Red List of Ecosystems

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Research into the critical connections between human, wildlife health and ecosystems.

• How human activities (land use change) could lead to disease emergence (Ebola, Zika, ...)
• Disease regulation as an ecosystem service: Estimate the economic impact of infectious diseases due to land use change

**Red List of Ecosystems**: a quantitative framework to evaluate ecosystem condition
Red List of Ecosystems

**Goal**: develop a consistent global framework for monitoring the status of ecosystems and identifying those most at risk of biodiversity loss.

- How great are the risks?
- How soon are the changes likely to occur?
Assessing risks to ecosystems

- Unlike species, ecosystems do not go extinct!
  - Cannot sustain its *defining features*: Characteristic native biota and Ecological processes that structure & sustain the system
- Ecosystem collapse ~ species extinction - Analogous concepts
- Ecosystem collapse affects capacity to deliver ecosystem services

Aral sea: collapsed ecosystem

Freshwater aquatic → ephemeral steppe + hypersaline lakes
Conceptual models

[Diagram showing relationships between soil erosion, fire frequency, species richness, charcoal production, exotic invasive species, timber harvesting, cattle grazing, and managed timber pressure on natives.]

- **Soil**: acidic and lateritic
- **Precipitation**: 800-1400 mm, 80-90 rainy days
- **Fire**: low frequency (natural)
- **Socio environmental factors**: management
- **Species richness reduction**
- **Evergreen open canopy (10-12 m)**, dominated by *Uapaca bojeri*. Understory ericoid shrubs. Herbaceous layer dominated by grasses
- **Forest clearing**
- **Displacement of native species**
- **Species richness reduction**
- **Charcoal production**
- **Exotic invasive spp**
- **Timber harvesting**
- **Cattle grazing**
- **Managed timber reduces pressure on natives**

Promotes, May promote, May reduce.
RLE Methodology

- **5 Criteria**
- **4 Time periods**

### Extent of Occurrence (km²)

### Area of Occupancy (10x10 km grid cells)
RLE Methodology

Risk of loss of characteristic native biota

- A. Declining distribution
  - reduced carrying capacity (habitat quantity)
  - reduced niche diversity

- B. Restricted distribution
  - susceptibility to spatially explicit threats and catastrophes

- C. Degradation of abiotic environment
  - reduced carrying capacity (habitat quality)
  - reduced niche diversity

- D. Altered biotic interactions
  - reduced vital rates and mutualisms, increased interference

- E. Quantitative risk analysis

Threatening processes

Ecosystem distribution

Ecosystem process
RLE Methodology

Listing Criteria (decision rules)

A. Distribution reduction
B. Restricted distribution & decline
C. Degradation of abiotic environment
D. Disruption to biotic processes
E. Quantitative estimate of risk of collapse

Quantitative thresholds

Each ecosystem type assigned to an ordinal category of risk:
- Collapsed
- Critically endangered
- Endangered
- Vulnerable
- Near-threatened
- Least concern
- Data deficient
- Not Evaluated

RLE outcomes: more than a threat category
Example from Paraguay:
Decline in distribution in the past 50 years > 50%:

Endangered
RLE Criterion C: Degradation abiotic environment

Example Parana Seasonal Dry Forest

Precipitation will increase in more than 40% of the area in the next 50 years

Critically Endangered
RLE Methodology

CRITERIA HAVE ENSEMBLE PROPERTIES

Two principles:

• Assess as many criteria for which data are available
• Overall status: highest returned by any one criterion

Overall status: Critically Endangered
Global policy impact of RLE

• National RLE assessments underway/completed in >20 countries on 6 continents
  • 3 countries already updating first assessments
  • 5 countries already integrate RLE into regulatory policy
Applications of the RLE

APPLICATIONS - conservation options

• CR + EN  Conservation in low represented ecosystems

<table>
<thead>
<tr>
<th>RLE</th>
<th>% Area in NPAs</th>
<th>% Area in Indigenous Terr.</th>
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<tbody>
<tr>
<td>CR</td>
<td>4%</td>
<td>33%</td>
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<tr>
<td>EN</td>
<td>12%</td>
<td>18%</td>
</tr>
<tr>
<td>VU</td>
<td>16%</td>
<td>47%</td>
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<tr>
<td>LC</td>
<td>20%</td>
<td>49%</td>
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Applications of the RLE

APPLICATIONS - restoration options

- **CR + EN** *Conservation* in low represented ecosystems
- **CR + EN** *Restoration* in remote areas with improdutive cattle
Applications of the RLE

Preliminary assessment of ecosystem risk based on IUCN criteria in a hierarchy of spatial domains: A case study in Southwestern China

Jianbo Tan\textsuperscript{a,b}, Ainong Li\textsuperscript{a}, Guangbin Lei\textsuperscript{a}, Jinhu Bian\textsuperscript{a}, Guoke Chen\textsuperscript{c}, Keping Ma\textsuperscript{c}

Mapping ecosystem services in China

Ouyang et al. (2016) Science
Applications of the RLE

Reporting on ecosystem status

Convention on Biological Diversity

Reporting against Aichi targets

France  China  Norway  Chile
Applications of the RLE

Support for assessors

Introduction to the IUCN Red List of Ecosystems Categories and Criteria

Course Manual

Guidelines for the Application of IUCN Red List of Ecosystems Categories and Criteria

Edited by L.M. Bland, D.A. Keith, N.J. Murray and J.P. Rodriguez

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