Journal of Wildlife and Biodiversity 3(3): 44-49 (2019)

(http://jwb.araku.ac.ir/)

DOI: 10.22120/jwb.2019.108643.1070

Short Communication

Planning wildlife habitat's corridors in three adjacent provinces in Iran: Hamedan, Markazi, and Qom

Elahe khangholi

Department of Environmental Sciences, Faculty of Agriculture and Natural Resources, Arak University, Iran

email: elaheh.khangholi@gmail.com

Received: 16 February 2019 / Revised: 20 March 2019 / Accepted: 15 April 2019 / Published online: 28 May 2019. Ministry of Sciences, Research and Technology, Arak University, Iran.

Abstract

Nowadays, habitat destruction is one the most important satanic factors which threats biodiversity throughout the world. Corridors, which connect fragmented habitats, are substantially important in reducing the negative consequences of habitat fragmentation. In this study, using Arc GIS and focusing on large herbivores in the protected areas, I tried to design the most suitable habitat corridors relying on the target model species habitat needs. Totally, 10 protected areas were selected in three adjacent provinces and tried to find the shortest pass ways where cover te most habitat requirements of the species especially structural variables like topography, slope and distal factors.

Keywords: conservation, habitat hotspots, protected areas network, geographic information systems.

Introduction

Biodiversity is rapidly eradicating due to the human activity (Sanaei *et al*. 2012). Today, the destructions of habitats are the biggest threat to biodiversity in the world, which is occurred subsequently after habitat fragmentation and destruction. Due to the human's unplanned activities, especially in developing countries, many small habitats, which may be less important than non-protected species, are destroyed (Yousefi and Jafari Sayadi 2013). The fragmentation of habitats increases the risk of species extinction as results of increased inbreeding and therefore accidental demographic events (Shabani *et al*. 2017). The viability of any living organisms is completely dependent to the other living beings (Yousefi and Jafari Sayadi 2013). Infrastructure development can be considered as one of the main threats to the species viability, which lower species abundance and maximize the number of threatened species (Senaei *et al*. 2012). Traffic roads are on the main infrastructures that cause habitat to be fragmented while increasing negative consequences of the edge effect. Some of isolated populations in the fragmented habitats may pass under from the extinction (Sabzghabaie *et al*. 2013, Valizadegan and Ramezani 2013). Therefore, carefully and accurately designing and plotting wildlife corridors can reduce the negative and harmful effects of habitat fragmentation (Yousefi and Jafari Sayadi 2013). In some investigations using the GIS, potential corridors were modeled on the regional scale among the potential habitats of the Lynx (Bates and Jones 2007). Bates and Jones (2007) used habitat symmetry analysis to determine the most suitable corridor planning. In this modeling, it has been assumed that the identified dynamic corridors will provide adequate heat and nutritional resources along the way, in addition to providing the habitat and safety necessary for safe travel between the spots of the safe areas. Chetteri *et al*. (2007) examined the expansion and development of corridors in order to preserve the link between the forests in the eastern Himalayas. They began the overall goal of revitalizing scattered forest resources, which are getting worse, through the developing

protective corridors and moving conservation actions from a species approach to a landform approach. The results showed that in the new approach to environmental protection, strategic partnership and understanding the importance of the planning process in ecosystem management would be very effective in the implementation. Jantz and Goetz (2008) carried out an assessment of the effect of roads and buffers on main habitat areas and connectivity in these habitats in temperate northeast forests in the United States, using available data. Construction and road development is always a major factor in the fragmentation of the habitat. Roads The obstacles to the wildlife movement are directly linked to the deaths of wildlife and increase the introduction of non-indigenous species, and vice versa, areas without roads have higher levels of native diversity and less invasive species. Ferrari *et al*. (2012) examined the connection between forest components through corridors. In this survey, the corridor was identified as an important strategy to reverse the negative impacts of forest integration, and using the GIS, possible routes were identified for implementation of wildlife corridors, which facilitated the connection among the remaining patches of forest. Van Looy *et al*. (2014) carried out a study on the modeling of the structural and functional connection of corridors for the restoration of European marten. Loro *et al*. (2015) carried out research on ecological connectivity to prevent the fragmentation of the ecosystem by focusing on the Roe deer (*Capreolus capreolus*). In these studies, to obtain the location of corridors with comparable costs, the development of a network path and a repetitive GIS method were used. Erfanian *et al*. (2010) carried out studies on the role of overpasses and underpasses in compensating for the negative effects of habitat fragmentation in Golestan National Park. They investigated on a pattern for locating overpasses and underpasses in the park in order to reach short paths, optimized and safe for crossing the Persian leopard from the traffic roads using Niche Factor Analysis and Arc GIS. This study showed that the structure and location of existing underpasses are not standard and in accordance with existing needs. Rouhi (2014) investigated and determined the probable leopard corridors between two habitats of Khoshyeylagh Wildlife Sanctuary and Golestan National Park. In this study, firstly, the desirability of the leopard habitat in two habitats of Khoshyeylagh Wildlife Sanctuary and Golestan National Park was investigated by means of niche factor analysis.

