Impacts of roads through protected areas biology essay

Science, Biology

General Ecology

Lorin

Abstract:

Protected areas across the world face threats of a wide variety. The installation of roads through protected areas seems harmless on the surface; used as a means to increase economic wealth by creating easy access to natural resources, and providing an avenue to support the transportation of these resources. However, research has shown that road installation throughout protected areas has a great ecological impact; it threatens the ecosystem, and causes fragmentation of a once continuous habitat. One immediate affect we see is road kill. Animals don’t recognize a road as a hazard and because it may have cut their territory in half they will attempt to cross it to reach food, water, or a mate. Snakes and other ectothermic animals will use the hot pavement as a heat source to acquire energy after cool nights. Because they won’t have the energy to move quickly enough, vehicles will run over them pretty easily. The road kill issue is discussed in Llorente’s article titled. " Are Protected Areas Truly Protected? The Impact Of Road Traffic On Vertebrate Fauna." It goes on to say that amphibians are victims of road kill more often in protected areas than in unprotected areas. We’ve also learned that road construction can also change animals behavior which was suggested in a study titled " Roadless Wilderness Area Determines Forest Elephant Movements in the Congo Basin" and " The Genetic Rescue of the Florida Panther." Additionally, there are several other

studies that have analyzed landscape-scale habitat use and road-kill impacts.

Introduction:

The increase in human population directly correlates with the increase of road networks. Road construction destroys habitats, creates population fragmentation (Mader 1984), and consequently vertebrate mortality (Forman and Alexander 1998; Trombulak and Frissell 2000; Lesbarre`res et al. 2003; Malo et al. 2004). Fragmentation alone creates serious negative impacts on a habitat by decreasing biodiversity, genetic diversity and edge effects. An example of this can be demonstrated by the Florida panthers which show firsthand the loss of genetic diversity due to habitat fragmentation. Fragmented systems may also favor the spread of disease, pests, and/or invasive species through an area (Janssen 2012). Species from across the globe face the impacts of roads. Amphibians and reptiles are the most affected by roads in protect areas in Catalonia. In Australia, the common wombat has experienced great losses that have affected the overall species. Another example, of the negative impacts is found with the Congo Basin’s forest elephants which of course are not road kill victims, but the roads change their behavior and routine. As discussed earlier, the Florida panther is an excellent example of the negative effects of habitat disruption.

The Florida panthers

The panther’s population has dramatically decreased due to fragmentation of their habitat. Interstate 75 and other highways have separated Florida habitats for the panthers. Fragmentation has reduced the amount of area the

panthers have to find food and a mate. For the most part, they are confined to an inverted " L" shape region north of Interstate 75. However, purebred panthers were found in the Fakahatchee Strand State Preserve, Big Cypress National Preserve, and the Everglades National Park located south of the Interstate. (Pimm 2006)Once a habitat is separated, the population of a particular animal will begin to decline rapidly because they will be compelled to make dangerous road crossings to reach resources that were previously available. The animals will not adapt to the new dangers until several other animals are killed and they see the threat first hand. Habitat Fragmentation leads to the edge effect. This occurs on the outskirts of the habitat, it is the areas in which the forest’s tree line ends and meets up against an open area. This area provides little to no protection and the animals face a higher threat of predation. Below are two photographs (Figure 1 and Figure 2) (USDA 2013) that provide a visual example of a fragmented area where edge effect occurs. There are two habitats in Figure one; between them lays the open corridor where animals are more vulnerable to be hunted by other animals or humans. Figure two, shows the opposite; the wooded corridor faces edge effect on two sides. If we consider these the open corridors being a major highway we can see the potential for negative effects. Figure 1Figure 2Fragmentation causes serious challenges such as a decline in biodiversity created by secluding members of a population from the rest the population in that area. Once a population becomes limited to one area, mate selection decreases which creates weaker inbred offspring. Mate selection has decreased in Florida causing the panthers to mate with panthers that are related to them. This has limited the genetic diversity creating several health

and survivability problems. This inbreeding has led to physical abnormalities that include, kinked tail, cowlick, sperm defects, heart defects, and 90% of males born after 1990 had one or both testicles undescended (Primm 2006).

The solution to rescue the Genetics

Researchers believed that the solution to this problem would be to release eight female panthers taken from Texas and introduce them in Florida in an effort to increase genetic variability. The Florida panther's population did increase its numbers and range as a result of the release. The Texan cats did not remain in Florida very long; some cats were killed, died, or were removed by 2003. From the 1992 Texan panther release, researchers marked 118 purebred and 54 hybrid kittens; 13 purebreds, and 20 hybrids of the panther's marked, survived long enough to receive an ' adult' number. This demonstrated that the hybrids had a three-fold advantage in survival over the purebreds (Primm 2006). However, not all scientists were supportive of this type of rescue because of the cost and the logistics of having to repeatedly bring in other panthers to keep them from going extinct. Many scientists felt that restoring and protecting more habitats was a better course of action because habitat loss is the main reason why species are threatened. Bringing in more panthers won't solve the problem because there is no longer a suitable habitat to support them so their numbers will decrease again in time (Primm 2006).

