Using Multi-criteria Decision Analysis to Evaluate LTEMP Alternatives

Mock Swing-Weighting Exercise

Table 1. Consequence matrix for management of a bat winter hibernaculum that has become affected by white-nose syndrome. The performance across 3 objectives is shown for 4 alternatives. For each objective, the alternatives that score best are shown in white, the alternatives that score worst are shown in black, and middle-performing alternatives are shaded gray.

Objective	**Prevent spread**	**Minimize Take**	**Recreation**
Scale	p(spread)	# killed	user-days
Direction	min	min	max
Action			
No Action	0.8	0	500
Gate Cave	0.475	0	0
Winter Exit Trap	0.5	1000	250
Local Culling	0.35	20000	300

Objectives and their measurable attributes.

Minimize the spread of WNS	The probability that the disease will arrive in any of the neighboring caves in the next two years
Minimize direct take of bats	Number of bats killed as a direct consequence of management efforts
Maximize recreational opportunity	Visitor-days per year (for spelunking)

Alternative Strategies

No Action	No response to the situation. Maintain status quo access to the cave and do not interfere with bat ecology.
Gate Cave	Install a gate on the cave that prevents human access, but does not hinder bat access.
Winter Exit Trap	Install a trap during the hibernation period to catch (and remove) any bats that attempt to leave the cave during winter.
Local Culling	Conduct lethal removal of the bats in the affected cave.

Table 2. Swing weighting exercise. Four hypothetical scenarios are shown, the first of which (baseline) performs worst on all objectives, and the others of which perform best on one objective at a time.

Objective	Prevent spread	Minimize Take	Recreation		Rank	Score
Scale	p(spread)	# killed	user-days			
Direction	min	min	max			
Hypothetical Scenarios						
Baseline	0.8	20000	0		4	0
1	0.35	20000	0			
2	0.8	0	0			
3	0.8	20000	500			

To develop weights on the objectives:

1. Rank the four hypothetical scenarios, paying attention both to the objectives and the amount they change.
2. Assign a score of 100 to the scenario that ranked first.
3. Assign scores between 0 and 100 for the remaining scenarios. The scores should reflect the rankings, as well as a more nuanced interpretation of how much the scenarios would be valued relative to each other.
4. The weights are found by rescaling the scores so they sum to 1.