

**LANDFORM INFLUENCE ON ECOSYSTEM DEVELOPMENT AND RESILIENCE: A CONCEPTUAL MODEL FOR ANTARCTIC ENVIRONMENTAL RESEARCH**

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There are only two important questions facing environmental managers and scientists; is there a problem and how do we fix it? The Australian Antarctic Program uses applied environmental research to address both questions at a very practical level. To support management of contaminated sites for example, assessment and monitoring are used to define concentrations of environmental contaminants and associated changes in biological community structure. Toxicology experiments are being used to determine critical concentrations of contaminants against a range of Antarctic species. Together these begin to address the question of whether there is an ecological problem.

The Antarctic Treaty System uses the phrase 'minor and transitory' to define degrees of environmental impact. The phrase 'transitory' implies that in this jurisdiction the ability to recover from disturbance is important for determining the significance of an environmental problem. For this reason, although the toxicological approach is commonly used in other regions, in the Antarctic, many other factors that might influence ecosystem sensitivity or resilience, beyond the sensitivity of individual species, should also be considered. These include highly seasonal productivity and reproduction, slow development times, simple food chains, potential lack of functional redundancy and fragmented populations.

Most human activity and impacts in Antarctica are concentrated on the seasonally ice-free land and nearshore open-water marine environments where snow and ice cover are highly variable both in time and space. Using both terrestrial and marine examples we will illustrate how landform influences many aspects of the Antarctic ecosystem by controlling the formation and persistence of snow and ice. We will discuss how this in turn may affect ecosystem resilience and the relative susceptibility of Antarctic ecosystems to human disturbance and the implications of this to Antarctic environmental management.

How we fix environmental problems is another story altogether.