Can We Preserve Parks in a Changing World? An Exploratory-Sequential Mixed-Methods Approach

Michelle Sullivan, Dissertation Proposal
School of Life Sciences, Arizona State University

Research Problem

August 2016 marked the100-year anniversary of the U.S. National Park Service (NPS), providing the perfect opportunity to ask what the next century will bring for our nation's flagship conservation program. The National Park Service has a legal mandate to enable and protect visitor enjoyment in the parks now and in the future.[1] Given this mandate, the NPS must consider how the public perceives socio-ecological changes facing parks and potential impacts on park features and visitor enjoyment. Also, the myriad challenges facing parks add complexity to attempts to describe current and to project future park scenarios. Now more than ever managers acknowledge that they have incomplete evidence and thus often make subjective decisions.[2] Accounting for visitor perceptions could aid in decision-making for managers dealing with such uncertainty. NPS staff can utilize social sciences to complement research and to make publicly informed decisions.[3]

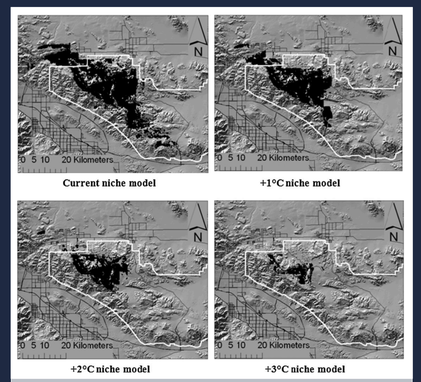

Fig. 1: The amount of suitable habitat for the Joshua tree is projected to decline within JTNP[4]

Fig. 2: Dr. Barrows, author of the work in Fig. 1, observes a dying Joshua tree, suffering from overheating and drought[5]

Joshua Tree National Park, Climate Change Poster Child

- Designated as a U.S. National Park in 1994
- 3,207 square kilometers that lies at the intersection of the Mojave Desert and the Colorado Desert
- Visitation in 2015 was the highest on record at more than 2 million visitors; JTNP is one of the top 20 most visited national parks.
- Climate change[4,6] threatens the park's namesake species, the Joshua tree, (*Yucca brevifolia*) (Fig. 1 and 2)
- Beyond climate change, JTNP is also confronted with urban development, invasive species,[7] fire,[7] and pollution,[8] etc. (Fig. 3)
- Such complex and interacting socio-ecological challenges feed into the uncertainty in decision-making that may be aided by an understanding of public preference

Fig. 3: Complex and interacting change in JTNP. Left: Red brome grass, an invasive species that grows in JTNP. Middle: The fire regime in JTNP has changed in recent years, as a combined result of increased average annual temperature, changes in rainfall patterns, and spread of invasive grasses that provide fire-fuel. Right: Air pollution settled in one of the park's valleys. Nearby urban areas contribute to ozone, nitrogen, and even light pollution surrounding JTNP. Nitrogen pollution, in particular, can contribute to the growth of invasive grasses such as red brome.

Research Questions

How will socio-ecological change influence management priorities in and visitor perceptions of U.S. National Park landscapes?

1. How will management respond to socio-ecological change in JTNP?
2. How will visitors respond to socio-ecological change in JTNP?
3. How will visitors make tradeoffs among proposed management options and scenarios of socio-ecological change?
4. Understanding the assumptions and complexities inherent to choice modeling, how are these results still useful for NPS decision-makers?

Conceptual Model: Choice Modeling

- First used to understand how consumers make choices among "configurations of a multi-attributed good"[9]
- Parks are "multi-attributed goods," with attributes such as natural resource conditions, visitor amenities, and management policies[10]
- Several scenarios are prepared to represent different configurations of the park. In each scenario, attributes are set at different levels, and no two scenarios have the same combination of attribute levels
- In a questionnaire, the scenarios are presented as a series of pair-wise comparisons, and study participants are asked to repeatedly pick one among the paired scenarios (e.g., Fig. 6)

