

# **Population Dynamics Models Based on Cellular Automata that includes Habitat Quality Indices defined through Remote Sensing**

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**Abstract** –The spatial distribution of different populations has a deep effect on their dynamics as well as on the landscape. Spatially explicit models are becoming very important tools in Ecology.

Patch occupancy models include two different spatial scales: the local neighborhood and the global landscape. Among these are Cellular Automata, which permit to visualize the evolution of the spatial dynamics of populations and analyze the strategies of the species in regard to environmental changes. In particular, they permit not only to estimate the percentage of occupation of the landscape when a species reaches its stable equilibrium level but also to observe the patterns of occupation. One interesting feature of Cellular Automata is the possibility of including spatial heterogeneity in a simple manner.

A standard tool for linking spatial heterogeneity to population dynamics is the definition of Habitat Quality Indices. These Habitat Quality Indices can be defined by respecting the philosophy of HEP procedures (Habitat Evaluation Procedures).

Here we present a methodology for the utilization of remote sensing information for the production of dynamic maps for landscape classification. The corresponding habitat quality indices are then defined and used to feed the discrete mathematical population models that run within the framework of Cellular Automata.

Models with these characteristics permit, as a first approach, to monitor the impact of environmental changes on the dynamics of the population under study as well as on the landscape, thanks to the availability of satellite images through time. Moreover, these models are appropriate for the analysis of different strategies that could be helpful in improving the habitat conditions of species that suffer the stress of negative environmental changes, the use of projections to simulate the space-time dynamics helping to evaluate "a priori" the results of any given strategy.