The theory of electrical circuits was used to investigate Persian leopard habitat connectivity between the two mentioned habitats. Based on flow maps, the pattern of movement and functional requirements for the target species as well as important step stones were identified. Pourchitsaz (2015) determined the corridors for Asian cheetah between the protected areas of Bafq Mountain, Darreh Anjir and Siahkoh in Yazd province. The results of this study showed that 25% of the study area is suitable for Asian cheetah species. Shabani *et al*. (2017) determined the priority of the wildlife corridors between the protected areas of East Azarbaijan. Based on the results, the need to establish movement corridors between Kayamaki Wildlife Sanctuary and the Markan protected area is at the top of the provincial priorities.

A summary of such studies shows that the determination of habitat corridors will have an important role in conservation of the biodiversity and all large animals of the fragile habitat. Connection among the fragmented habitats plays vital role in the species viability. Therefore, I aimed to define best corridors in three adjacent provinces in the central Iran based on Arc GIS algorithms and ecological factors.

Material and methods

Study area

The characteristics of protected areas studied are shown in the table 1 and figure 1.

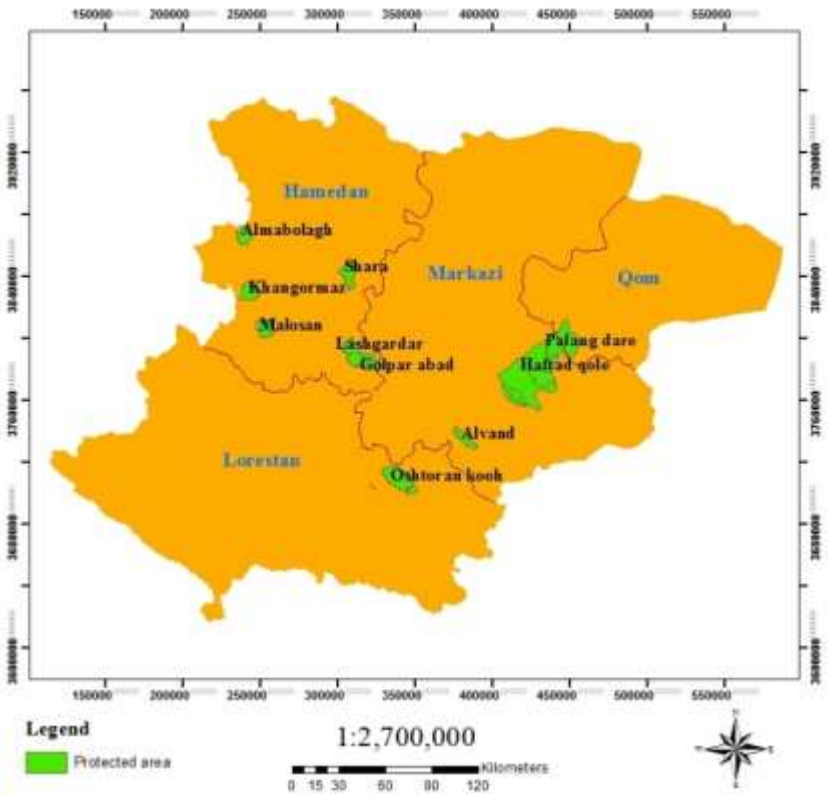

Figure 1. Location of studied protected areas in three provinces

In these areas, wild goats and Armenian sheep occupy the mountainous regions. Wild goat (*Capra aegagrus*) and wild sheep (*Ovis Orientalis*) are one of the most prominent mammals in the mountainous regions of Iran (Sarhangzadeh *et al*. 2011). For these species, altitude and slope are a limiting factor. For this purpose and for determining the habitat corridors, slope classes and altitude maps were prepared. Then, after classifying the maps, the probable habitat corridors were estimated. Finally, by studying the map of the study area and the map of the corridors, the sensitive and hazardous areas for the animal passage were determined.

