

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.

Grasslands lack a robust, spatially explicit way to measure ecosystem health

Grasslands are the world's largest terrestrial ecosystem, supporting billions of people and vast biodiversity and carbon values. Yet unlike forests, grasslands lack a robust, spatially explicit way to measure 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.

A multi-institution science collaboration.

WCS is co-leading a collaborative science initiative with the World Wildlife Fund, The Nature Conservancy, Conservation International, and academic partners including the University of Minnesota, Cornell University, World Resources Institute, and Project Drawdown to design and test the Grassland Integrity Index (GII).

Why it matters for policy and practice. Global frameworks are increasingly shifting from area-based targets toward ecosystem quality and integrity. The GII is designed to give governments, conservation practitioners, and the private sector a common, science-based tool to:

01 Track grassland condition and change over time, complementing area-based commitments like 30x30 with a quality dimension.

02 Support reporting against international frameworks, including Land Degradation Neutrality targets under the UNCCD, and CBD and UNFCCC ecosystem-integrity goals.

03 Inform land management and restoration priorities within and beyond protected areas.

04 Provide a quantitative basis for private-sector nature reporting, including under the TNFD and the Science Based Targets Network.

How the Index is built. The work unfolds in four linked stages.

The GII combines cutting-edge Earth observation data with decades of field science from WCS and partner organizations' country programs.

01

Structure and function indicators

Satellite-derived measures of grassland vegetation structure (cover, height, biomass) and ecological function (productivity, fire regimes, soil carbon) are 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.

02

Field validation

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

03

A composite index

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

04

Biodiversity linkage

Decades of species occurrence data from camera traps, transects, and other field surveys are 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 are underway.

Since late 2025, WCS and partner scientists have convened a series of technical working groups to identify candidate indicators and reference datasets. Field validation and index development are now underway, with results intended for peer-reviewed publication and free public release via a dedicated web platform — 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

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

FOR MORE INFORMATION

Paul Elsen, Director, Conservation Planning
pelsen@wcs.org · wcs.org

Natalie Ingle © WCS
Wildlife Conservation Society

