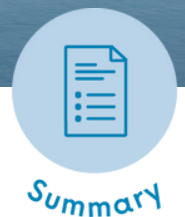


Coastal ecosystem management: Managing multiple stressors by considering network interactions



This summary suggests a series of questions which will enable environmental managers and scientists to understand the potential for unexpected risks, and to develop strategies for handling unexpected environmental outcomes.

Managing coastal ecosystems can be further complicated by the effects of multiple stressors, where more than one small issue can result in large ecological shifts. Ecological evidence can provide insight into how the effects of stressors will impact an ecosystem network, and which ecological components should be prioritised for management of these stressors.

Case studies from research by the *Ecological responses to cumulative effects* project have highlighted that a single activity or issue can often generate multiple stressors. Rather than focusing solely on reducing the issue, considering how each stressor impacts different parts of the ecological network can help identify the highest priorities for environmental management.

These findings suggest that considering the dynamics of an ecological network can help manage which stressor effects should be considered as part of a network of effects and interactions.

To inform management, identify risks, and prioritise actions, you can ask the following questions:

1. Is the stressor(s) affecting any ecosystem components connected to other important components that could increase the path length of indirect effects?
2. How many (one, few or many) ecosystem components does the stressor(s) impact directly at low, medium and high levels? And are the effects in the same or opposite directions to the flow of indirect effects?
3. Are any of these ecosystem components implicated in reinforcing feedbacks or balancing feedbacks?
4. Are these indirect effects likely to be magnified or reduced by feedbacks?
5. Do the indirect effects alter resilience to the other stressors in the ecosystem at low levels?



Gladstone-Gallagher, R. V., Thrush, S. F., Low, J. M. L., Pilditch, C. A., Ellis, J. I. & Hewitt, J. E. *Toward a network perspective in coastal ecosystem management.* *Journal of Environmental Management* (November 2023)