# A Spatial Analysis of Human-Wolf Conflict Risk in Montana

## The Northern Rocky Mountain Gray Wolf

The northern rocky mountain gray wolf *(Canis lupus)* population met biological recovery criteria in 2002, and the species was removed from the federal endangered species list in March of 2008.

The growth of the gray wolf population in Montana has triggered an increase in human-wolf conflicts. Between 1995 and 2007, a total of 803 domestic livestock were killed by wolves. In response, 328 wolves were killed by humans within the same time period.

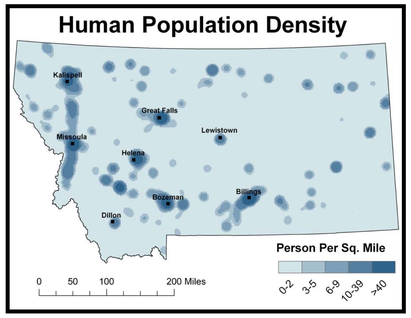
Currently, Montana law mandates that wolves can only be legally killed during an official hunting season or if the wolf is seen actively killing or threatening domestic livestock.

Non-lethal deterrents to wolf management, such as electric fencing, guarding/herding animals, increased human presence, night pens, and siren warning devices are encouraged to prevent needless killing of Montana's wildlife.

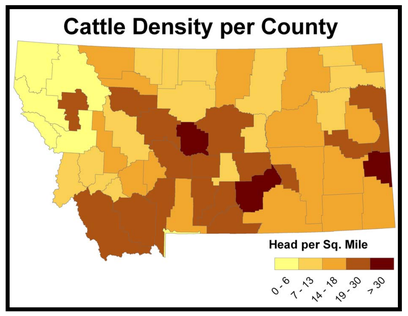
Currently, about 420 wolves inhabit Montana in about 73 packs and 39 breeding pairs.

(Montana Fish, Wildlife, and Parks)

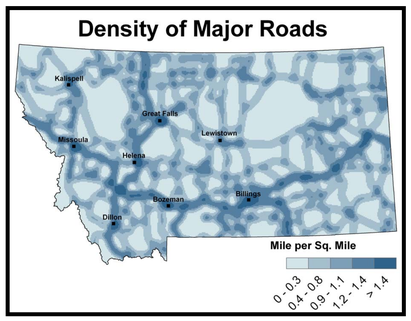
## Anthropogenic Risk Factors



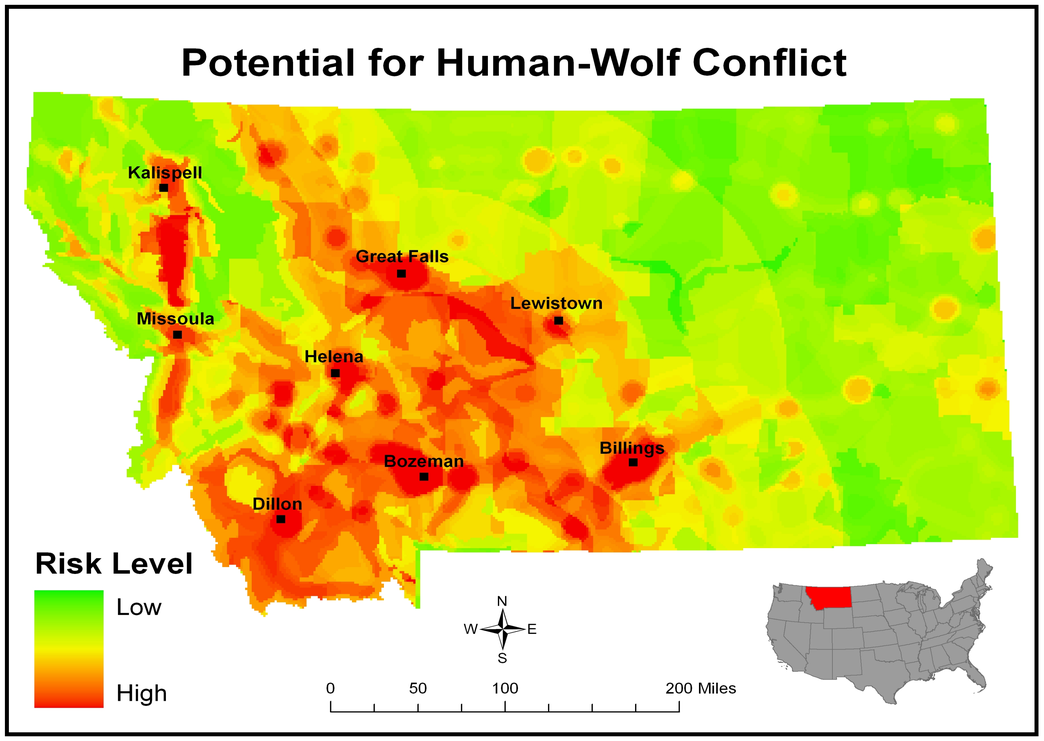

Human pop. density is an indicator of hunter effort and habitat change due to human development (Nesslage *et al.* 2006). Also, the vulnerability of wolf populations is directly related to human presence (Le Lay *et al.* 2001). Therefore, human pop. density is an important gauge of human-wolf conflict. Density was divided into five categories and densities of >10 humans per sq. mi. were considered at high risk of conflict (Harrison &Chapin 1997). Human population density was weighted with a score of three.