Table 1. The characteristics of protected areas studied

Type of protection	Area (ha)	province	Region name
Protected area	9026	Hamedan	Khangormaz
Protected area	15550	Hamedan	Lashgardar
Protected area	10700	Hamedan	Shara
Protected area	9500	Hamedan	Malosan
Protected area	7800	Hamedan	Almabolagh
Protected area	8326	Hamedan	Golpar Abad
Protected area	97437	Markazi	Haftad Qole
Protected area	8618	Markazi	Alvand
Protected area	106607	Lorestan	Oshtorankooh
Protected area	31735	Qom	Palang Dare

Results and Discussion

In this study, the most suitable and probable corridors between the protected areas were mapped out (Fig. 3). Connectivity is now a key issue in landform management and wildlife protection especially in the fragmented areas. The study of the assessment of the importance of corridors and the linkage between habitat

fragments has an important impact on the distribution of wildlife populations in this habitat. Corridors are important for designing conservation in fragmented ecosystems and reducing the harmful consequences of Islanding phenomena. Considering the importance of connecting corridors management methods proportionate to conservation, it is essential to rebuild the connection between fragmented ecosystems in order to better protect the healthy environment and biodiversity. I mapped key habitats and corridors in a regional scale in the central Iran to provide a framework of key fauna habitats and linking habitat corridors.

Key habitat and corridor maps were constructed based on major protected areas and wild sheep's habitat requirements as a model species. This investigation allows interrogating the key habitats and corridors among three central provinces in the country.

Wildlife corridors provide a link among wildlife habitat, and joins two or more larger areas of similar wildlife habitat. Such pass ways or connections are play critical role in the maintenance of ecological processes and capable animals to move between the habitats and enable gene reciprocal flow among the populations (Scotts and Drielsma 2003).

