Informal trails and fragmentation effects: A conceptual and research overview

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Introduction

Trails are important recreation infrastructure in protected areas, but their presence and use can affect the ecology of adjacent corridors. Trail networks fragment highly-valued protected areas already confined by roads and other human development. Unplanned visitor-created informal trails, which commonly exist in many protected areas, further exacerbate ecological and fragmentation effects by expanding the influence into relatively undisturbed habitats. This problem presents an important threat to biodiversity and landscape conservation objectives. Trail impacts have attracted considerable research attention in the past few decades, but only until recently have there been focused research efforts on informal trails and their ecological consequences (Leung et al,. 2011; Wimpey & Marion, 2011). This presentation provides an overview of visitor-created informal trails and past research that has examined their effects on landscape and habitat fragmentation.

Characterizing informal trails

Informal trails, sometimes referred to as social trails, can be characterized in different ways, including spatial scale, distribution patterns, motivation of trail users, and types and significance of environmental impacts. Leung and Cole (in prep.) present a typology of informal trail networks based on the distribution pattern and spatial extent of informal trails. Informal trails may exist as individual trail segments or they may intertwine to form dense trail webs. These basic types of informal trails may occupy very limited spatial extent around a specific recreation site, or they can be spatially extensive in a landscape. Such differences in informal trail presence have implications for their fragmentation effects as well as for monitoring and management strategies.

Informal trails and fragmentation

Focused research on the fragmentation effects of informal trails emerged only recently, although past recreation ecology research on human trampling provides ample empirical evidence of trail-related ecological changes at a local scale. At the local or trail corridor scale, research has examined immediate effects on the *trail surface* from trampling pressure and biophysical changes (Wimpey & Marion, 2011). These can contribute to *edge* effects on soil biota, flora and fauna next to trails, which can vary in intensity and extents (Pickering & Growcock, 2009). Research has also examined *conduit* effects of trails as they provide channels for dispersing invasive species and disease (Pickering & Mount, 2010). Informal trails can also create *barriers* for certain species, reducing the effectiveness of seed dispersal and the movement of ground dwelling insects and arboreal mammals (Holmquist, 2004). Surface, edge, conduit and barrier effects all contribute to fragmentation of habitats as a result of informal trail networks, reducing the area's conservation values and ecosystem services.

Implications and conclusions

Further research is much needed on this topic. Informal trails need to better measured and their effects better examined so that the ecological significance of their fragmentation effects can be evaluated. What is clear is that land managers need to minimize the formation of new informal trail networks and manage existing trail networks to reduce the impacts of fragmentation.

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