

EO 4 Ecosystem Accounting 2022



EO for ecosystem condition assessments: Lessons from the Myanmar National Ecosystem Assessment

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The Myanmar National Ecosystem Assessment



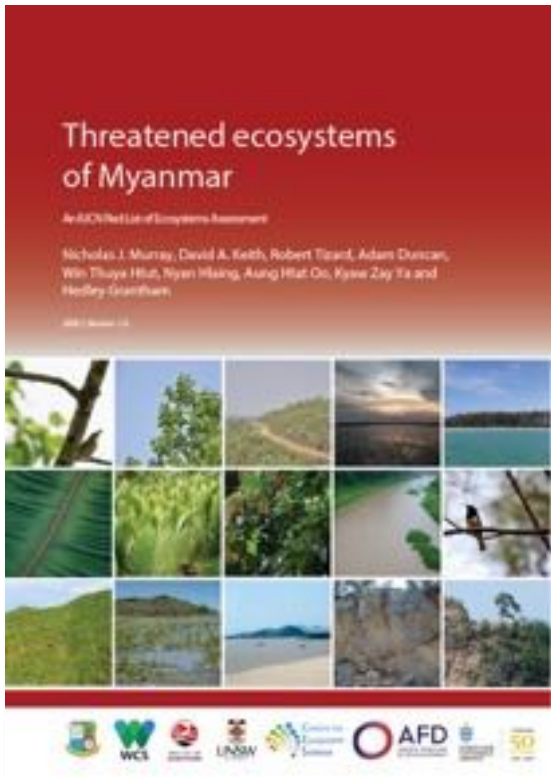
Aim of the Myanmar National Ecosystem Assessment:

- Assess the status of all of Myanmar's terrestrial, freshwater, subterranean and coastal ecosystems.

Methods:

- Conduct a full IUCN Red List of Ecosystems assessment

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IUCN Red List of Ecosystems requires the evaluation of 5 criteria focused primarily on ecosystem **extent** and **condition**.

