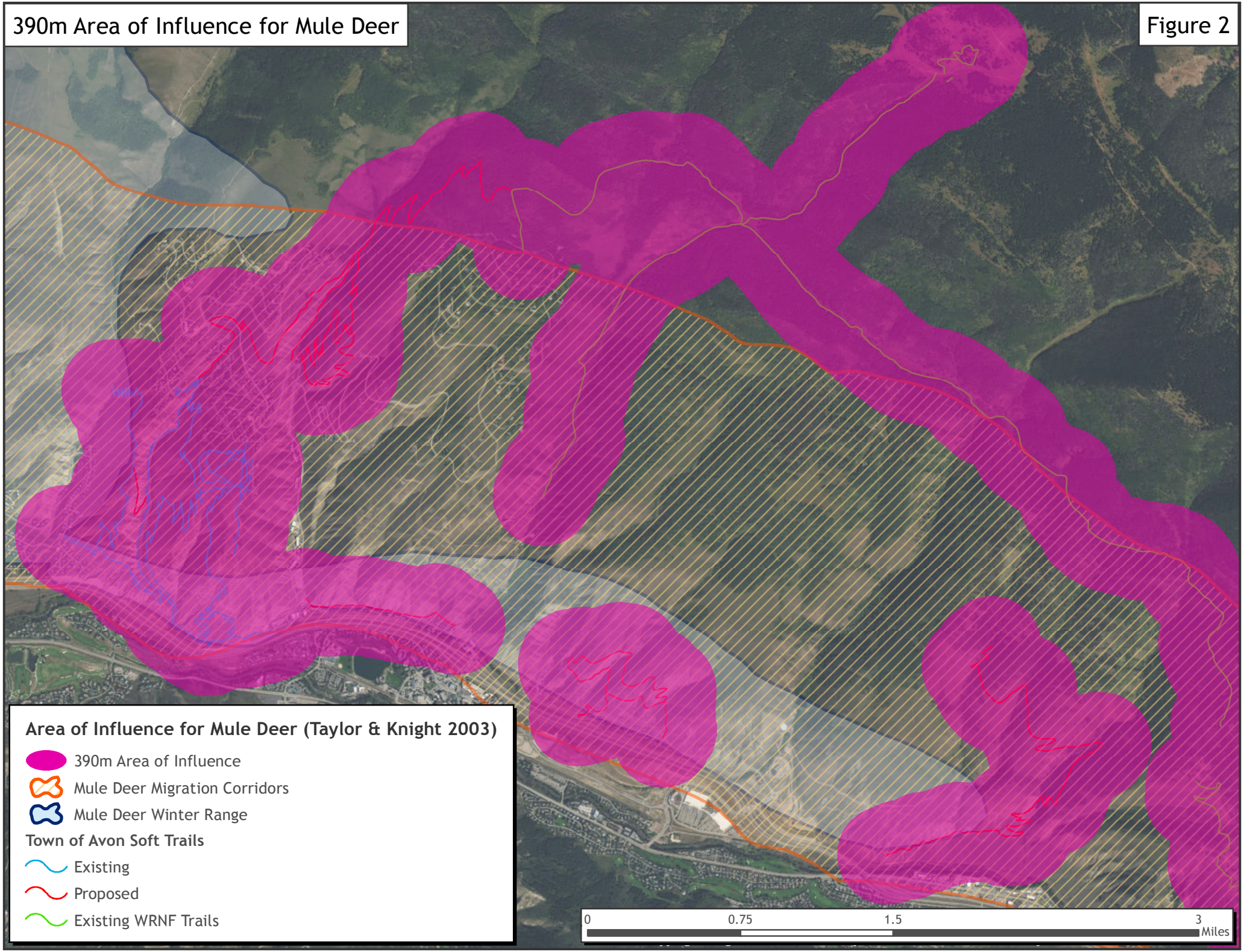
100m Area of Influence for Mule Deer

Figure 1



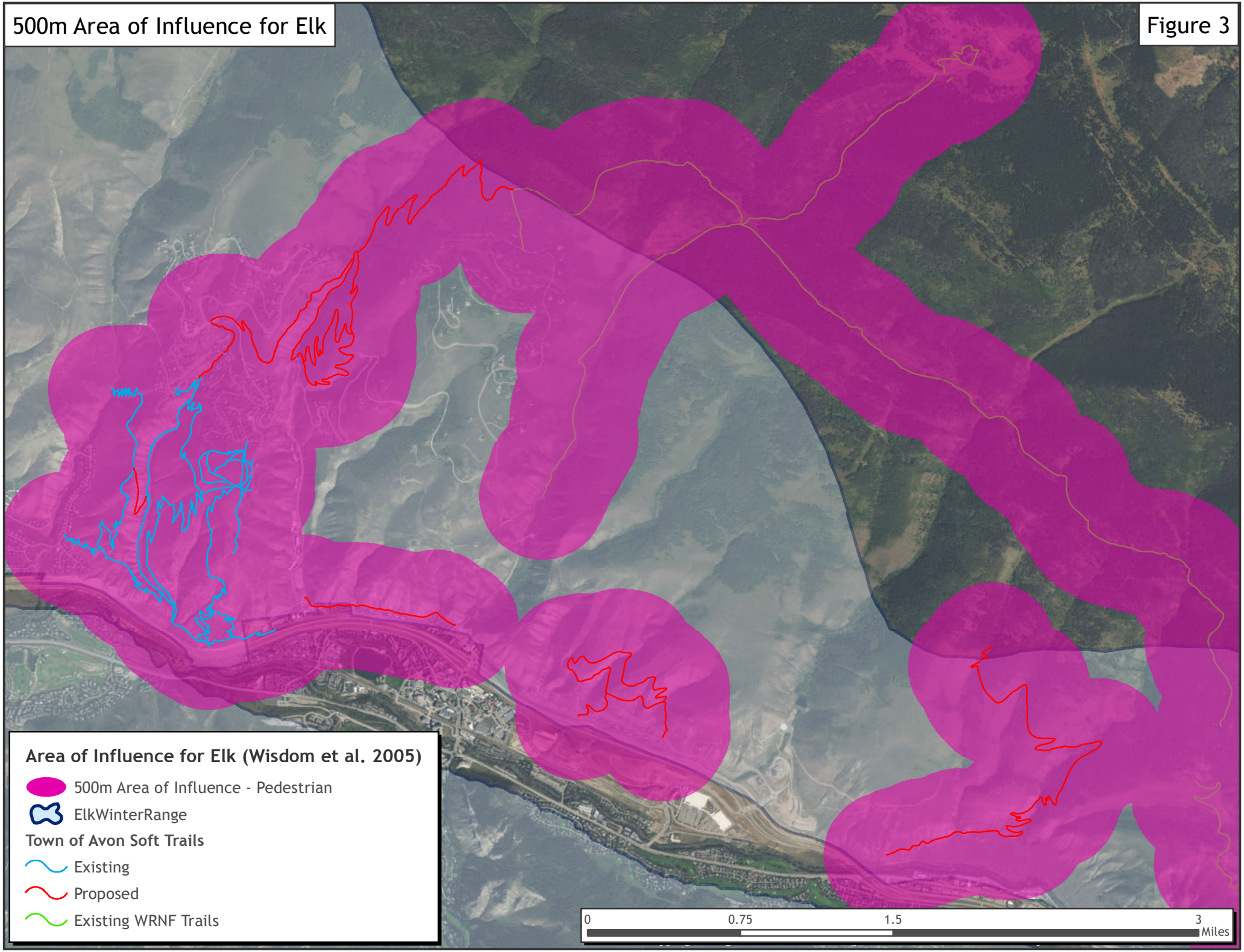
390m Area of Influence for Mule Deer

Figure 2



500m Area of Influence for Elk

Figure 3



1500m Area of Influence for Elk

Figure 4

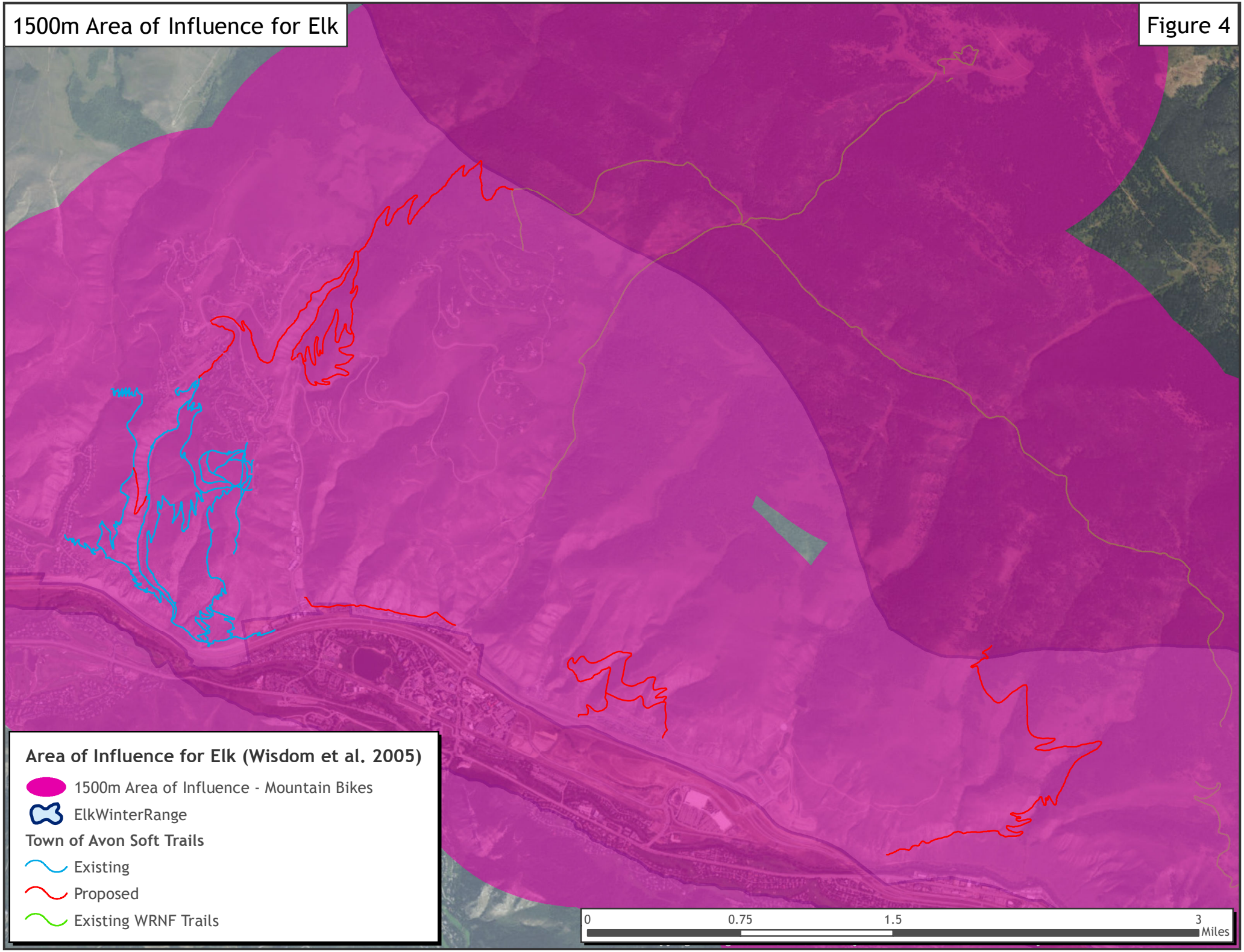


Figure 5

			Trail Areas of Influence (AOI) from Literature:							
Acreage Categories:	**Within TOA**	**% of TOA**	**100m AOI**	%	**390m AOI**	%	**500m AOI**	%	**1500m AOI**	%
Total Acreages	5436.04	100%	1081.00	20%	2579.80	47%	3059.79	56%	5180.06	95%
Elk Winter Range	4505.22	83%	1046.23	23%	2312.91	51%	2691.33	60%	4411.47	98%
Deer Winter Range	1027.97	19%	308.03	30%	632.55	62%	722.21	70%	1027.97	100%
Deer Migration Corridor	4735.72	87%	1070.79	23%	2438.29	51%	2825.70	60%	4624.48	98%

Example:	Of the 1027.97 acres of MD winter range habitat within the Town of Avon, 308.03 acres or 30% is indirectly impacted by proposed and existing trails when a 100 meter buffer is applied.