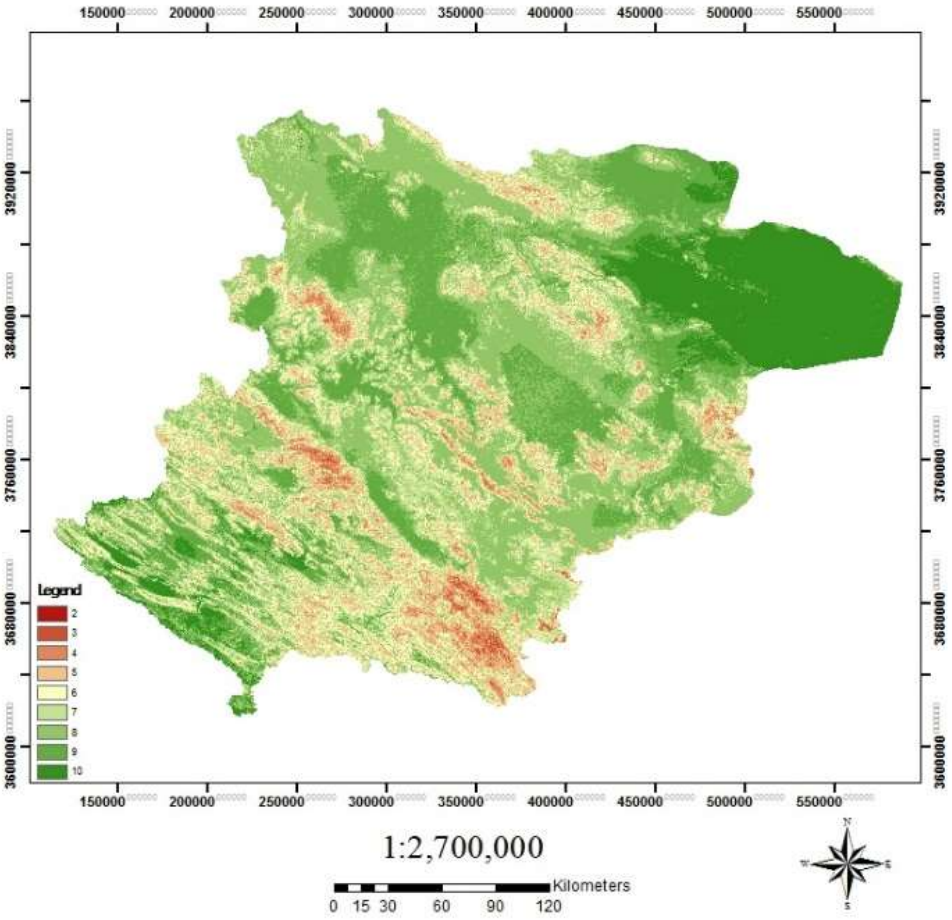

Figure 2. Surface cost map shows the lowest cost pass ways

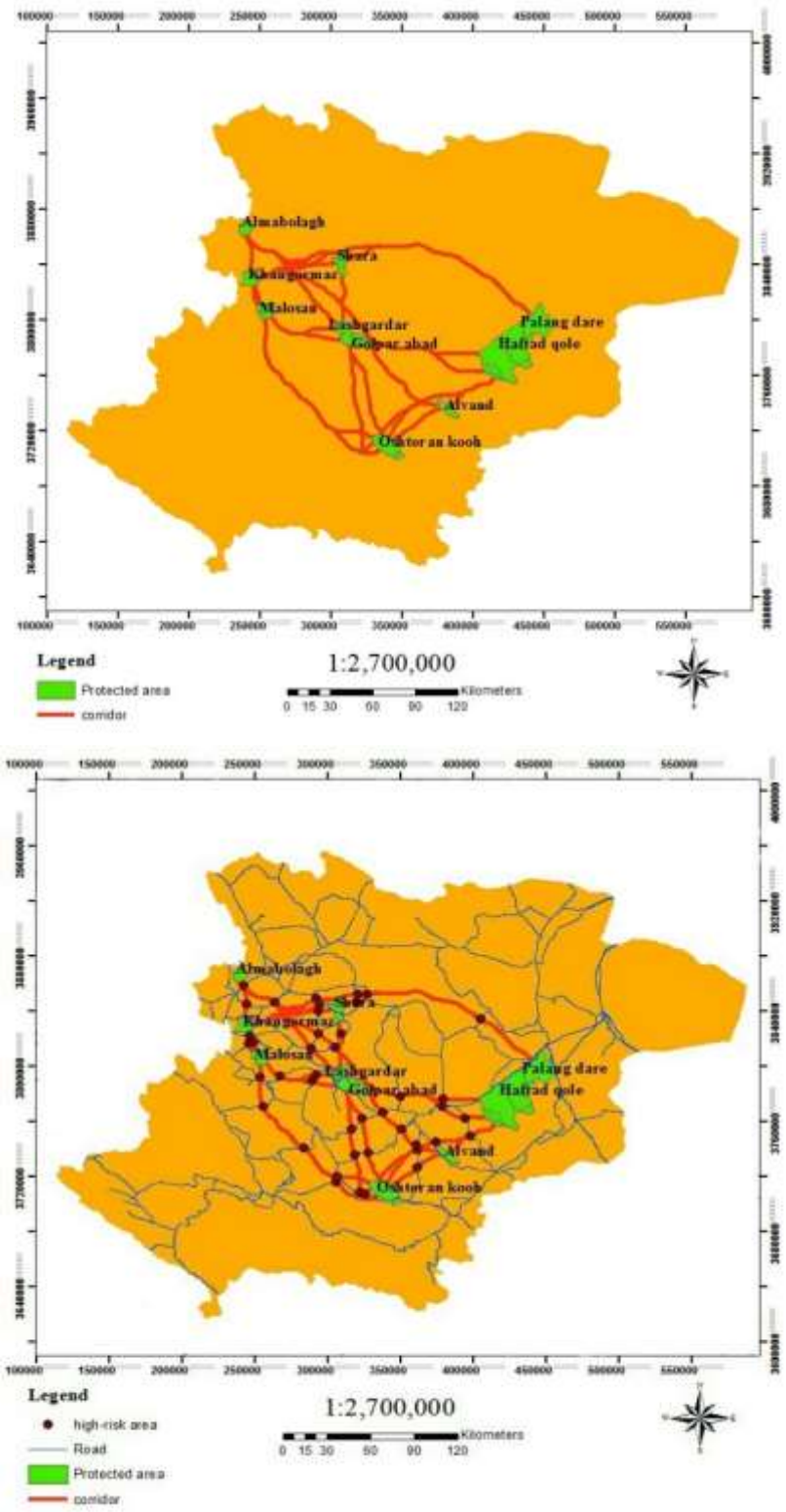

Figure 3. Corridors map (up) and critical areas with high-risk areas (below)

