Framework Mafreina: management toolkit recreation and wildlife in the Swiss Alps

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Introduction

In the last years the pressure on nature in alpine regions has increased and this trend is continuing. One cause is the various winter and summer outdoor sports activities: snowshoeing, backcountry skiing and freeriding, hiking and mountain biking (Lamprecht et al. 2008). More users lead to diverse conflicts. Mountain biking, backcountry skiing and snowshoeing are seen as most important activities regarding sports-nature conflicts. With regards to social conflicts, mountain bikers are considered as a major conflict causing group (Freuler 2008). Other land use concerns are the establishment of new wildlife sanctuaries and the construction of new mountaineering cabins (BAFU 2009). All these issues exist in the pilot region Val Müstair in eastern Switzerland, which is part of a proposal to establish a UNESCO biosphere reserve. Increasing income for local people with visitor enjoyment and conservation is the main management concern. Therefore it is important to approach new development initiatives in a pro-active manner with suitable planning tools to avoid possible conflicts.

Goals

The research project mafreina (2008 – 2011) pursues the following goals:

- Documentation of the existing spatial and temporal outdoor uses in Val Müstair.
- Documentation of the outdoor recreationists requirements.
- Research visitor preferences for planned projects.
- Development of a predictive environmental planning tool to simulate results of management decisions on the recreation-wildlife-system.

Methods

According to the comprehensive rational planning approach, the estimation of the impacts of a planned object and scenarios on the human-nature-system is a critical step in the planning process (Briassoulis 1989). Until now, no relevant decision tools exist for recreation and wildlife management. Agent-based models (ABM) are said to fill this gap (Pröbstl et al. 2008, Lawson 2006). Besides the still existing technical challenges with ABMs new procedures allow more flexible description of behavior of the agents (Zellner 2008). Figure 1 shows the development system of the mafreina toolkit.

Different authors suggest several methods to obtain rules for the agents. GPS-monitoring is a method with new perspectives to record real spatial and temporal movements as revealed preference data (Taczanowska et al. 2008, Skov-Petersen 2005). A disadvantage of such revealed preference data is that they only deliver information of already existing situations and not about planned alternatives or anticipated scenarios. Another method, discrete choice experiments (DCE), could help to detect agent rules for future, currently non-existent scenarios (Hunt et al. 2007, Haider 2002). Therefore a generic DCE is developed from the base of environmental data

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of the project region; first GPS-monitoring data combined with new scenarios such as new infrastructure and scenarios.

In the mafreina toolkit the geographical information system (GIS) has central position with three different tasks. First it serves as a database of all environmental and GPS-logging data. Second the GIS is an integrated tool for the ABM and the base of the virtual area in which the different scenarios will be computed and third, results are visualized with GIS.

