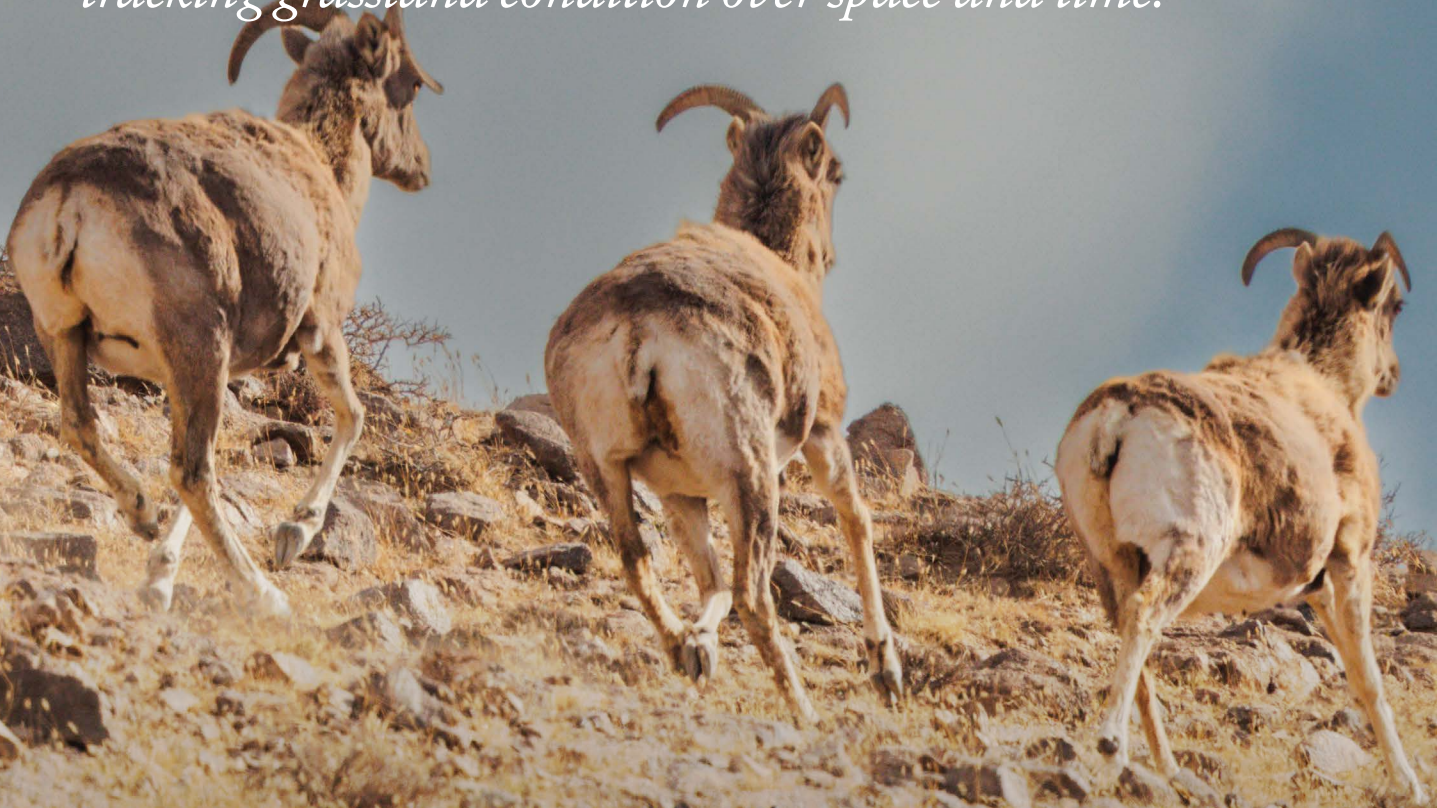


The Grassland Integrity Index

The world's first spatially explicit, satellite-based metric of grassland ecosystem integrity, capable of tracking grassland condition over space and time.





