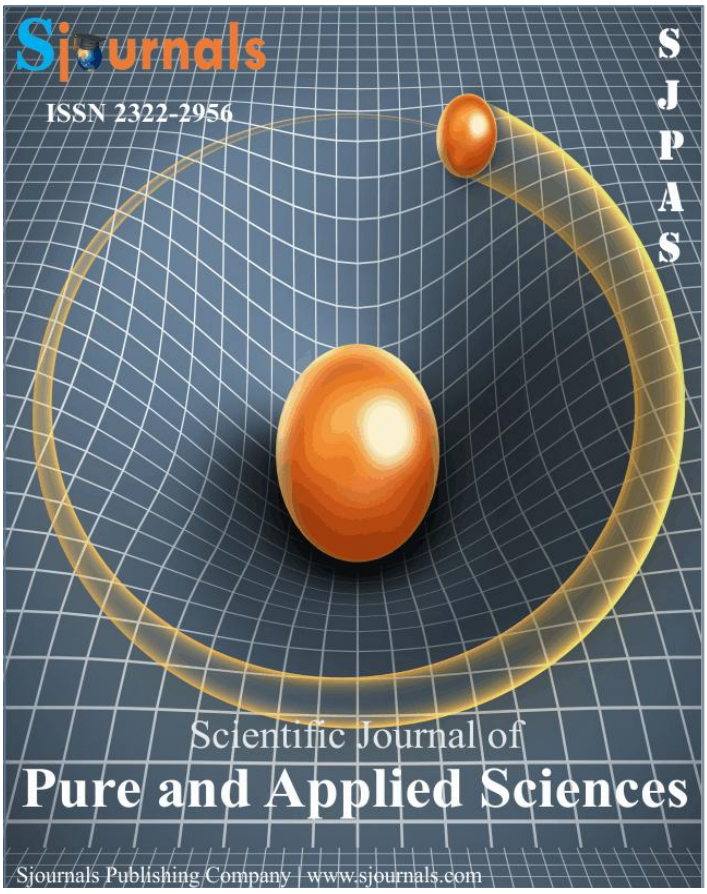

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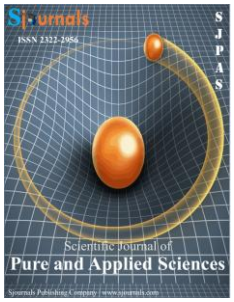

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Short communication

Determining human-elephant conflict hot spots in Hwange

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ABSTRACT

This study predicted the spatial determinants of human-elephant conflict in Victoria Falls town, Hwange West communal area and the resettlement areas of Don Rovin, Mubiya and Kalala. The Garmin GPS receiver, digitizing and observation instruments were employed for collecting human-elephant conflict location. Results indicate that all the areas located close to the forest protected area are vulnerable to human-elephant conflict incidents. Therefore, areas such as Ndlovu, Mvutu, Chikandakubi and Chenamisa in Jambezi are human-elephant conflict hot spots as they share a boundary with the forest. Areas such as Chinotimba and Mkhosana residential area are human-elephant conflict hot spots in Victoria Falls as they share a boundary with both the Victoria Falls and the Zambezi National parks. The resettlement areas of Mubiya, Don Rovin and Kalala are hot spots for human-elephant conflict incidents. This is because the resettlement areas are all located at the boundary of the Fuller forest protected area. It is recommended that a deterrent method such as the installation of electric fence around Victoria Falls town has a great potential of preventing elephants from entering settlements and minimizing human-elephant conflict. For Hwange communal and resettlement areas, land use planners should prevent settlements patterns that leave crop fields vulnerable to crop raiding. Alternatively, land use planners can consider allocating land to other uses besides settlements and agriculture. Integrating the spatial determinants of human-elephant conflict with land use planning has a great potential of offering permanent solutions to the conflict problem.

1. Introduction

Conflict between humans and elephants is one of the greatest challenges currently facing biodiversity conservation. The conflict is a global problem and occurs in situations where agriculture and settlements are located close to elephant sanctuaries (Gandiwa, 2013). Human-elephant conflict refers to the interactions which lead to negative implications for human livelihoods and elephant conservation (Nyirenda et al., 2012). Interactions between humans and elephants become a conflict when people begin to experience negative effects, such as crop raiding, human injury or death or when elephant deaths occur as a result of poisoning and snaring. Providing long lasting human-elephant conflict mitigation remains a challenge due to lack of appropriate predictive models which takes into cognisance both environmental factors and human-elephant conflict. Geographic Information Systems (GIS) provides means for modelling potential determinants of human-elephant conflict and the environmental variables (Prasad et al., 2011). Though the spatial capabilities of GIS offer valuable potential for wildlife management, the application of GIS in human-elephant conflict studies remains largely unexplored. Human-elephant conflict is a spatial phenomenon and so it's important to investigate the effects of spatially explicit factors on its distribution. GIS plays an important role in the analysis of human-elephant conflict. The GIS system allows the integration and manipulation of a range of spatial data and can be used to predict the effects of human-elephant conflict management (Smith and Kasiki, 2011). Quantifying the extent of human-elephant conflict using the participatory GIS is an efficient way to model the spatial aspects of human-elephant conflict (Mutanga and Adjorloolo, 2008). This study, therefore mapped the location of human-elephant conflict hot spots using GIS technology.