Related Work

Amphibians in Catalonia

Amphibians and reptiles killed in highly protected areas in Catalonia are represented in the article " Are protected areas truly protected? The impact of road traffic on vertebrate fauna". Catalonia ranges 41 countries which includes14 Natural Parks and one National Park. The point of this article is to test for four objectives; " Are there more road kills in spring (breeding season) than in autumn (dispersion season)? Is there any difference, in terms of number of road kills, between vertebrate groups? Does climatology affect the number of casualties by, for example, increasing amphibian road kills in the rainiest areas? Do protected areas register a higher incidence of road kills?" (Gustavo 2013). Surveys were performed by bicycle, walking, or even by car at slow speeds (40 km/h). The surveyors surveyed 820 km of 41 roads in two different seasons including spring, the breeding season, and autumn, the dispersion season. There were no distinct differences in road kill based on climatic region. There was however, a number of road kills linked to areas with protected status. The highest numbers of road kills occurred in highly protected areas. More amphibians and reptiles were killed in protected areas than mammals and birds. In unprotected areas mammals and birds were more likely to be killed. A total of 2, 013 road kills we recorded; 853 in spring and 1, 160 in autumn. The data accounted was composed of 267 mammals, 253 birds, 245 reptiles, and 1, 248 amphibians (Gustavo 2013). This data shows the impacts a road can have through an area that is supposed to be a safe haven for animals.

The Australian common wombat

In Australia, the common wombat is studied to determine the habitat suitability and road mortalities. In the study " Linking habitat suitability and road mortalities across geographic ranges" they modeled their state-wide distribution from atlas records and evaluated the relationship between habitat suitability and wombat road fatalities at that scale. This study also used local-scale fatality data to derive an annual estimate of wombats killed within an optimal habitat area by analyzing landscape-scale habitat use and road-kill impacts of the common wombat. Wombats are very adaptable but they are frequently killed because they don’t exhibit road avoidance or aversive behavior. The study area includes the available habitat in New South Wales in Australia and the Australian Capital Territory (Roger 2013). Results showed that common wombats have a broad distribution (290, 981 km), one quarter (24. 9 %) of their distribution lies within protected areas. The percentage of optimal habitat contained within protected areas is 35. 6 %. But the protected areas have not been a way to block the effects of road kill. The total amount of wombats killed on the roads was as high as 13. 6 % of the total population in New South Wales, Australia.

Elephants in the Congo Basin

There is an abundance of mammal species in the Congo Basin. Studies indicate that the further from a road an animal lives their abundance increases. The hunting pressure on the animals is also at a much higher rate when in close proximity to a road. This is why there is a greater amount of species further from the road. Elephants were studied in " Roadless

Wilderness Area Determines Forest Elephant Movements in the Congo Basin" to investigate the behavior of the Congo Basin forest elephants in relation to roads and road less wilderness areas. Global Positioning Systems (GPS) telemetry collars were used to track 28 forest elephants in six conservation areas. Data from the elephants was to be used evaluate which of the proposed strategies, ‘‘ siege’’ or ‘‘ skirmish,’’ is adopted by the elephants in response to the presence of roads by examining two questions. One; does the size of road less wilderness influence the size of forest elephant home range? Two; do forest elephants cross roads, and if so, do they differentiate between roads inside and outside of protected areas? Collared forest elephants routinely crossed roads that were located inside protected areas. The four elephants collared in Minkebe National Park did not have the option to cross protected roads since they did not exist at their site. Of the remaining 24 collared elephants, 17 individuals crossed protected roads at least once, and many crossed on multiple occasions. One elephant did cross an unprotected road, in doing so, her mean speed increased 14-fold compared to her normal movements (Kock, 2008). The conclusion was that forest elephants tend to adopt a siege strategy in the face of road encroachment, rather than face the dangers associated with skirmishing. Roads have not stopped elephants from traveling but they may avoid them because roads can reduce the resource quantity and quality. Management polices that may help maintain viable populations whose behavior is driven by ecological constraint rather than fear of roads is to " stop new road encroachment into remaining large road less wildernesses, and reduce the factors that promote elephant's fear of roads. No new permanent roads

should be built either around the peripheries of priority elephant conservation areas or penetrating deeper into them" (Kock, 2008).

Discussion:

As we can see, roads pose a significant danger to Wildlife, both inside and outside of protected areas. The results from the articles proved various impacts roads in protected areas can have on wildlife. Fragmentation is a major threat to genetic variation, the health of a community, and invasive species. The lack of genetic variation can lead to deformities and other health issues and a fragmented area can make it easier for disease and parasites. Research in Catalonia of roads in protected area represented the amount of damage a road can do to wildlife. Of the total 2, 013 road kill recorded 1, 248 were amphibians. Wombats killed on the roads of protected areas were as high as 13. 6 % of the total population in New South Wales, Australia. And behavioral changes in forest elephants located in the Congo Basin because of the dangers of roads in correlation with hunting were recorded.

Conclusion:

Protected areas around the world still struggle to fully protect the animals that inhabit them. The human population and expansion is continuously growing and road construction leads to increased lines of communication, economic growth, trade, and access to natural resources. The transportation of these resources and government aspirations to expand create jobs and make money and therefore will continue to be exploited. The examples used were selected from cases in differing parts of the world to demonstrate the

real global impact road construction has on all types of wildlife. Possible solutions to this issue could be providing protected areas with a deer siren type device that can be mounted on a vehicle for as little as $6. 00. This will however only work for larger animals; amphibians and reptiles may go undetected and still be threatened by roads. Another possible solution would be strict enforcement of speed limits accompanied with speed bumps. Finally, a more controversial fix could be widening the roads to provide more maneuver room for drivers who happen upon an animal. This also carries a negative effect of encroaching more into the habitat. However, unless man stops building and expanding road construction will always pose a threat to the animal population.

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