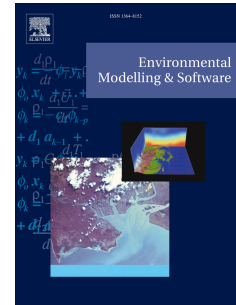


# Accepted Manuscript

Managing ecological disturbances: Learning and the structure of social-ecological networks

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# 1 **Managing ecological disturbances: Learning and the structure of social-** 2 **ecological networks**

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## 10 **Abstract:**

11 Ecological disturbances (i.e. pests, fires, floods, biological invasions, etc.) are a critical challenge  
12 for natural resource managers. Land managers play a key role in altering the rate and extent of  
13 disturbance propagation. Ecological disturbances propagate across the landscape, while  
14 management strategies propagate across social networks of managers. Often, these related  
15 processes of diffusion are studied separately. Here we use an agent-based model to examine the  
16 simultaneous diffusion of ecological disturbances and management strategies across a multiplex,  
17 social-ecological network, that allows us to account for the fundamental role of social-ecological  
18 feedbacks. We examine the management of a generic ecological disturbance as a function of  
19 different learning strategies and social-ecological network structure. Our results show that  
20 managers who imitate other successful managers and have access to accurate information are  
21 most effective at controlling disturbances. The structural properties of the social-ecological  
22 network also play an important role: an increase in inter-layer assortativity and average multiplex  
23 degree reduce the expected disturbance prevalence, while an increase in local clustering  
24 increases it. The results presented here highlight the potential for local, close-knit communities  
25 to impede the learning and coordination required to accurately transmit information for  
26 disturbance management, as well as the importance of social structures that match ecological  
27 processes on the landscape. Our approach, integrating coupled social-ecological models with  
28 network analysis, provides a general scaffold that can be modified to examine a variety of more  
29 specific processes in which both social and ecological flows diffuse across a multiplex network.  
30

31  
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33 for natural resource managers. Land managers play a key role in altering the rate and extent of  
34 disturbance propagation. Ecological disturbances propagate across the landscape, while  
35 management strategies propagate across social networks of managers. Here we use an agent-  
36 based model to examine the joint diffusion of ecological disturbances and management strategies  
37 across a social-ecological network, accounting for the fundamental role of social-ecological  
38 feedbacks. We examine the management of a generic ecological disturbance as a function of  
39 different learning strategies and the social-ecological network. Our approach provides a general  
40 scaffold that can be modified to examine a variety of processes in which both social and  
41 ecological flows propagate across a social-ecological network. Our findings highlight the  
42 importance of full and accurate information to assess successful strategy, limited clustering and  
43 alignment between the social and the ecological system.  
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47 **Keywords:**

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