2. Data collection

2.1. Global Positioning System (GPS) instrument

GPS is a satellite based technology used for navigation and location of geographic features. The GPS system is made up of a network of 24 satellites placed into orbit by the U.S Department of defence. The GPS satellites circle the earth twice a day and transmit signal information to the earth. The GPS receivers take this information and use trilateration to calculate the user's exact position. The type of GPS receiver which was used for this study is the GPS Garmin Etrex 10 equipment. The GPS Garmin was used to record information on the location human-elephant conflict sites, as well as the position of spatial factors such as fields, settlements, water points, forests and the park.

2.2. Spatial distribution of human-elephant conflict hot spots in Hwange West communal area

Fig. 1 shows the location of human-elephant conflict hot spots.

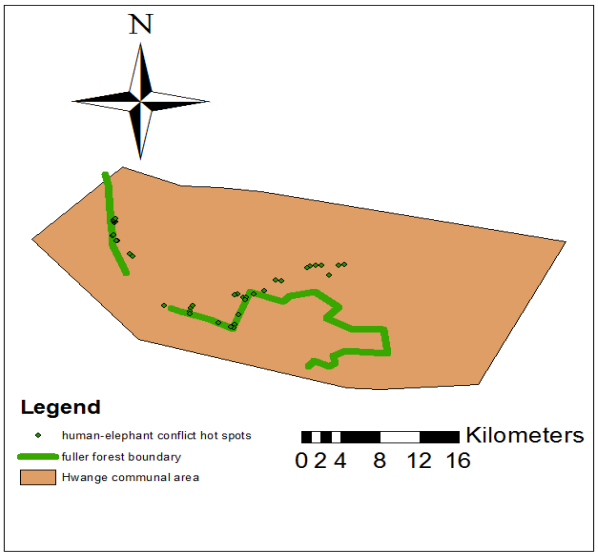

Fig. 1. Human-elephant conflict hot spots in Hwange communal area.

Results indicated that distance from the forest is significantly and negatively related to human-elephant conflict probability in the communal area of Hwange. These findings imply that all the areas located close to the forest protected area are vulnerable to human-elephant conflict incidents. Therefore, areas such as Ndlovu, Mvutu, Chikandakubi and Chenamisa in Jambezi are human-elephant conflict hot spots as they share a boundary with the forest.

2.3. Spatial distribution of human-elephant conflict hot spots in Victoria Falls urban area

Fig. 2 illustrates the spatial distribution of human-elephant conflict hot spots in Victoria Falls town.

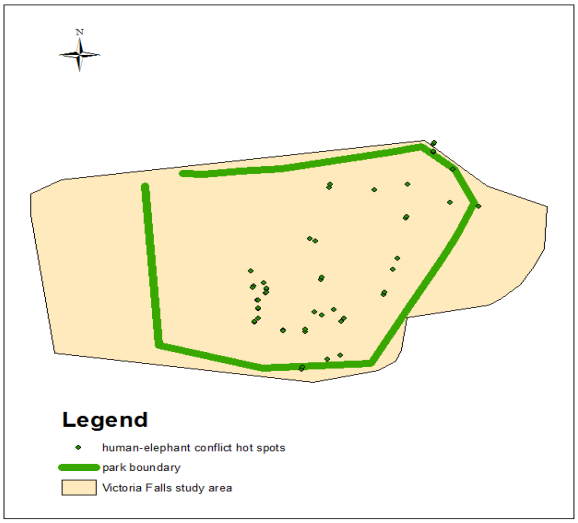

Fig. 2. Human-elephant conflict hot spots in Victoria Falls town.

The results of this study indicated that distance from the park boundary is significantly and negatively related to human-elephant conflict probability. This means that all the houses located close to the park boundary are hot spots for human-elephant conflict incidents. Therefore, areas such as Chinotimba and Mkhosana residential area are human-elephant conflict hot spots in Victoria Falls as they share a boundary with both the Victoria Falls and the Zambezi National parks. Distance from urban settlements is also significantly and negatively related to human-elephant conflict probability as confirmed by the results. This implies that the whole town of Victoria Falls is a hot spot for human-elephant conflict incidents.

