

## Development of userfriendly decision support tool to support visitor impact management in protected areas

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Wageningen UR developed a Decision Support Tool (DST) which supports protected area managers in the management of visitor flows. The main purpose of the DST is to harmonise the objectives for visitor management and nature management, like those laid down under Natura2000. The DST is an integration of two GIS-based models: an ecological model (mainly the LARCH model) and the recreation model MASOOR. The ecological model simulates the sustainability of breeding bird populations based on, among others, the quality, surface area and configuration of breeding habitat concerned. The recreation model MASOOR simulates the visitor pressure within the protected area, based on visitor characteristics and the area's visitor infrastructure. The DST has proven successful for the Natura2000 managers involved in the EU Interreg IIIB project named PROGRESS. The development of a user interface, aiming to make the DST more user-friendly, will enable its applicability by other protected area managers.

### Methods

The GIS-based models MASOOR and LARCH developed at Alterra form the basic components of the DST. MASOOR stands for Multi Agent Simulation of Outdoor Recreation; 'agents' meaning user-groups such as walkers, cyclists, horse riders etc. MASOOR simulates the recreational use of a network of roads and paths in an area. Car-parks are the main entrances to this network, and their parking capacities and level of usage are determining factors in the eventual distribution pattern of the visitor pressure. Other important factors are specific (marked) trails, attractions and path quality which steer visitors in a certain direction. Behaviour characteristics of user-groups have been derived through interviews and GPS-research (see van Marwijk 2009). GPS's handed out to visitors can be used to analyse the actual use of an area and to validate the model output. The model output is a GIS map indicating the visitor pressure within the network specified per track of path or road. This visitor pressure gives an indication about the visitor disturbance level on, for instance, breeding birds.

The model LARCH stands for Landscape Assessment using Rules for Configuration of Habitat. LARCH requires a GIS vegetation map as the basis for analysing potential breeding bird habitats. LARCH determines ecological networks for specific species in a patchy landscape and assesses the potential sustainability of these networks (Opdam et al. 2003, Verboom & Pouwels 2004). The overlay of the GIS-maps on visitor pressure (MASOOR) and potential breeding habitat (LARCH) indicates whether visitor pressure creates bottlenecks for breeding birds. The nature management objectives determine if this bottleneck requires visitor management actions like zoning or not.

### Results

The DST has been applied in several protected areas, like the New Forest Natura2000 case study site within the EU Interreg IIIB project named PROGRESS. The figures 1 and 2 have been received from park management who presented them at stakeholder meetings as part of their communication strategy. Figure 1 shows the marginal, suboptimal and optimal breeding habitat of wader species at a certain location (output LARCH model), with an overlay of the visitor pressure or disturbance zones along the network of car-parks and paths (output MASOOR model). Conservation of wader species is an important nature management objective and management aims to improve their breeding conditions. A possible management option is the closure of car

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parks in the east of the area (figure 1, right). Although this will lead to a higher car park usage and related visitor pressure at locations further away, the simulation of this action indicates that it will result in the desired vast area of tranquil breeding habitat. This zoning proposal received sufficient support from user-groups to be put into practice.

The positive feedback from end-users of this DST has led to the development of a user interface to make the tool more accessible to other protected area managers.

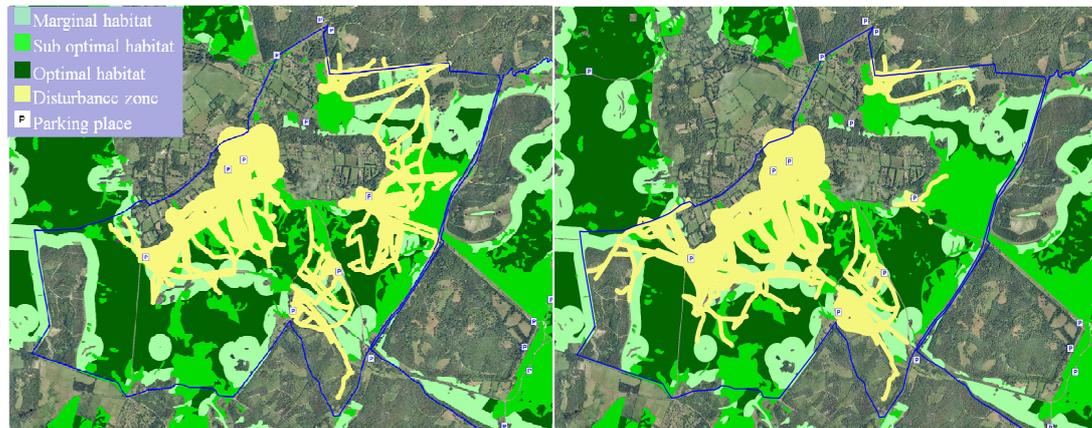


Figure 1. Simulation of wader species breeding habitat and disturbance pressure in pre-action phase and post-action phase.

### Main conclusions

The DST supports protected area managers in the identification of possible bottlenecks between visitor objectives and nature objectives. It is an independent DST which indicates the development opportunities for both nature and visitor infrastructure.

The DST is an important communication tool for protected area managers as the visualisations through GIS build trust among stakeholders. This increases the acceptance of proposed management actions.

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