Accounting for Animal Movement Decisions in the Design and Management of Civil Infrastructure

R. Andrew Goodwin, PhD
LinkedIn: www.linkedin.com/in/r-andrew-goodwin-a7524491

Abstract

Animal movement is driven by responses to both social and non-social factors of the environment. Across species, animal decisions often depend on the context of the decision. Therefore, decision-making is not based solely on information measured at the animal's position at time t. Rather, animal movement decisions depend on information accumulated over space and time leading up to time t. This raises the conundrum of how to relate the distributions of animals to environmental variables since preceding experience, possibly to unobserved conditions, contribute to the behaviors that are observed. I use a rich animal and environmental data set to integrate a spectrum of behavioral research and construct a theoretical platform for describing the observed distributions of species populations. My work in the aquatic, terrestrial, and aerial environments falls into two categories, (i) better managing civil infrastructure that impacts animal movement and (ii) developing/evaluating computational abstractions of environmental sensing and decision-making in individuals and groups of animals in open field environments. In the aquatic realm, I'll share research suggesting that water acceleration "shapes" the individual movement trajectories of juvenile salmon near hydropower dams. Then, I'll discuss how I am building off this research to understand Sonoran Pronghorn that can interfere with military training activities in the Arizona desert. Lastly, I'll discuss bird flocking as a biological network that can inform the design of fast, light, mobile, compact, and collapsible engineered systems, e.g., geospatial sensors.