

Greater Kruger National Park, GEDI Canopy Metrics, 2007-2024

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Documentation Revision Date: 2026-01-22

Dataset Version: 1

Summary

This dataset contains vegetation canopy metrics for the Greater Kruger National Park region of South Africa for 2007-2010 and 2015-2024. Metrics include relative height 98th percentile (RH98), fractional canopy cover, and foliage height diversity. This dataset contains vegetation canopy metrics for the Greater Kruger National Park region of South Africa. Metrics include relative height 98th percentile (RH98), fractional canopy cover, and foliage height diversity. They were derived by modeling a sample of Global Ecosystem Dynamics Investigation (GEDI) Level 2A Elevation and Height Metrics and Level 2B Canopy Cover and Vertical Profile Metrics at the 25-m footprint level with wall-to-wall spatial datasets including Landsat, PALSAR, topography derived from NASADEM, and soils data from iSDAsoil. Maps for 2023 and 2024 were created by applying the model trained from 2007-2022 data to PALSAR and Landsat data for 2023 and 2024. The data are suitable for analyzing change in woody canopy structure within the savanna ecosystems of this region. The data are provided in cloud optimized GeoTIFF format.

This dataset holds 42 data files in cloud-optimized GeoTIFF (.tif) format.

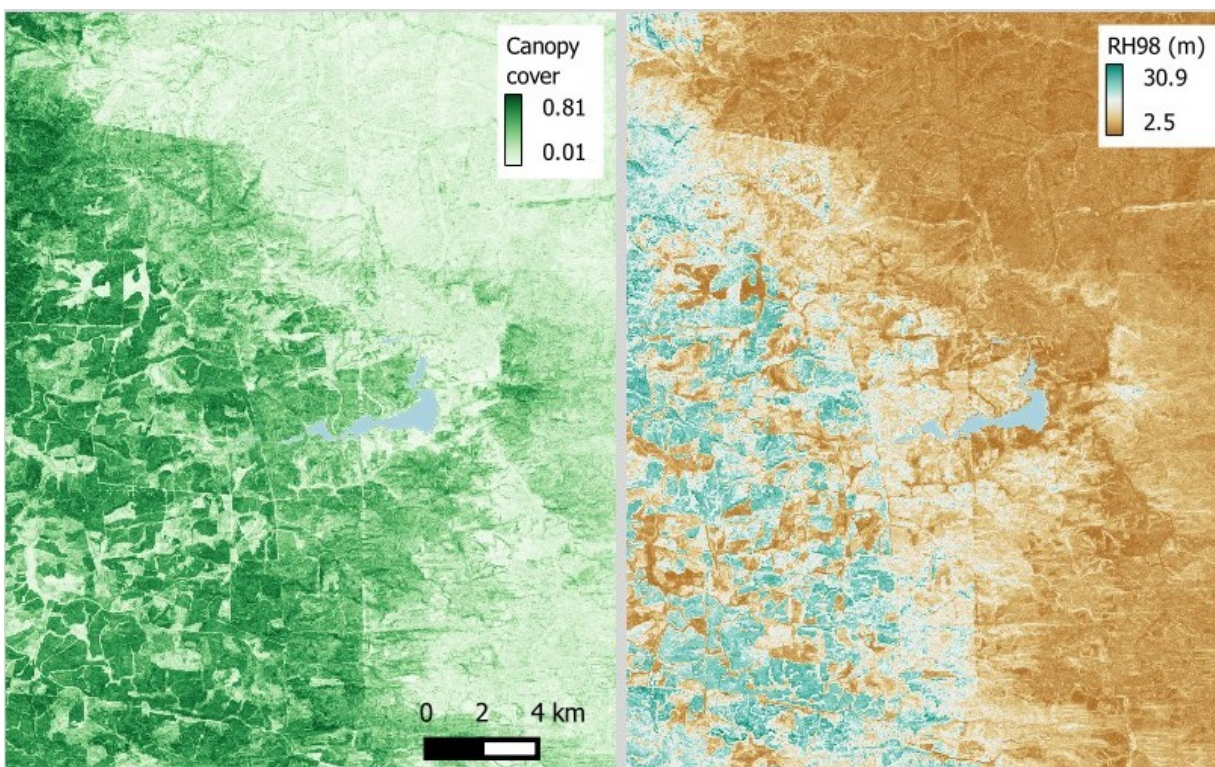


Figure 1. GEDI derived vegetation metrics for a portion of the Greater Kruger National Park region in South Africa in 2022: Fractional canopy cover (left), Relative height 98th percentile (right, units = m). Area depicted is southwest of Bushbuckridge (approximate center: -24.9013 lat, 30.9881 lon).

