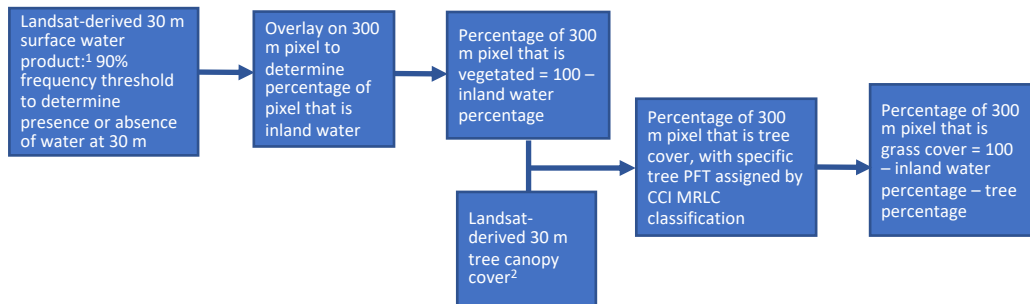# Land Cover
CCI+ Medium Resolution

Introducing spatial variability in the plant functional type characterization of the CCI Medium-Resolution Land Cover map series

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Overview

The CCI medium-resolution land cover (MRLC) product provides 22 LCCS classes of land cover at 300 meter resolution. With global coverage, an annual time step extending from 1992, spatial and temporal consistency, and a quantified accuracy of 71%, the CCI MRLC product is a useful input to land surface and earth system models. Because such models categorize vegetation into a small number of plant functional types (PFTs) that describe life form, leaf type, and phenological type, application of the MRLC product to land surface modeling requires translation of the remote-sensing derived land cover classes into model-appropriate PFTs (and additional functional types, such as bare ground, water, urban area, and snow/ice). That is, for each land cover class, a cross-walking table defines the fractional composition of the pixel in terms of PFTs. Here, we use a quantitative, globally consistent method that makes use of a suite of auxiliary datasets to develop a spatially variable cross-walking table at 300 meter resolution. By combining knowledge of remote sensing products and land surface models, we aim to produce a product that is designed specifically to meet the needs of the modeling community. For example, the updated product identifies, within the bare area class, pixels that have the potential to be vegetated depending on the prescribed or simulated climate conditions.

Work flow for vegetated classes

For the vegetated classes, all land area in the 300 meter pixels is 100% vegetated (no bare area fraction) in the refined land cover product, allowing the land surface model to determine the presence or absence of vegetation based on simulated or prescribed climate conditions. In our method, trees & shrubs do not co-exist in a single pixel. **Dataset references**: (1) Pekel et al., High-resolution mapping of global surface water and its long-term changes, Nature 2016. (2) Hansen et al., High-resolution global maps of 21st-century forest cover change, Science 2013.
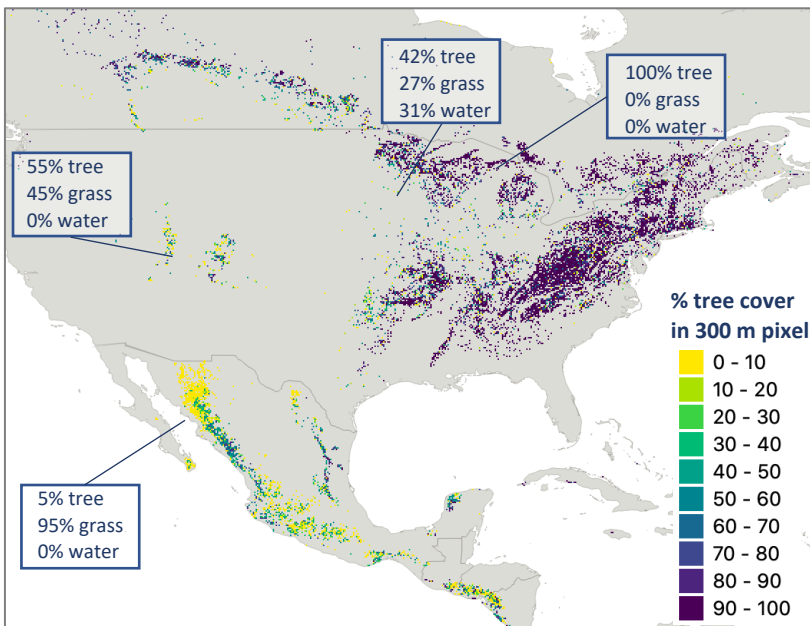
Work flow for bare area class
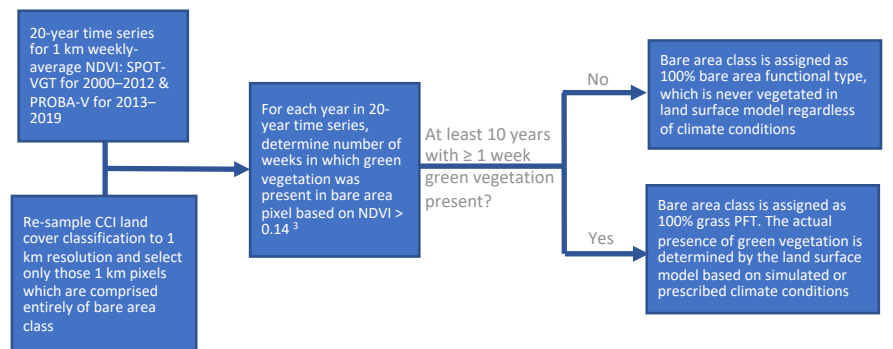
(3) Cherlet et al., SPOT-VEGETATION contribution to Desert Locust habitat monitoring. In Proceedings of the VEGETATION 2000 Conference, Lake Maggiore, Italy, April 2000.