A. Reduction in geographic distribution

Spatial

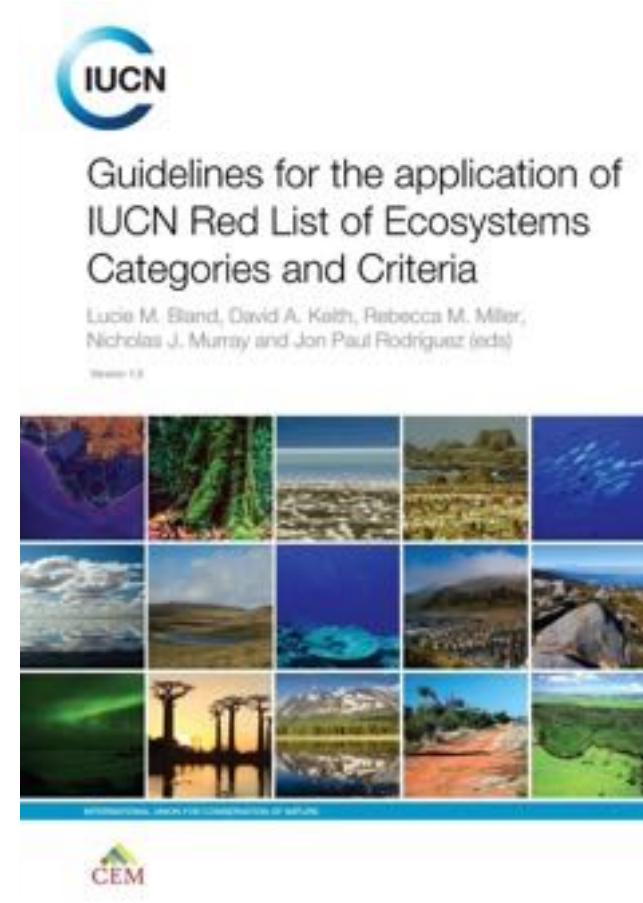
B. Restricted geographic distribution

C. Environmental degradation

D. Disruption of processes or interactions

Condition

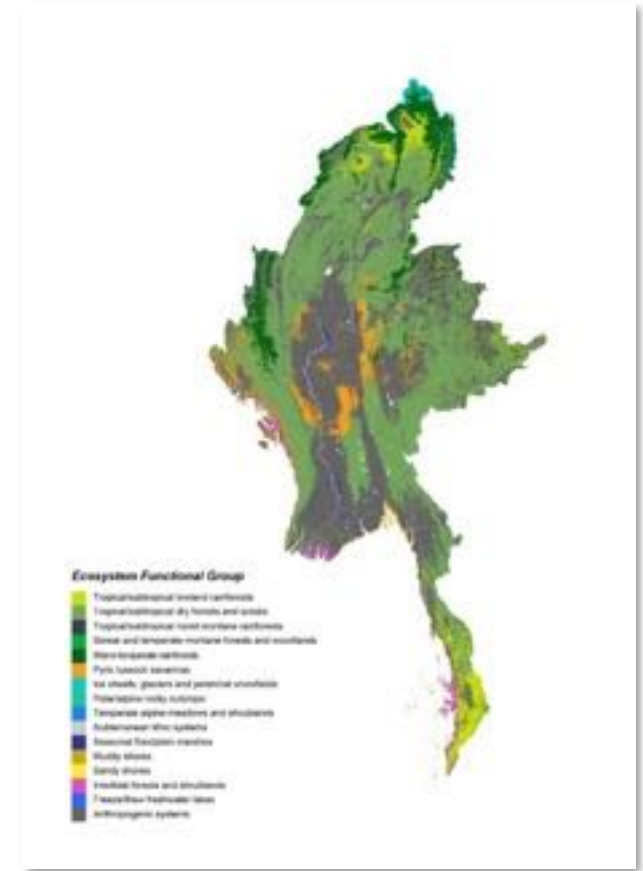
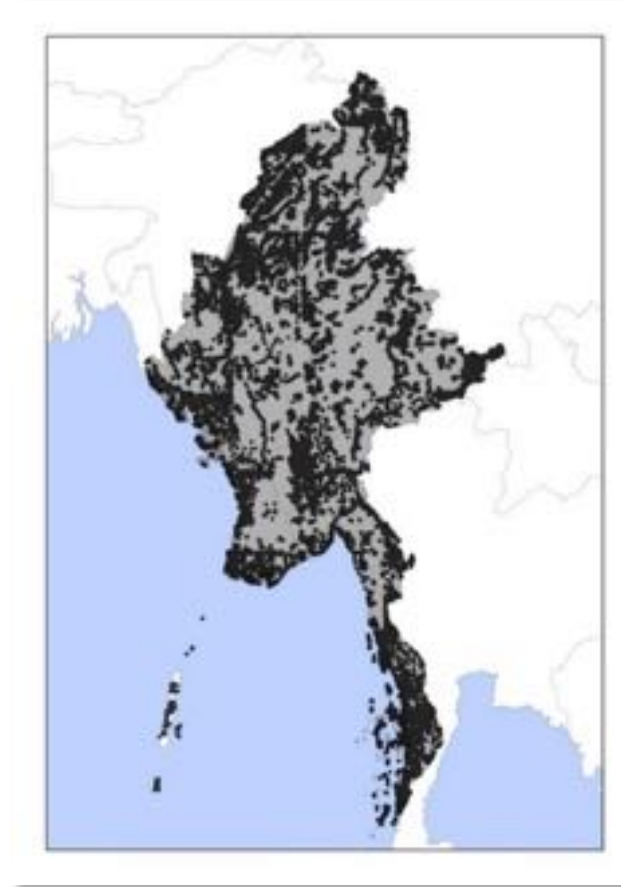
E. A quantitative analysis



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Two spatial extent criteria:

- New national map developed from thousands of hours of field work and image interpretation, together with supervised remote sensing classifications of Sentinel 2 and Landsat data
- Straightforward assessment of the change in extent and distribution criteria.