Citation

Filippelli, S.K., J. Vogeler, and D. Bunn. 2025. Greater Kruger National Park, GEDI Canopy Metrics, 2007-2024. ORNL DAAC, Oak Ridge, Tennessee, USA. <https://doi.org/10.3334/ORNLDAAC/2401>

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1. Dataset Overview

This dataset contains vegetation canopy metrics for the Greater Kruger National Park region of South Africa for 2007-2010 and 2015-2024. Metrics include relative height 98th percentile (RH98), fractional canopy cover, and foliage height diversity. They were derived by modeling a sample of Global Ecosystem Dynamics Investigation (GEDI) Level 2A Elevation and Height Metrics and Level 2B Canopy Cover and Vertical Profile Metrics at the 25-m footprint level with wall-to-wall spatial datasets including Landsat, PALSAR, topography derived from NASADEM, and soils data from iSDAsoil. Maps for 2023 and 2024 were created by applying the model trained from 2007-2022 data to PALSAR and Landsat data for 2023 and 2024. The data are suitable for analyzing change in woody canopy structure within the savanna ecosystems of this region.

Project: [Biodiversity](#)

The ORNL DAAC archives Biological Diversity datasets from research that contribute to the understanding of the complexity, structure, function, and interactions within and among species, ecosystems, and genetic variations, and how and why they are changing. These datasets help explore how biodiversity contributes to ecosystem health, stability, and services, as well as threats due to human activities and environmental changes.

Related Publication

Filippelli, S.K., J.C. Vogeler, F. Mauro, C. Coetsee, P.A. Fekety, M. McHale, and D. Bunn. 2025. Tracking savanna vegetation structure in South Africa by extension of GEDI canopy metrics with Landsat, Sentinel-2, and PALSAR. In review. Preprint: <https://doi.org/10.1101/2025.07.16.664478>

Acknowledgement

This research was funded by the NASA Biological Diversity and Ecological Conservation program (grant 80NSSC21K1716).

2. Data Characteristics

Spatial coverage: Greater Kruger National Park region of South Africa

Spatial Resolution: 30 m

Temporal Coverage: 2007-2010 and 2015-2024

Temporal Resolution: Annual

Site Boundaries: Latitude and longitude are given in decimal degrees.

Site	Westernmost Longitude	Easternmost Longitude	Northernmost Latitude	Southernmost Latitude
Great Kruger National Park region, South Africa	29.7380	32.0531	-22.2749	-26.1412

Data File Information

There are 42 data files in cloud-optimized GeoTIFF (.tif) format. There are three groups of files: 14 files for total fractional canopy cover, 14 files for foliage height diversity index, and 14 files for relative height 98th percentile.

File names and data descriptions

For all file groups, YYYY is year from 2007-2010 and 2015-2024.

- **Canopy_Metrics_GreaterKNP__cover_YYYY.tif** – Total fractional canopy cover from 0 to 1. This metric's definition corresponds to the "cover" metric from the GEDI Level 2B Canopy Cover and Vertical Profile Metrics product (Dubayah et al., 2021) as described in LPDAAC (2019): "Total canopy cover, defined as the percent of the ground covered by the vertical projection of canopy material." Details are given in the Algorithm Theoretical Basis Document (Tang and Armston, 2019).
- **Canopy_Metrics_GreaterKNP_fhd_YYYY.tif** – Foliage height diversity index. This metric's definition corresponds to the "fhd_normal" metric from the GEDI Level 2B Canopy Cover and Vertical Profile Metrics product (Dubayah et al., 2021) as described in LPDAAC (2019): "Foliage height diversity index calculated by vertical foliage profile normalized by total plant area index." Details are given in the Algorithm Theoretical Basis Document (Tang and Armston, 2019).
- **Canopy_Metrics_GreaterKNP_rh98_YYYY.tif** – Relative height 98th percentile from 0 to 40 m. This metric's definition corresponds to the relative height metric at the 98th percentile from the GEDI Level 2A Level 2A Elevation and Height Metrics product (Dubayah et al., 2021) and is described in the Algorithm Theoretical Basis Document (Hofton and Blair, 2019).

