# Navigating Uncertainty: The Adaptive Value of Low Fidelity in Desert Bighorn Sheep

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**ABSTRACT:** An individual's fitness is fundamentally tied to its ability to access high-quality forage and avoid predators; attributes that vary across the physical environment the individual inhabits. Individuals with better information about the area they inhabit should have greater fitness because they can move more directly among resource patches while minimizing exposure to predation risk. However, factors influencing range fidelity can fluctuate seasonally in response to changes in the environment. Individuals that live in temporally predictable environments can benefit from having high fidelity to their seasonal ranges, however, when predation risk or food availability are not predictable through time, high site fidelity may reduce fitness. Desert bighorn sheep (*Ovis canadensis nelsoni*) are synonymous with the arid desert southwest and occupy environments that are stochastic across space and time, making them an ideal species for testing hypotheses about adaptive range fidelity. We utilized GPS data from the Zion desert bighorn population in southwest Utah to (a) determine seasonal home ranges and core areas, (b) quantify site fidelity, and (c) monitor survival and cause of mortality. We then estimated time within the seasonal core area and used that value as a measure of site familiarity to examine how risk of mortality varied with familiarity across both temporal and spatial scales. We found that larger seasonal home ranges were associated with reduced seasonal mortality rates, and that seasonal mortality rates were elevated when individuals concentrated space use within smaller regions of their home ranges. Our results indicate that in temporally unstable environments, site fidelity may be a maladaptive strategy. Consequently, conservation efforts should focus on maintaining and supporting high connectivity within desert bighorn ranges to ensure that animals are able to access adequate resources while still limiting predation risk.

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