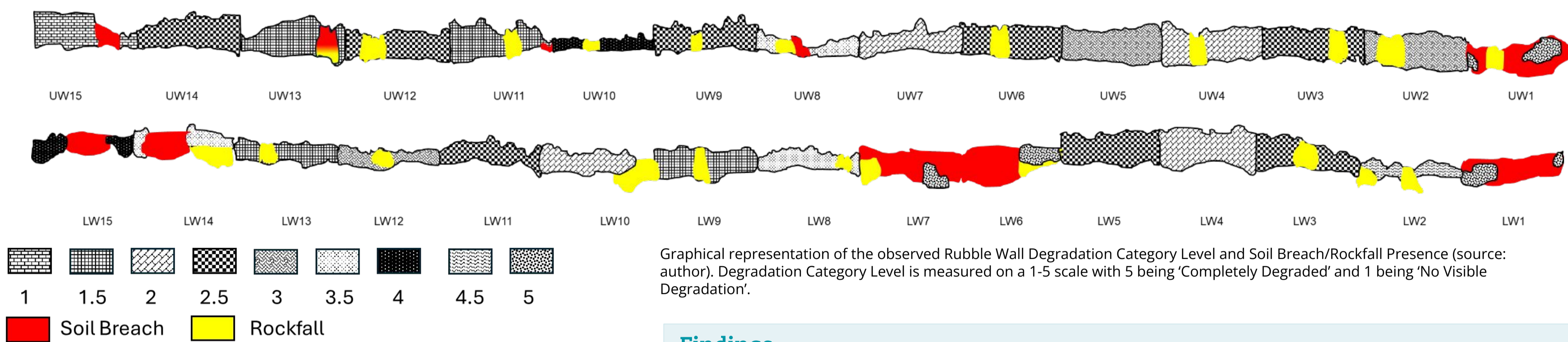


Assessment and evaluation of the values and threats affecting abandoned agricultural terrace environments in Il-Majjistral Nature and History Park, Malta

Context:

This research is about assessing the values of, and threats to Maltese dry stone rubble walls and biodiversity within abandoned agricultural terrace systems in Malta. An agricultural terrace is a collection of farming fields adapted to sloped, hilly environments in order to conserve soil and water, forming a complex hydrological system. Dry-stone rubble walls, defined as natural stone walls made with no mortar, are a prominent feature of Mediterranean landscapes, functioning to define property boundaries as well as forming a vital part of the agricultural terraced environment. Agricultural terracing and dry-stone rubble walls are ingrained in Maltese farming culture and provides many benefits.

- . To create a Rubble Wall Degradation Index for use in identifying maintenance and conservation needs of Maltese terraced rubble walls
- . To understand plant distribution in relation to soil wetness and the implications this can have on biodiversity goals and reintroducing species
- . To suggest practical conservation actions Il-Majjistral History and Nature Park could take to sustainably manage abandoned agricultural terraced systems



Photograph of (Upper Wall transect 8) UW8 section, displaying evidence of vegetation populating the terrace rubble wall

A cluster of Bermuda Buttercup that has invaded another coastal abandoned terrace (source: Author). Many rubble walls at this location had collapsed and Bermuda Buttercup dominated the area.



Findings

- 44 different plant species were recorded across the research site, including several scarce and very rare classed species. Four species were found to be alien invaders, including *Bermuda Buttercup* (*Oxalis pes-caprae*), which can threaten endemic plant seeding and stunt biodiversity growth (Mifsud, n.d).
- Woodier garrigue plant species like the *Spiny Spurge* (*Euphorbia acanthothamnus*) were observed clinging to the rubble wall crevices, implying that plants draw retained moisture out from the porous limestone rubble walls.
- In the case of rockfall, vegetation growth may be a sign of degradation and biological weathering, but the removal of such non-invasive plant colonies may damage the biodiverse value of the site
- Soil conditions were wetter around the middle and front of the terrace, but dryer at the back of the terrace and near footpaths, indicating that water in abandoned terraces mobilise similarly to active terraces. Variations in soil moisture may be due to different flora and fauna that would not be present on active terraces.