The 'condition' criteria were assessed with:

- Per-ecosystem literature review
- Global indicators were effective for many ecosystems – though were compared against field studies where possible
- Multiple indicators used as much as possible
- Choice of indicators clearly justified in every ecosystem assessment summary (5-9 pages)

ECOSYSTEM DESCRIPTION

Bago semi-evergreen forest

Authors Murray, N.J., Tappin, R., Keith, D.A.
 Myanmar ecosystem names: Mixed oak forest, dry oak forest, Pyroclastic semi-evergreen forest (Sims et al., 2015), Mixed deciduous forest (Campson, 2008)
 Stone Tropical and subtropical forests (T1)
 Functional group: Tropical/deciduous dry forest and wetlands (T1.2)
 Global classification: IUCN T1.2.4
 IUCN Status: Critically Endangered (Endangered-Critically Endangered)

Description
 A semi-evergreen forest that formerly occurred across much of the Bago Yoma. *Albizia clypeata* and *Tectona grandis* are the primary species with dominance changing from south to north along a precipitation gradient (Sims, 1994). It is primarily deciduous, but some evergreen elements may occur. Much of the Bago Yoma range is now highly degraded with plantation oak and bamboo regrowth.

Distribution
 Occurs across the majority of the Bago Yoma with approximately 18,000 km² identified in our remote sensing analysis.

Characteristic native taxa
 The dominant tree species of Bago semi-evergreen forest are *Albizia clypeata* or *A. chiniformis* (Fabaceae) and *Tectona grandis* (Lamiaceae), with *Lagerflora* spp. (Sapotaceae), *Opsonocarpus alatus* and *O. luteolatus* (Dypterocarpaceae) also present (Sims et al. 2015). *Barringtonia* are present throughout, particularly in degraded or formerly cleared areas, and include the species *Barringtonia polymorpha* and *Cyathostachyum pargamentii* (Poaceae). *Fernandus lanceolatus* (Lamiaceae) may be present in the more northern region of the Bago Yoma. The assemblage is similar to ecosystems further south and east including Tertiary semi-evergreen forest and East Malayan dry valley forest with species such as *Cestrum hookeri* Benth., *Mimosa tomentosum*, *Lonicera barbatiflora* (Rubiaceae), *Podocarpus amarus*, *Blumeodendron papuanum*, *Pithecellobium spicatum* and *Podocarpus barbatus* (Conocephalaceae). There is at least one endemic bird found in this ecosystem (Endangered Rufous Whistler).

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ECOSYSTEM DESCRIPTION

grassland which has recently been elevated to full species list has yet to be studied. This ecosystem can still support small populations of large mammals that include leopard *Panthera pardus* (Felidae), Sambar deer *Cervus urocyon* (Felidae), Gaur buffalo *Bubalus bubalis* (Bovidae) and Banteng *Bos javanicus* (Bovidae). Asian Elephant *Elephas maximus* (Proboscidea) is known to survive in small numbers in this ecosystem (Campson, 2008).

Abiotic environment
 This ecosystem occurs in areas with moderately high rainfall with high seasonality, with most rainfall occurring between May and October. Mean annual rainfall varies from 1,500 mm in the north to 2,500 mm in the south, but in the drier foothills in some areas may occur as little as 800 mm (Sims et al., 2015). Mean temperature is 26.1°C. Soils are generally light textured and acidic, with increasing clay content with depth (Sims et al., 2015).

Key processes and interactions
 Rainfall seasonality and seasonal water stress is a key factor that influences the distribution and species composition of seasonally dry ecosystems such as Bago semi-evergreen forest (Sims et al., 2015). The dominant tree species are drought deciduous, enabling them to persist through prolonged water deficits in the dry season, and support rapid growth when monsoon rains halt primary productivity. Fertilisability is likely to be low, except where extensive disturbance has promoted increased fertility, particularly in areas with large tracts of bamboo regrowth.

