

Name : Muhammad Shoaib

ID : 16093

Department : BS (civil Engineering)

Subject : Architecture

Section : (A)

Impacts of highways and buildings on agriculture lands

Roads are increasingly common in today's world as human development expands and people increasingly rely on cars for transportation on a daily basis. The United States contains over 4 million miles of roadways and an estimated 20% of land in the country is impacted by the presence of roads.¹ This large network of roads has dramatically altered the landscape and can impact wildlife in a number of deleterious ways. In addition to causing mortality, roads can also shift population demographics and be a source of pollution into the environment. Studying the ecological impacts of roads is an important area of study in conservation biology and environmental science, as the impacts often extend far beyond the surface of the road itself.

Mortality & Population Declines

When animals cross roads, mortality is often the result. In fact, road mortality is the leading source of mortality to many wildlife populations and an estimated 1 million vertebrates die on roads every day in the United States.² This rate of mortality can severely threaten animals and has been identified as a leading cause of decline in some populations.

While the consequences of road mortality can be severe, many factors influence the degree to which roads impact particular animal populations. When a road crosses through an animal's preferred habitat, the chances increase for road mortality. For example, Highway that passes over a lake inhabited by many turtles has been shown to have very high turtle mortality rates and be one of the most dangerous roads for wildlife in the country. Particular behaviors also put some animals more at risk. Chimney swifts eat insects and fly close to the ground as they follow prey. When these birds follow prey that fly over roads, it increases their chances of being struck by a car. Groups of animals like amphibians that have regular mass migrations are also particularly vulnerable.

Some animals are prone to road mortality due to their natural defense mechanisms, which although effective when dealing with natural predation, are often poorly equipped to handle the

dangers posed by cars. Turtles often perceive cars as a threat and draw into their shell to protect themselves, which can put them at risk for getting struck by a car because they stay on the road longer. Snakes may also become immobilized when approached by a car and may remain immobilized for a minute after a car passes. Venomous snakes may be less inclined to flee from a perceived threat because they typically use venom for defense. Turkey vultures that normally fly away from predators may be unable to initiate flight quickly enough when approached by a fast-moving vehicle. The way in which animals naturally respond to threats may increase their risk of being struck by cars.

Animals may also be attracted to the road surface. Reptiles like snakes and turtles sometimes bask on the warm asphalt of the road to regulate their body temperatures. Many scavengers prey on the carcasses of animals that have been killed on the road. These kinds of behavior increase the risk of mortality as they cause animals to spend more time around the road.

Rates of mortality are closely linked with movement patterns, as more movement generally incurs a greater chance of coming into contact with a road. Animals with large home ranges, such as Florida panthers with ranges of up to 630 km², have a high chance of encountering roads as they traverse such large distances.⁸ Movement during particular life stages can also result in peaks in mortality. These patterns are often associated with reproduction, as when gravid turtles undergo migrations to seek out a site to nest. In some snake species, the male can increase its home range up to 6 times as it searches for a mate. Many reptiles begin dispersing immediately after hatching, which also results in mortality peaks.¹⁰ In red foxes, the female repeatedly visits cubs at breeding sites, sometimes up to 10 times in a single night, which increases the chance for mortality. Some studies have reported movement rates as the single greatest factor influencing the risk of road mortality.

These specific factors that influence mortality can also result in demographic shifts in the population when particular segments of the population are killed. For example, aquatic female turtles make egg-laying migrations that males do not make, which puts them at a greater risk for mortality. As a result, turtle populations near roads can become male-biased as females are differentially killed. These types of shifts can further exacerbate population declines and threaten population viability. In some populations, the presence of roads has been identified as a component in the “extinction vortex” by amplifying the threats animals already face.

In addition to causing direct mortality, roads can have a number of indirect impacts such as habitat fragmentation. This can result from either animals not being able to cross the road without being killed or through avoidance of the road. For example, some snakes have been shown to turn around and not cross the road when they encounter it. Some animals avoid the surface of the road even when there are no cars driving on it. Birds that typically fly short distances from one tree to the next may also be hesitant to fly across a large open space, which restricts their movements across roads.

When roads create barriers to movement they can impact animal populations in many ways. One of these is through prohibiting gene flow. For example, in timber rattlesnakes, a study of genetics at hibernacula showed that in hibernacula that were blocked off by roads, genetic diversity was lower than in those that occurred across contiguous habitats. Additionally, some male snakes follow trails of pheromones along the ground in order to locate mates.

