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Spatial analysis and modelling

BCS Remote Sensing and Spatial Analysis

Project Core Team

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Project Team granted
Program Leader granted
Directorate required

Spatial analysis and modelling

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Context

The spatial analysis and modelling project develops and utilises tools to assist in the evaluation, interpretation and prediction of conservation values, threatening processes and management actions. These tools generally integrate spatial data sets, expert knowledge and GIS modelling techniques to produce spatially explicit products that can be used to inform decision making. Projects can be focused on species occurrence (e.g. species distribution models, habitat suitability modelling), animal movement (e.g. home range, identification of habitat linkages), landscape scale processes (e.g. assessment of habitat fragmentation) or assessments such as quantifying risk (e.g. risk presented by feral cattle to biodiversity values). Identification of areas of high conservation value for protection is also undertaken by combining numerous conservation value data sets and using software to evaluate possible conservation scenarios.

Aims

- Develop spatial models to describe ecological processes, thereby increasing the understanding and protection of biodiversity.
- Develop and utilise spatial analysis tools to inform management and support decision making.
- Collate and summarise spatial information using statistical and documented methods to inform monitoring and management practices.

Progress

- The 2021 terrestrial lands report was produced.
- A Maxent habitat suitability model was developed for the yellow-spotted monitor (*Varanus panoptes)* for an area in the west Kimberley to north-west Pilbara. This monitor is a target species for cane toad taste aversion training. The spatial products were published on ArcGIS online to enable access to other cane toad project partners including traditional owner groups.
- Completed multi-criteria analysis of the ecological value of wetlands in the South west region.
- Further developed fire regime spatial metrics for several Kimberley DBCA-managed lands using remotely sensed fire history data over 2000-20.
- Published a paper in *Nature Communications*, investigating the role wildfires in tropical savannas play in enhancing marine phytoplankton production.
- Contributed to the spatial analysis for a paper, published in *Plant Ecology*, that identifies risk to plant populations of short or long fire intervals.
- Spatial variables developed for the North West Shelf flatback turtle rookeries and at-sea distribution models.
- Developed a software solution for data parsing oxygenation metrics for Rivers and Estuaries Branch.
- An R Shiny app framework was developed for exploration of genetics data associated with an upcoming paper for *Animal Science*.
- Developed and delivered an R software package (ScatMatch) to aid identification of individual animals from genotype data.
- Supported regional conservation planning processes with spatial analysis, including fauna and threat matrix compilation for the south coast region.

Management implications

- The department uses vegetation and protected areas statistics to report against aspects of the CAR (comprehensive, adequate, representative) principles.
- Spatial information on where significant habitat of the yellow-spotted monitor is likely to occur will be used to optimise the location of cane toad taste aversion training.

- Species distribution models provide information on the likelihood of habitat for a species being present and thus are critical for determining species conservation and management priorities and actions.
- Information on the conservation values and threats present in each conservation management unit, contributes to the identification of management priorities during the DBCA's Regional conservation planning process.
- Prescribed burning is used to mitigate the threat of wildfires in WA's tropical savannas and fire metrics contribute to the assessment of the effectiveness of the burn program against ecologically derived fire pattern targets. In the south-west of WA, varying tolerable fire intervals of different plant species need to be considered during prescribed burn planning.
- R software solutions have provided robust and easy to use tools to significantly simplify data analysis for animal scientists and aid in the formulation of quality inputs for complex environmental modelling for the Rivers and Estuaries Branch.
- R Shiny interface allows for unique visualisation of data used in a publication and assists with science communication to the public.

Future directions

- Further develop landscape scale spatial metrics that assess conservation values and threats. Develop models for the yellow spotted monitor in other locations along the cane toad front.
- Document and publish application of the multi criteria evaluation of the ecological value of wetlands to south-west Western Australia.
- Identify potential barriers to water flows to the Swan Canning River by examining where primary drainage lines intersect with linear infrastructure, abstraction points and gauging stations.
- Develop further functionality for the ScatMatch software to allow for alternative data inputs.