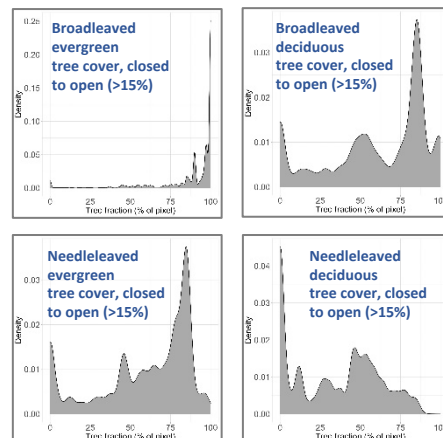## Spatial variability in PFT fractions within specific land cover classes

Broadleaved deciduous tree cover (>15%)
Improved tree, grass, and water cover fractions

42% tree
27% grass
31% water

100% tree
0% grass
0% water

55% tree
45% grass
0% water

5% tree
95% grass
0% water

% tree cover in 300 m pixel
- 0 - 10
- 10 - 20
- 20 - 30
- 30 - 40
- 40 - 50
- 50 - 60
- 60 - 70
- 70 - 80
- 80 - 90
- 90 - 100

The 300 meter pixels shown in color are classified as "broadleaved deciduous tree cover, closed to open (> 15%)" in the CCI MRLC dataset. The color coding indicates the derived tree cover fraction for each pixel based on our updated method. The call-out boxes indicate, for four diverse sample pixels, the percentage of the 300 meter pixel that is assigned as tree, grass, and inland water; that is, these values represent the local 300 meter cross-walking table for assigning PFT fractions to pixels of this land cover class.

### Global distributions of tree fractions for 300 m pixels

Broadleaved evergreen tree cover, closed to open (>15%)

Broadleaved deciduous tree cover, closed to open (>15%)

Needleleaved evergreen tree cover, closed to open (>15%)

Needleleaved deciduous tree cover, closed to open (>15%)

Rainfed cropland
Improved delineation of tree vs. herbaceous cropland

% tree cover in 300 m pixel
- 0 - 10
- 10 - 20
- 20 - 30
- 30 - 40
- 40 - 50
- 50 - 60
- 60 - 70
- 70 - 80
- 80 - 90
- 90 - 100
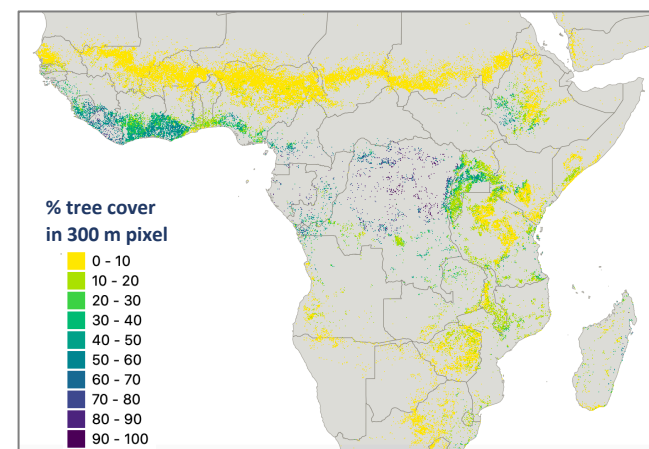
Bare area
Improved distribution of potentially vegetated vs. never vegetated fractions

Northern Africa & the Middle East

Central Asia

Australia
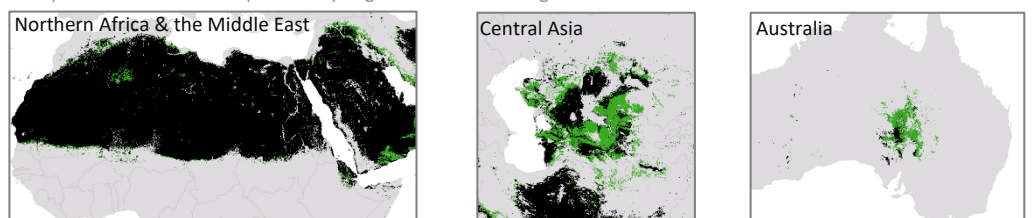
The pixels shown in black & green are classified as "bare area" in the CCI MRLC dataset. Based on the updated CWT method, black pixels are assigned as 100% bare area functional type (never vegetated), and green pixels are assigned as 100% grass PFT (vegetation presence determined by land surface model).