Wildlife Connectivity: We've been telling for twenty years that we don't have enough time to gather the data

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Conservation Biologists are forced by circumstance to work on complex problems with very little information and no unified theories, other than those associated with Darwin's synthesis of natural selection. We know that the natural world is altered by human actions, often with irreparable damage; but we have limited power to predict the consequences of ecological damage because new impacts are evolving a rate that exceeds the development of ecological knowledge. Conservation biology is not the only science forced into a reactive mode by novel problems; fields such as geology and medicine have been placed under similar pressures with remarkable successes (plate tectonics) and stunning failures (bleeding disease victims). So necessity breeds innovation, but it can also tumble practitioners into actions based on beliefs rather than science. Wildlife corridors exemplify this range of responses, from well-documented connectivity among wildlife populations to almost religious demands to maintain symbolic but dysfunctional linkages between natural areas.

Perhaps more important, biological components of ecosystems have the intrinsic ability to self-organize at a number of different scales; so responses to human-induced changes are dynamic, chaotic, and idiosyncratic. Moreover, questions about wildlife connectivity typically come from disciplines outside the biological sciences, framed by induction (e.g., what do we need to know about wildlife respond to a freeway?) rather than deduction from previous research (e.g., demography, distribution, and dispersal of wildlife populations). Inductive reasoning forces conservation scientists to select ideas from a diverging array of biological paradigms (genetics, animal behavior, population biology, habitat relationships, community ecology, ecosystem science, phylogeography/biogeography, and global-change science). Each of these paradigms emphasizes or de-emphasizes components parts of complex ecological systems, which can lead to well-reasoned but profoundly different conclusions about impacts to and management options for connectivity. The need for expeditious studies and project-compatible mitigations further constrains the way connectivity questions are framed. Plans for wildlife connectivity can become simplistic (how wide should wildlife corridors be?), fail to consider alternative models, and persist only because they are not tested. We seldom document long-term outcomes of individual wildlife corridors to see if they have fulfilled their proposed functions, and invariably fail to test if the underlying models of wildlife connectivity were actually correct.

Models of global change have focused our attention on the dynamic nature of wildlife distributions, and the importance of connectivity. Nevertheless, Wildlife corridors can't be treated as mitigation/management actions, unless their proposed functions can be substantiated by research-based information. Corridors plans should, at minimum, be supported by examples of similar corridors that have successfully met their connectivity goals. This conclusion may seem like a mandate for inertia: We haven't even described all the species and unique populations in the southwest. We don't know enough about the distribution, demography, dispersion, or dispersal patterns of the described species to predict change. We don't know what sort of connectivity is needed for the long-term persistence of wildlife species and populations, and we don't know how or if wildlife corridors provide this connectivity. Finally, we don't know the role that connectivity (present or future) should play in the persistence of species. But we do know that human alteration of ecosystems is inevitable; and management responses will be needed. Admitting how little we know is probably a good starting point. Treating each wildlife connection as an experiment will force us into better questions and more comprehensive monitoring. Intuition and induction are critical tools in wildlife connectivity, but we also need to be pragmatic and deductive to avoid acting like 13th century barbers.

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