GeoTIFF characteristics

- Coordinate system: Projected coordinates in UTM zone 36S, EPSG 32736, units = meters.
- Spatial resolution: 30 m
- Dimensions: 7624 columns x 14,167 rows
- Pixel values: fractional canopy cover, foliage height diversity, or RH98 values as described above.
- Data type: Float32
- Nodata value: -9999

3. Application and Derivation

The data are suitable for analyzing the spatial pattern and change in time of woody canopy structure within the savanna ecosystems of the region.

4. Quality Assessment

The accuracy of the random forest model for each canopy metric was assessed by its root mean square error, coefficient of determination, and mean of residuals (bias) using out-of-bag predictions. The accuracy of GEDI's RH98 values with respect to airborne lidar were assessed for the region by Li et al. (2023).

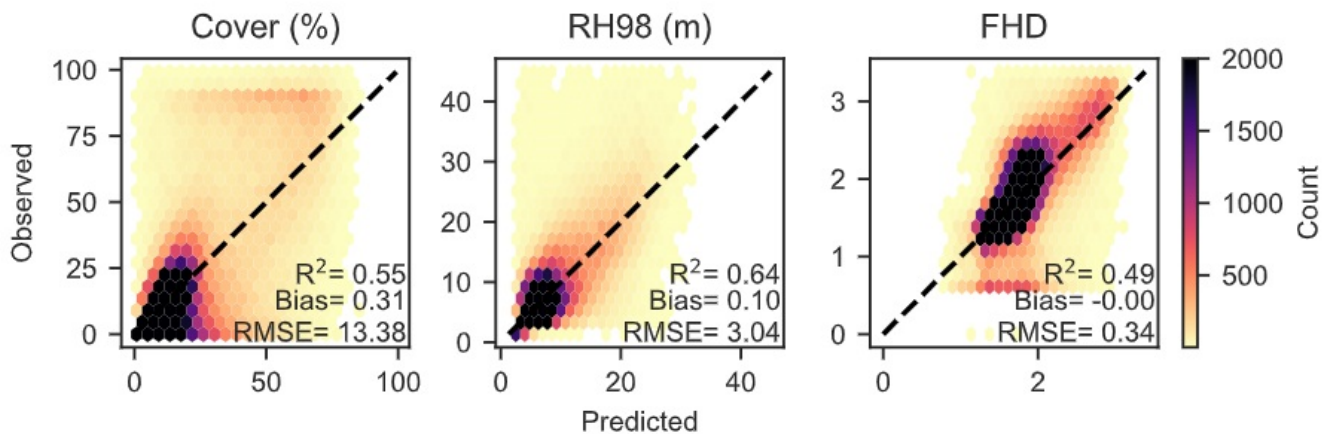


Figure 2. Random forest out-of-bag accuracy for fractional canopy cover (Cover), relative height 98th percentile (RH98), and foliage height diversity (FHD).

Maps for 2023 and 2024 were created by applying the model trained from 2007-2022 data to PALSAR and Landsat data for 2023 and 2024. Uncertainty was not assessed for the 2023 and 2024 maps.

5. Data Acquisition, Materials, and Methods

The Global Ecosystem Dynamics Investigation (GEDI) canopy metrics of relative height 98th percentile (RH98), fractional canopy cover, and foliage height diversity were extended wall-to-wall at a 30-m resolution for the Great Kruger National Park region of South Africa for 2007-2010 and 2015-2022. These data were created by modeling a sample of the GEDI Level 2B Canopy Cover and Vertical Profile Metrics at the 25-m footprint level (Dubyah et al., 2021) with spatial datasets including Landsat (EROS 2020a; EROS, 2020b; EROS, 2020c), PALSAR (v. 2.1.2 annual backscatter mosaics for 2007-2010 and 2015-2022; Shimada et al., 2014), topography derived from NASADEM (NASA JPL, 2020) and estimated soils data from iSDAsoil (isda, 2023).

Maps for 2023 and 2024 were created by applying the model trained from 2007-2022 data to PALSAR and Landsat data for 2023 and 2024.

Information on the fractional canopy cover, foliage height diversity index, and RH98 metrics is available from GEDI L2B Dictionary (LPDAAC, 2019) and the GEDI Algorithm Theoretical Basis Documents (Tang and Armston, 2019).

6. Data Access

These data are available through the Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC).

[Greater Kruger National Park, GEDI Canopy Metrics, 2007-2024](#)

Contact for Data Center Access Information:

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- Telephone: +1 (865) 241-3952

7. References

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8. Dataset Revisions

Version	Release Date	Revision Notes
1	2026-01-22	Canopy metric maps for 2023 and 2024 were appended to this dataset. Previously published files were not changed.
1	2025-09-15	First publication



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