Major threats
 The ecosystem has been extensively logged, fragmented by shifting cultivation and the development of plantations (Srinivas et al., 2011). Only tiny patches of primary forest remain, with the vast majority of this ecosystem now occurring as highly degraded forest regrowth dominated by bamboo. Plant disturbance benefits birds but is a persistent enemy to trees, with severe events leading to dispersal and establishment of new species typical of primary forest. They may also maintain a fire regime that limits establishment of primary forest species. The impact of shifting cultivation has been reported to be decreasing in the tall deciduous, while logging, overabundant development, urban development and water construction have

birds have expanded (Srinivas et al., 2011). Pruning of old trees, including elephants, appears regular (Sampson et al., 2015).

Ecosystem collapse definition
 Bago semi-evergreen forest is regarded as collapsed when its original distribution has declined to zero, or when primary forest accounts for 0% of total forest cover, or when patches of remnant primary forest are less than 1/10 km² in area.

Assessment summary
 This ecosystem now occurs across a relatively small distribution, and about 33.2% of the ecosystem is considered degraded since a primary state at year 1750. Ongoing degradation is clearly occurring, with 8.2% of remaining primary areas lost between 2000-2017. Projections from the dataset suggest that ongoing degradation will not occur sufficiently to meet category thresholds for DEB. However, a remote suitability projection model suggests that environmental suitability for this ecosystem will severely reduce by 2050, with an effect and severity sufficient to meet the thresholds for Critically Endangered, with model uncertainty suggesting a plausible bound of falling between Endangered and Critically Endangered.

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Example (forest biomes) – biotic degradation:

- 26 ecosystem assessments used a remotely-sensed dataset of the distribution of primary forest in Asia.
- The *proportion* of ecosystem that remains as primary forest is used as a spatially comprehensive estimate of condition.
- Assumption: 100% of forest is primary forest in the year 1750.
- Requires ecosystem map to bound analyses.

Environmental Research Letters

LETTER

Ongoing primary forest loss in Brazil, Democratic Republic of the Congo, and Indonesia

Svetlana Turubanova¹, Peter V. Potapov¹, Alexandra Tyukavina¹ and Matthew C. Hansen^{1,2}

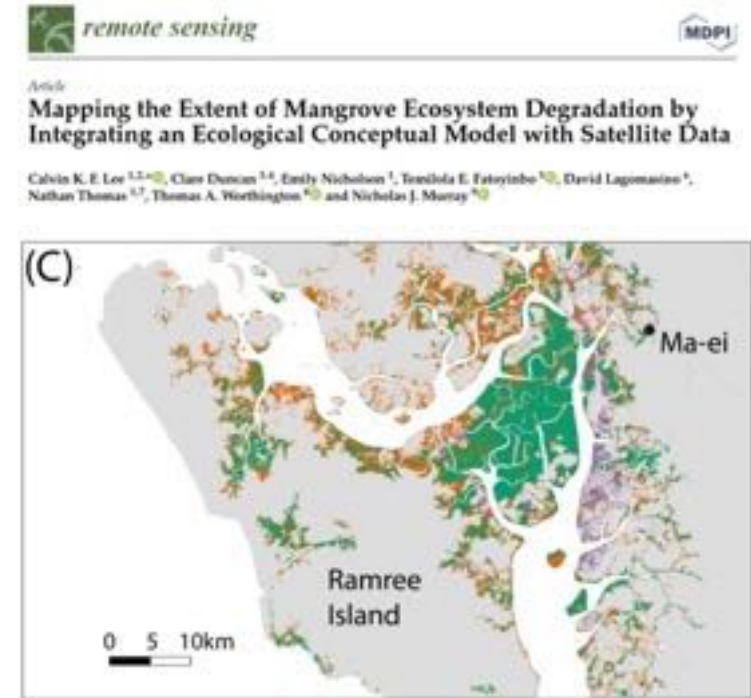
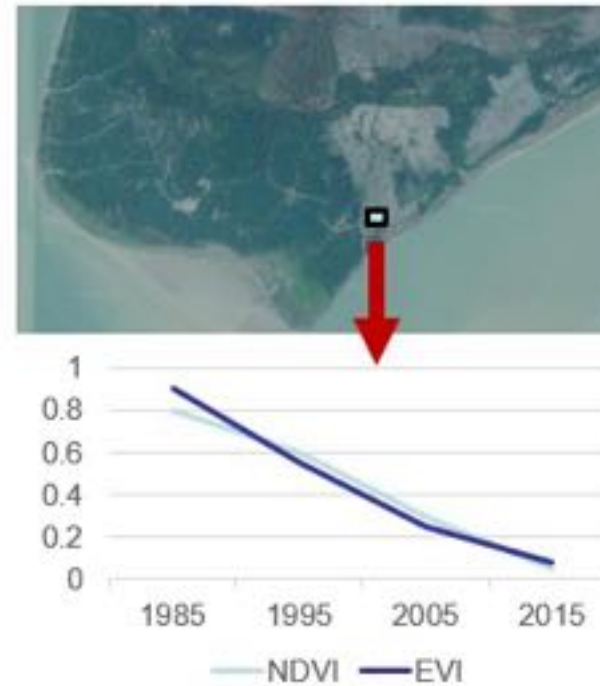
¹ University of Maryland, College Park, MD 20742, United States of America
² Author to whom any correspondence should be addressed