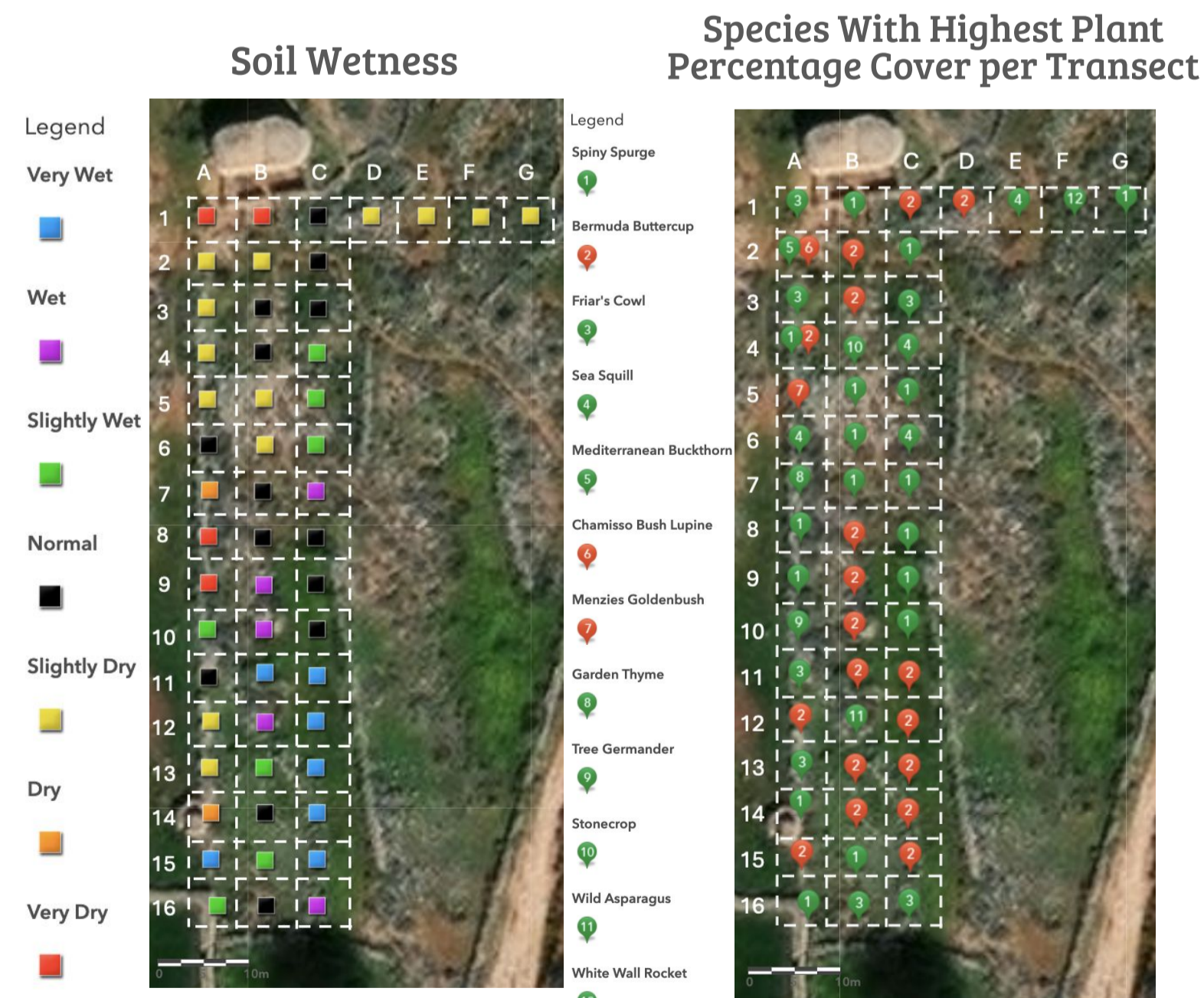
Analysing the complete Rubble Wall Degradation Index results, a large majority of the wall sections have rockfall and infill spill. Heavy rainfall events could contribute to gravitational failure and low heights, such as with UW1.

Conservation Recommendations:

- The washing of footwear such as hiking boots before entering the park, inspired by management protocols for invasive species at airports, could prevent the spread of alien species throughout the abandoned terraces.
- Rubble walls could be built up where total wall height is too low and wall width is too thin, especially where height hits 0.55m and below, which corresponds to soil breach presence. Rubble wall restorations are already in place across the park (The Majjistral Nature and History Park, n.d b), making this a possibility.
- Targeted removal procedures and monitoring of invasive species. Strategies as such are in place across the park (The Majjistral Nature and History Park, n.d a), therefore applying this to species like Bermuda Buttercup on terraces is possible and beneficial to stop invaders outcompeting rare, endemic, or at risk species.
- Restricting access to certain areas and designating clear paths. Il-Majjistral have previously overhauled trails and restricted areas due to conservation (Restal, 2021), meaning the extension of these restrictions to vulnerable terrace ecosystems may be possible and would be beneficial to conservation efforts.

Conclusions:

This research presents a strong case for conserving abandoned agricultural terraces to protect the rich ecosystem of species that form, and prevent the degradation of dry-stone rubble walls for the educational and biodiversity value. The Rubble Wall Degradation Index created was effective in pinpointing areas of walls where soil breaches and low height necessitate wall rebuilding, and where sites of vegetation succession should be left to repopulate.



Two maps of the study area showing soil wetness and the species with the highest plant percentage cover for each transect (Source: Esri, Maxar). Species map: species 1-4 are ranked by frequency, 1 occurring the most and 4 occurring the least, but occurs more than once. Species numbered 5-11 occur once and are not ranked specifically. Red markers indicate invasive alien species, green markers indicate native plants. Wetness map: wetness was measured using a finger texturing technique and has been ranked on a seven-point scale as appears in the legend.

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