References

Bates W., Jones A. 2007. Least-Cost Corridor Analysis for Evaluation of Lynx Habitat Connectivity in the Middle Rockies, Research report submitted to The Utah Office of the Nature Conservancy, USA. Available: http://wildutahproject.org Accessed March 2019.

Chettri N., Sharma E., Shakya B., Bajracharya B. 2007. Developing Forested Conservation Corridors in the Kangch Njunga Landscape,

Eastern Himalay 27(3): 214-211.

Erfanian B., Mirkarimi S., Salman Mahini A., Rezaei H. 2010. The role of overpasses and underpasses in compensating for the negative effects of the fragmentation of habitats. Environment and development, 1:35-42.

Ferrari J.L., Silva S.F., Santos A.R., Garcia R.F. 2012. Potential wildlife corridors in the Horizonte stream sub watershed , Alegre, Espirito Santo, Brazil. Listed by GIS, 7(1): 141-133.

Jantz P., Goetz S. 2008. Using Widely Available Geospatial Data Sets to Assess the Influence of Roads and Buffers on Habitat Core Areas and Connectivity 27(3): 261-271.

Loro M., Ortega E., Arc R.M., Geneletti D., 2015. Ecological connectivity analysis to reduce the barrier effect of roads .An innovative graph-theory approach to define wildlife corridors with multiple paths and without bottlenecks. Landscape and Urban planning, 139: 149-162.

Pourchitsaz A. 2015. Identification of Asian cheetah habitat corridors between protected areas Bafgh Mountain, Anjir Valley and Siah kouh in Yazd province. Master's thesis, Yazd University, Faculty of natural resources and desertification.

Rouhi H. 2014. Determining the panthers potential corridor between two habitat wildlife habitats, Khoshishilak and Golestan National Park. master's theses, Gorgan University of Agricultural Sciences and Natural Resources, Faculty of Rangeland, Watershed management and fisheries and the environment.

Sabzghabaie GH., Bazmara M., Jaafari Azar S. 2013. Design and management of environmental green corridors. First national conference on environment, Energy and bio-defense.

Sanaei F., Mahini A., Mirkarimi H., Varasteh Moradi H. 2012. Corridor ecology and habitat fragmentation. The first national conference on sustainable development, Agriculture and the healthy environment, Islamic Azad University of Hamedan.

Sarhangzadeh J., Yavari A., Hemami M., Jafari H., Shams E.B. 2011. Modeling the desirability of habitat of wildlife species in arid regions (Case Study: Wild Goat (*Capra aegagrus*) in the protected area of Bafgh Mountains). Journal of Arid biome, 1(3): 38-50.

Scotts D., Dilemma M. 2003. Developing landscape frameworks for regional conservation planning: an approach integrating fauna spatial distributions and ecological principles. Pacific Conservation Biology, 8(4): 235-254.

Shabani A., Habibzadeh N., Hoseini Ghomi M. 2017. The priority of the wildlife corridors between the protected areas of East Azarbaijan province. Geography and environmental sustainability 32: 67-82.

Valizadegan N., Ramezani M. 2013. Wildlife corridors and how to identify the best places to create a corridor in protected areas. National Conference on Conservation, Environmental protection and sustainable development. Hamedan, Hegmataneh Environment Center, Fall 2013.

Van L. K., Piffady J., Cavillon C., Tormas T., Landry P., Souchon Y. 2014. Integrated modelling of functional and structural connectivity of river corridors for European otter recovery. Ecological Modelling 273: 228- 235.

Yousefi E., Jafari Sayadi M. 2013. The role of corridors or walkways in biodiversity conservation. National congress of biology and natural sciences of Iran, Tehran, Center for sustainable development solutions, Association for the Protection of Nature of Iran.