

基于生态足迹的辉河保护区繁殖鹤栖息地环境 承载判别分析

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摘要: 繁殖期是野生动物种群得以延续的重要时期, 内蒙古辉河国家级自然保护区又是鹤类重要的繁殖地之一。为判别辉河保护区对繁殖鹤(丹顶鹤、白枕鹤、灰鹤)的环境承载, 本文基于 2018-2022 年遥感影像、2021-2022 年繁殖期野外实地调查、统计年鉴等数据, 结合生态足迹法、景观格局指数、MaxEnt 模型等方法, 以辉河保护区区内居民和繁殖鹤类作为研究对象, 首先分析了近五年的保护区生态承载力的年度变化及景观格局的变化, 然后利用 MaxEnt 模型预测了繁殖鹤的适宜栖息地, 以居民的生态足迹和鹤类繁殖领域需求作为切入点, 多角度分析了辉河保护区繁殖鹤栖息地的环境承载。研究表明:

(1) 研究期间, 辉河保护区内土地利用类型变化呈平稳趋势, 草地及芦苇沼泽一直是保护区内的主要景观类型; 保护区内六种斑块形状特征较为简单; 保护区内景观多样性和均匀度变化不大, 整体的连通度没有增强;

(2) 辉河保护区 2018-2022 的平均生态足迹供给为需求为 33.52 ha/人, 生态足迹需求为 5.92 ha/人, 生态足承载力均呈盈余状态, 每年平均盈余 27.60 ha/人;

(3) MaxEnt 模型的评价结果均达到优秀水平, 2021 年及 2022 年预测得到三种鹤的适宜栖息地总面积分别为 7 806.63 ha 和 14 895.31 ha, 主要分布在高林温多尔核心区;

(4) 辉河保护区内为保护生物多样性预留的 12%的芦苇沼泽面积、芦苇沼泽的环境承载力盈余面积及 MaxEnt 模型预测的繁殖鹤的适宜栖息地需求均满足实际繁殖鹤的栖息地需求。进一步分析表明: 辉河保护区目前的环境能够承载三种繁殖鹤的繁殖栖息需求, 且经过测算至少能容纳丹顶鹤、白枕鹤、灰鹤各 27-52 对。

关键词 栖息地需求; 生态足迹法; 环境承载; 繁殖鹤; 辉河保护区

Inter-species differences, temporal variation and spatial separation of vocalization language spectrum from Red-crowned crane (*Grus japonensis*), White-naped crane (*Grus vipio*) and common crane (*Grus grus*)

Abstract: The breeding period is an important period for the continuation of wild animal populations, and Huihe National Nature Reserve in Inner Mongolia is one of the important breeding grounds for cranes. In order to identify the environmental bearing of breeding cranes (red-crowned crane, white-naped crane and eurasian crane) in the Huihe Reserve, this paper first analyzes the annual changes of ecological carrying capacity and landscape pattern changes in the past five years based on remote sensing images from 2018 to 2022, field surveys during breeding periods from 2021 to 2022, statistical yearbook and other data, combined with ecological footprint method, landscape pattern index, MaxEnt model and other methods, taking residents and breeding cranes in the Huihe

Reserve as research objects. Then, the MaxEnt model was used to predict the suitable habitat of breeding cranes, and the ecological footprint of residents and the needs of crane breeding fields were used as the starting point, analyzing the environmental carrying capacity of breeding crane habitats in Huihe Nature Reserve from multiple perspectives.

The research results indicate that: (1) During the research period, the changes in land use types in the Huihe Nature Reserve showed a stable trend, and grasslands and reed swamps have always been the main landscape types in the reserve; The shape characteristics of the six patches in the protected area are relatively simple; The diversity and evenness of the landscape within the protected area have not changed significantly, and the overall connectivity has not been enhanced; (2) The average ecological footprint supply of Huihe Nature Reserve from 2018 to 2022 is 33.52 ha/person, and the ecological footprint demand is 5.92 ha/person. The ecological carrying capacity is in surplus, with an average annual surplus of 27.60 ha/person; (3) The evaluation results of the MaxEnt model have all reached an excellent level, The total suitable habitat areas for the three crane species were predicted to be 7806.63 ha and 14895.31 ha in 2021 and 2022, respectively, mainly distributed in the core area of Gaolin Wendor; (4) The 12% reed swamp area reserved for biodiversity conservation in the Huihe Nature Reserve, the surplus area of environmental carrying capacity of the reed swamp, and the suitable habitat requirements for breeding cranes predicted by the MaxEnt model all meet the actual habitat needs of breeding cranes. Further analysis shows that the current environment of the Huihe Nature Reserve can accommodate the breeding and habitat needs of three breeding cranes, and after calculation, it can accommodate at least 27 to 52 pairs of red crowned cranes, white naped cranes, and eurasian cranes each.

Keywords: Habitat needs; Ecological footprint method; Environmental carrying capacity; Breeding crane; Huihe Nature Reserve