“Recovery Action Prioritization” Tool

A simple decision optimization tool designed with and for Fish and Wildlife Service (FWS) field office staff to more effectively allocate program money to achieve recovery of Endangered Species.

The Puerto Rico FWS are leading a transition from a reactive to a proactive approach to selecting and implementing Recovery Actions for endangered species recovery. In the absence of a prioritization strategy, the staff expressed frustration that good recovery work was not translating to higher numbers of petitions to positively reclassify species. They cited several examples of near-complete recovery projects, where final action was delayed as other emergencies or opportunities demanded resources. Furthermore, with greater than 74 listed species and hundreds of recommended Recovery Actions, they lacked a structured way to annually select the few projects that would best achieve their mandate.

Our project facilitated the design of a structured approach to this previously unstructured problem. Together, we completed a decision-making workshop *and* created a fully-functional decision optimization model. The workshop resulted in the identification of three fundamental objectives by which the Puerto Rico staff select Recovery Actions to achieve their mandate:

1. *Maximize the probability of positive reclassification.*
2. *Minimize the risk of short-term extinction.*
3. *Maximize the increase in probability of long-term persistence.*

Using Best Available Science and Best Professional Judgement, the science and management staff extracted Recovery Actions from species’ plans. For each action, they estimated: (1) the cost and time requirements to complete the action, (2) the probability of extinction in 5 years if the action were delayed, (3) the probability of persistence for 50 years with and without the action, (4) the probability of successfully completing the action at present, and (5) their confidence in the information supporting their estimates. The integration of cost and probability of success have been shown to dramatically improve recovery efficiency and effectiveness of endangered species recovery in New Zealand and Australia. I used these FWS data and the group’s value judgements (e.g., relative importance of the three objectives) to write a decision optimization program to identify the set of Recovery Actions that best met the joint objectives given a specified budget.

The model accounts both for knowledge uncertainty and administrative uncertainty. I addressed knowledge uncertainty by using simulation modeling. The probability values are drawn from distributions, with the greatest variance (highest uncertainty) applied where confidence in the information is lowest. Administrative uncertainty is incorporated by allowing the manager to run the model with alternative budgets and to vary the relative importance of the three objectives. By these design features, managers obtain a set of recommended Recovery Actions which they know to be robust to uncertainty. At the same time, they receive output that shows the many “runner-up” decision sets and the objective scores for each Recovery Action (individually and jointly). These supporting data ensure that they maintain the flexibility to make informed decisions in response to changing opportunities or emergencies.

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