a) Primary forest
2000
Year of loss
2001 2016

Example (mangrove ecosystems):

- 4 mangrove assessments used remotely-sensed analyses developed for the project:
 - Supervised classification with a 'degradation' training set
 - Per-pixel time-series of vegetation indices *within* mangroves
- The **proportion** of ecosystem meeting thresholds of mangrove degradation used to assess the extent of degradation.
- Requires ecosystem map to bound analyses.



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Results:

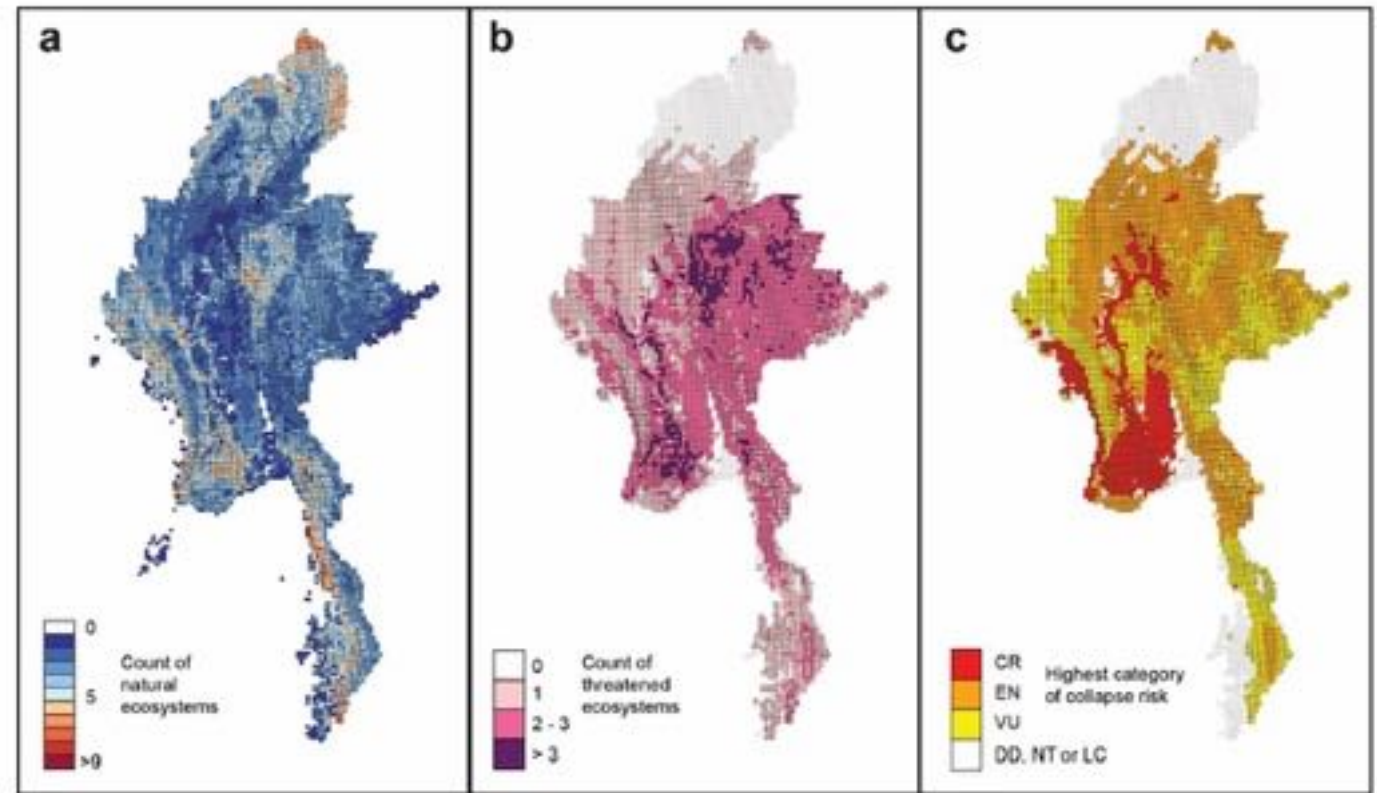
- Condition criteria set the overall ecosystem assessment outcomes more often than the extent criteria

