SDG 15.3.1 indicator at local scale for land degradation monitoring in Alta Murgia protected area

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NewLife4Drylands LIFE20 PRE/IT/000007

Remote sensing oriented nature-based solutions towards a NEW LIFE FOR DRYLANDS

Overview

In the framework of NewLife4Drylands LIFE Preparatory project (LIFE20 PRE/IT/000007, 2021-2024, https://www.newlife4drylands.eu/), this study addresses the computation of SDG 15.3.1 "Proportion of land that is degraded over total land area" indicator, adopted in the UNCCD's Good Practice Guidance [1] to evaluate Land Degradation (LD) status of grassland coverage in Alta Murgia Protected Area (PA, IT9120007, southern Italy).

SDG 15.3.1 indicator is computed by integration of three main sub-indicators:

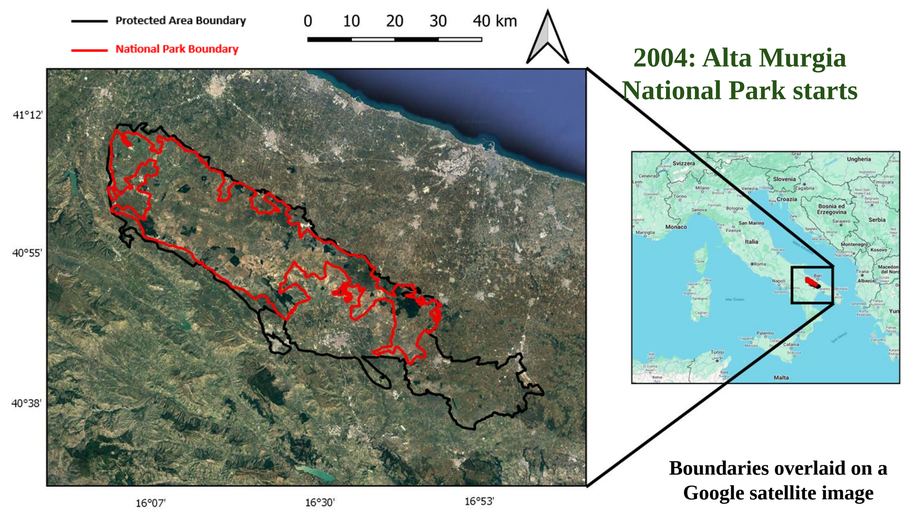
- ❑ **Land Cover trend;**
- ❑ **Primary Productivity trend;**
- ❑ **Soil Organic Carbon (SOC) stock trend**

To effectively aid PAs managers this study suggests:

- ❑ **Additional sub-indicators related to pressures and threats affecting the site (e.g., fires);**
- ❑ **Sub-indicators computed at local scale as much as possible: free global/European databases not reliable at site-scale [2];**
- ❑ **LD in grassland coverage only was evaluated.**

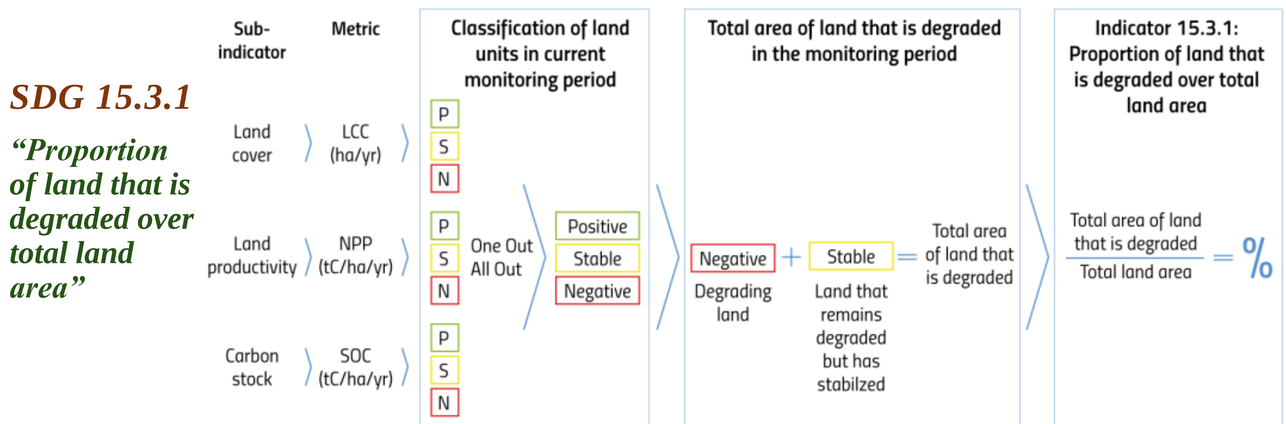
Study site

Alta Murgia PA has a dominant semi-/natural rocky dry grassland which hosts endemic and priority habitats of community interest. It is frequently subjected to fire events during summer season, hence, Burn Severity index was considered. Period investigated: 2004-2018.



