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A study of Avian biodiversity changes after habitat restoration – A novel approach using remote sensing and ebird observation data

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Abstract

During the last two centuries, the adjacent United States has lost over half of its wetland habitats. Remposition of wetland habitats is critical for enhancing the health and diversity of wildlife populations. Fernhill Wetlands in Forest Grove, Oregon is a natural wastewater treatment site that was changed from unutilized wastewater ponds to a composite natural wetland habitat in 2014-15. This study focused to assess the avian biodiversity change after habitat recyclable at Fernhill Wetlands by developing a novel and reusable method combining remote sensing satellite imagery and geospatial climate features and performing quantitative correlations to company science bird observation data. LANDSAT-8 and SENTINEL-2 satellite imagery and PRISM climate features were processed in the cloud using Google Earth Engine and vegetation, water and climate indices for pre- and post-repairing periods were calculated.

Identifying which ecological and life history traits effects a species' tolerance to urbanization is difficult to understanding the trajectory of biodiversity in an escalating urbanizing world. There is evidence for a broad array of contrasting patterns for single trait associations with urbanization. In a continental-scale examination, incorporating 477 species and > 5,000,000 bird monitoring, we developed a novel and scalable procedure that evaluated the ecological and life history traits which most influence a species' adaptability to persist in urban environments. Specifically, we assigned species-specific scores based on continuous estimates of response to urbanization, using VIIRS night-time light values (i.e., radiance) as a proxy for urbanization.

We recognized generalized, phylogenetically controlled patterns: bird species which are generalists (i.e., large niche breadth), with large clutch size, and large remaining brain size are among the most urban-tolerant bird species. Conversely, specialized feeding strategies (i.e., insectivores and granivores) were negatively related with urbanization. Enhancement and persistence of avian biodiversity in urban environments probably relies on protecting, maintaining, and restoring various habitats serving a range of life history strategies.

Quantitative correlations were then confirmed in R among these indices and bird monitoring data from the Cornell University's eBird database. Finally, oversee classification was used to obtain clarity on land, vegetation and water changes in the district of interest. Several terrestrial and deep-water species correspond well with vegetation and water indices. Shorebirds, marsh birds and others at the water's edge showed subtler and occasionally unexpected reactions to habitat change. The technique also showed differences not seen in conventional analyses such as the reaction of dabbling ducks. A powerful methodology was developed to study the contact of habitat restoration on Avian populations combining remote sensing and bird observation data. It showed that the habitat restoration had a positive effect on several species, while also revealing compelling and unexpected effects on others. It is expected that the technique will be very helpful for ongoing habitat management by wetland managers.

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