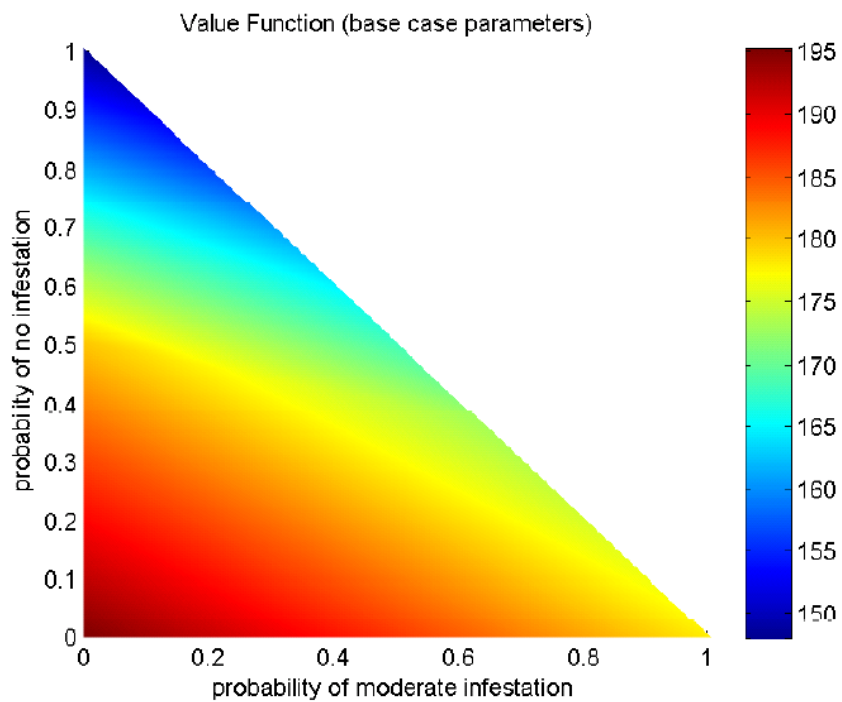# Optimization for Natural Resource Management with MDPSOLVE

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Value Function (base case parameters)

I. Objectives of the workshop

In recent years there has been a rapid growth in the number of managing agencies, academic institutions, and NGOs interested in applying structured decision making and adaptive management to natural resource management. One major limitation to the implementation of these approaches has been the scarcity of analysts who understand and can implement the optimization part of the process. Until recently many analysts used the software program ASDP (developed by Bruce Lubow) for the optimization. Unfortunately this software is not being maintained and has become somewhat outdated. The purpose of this workshop is to introduce analysts to a new software package, MDPSOLVE (written by Paul Fackler in the MATLAB programming language), that provides an alternative to ASDP. More specifically, our goal is to train a group of analysts who could use, teach and improve this software.

We will discuss the theory behind the software, and present some of its most important features. In particular we will show how to account for important sources of uncertainty: environmental stochasticity, partial controllability, partial observability and structural uncertainty. The new software has several features that improve on ASDP: it is faster, more transparent and flexible, it has several features not available in ASDP including the ability to implement partial observability models and is easily extended to new problems. This workshop will provide an opportunity for analysts to form a working group to promote and improve the software over time and request features that may be important to solve real world problems.

The workshop will include lecture, group discussion and hands-on programming sessions. During hands-on sessions specific management problems will be posed and participants will have the opportunity to work alone or in groups to develop and solve the problems with help from the workshop leaders.

II. Prerequisites

This workshop is aimed at people with some previous experience in developing decision models to address resource management problems and some programming experience (not necessarily in MATLAB although this is highly desirable). Participants should bring their own laptops with MATLAB installed if possible (the organizers will attempt to accommodate those that are unable to do so).

III. Material covered

1-Theory of dynamic optimization.

2-MATLAB programming and MDPSOLVE.

3-Constructing meaningful objective functions.

4-Optimization techniques for dynamic programming.

5-Accounting for uncertainty: environmental stochasticity, partial controllability, partial observability and structural uncertainty (passive and active adaptive management).

6-Additional features covered: postoptimality analyses and simulations; using stages in MDPSOLVE; dealing with non-stationary dynamics.

7-Example problems will depend on participant interests. Registered participants will be surveyed about a month before the workshop to access their interests. Participants will also be provided a set of solved problems drawn from the literature.

IV. Logistics

Details of logistics for the workshop are currently still being finalized. A block of rooms at a nearby hotel will be reserved for workshop participants. A nominal fee will be charged to cover workshop expenses and (possibly) to cover lunch costs. Opportunities to network with other participants in the evenings will be available.

V. Registration

The workshop will be limited to 30 participants. To reserve a place at the workshop please send an email to Paul Fackler at paul_fackler@ncsu.edu.