→ The national ecosystem assessment was not dominated by extent change

Count of natural ecosystems

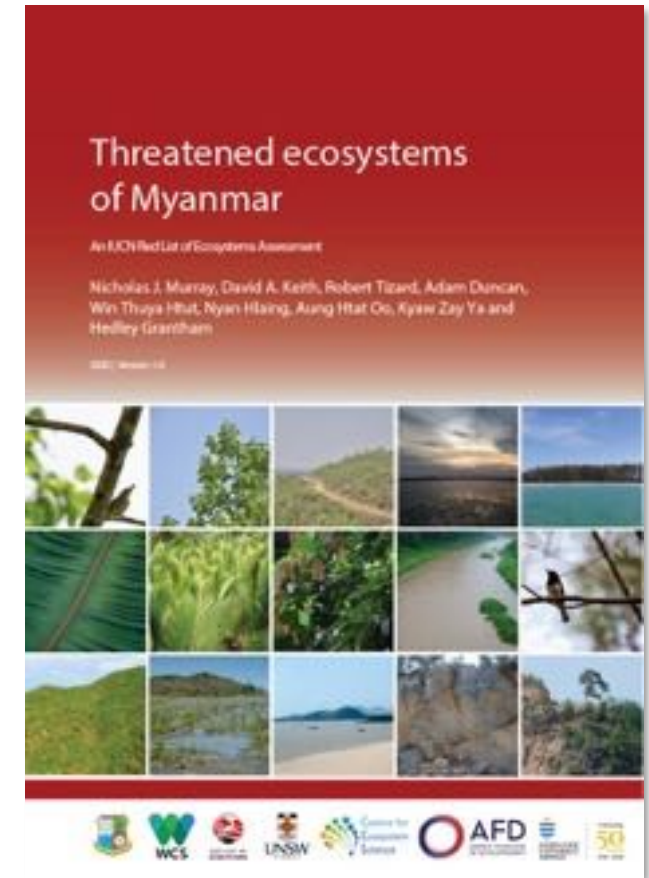
Count of threatened ecosystems

Highest category



- Per-ecosystem literature review was effective to identify and/or develop appropriate condition indicators
- Compare against local-scale studies where possible
- Choose validated datasets – or validate them yourself
- Consider extras needed to ‘operationalise’ an indicator (e.g. maps to bound analyses, thresholds of condition)
- Use multiple indicators when several are available
- Propagate uncertainty through to outcomes:
 - Known data errors (e.g. via upper and lower bounds)
 - Where multiple indicators yield different results

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