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# Systematic conservation planning in New Caledonia: supporting sustainable land-use policies with reserve selection models

Dimitri Justeau-Allaire\*<sup>†1,2</sup>, Nicolas Rinck<sup>3</sup>, Xavier Lorca<sup>4</sup>, Emmanuel Coutures<sup>3</sup>, and Philippe Birnbaum<sup>1,2</sup>

<sup>1</sup>Botanique et Modélisation de l'Architecture des Plantes et des Végétations (UMR AMAP) – Centre de Coopération Internationale en Recherche Agronomique pour le Développement : UMR51-2015, Institut national de la recherche agronomique [Montpellier] : UMR931, Université de Montpellier : UMR5120, Centre National de la Recherche Scientifique : UMR5120, Institut de Recherche pour le Développement : UMR123 – Bd de la Lironde TA A-51/ PS 2 34398 Montpellier cedex 5, France

<sup>2</sup>Institut Agronomique Néo-Calédonien (IAC) – Nouméa, Nouvelle-Calédonie, New Caledonia

<sup>3</sup>Province Sud - DENV – BP L1 - 98849 Nouméa Cedex, New Caledonia

<sup>4</sup>ORKID, Centre de Génie Industriel, IMT Mines Albi – IMT Mines Albi – Campus Jarlard, 81013 Albi cedex 09, France

## Abstract

Habitat degradation, fragmentation, and destruction are today the leading causes of species extinction on Earth. A major challenge for environmental managers, hence, is to efficiently balance land use between economic development and conservation of natural habitats. In New Caledonia, the smallest biodiversity hotspot in the world, finding this trade-off is tedious. In particular, the conservation of its highly diverse forest ecosystems, distinguished by high rates of endemism, can be conflicting with mining activity, the major economic sector of New Caledonia. Managers are willing to study how to refine decisional processes through the use of systematic conservation planning and computational sustainability. To this end, we considered the project "Côte Oubliée" started in 2016 by the environmental managers of the South Province of New Caledonia. It aims at delineating a complex reserve system (including about 1200 km<sup>2</sup> of terrestrial and 950 km<sup>2</sup> of marine reserve) in the southeast of New Caledonia in an area with rich biodiversity and overlapping with different socioeconomic interests (such as 238 mining concessions, private and cultural lands, and fisheries) as well as 135 km<sup>2</sup> of area to be restored. Our objective was to identify how the reserve could be efficiently delineated while respecting socioeconomic constraints. More precisely, we focused on the biodiversity representation as much as on the spatial configuration of the reserve. Additionally, we aimed at reducing fragmentation through the identification of areas suitable for ecological restoration. Relying on a constraint-based reserve selection model, we iteratively considered operational scenarios and produced maps providing the basis for decision support. The model was then refined according to a feedback loop between managers and scientists. Through this iterative process, we could suggest a delineation of the reserve that maximized the representation of biodiversity features while satisfying managers

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\*Speaker

<sup>†</sup>Corresponding author: dimitri.justeau-allaire@cirad.fr

constraints. We also highlighted key areas for reducing fragmentation through ecological restoration. This real-world pilot study showed how systematic conservation planning can provide the basis of a decision support framework for conservation, through reserve selection models. Beyond that, it showed how the iterative use of such a framework could help to reduce the gap that can sometimes exist between scientists and managers.

**Keywords:** New Caledonia, systematic conservation planning, computational sustainability, reserve selection