We lack a robust, spatially explicit way to measure grassland ecosystem health

Grasslands are the world's largest terrestrial ecosystem, supporting billions of people and vast biodiversity and carbon values. Yet unlike for forests, we lack a robust, spatially explicit way to measure grassland ecosystem health — a gap that hinders governments, land managers, and the private sector alike in tracking degradation, guiding restoration, and reporting progress under global frameworks such as the CBD, UNFCCC, and UNCCD. WCS scientists are helping close this gap.

THE GRASSLAND INTEGRITY INDEX

A multi-institution science collaboration

WCS is leading a collaborative science initiative to design and test a Grassland Integrity Index (GII) — the world's first spatially explicit, satellite-based metric of grassland ecosystem integrity, capable of tracking grassland condition over space and time. The GII is being developed by a partnership co-led by WCS, the World Wildlife Fund, The Nature Conservancy, and Conservation International, with foundational support from the National Center for Ecological Analysis and Synthesis (NCEAS). The collaboration also involves scientists from the University of Minnesota, Cornell University / the Cornell Lab of Ornithology, the World Resources Institute / Global Pasture Watch, and Project Drawdown.

WHY IT MATTERS FOR POLICY AND PRACTICE

Global frameworks are increasingly shifting from area-based targets toward ecosystem quality and integrity. The GII will be designed to give governments, conservation practitioners, and the private sector a common, science-based tool to:

- 1 Track grassland condition and change over time, complementing area-based commitments like 30x30 with a quality dimension.
- 2 Support reporting against international frameworks, including Land Degradation Neutrality targets under the UNCCD, and CBD and UNFCCC ecosystem-integrity goals.
- 3 Inform land management and restoration priorities within and beyond protected areas.
- 4 Provide a quantitative basis for private-sector nature reporting, including under the Taskforce on Nature-related Financial Disclosures (TNFD) and Science Based Targets Network (SBTN).



How the Index is being built. The work will unfold in four linked stages.

The GII will combine cutting-edge Earth observation data with decades of field science from WCS and partner organizations' country programs. The ongoing work will include four linked stages:

1

Structure and function indicators

Satellite-derived measures of grassland vegetation structure (e.g., cover, height, biomass) and ecological function (e.g., productivity, fire regimes, soil carbon) will be compared against reference sites of known high ecological integrity within each of the world's distinct grassland types, using machine learning to score how closely any location resembles a healthy reference condition.

2

Field validation

Extensive in situ vegetation and soil data collected by field biologists across WCS, WWF, TNC, and CI country programs will be used to test and refine the accuracy of these indicators across dry and wet, temperate and tropical grasslands.

3

A composite index

Individual indicators will be combined — with input from a global panel of grassland experts on appropriate weighting — into a single, holistic Grassland Integrity Index, with uncertainty estimated across expert-weighting scenarios.

4

Biodiversity linkage

Decades of species occurrence data from camera traps, transects, and other field surveys will be used to test how well the Index captures grassland plant and animal composition — not just structure and function — ensuring it reflects the full scope of ecological integrity.

Status and next steps.

Field validation and index development

Since late 2025, WCS and partner scientists have convened a series of technical working groups to identify candidate indicators and reference datasets. Field validation is the next step. Results will be published in a peer-reviewed publication and released publicly — making the Grassland Integrity Index openly available to governments, practitioners, and the global rangeland and grassland conservation community.

Candidate indicators and example data sources

TYPE	INDICATOR	EXAMPLE DATA SOURCE	RESOLUTION / EXTENT
Structure	Percent woody, herbaceous, and bare ground cover	ESA CCI	300 m, 1992–2026
Structure	Tree and short vegetation height	Potapov et al. 2024; Hunter et al. 2025	30 m, 2000–2024
Function	Gross Primary Productivity & phenology	MODIS	500 m, 2001–2026
Function	Fire extent and dynamics	Long et al. 2019	30 m, 1990–2024
Function	Soil organic carbon	Hengl et al. 2026	30 m, 2000–2022
Composition	Grassland bird community completeness	Cornell Lab of Ornithology	3 km, 2017–2025
Composition	Species abundance, functional diversity, community intactness	Site level data, where available	(Varies)

The Grassland Integrity Index will be openly available to governments, practitioners, and the global rangeland and grassland conservation community.

FOR MORE INFORMATION

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