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Greater One-Horned Rhino Habitat Risk Mapping Due to Flood Using Google Earth Engine for Informed Conservation Management in Assam

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Assam, a flood-prone state, comprises multiple national parks and wildlife sanctuaries (Kaziranga, Orang, Manas National Parks, and Pabitro, Laokhawa, and Burachapori Wildlife Sanctuaries) located in the southern part of the Brahmaputra River. Floods significantly influence wildlife in these conserved areas, which are less discussed. The greater one-horned Rhinoceros (Rhinoceros unicornis) is listed as vulnerable on the International Union for Conservation of Nature (IUCN) Red List. While floods are ecologically integral to the Brahmaputra floodplain, extreme and frequent flood events increasingly threaten rhino habitat suitability, mobility, and survival, underscoring the need for spatially explicit risk assessment to support conservation planning.
The present study focuses on mapping the spatial risk index of the one-horned Rhino using Earth observation (EO) based Analytical Hierarchy Process (AHP) in the Google Earth Engine (GEE) platform. The Shuttle Radar Topographic Mission (SRTM) Digital Elevation Model (DEM) is used in conjunction with GEE to generate flood-influencing parameters, including elevation, slope, aspect, flow accumulation, distance to drainage, drainage network, and topographic wetness index. Flood depth, distance from roads, and distance from built-up areas have been used to develop layers for the Flood Risk Index (FRI) in rhino conservation. Rhino locations were collected from the Assam Biodiversity portal.
The primary rhino habitat occupies approximately 23% of the study area, yet a substantial proportion of these habitats overlaps with zones of elevated flood risk. The Flood Risk Index (FRI) indicates that nearly 78% of the region falls within moderate to high flood-risk categories, with several rhino habitat areas consistently exposed to high inundation susceptibility. Spatial overlay analysis highlights critical habitat patches where flood risk, anthropogenic proximity and low-lying terrain converge, and need priority zones for intervention during extreme flood events. The findings provide actionable insights for flood-responsive rhino management, including targeted evacuation planning, habitat restoration, and infrastructure placement, contributing to more resilient conservation strategies under intensifying hydro-climatic extremes.