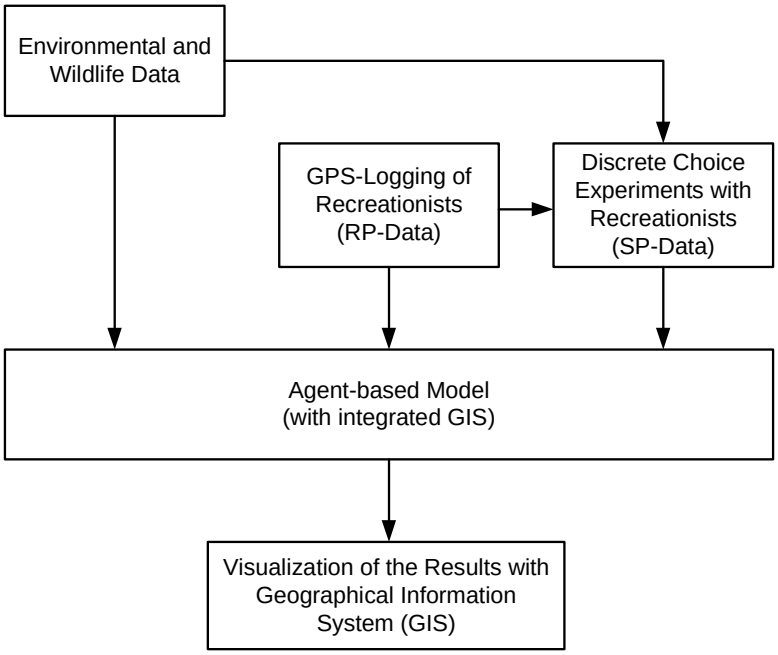

Figure 1: Mafreina – methodological system

First Results

We developed new GPS loggers with a capacity to record over 50 hours of activity over a period of 14 consecutive days and an adjustable minimal recording interval of 0.5 seconds. During the test of GPS logging from February to April 2009, the movement of 111 people was recorded. These persons made over 300 daytrips (5% hiking, 15% downhill skiing, 25% snowshoeing and 55% backcountry skiing). The collected GPS data allows for diverse analyses to detect rules for the agent-based model, e.g. the frequency and location of starting points or the trip duration: the average backcountry skiing trip starts around 08:30 in the morning and lasts about 4 hours 10 minutes. The duration is distributed unimodal contrary to snowshoers. The data also show that certain persons crossed a wildlife sanctuary. Based of these findings the managers established a new guidance in those areas. Regarding the current state of the ABM, the software kvintus is able to handle interactions between recreationists on trails and wildlife in their surroundings.

Conclusions

Mafreina will continue to develop several tools to assess and estimate recreationists' behaviour in the landscape. The toolkit will allow the estimation of the impact of management interventions, as well as to plan an optimal infrastructure with a coexistent protection of wildlife and nature. Still an open question and challenge is the acceptance of the toolkit mafreina among managers of protected areas.

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References

BAFU (2009). Medienmitteilung - Sport in freier Natur: Pilotprojekt für mehr Rücksichtnahme auf Wildtiere www.bafu.admin.ch/dokumentation/medieninformation/00962/index.html?lang=de&msg-id=25179 (28.3.2009)

Briassoulis, H. (1989). Theoretical Orientations in Environmental Planning: An Inquiry into Alternative Approaches. Environmental Management Vol. 13-4, 381-392.

Freuler, B. (2008). Management von Freizeitaktivitäten: Interventionen zur Beeinflussung von sozialen und ökologischen Nutzungskonflikten im Outdoorbereich, Dissertation Universität Zürich

Haider, W. (2002). Stated Preference & Choice Models –A Versatile Alternative to Traditional Recreation Research. In: Arnberger, A., Brandenburg, C. & Muhar, A. (2002), Monitoring and Management of Visitor Flows in Recreational and Protected Areas, Conference Proceedings. 115-121.

Hunt, L. M., Kushneriuk, R. & Lester, N. L. (2007). Linking agent-based and choice models to study outdoor recreation behavior. Special Issue of Forest Snow and Landscape Research.

Lamprecht, M., Fischer, A. and H.P. Stamm, H.P. (2008). Sport Schweiz 2008: Das Sportverhalten der Schweizer Bevölkerung. Magglingen: Bundesamt für Sport BASPO

Lawson, S. R. (2006). Computer Simulation as a Tool for Planning and Management of Visitor Use in Protected Natural Areas. Journal of Sustainable Tourism. Vol. 14-6, 600-617.

Skov-Petersen, H. (2005). Feeding the Agents: Collecting parameters for agent-based models. Computers in Urban Planning and Urban Management

Taczanowska, K., Muhar, A. & Arnberger, A. (2008). Exploring Spatial Behavior of Individual Visitors as Background for Agent-Based Simulation. In: Gimblett, R. & Skov-Petersen, H. (eds.) (2008). Monitoring, Simulation and Management of Visitor Landscapes. The University of Arizona Press, Tucson, 159-174.

Zellner, M. L. (2008). Embracing Compelxity and Uncertainty: The Potential of Agent-Based Modeling for Environmental Planning and Policy. Planning Theory & Practice, Vol. 9-4, 437-457.