2.4. Spatial distribution of human-elephant conflict hot spots in the resettlement areas

Fig. 3 illustrates the spatial distribution of human-elephant conflict hot spots in relation to the boundary of Fuller forest.

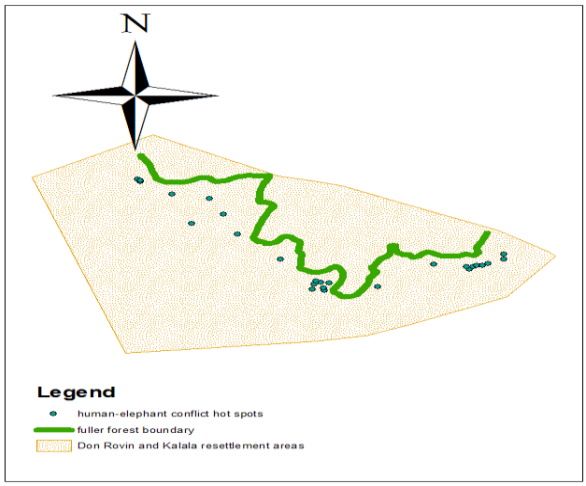

Fig. 3. Human-elephant conflict hot spots in the resettlement areas.

Logistic regression analysis resulted in a significant negative relationship between human-elephant probability and distance from the forest. This implies that areas located close to the forest are hot spots for human-elephant conflict incidents. Hence all the resettlement areas of Mubiya, Don Rovin and Kalala are hot spots for human-elephant conflict incidents. This is because the resettlement areas are all located at the boundary of the Fuller forest protected area.

3. Conclusion

For Victoria Falls town, it can be concluded that vulnerability to human-elephant conflict is determined by the location of a place in relation to the park boundary and the urban settlements. It can also be concluded that the chances of human-elephant conflict occurrence are determined by the location of a place in relation to the distance from the forest and elephants routes in Hwange West communal area. All the areas like Mvutu, Ndlovu, Chikandakubi and Chenamisa are human-elephant conflict hot spots as they share a boundary with the forest protected area. In the resettlement areas, it can be concluded that distance from the forest determines vulnerability to the human-elephant conflict incidents. Hence solutions to human-elephant conflict require land use planners should take into cognisance human-elephant conflict issues each time they allocate land to different projects. Such an approach may help address human-elephant conflict in the long term.

The most critical point to consider as recommendation is that, when applying the mitigatory measures in the communal land of Hwange conflict, hot spots are located near the forest and elephants routes. This implies that mitigation measures to minimise human-elephant conflict in the communal area of Hwange should consider the position of elephant routes and forests. Based upon these findings, the following mitigation strategies are suggested to address the issue of human-elephant conflict in the communal area of Hwange West. The first step is to inforrm all these people that they are in a high risk zone in terms of human-elephant conflict incidents. These communities and concerned stakeholders such as the District Adminisrators, wildlife managers, Ministry of Lands and Rural Resettlements, are informed and educated on the effective ways which can be adopted to minimise the human-elephant conflict issue in Hwange communal area. The farmers in Hwange West communal area can alternatively cultivate unpalatable crops to prevent elephants from raiding their fields. These include the growing of chillies. The chillies should be grown by people in the areas such as Ndlovu, Mvutu, Chikandakubi and Chenamisa villages. This is because areas are located in hot spots for human-elephant conflict, since they share a boundary with the Fuller forest protected area.

Acoustic deterrents can also be used by farmers who are in high human-elephant conflict risk zones to scare elephants away. These methods can be adopted by farmers in human-elephant conflict hot spots and they include the beating of drums, tins and the cracking of whips to prevent elephants from entering their fields. Shouting, yelling and whistling are some of the noises which can be used to keep elephants away from human settlements and fields. Elephants can be scared by the people located near the forest before proceeding to raid crops from the fields located further away from the forest. Alarm systems can be used to alert farmers to the presence of elephants. The farmers can then respond to these alarms by chasing the elephants away to prevent crop raids. The noise of alarms like cow bells scare elephants away. Disturbance shooting can also be used to prevent crop raiding. In this case gunshots are fired over the heads of crop-raiding elephants. This can be performed by trained personnel from Hwange Rural District Council or any other trained person who is authorised to carry out such activities. Olfactory deterrents can alternatively be adopted to prevent crop raiding by elephants in the communal land of Hwange. This involves spraying a chemical compound which produces an unpleasant or painful smell like chilli pepper. This is because chilli pepper produces an irritating and an unpleasant smell to the elephants. These chemicals can be sprayed along the routes which elephants use to enter the community. Spraying these chilli peppers at crossing points used by elephants to enter the villages has got a great potential of scaring elephants away.

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