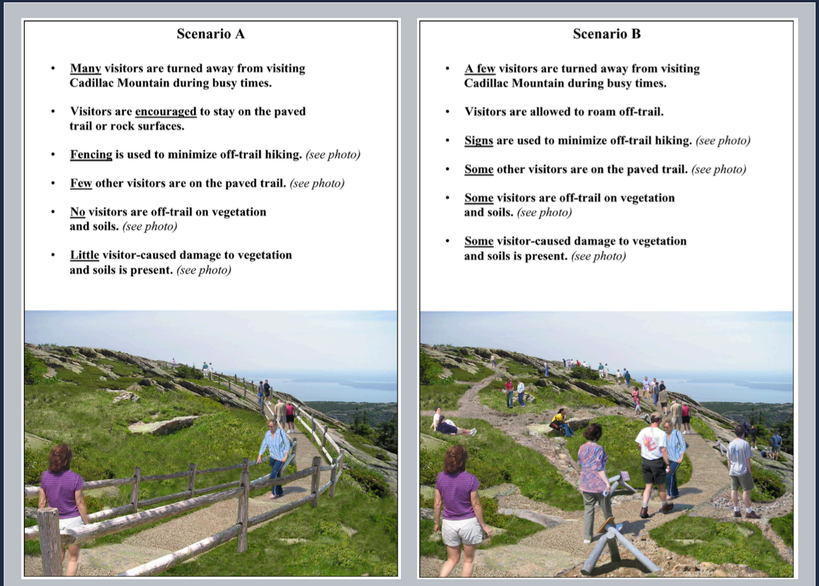

Fig. 6: Pictured above is an example of a choice set that would be included in a choice model survey (this one is sampled from Bullock and Lawson 2008, 77).[11] A survey participant would select one of the two scenarios as their most preferred. A Joshua Tree National Park example might include attributes such as: wildlife abundance, number or quality of campsites, abundance of invasive species, crowding levels, light pollution levels, etc. Determining such attributes and their levels would be the subject of a focus group with staff.

Methodology Overview

- Exploratory-sequential, mixed-methods, in which a qualitative phase informs a quantitative phase
- Qualitative phase is a focus group; managers will help design a questionnaire and brainstorm responses to socio-ecological changes
- Quantitative phase, based in utility theory, is called choice modeling and will be implemented as a questionnaire in which participants make repeated selections among different future scenarios for JTNP to reveal visitor choice (Fig. 6)

Focus group

Who: JTNP management staff
When: January 2017
What: I will ask open-ended questions to understand management responses to socio-ecological change.
Data: Collected via voice-recorder and notes. I will transcribe the recording and read it several times to single out "significant statements." These will be used to determine themes which will in turn be utilized to write a narrative to describe what happened in the focus group. Data will also be used to decide upon attributes and attribute levels for the survey.

Survey

Who: Random sample of 1000 JTNP visitors
When: Peak visitation months, March and April, 2018
What: A questionnaire in which participants select one "future JTNP" scenario in each of a series of pair-wise comparisons.
Data:. Using data from the pairwise choice sets, I will craft a model of visitor choice at JTNP that quantitatively describes the weight given to different attributes of the park (which attributes matter most); when managers understand how choices were made among scenarios, they can predict visitor responses to certain park management policies.

Outcomes

- A qualitative understanding of management challenges and options, complemented by a quantitative understanding of public preferences and the park's capacity for fulfilling the "enjoyment" mandate.
- Evaluation of utility: There are limitations to this survey design, particularly because it is impossible to perfectly account for all possible attributes and levels. Despite this, a carefully designed choice model survey has the potential to be useful to decision-makers. To evaluate this, I would like to share results with park management in a workshop in which we will have the opportunity to hone policy recommendations, reflecting NPS expertise in addition to the results of my research. We can also explore the following: Were visitor preferences as expected? Are visitor preferences likely to be used in park-management decision-making? If so, how and at what scale?
- Although the results will be specific to JTNP, the methodology, if deemed useful, could be applied in additional NPS units.

Acknowledgements: Thank you to the ASU Center for Biology and Society for providing funding. I would also like to extend thanks to my doctoral advisor, Ben Minteer, and members of the Ecoservices Lab in the School of Life Sciences for their feedback.

References: [1]*National Park Service Organic Act*, 16 U.S.C.1. [2]Cole and Yung, Beyond Naturalness. *Island Press* (2010). [3]Brownlee and Leong, *Park Science* 28(2), 21 (2011). [4]Barrows, *et al., Biol Conserv* 152, 29 (2012). [5]Associated Press, *The Spokesman-Review*. June 8, 2015. [6]Cole, *et al., Ecol App* 12(1), 137 (2011). [7]Rao, *et al., Ecological Applications* 20(5), 1320 (2010). [8]Burley, *et al., Atmos Environ* 87, 95 (2014). [9]Louviere and Timmermans, *Leisure Sciences* 12(1), 9 (1990). [10]Manning, Parks and Carrying Capacity. *Island Press* (2007). [11]Bullock and Lawson, *Leisure Sciences* 30(1), 71 (2008).