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# The Red List of Ecosystems: a new approach to conservation

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**Conservation scientists and managers tell us some of our best known (and loved) animals and plants are disappearing. Species' ranges are contracting, some in spectacular fashion, and population sizes are dwindling. For some species these declines may not lead to their loss, for the foreseeable future at least, but others may be close to becoming extinct. What can we do about it?**

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Well, we're going to try and save those species that are in trouble. Unfortunately, no government on the planet is prepared to invest anywhere near the amount needed because while people don't like threatened species going extinct, they also expect our governments to provide hospitals, schools and police forces.

At the end of day, conservation is just one of a range of activities supported by the government. So, many species are in trouble and governments don't invest enough resources to save them all. Choices have to be made. Which species do we allocate the limited resources too?

Current policy (in most places around the world) favours expenditure on the most threatened species. No politician wants a species going extinct on their watch. A growing number of researchers (and this includes Australia's collaborative Environmental Decisions Group, or EDG) would like to see available resources achieving the greatest good – and that might not only be by focusing on the most threatened species.

The arguments above are central to much of EDG's work – ie, many species are in trouble, there are not enough resources, choices need to be made, and there are different ways of approaching how these decisions should be made (see the box below on the species prism). I reiterate these points here because interwoven between them are a few underlying assumptions, and they are that conservation is largely viewed through a prism of the status of threatened species, and that different approaches to making a difference with our investments are judged by how it changes the

status of threatened species.

The status of threatened species, therefore, is a cornerstone to biodiversity conservation. That's in part because species are 'units' that are relatively easy to distinguish and count. It's also in part because an international body, the International Union for the Conservation of Nature (IUCN), has developed a widely accepted list of threatened species that it updates each year. The IUCN Red List of Threatened Species assigns species to one of five risk categories (from 'least concern' to 'critically endangered') with robust criteria for how any described species moves from one category to another.

However, the status of species is one facet of the conservation problem. Scientists have become increasingly concerned that the habitats of species and the ecological processes that influence the relationships between species are not adequately considered.

What we have long needed is a Red List of Ecosystems, and this year the IUCN has delivered one. It's a risk assessment framework for ecosystems that lets the IUCN rank ecosystems as endangered, vulnerable or not threatened according to the risks they face.

One of the reasons we've had a species list for much longer than an ecosystems list is that defining, measuring and comparing ecosystems is a much tougher proposition than defining, measuring and comparing the status of threatened species, which is challenging enough in itself. It's easy to observe that the Aral Sea is a collapsed ecosystem; the sea itself has largely disappeared and with it many of its native animals and plants – never to return. In terms of area, composition and function, this ecosystem is gone.

But what about the Coorong wetland in South Australia? It's suffering enormously from reduced freshwater inflows but recent heavy rains further up the catchment have enabled it to bounce back to some extent. As an ecosystem, what's its risk?

Or what about Florida's Everglades or Australia's Great Barrier Reef. Both are suffering, among other things, from nutrient inflows from nearby agricultural activity. These inflows are distorting ecosystem processes and species mix and thereby producing a raft of undesirable changes. Both ecosystems are under tremendous pressure but at what point should they be considered vulnerable as opposed to endangered?

Attempting to classify the threat level to ecosystems is a truly daunting task given the range of factors involved and things that could be measured. However, just as the Red List of Species has helped the basic framing of the problem of biodiversity decline and enabled a robust comparison of the various solutions, the conservation world desperately needs a framing for ecosystems, too. The ecosystems framework that has been released by the IUCN is the product of many discussions and workshops between scientists. It is very much a product of science and at this stage is a work in progress.

The framework for a Red List of Ecosystems was recently published in a scientific study in *PLoS ONE*. The article – the lead author of which is Professor David Keith from the University of New South Wales – illustrates how the framework would work focussing on 20 case studies. The long-term aim is to have a complete assessment of the world's ecosystems by 2025.

The *PLoS ONE* paper provides a scientific basis for the criteria for the IUCN Red List of Ecosystems. The Red List assesses each ecosystem against five criteria. Two of the criteria relate to an ecosystem's distribution – how rapidly it is declining and its current extent. Another two criteria relate to functional characteristics of ecosystems. They measure how rapidly and how extensively the physical and biological components of an ecosystem are degrading, particularly the processes that sustain the ecosystem and its species. The fifth criterion allows multiple threats to an ecosystem to be assessed, as well as potential interactions between these threats.

'We assessed 20 ecosystems as part of the study,' says David Keith. 'The remote mountain ecosystems of the Venezuelan Tepui are among those at least risk of collapse. These are showing little evidence of decline in distribution or function in the past or near future.

'At the other extreme is the Aral Sea of Central Asia, which collapsed during the 1980s and 1990s.

'The lessons from the Aral Sea assessment are sobering. Not only were a host of species lost forever as the sea became hypersaline and dried over much of its former extent, but the ecosystem collapse led to socio-economic disaster, including the closure of regional fisheries and shipping industries.

'Dust storms were generated from the dry sea bed and they continue to have major impacts on infant mortality and other indicators of human health.'

Professor Keith believes that the methods underpinning the assessment of ecosystems for the Red List are a vital part of the scientific infrastructure needed to support evidence-based environmental management.

'For the first time, we have a scientifically robust risk assessment framework, which works across the full range of terrestrial, freshwater, marine and subterranean ecosystems. As an early warning system, the Red List of Ecosystems will help governments, industries and communities avoid ecosystem collapse and the associated socio-economic impacts by informing better environmental decisions.

'Red List assessments will better target the ecosystems most vulnerable to degradation and help determine which options for investment in environmental management will work best. Ultimately, better planning and management is needed to conserve our rich biodiversity and sustain ecosystem services that support our current standards of living.'

So, while the state of biodiversity conservation around the world has up until now largely been framed by our perceptions of species loss, now we have a new and complementary prism to look through.

And it's important to note that the Red List of Ecosystems doesn't diminish the Red List of Species. They work together.

'The ecosystem Red List focuses on biodiversity, habitats for species, as well as their interactions and dependencies, including food webs,' says Keith.

'The species Red List focuses on individual species, some of which may go extinct even though the ecosystems in which they live continue to remain functional.

'Together, the Red Lists for species and ecosystems will provide a more comprehensive view of the status of the environment and its biodiversity than either can on its own.'

**More information**

Keith DA, JP Rodríguez, KM Rodríguez-Clark, E Nicholson et al. (2013) Scientific foundations for an IUCN Red List of Ecosystems. *PLoS ONE*, 8(5): e62111.

For more background on the Red List of Species see David Keith's article in The Conversation.

*This article was first published in Decision Point*.

## The species prism in a nutshell

1. **Species are in trouble:** In 2013, the IUCN lists 20 930 species as critically endangered, endangered or vulnerable. That number was 10 533 back in 1996/98.
2. **We don't spend enough to save species:** A recent analysis in the journal *Science* of what it would cost to reduce the extinction risk of all threatened species came up with a figure of US$4.76 billion each year, an order of magnitude more than current conservation funding.
3. **The change in status is one way of comparing investment options:** An EDG analysis on bird conservation in Australia demonstrated that an annual budget of $10 million (that's an average of $37,000 per bird species of conservation concern) can be expected to reduce the number of threatened species in 80 years time by approximately 15% while limiting the number of extinct species to one. It should be noted that this level of spending is approximately three times more than what is being spent at the moment.