Though regions of dense human populations are likely to initiate conflict with wildlife, the majority of human-wolf conflicts occur in rural regions of Montana, where human populations are sparse and the domestic livestock populations are abundant. Thus, this analysis includes cattle density as an indicator of potential human-wolf conflict. Cattle density per county was divided into five categories and densities of > 19 head of cattle/mi$^2$ were considered at high risk. Cattle density was assigned a weight of four.




Wolves tend to avoid regions of high road density. In fact, a study by Fuller (*et al.* 1992) determined that 88% of wolf packs were found in townships of <1.1 mile of road per sq. mile. However, it is important to consider the proximate location of roads to farms, livestock pastures, and other potential areas of human-wolf conflict. For this analysis, road density was divided into five categories and densities of >1.1 mi/mi$^2$ were considered at high risk of conflict. Road density was assigned a weight of one.

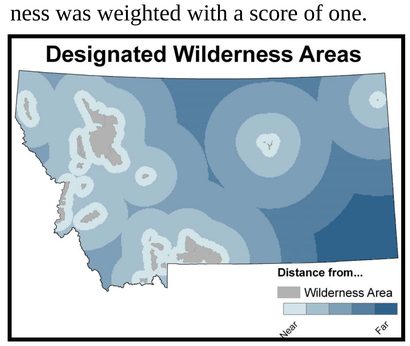



## Assessing Risk

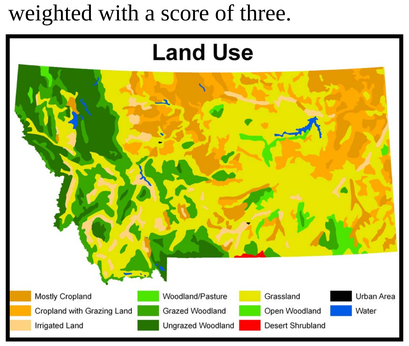
Each anthropogenic risk factor and environmental suitability factor was scaled on a range from 1 (greatest risk/least suitable) to 5 (least risk/most suitable) and then weighted according to overall importance to human-wolf conflict potentials. A weighted sum function was performed to overlay each risk factor to generate the final map of potential human-wolf conflict in Montana. While large-scale spatial analysis and modeling has been applied in previous studies of habitat suitability and human-wildlife conflict risk (Mladenoff *et al.* 2005), this study is the first to focus on recovering wolf populations in Montana. The goal of this analysis is to inform wildlife managers and urban planners of the potential human-wolf conflict zones in Montana to help mitigate conflict before it arises, as well as to encourage further use of Geographic Information Systems and other spatial analyses in the field of conservation biology.

## Environmental Suitability Factors

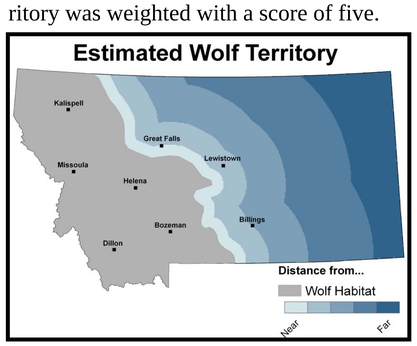
Designated wilderness areas are federally protected plots of land designated for the preservation or their natural condition. Thus, the closer a wolf pack is to wilderness, the lower the conflict risk. Wilderness was weighted with a score of one.




Harrison and Chapin (1997) concluded that woodlands and mixed forest/cropland were the preferred habitat for wolves. In the analysis, land use was scored as either ideal, suitable, or unsuitable, and was weighted with a score of three.




Wolf packs are concentrated in Eastern Montana, so there is a greater likelihood of conflict in this region. Potential conflict decreases with increased distance from this territory. Distance from wolf territory was weighted with a score of five.





**Literature Cited:**

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**Cartography:**
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May 2008
**Projection:**
NAD 1983
Montana State Plane
FIPS 2500
**Sources:**
U.S. Census 12000, Department of Agriculture 2006, Geographic Data Technology 2000, Montana Fish Wildlife and Parks 2005, Montana State Library 1993, and Montana Natural Heritage Program 2003