

In cooperation with the Colorado Division of Wildlife, Bureau of Land Management, U.S. Forest Service, and National Park Service

# Roads and Traffic: Effects on Ecology and Wildlife Habitat Use Applications for Cooperative Adaptive Management

## Vehicles in Wildlife Habitat

The land of the United States is dissected by more than 4 million miles of roads that fragment wildlife habitat on both public and private lands. Traffic on these roads causes additional effects. On secondary roads, which provide access to the most natural habitat, the levels, timing, and types of traffic are seldom known. In order to understand the effects of traffic on wildlife, USGS is conducting research cooperatively with the Bureau of Land Management, the U.S. Forest Service, the National Park Service, and the Colorado Division of Wildlife.

## Simultaneous Observations of Traffic and Wildlife

The key to understanding the effects of traffic on wildlife is to observe traffic and wildlife simultaneously. Several traffic monitoring technologies permit the observation of vehicles; the most common is the familiar pneumatic counter with hoses stretched across the road. This type of counter registers time of

vehicle crossing, speed, wheelbase, and number of axles. This information allows USGS scientists to separately count full size vehicles, vehicles towing trailers, off highway vehicles (OHVs), and trucks that may be used in extractive operations such as logging. Vehicles can also be counted using magnetometers and other sensors, but because these devices do not deliver information about vehicle type and speed, scientists use them only for special applications, where pneumatic counters are impractical.

Global Positioning System (GPS) instruments are now available for wildlife monitoring. GPS collars for medium and large animals operate for months or years, internally storing data on positions and times. Data from the collars can be downloaded over a radio link, so scientists can learn how animals are moving while the collars remain in place to collect more positions. Expected advances in miniaturization will soon permit GPS tracking of medium-size birds such as sage grouse.

With simultaneous application of these technologies, researchers can determine traffic effects on selected species. Analysis of traffic

and animal movement is done over multiple time scales because some animals may not respond immediately to traffic, but instead may respond to longer term changes in average traffic levels or in types of vehicles.

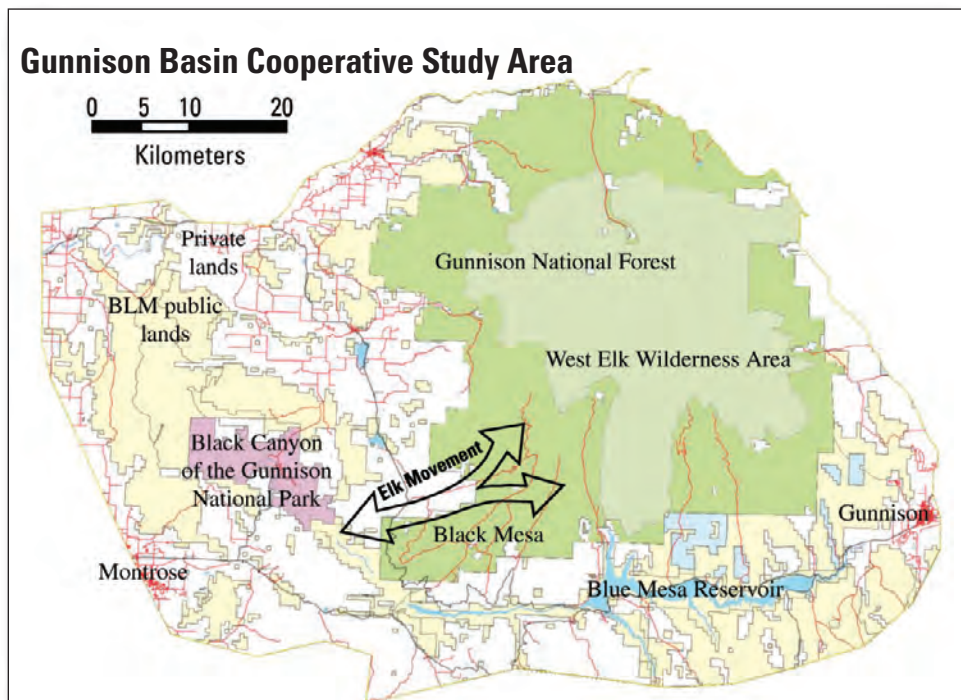
## Gunnison Basin Studies

The Gunnison Basin of western Colorado has two important species that may be disturbed by traffic, with attendant management consequences: elk (*Cervus elaphus*) and Gunnison sage grouse (*Centrocercus minimus*).