SDG 15.3.1 indicator: methodology

UNCCD: the three main sub-indicators are integrated by the principle *"One out, All out"* (1OAO) obtaining a 3-class mapping - *Degraded, Improved, Stable*



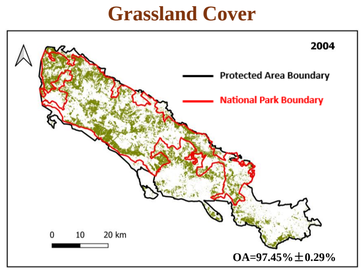
+ local scale sub-indicators based on pressures and threats

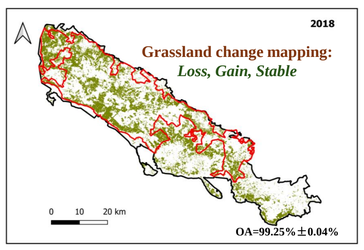
Aggregating SDG 15.3.1 sub-indicators - 1OAO

Land Productivity	Land Cover	SOC	SDG 15.3.1
Improving	Improving	Improving	Improving
Improving	Improving	Stable	Improving
Improving	Improving	Declining	Declining
Improving	Stable	Improving	Improving
Improving	Stable	Stable	Improving
Improving	Stable	Declining	Declining
Improving	Declining	Improving	Declining
Improving	Declining	Stable	Declining
Improving	Declining	Declining	Declining
Stable	Improving	Improving	Improving
Stable	Improving	Stable	Improving
Stable	Improving	Declining	Declining
Stable	Stable	Improving	Improving
Stable	Stable	Stable	Stable
Stable	Stable	Declining	Declining
Stable	Declining	Improving	Declining
Stable	Declining	Stable	Declining
Stable	Declining	Declining	Declining
Declining	Improving	Improving	Improving
Declining	Improving	Stable	Declining
Declining	Improving	Declining	Declining
Declining	Stable	Improving	Declining
Declining	Stable	Stable	Declining
Declining	Stable	Declining	Declining
Declining	Declining	Improving	Declining
Declining	Declining	Stable	Declining
Declining	Declining	Declining	Declining

Sub-indicators from satellite data

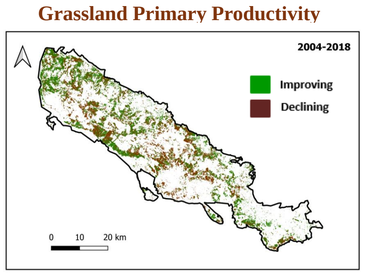
Grassland Cover





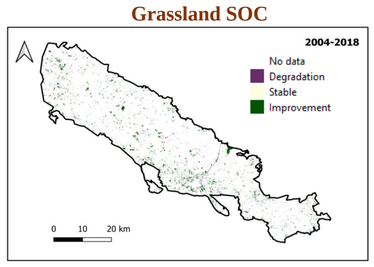
Grassland cover from a data-driven multi-class classification (by Support Vector Machine) [3]. Input: Landsat 5/8 multi-seasonal images (30m).

Grassland Primary Productivity



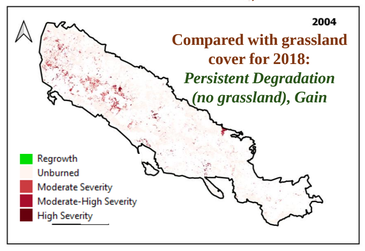
Mann-Kendall (threshold 0.05) applied to annual average values of MSAVI spectral index time series from Landsat 5/8 (30m)

Grassland SOC



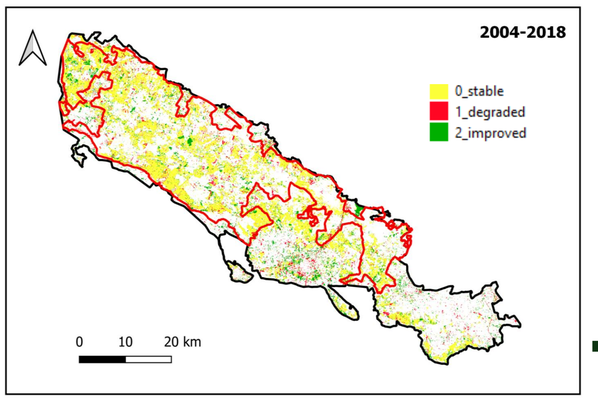
SOC trend from Trends.Earth with Soilgrids (250m) and custom Land Cover mappings (30m)

Burn Severity



Difference of NBR spectral index between starting and ending summer season from Landsat 5/8 images (30m) masking with previous grassland map

SDG 15.3.1 indicator: computation



$$SDG\ 15.3.1\ \%\ (P_n) = \frac{A(Degraded)_n}{A(Total)}$$

where:

P_n = proportion of land degraded at time t_n since the baseline t_0;

$A(Degraded)_n$= total land degraded at t_n computed as:

$$A(Degraded)_n = A(Recent\ Degraded)_n + A(Persistent\ Degraded)_n - A(Improvement)_n$$

$A(Total)$ = total land considered

→ SDG 15.3.1 % (2004-2018) = 15.63%

References

[1] UNCCD's Good Practice Guidance: https://www.unccd.int/publications/good-practice-guidance-sdg-indicator-1531-proportion-land-degraded-over-total-land

[2] Tarantino, C.; Forte, L.; Blonda, P.; Vicario, S.; Tomaselli, V.; Beierkuhnlein, C.; Adamo, M. (2021). Intra-Annual Sentinel-2 Time-Series Supporting Grassland Habitat Discrimination. *Remote Sensing*, Special Issue "Remote Sensing for Habitat Mapping", 13(2), 277. https://doi.org/10.3390/rs13020277

[3] Tarantino, C.; Aquilino, M.; Labadessa, R.; Adamo, M. (2023). Time Series of Land Cover Mappings Can Allow the Evaluation of Grassland Protection Actions Estimated by Sustainable Development Goal 15.1.2 Indicator: The Case of Murgia Alta Protected Area. *Remote Sensing*, Special Issue "Remote Sensing Measurements for Monitoring Achievement of the Sustainable Development Goals (SDGs)", 15(2), 505, https://doi.org/10.3390/rs15020505