## Elk Movement and Vehicles

Elk migrating between summer range on Black Mesa and in the West Elk Mountains, and winter range along the northeast rim of the Black Canyon of the Gunnison, have an increasing population. A working hypothesis advanced by the Colorado Division of Wildlife is that late summer OHV traffic on Gunnison National Forest fosters early movement of the herd to its winter range. There, in Black Canyon of the Gunnison National Park and on nearby private land, the herd finds refuge from hunting with the result that elk populations cannot be managed effectively. The large numbers of grazing elk compete with cattle for fodder on private lands, and on public lands they move through sensitive sage grouse habitat.

USGS is collecting its second season of vehicle data along the elk migration route, and in late 2005 will place collars on approximately 20 elk. Later placement of an additional 30 collars will bring the total count to 50, a number sufficient for definitive study. After two to three years of observation, as GPS locations continue to be acquired, answers should emerge as to the extent that vehicles influence the timing of elk movement. If managers make changes in their traffic policies, then continued observations will determine whether management changes are having the desired effect.



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## Human Impacts on Sage Grouse Habitat Use and Movements

Sage grouse exhibit elaborate mating rituals at courting sites known as leks. Bird watchers and other members of the public understandably want to observe these behaviors, but it has long been observed that grouse abandon their leks, and therefore their breeding activity, when disturbed by humans. Breeding may also be disturbed by large animals, such as elk and cattle.

Breeding success is particularly important for the Gunnison grouse; in 2000 its population was estimated at 4000 birds, less than 1% of the 1950 estimated population, and its range is now fragmented into 8 distinct areas. Roads may be a factor in the Gunnison Sage grouse population decline, for a number of reasons including disturbance by vehicles and increased vulnerability to predators. Power lines are often associated with roads and add risk by providing perches for predators.

During the spring of 2005, USGS monitored motorized vehicle use on a network

of roads that give access to Gunnison sage grouse leks. This was the first monitoring program that provided local land managers with definitive, quantitative information about the number of vehicles present during the breeding season. Scientists from the cooperating agencies and from Western State College have been planning an augmented observation program involving GPS tracking of cattle in order to better understand possible disturbance of grouse breeding by livestock. Quantitative disturbance data will provide a basis for consideration of adaptive management options, including restriction of grazing during the grouse breeding and rearing seasons of spring and early summer.

## Long Term Monitoring of Sage Grouse Habitat

Habitat responds constantly to weather, land use, invasive species, and other factors. Traffic disturbance occurs against this changing background, so USGS and BLM have designed a habitat monitoring program, using high resolution satellite imagery, as a companion to traffic and grouse monitoring. These

observations will document changes in the road network, general type of vegetation, and vegetation canopy. Observations are planned four times per year for thirty years.

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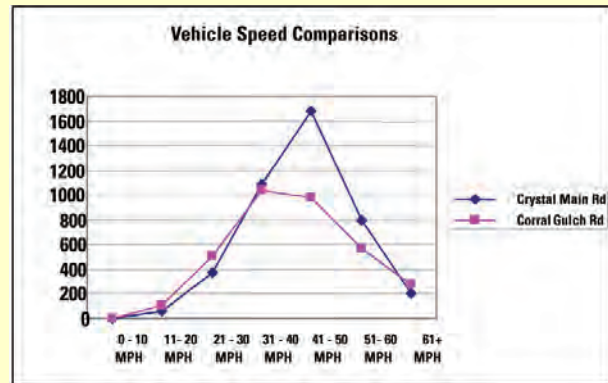
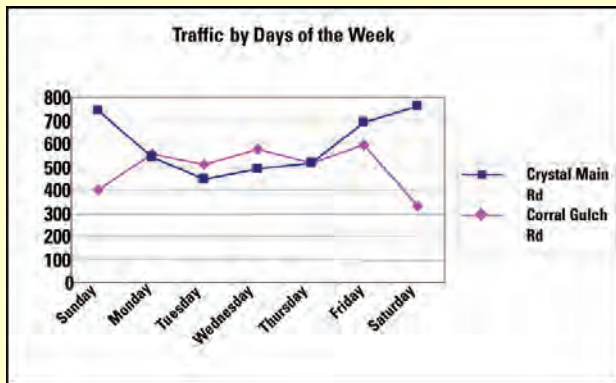
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These graphs illustrate summary traffic data for two roads in the Gunnison Basin. Corral Gulch Road gives access to a logging lease on Gunnison National Forest, and has higher traffic levels (and larger vehicles) during the week. Crystal Main Road is similar but used primarily for recreation; it has higher traffic levels on weekends. Higher speeds and traffic levels on the recreational road may imply higher risk of vehicle-animal collisions.

