COMPARISON OF SPATIO-TEMPORAL BURNED AREA DISTRIBUTION

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Why Study Burned Area Distribution in Australia?

- Australia faces frequent, intense bushfires, especially during summer.

- The 2019–2020 'Black Summer' highlighted severe ecological and economic impacts.

- Understanding fire dynamics is crucial for risk mitigation and land management.

- Google Earth Engine (GEE) offers scalable tools for spatio-temporal analysis.

- Compare MODIS MCD64 and FIRMS fire datasets.

- Analyse spatial and temporal trends in burned areas.

- Study environmental impacts: NDVI, LULC, LST, and forest loss.

- Utilize Google Earth Engine for scalable cloud-based processing.

Datasets and Tools

- MCD64A1 (MODIS) – Burned Area
- FIRMS – Active Fire Points
- MOD11A1 – Land Surface Temperature (LST)
- MOD13A2 – NDVI (Vegetation Health)
- MCD12C1 – Land Use Land Cover (LULC)
- Hansen – Global Forest Change
- Tools: Google Earth Engine, QGIS, Python

Workflow in Google Earth Engine

- Define Region of Interest (Australia) using GAUL boundaries.
- Filter and preprocess MODIS, FIRMS, Hansen datasets.
- Calculate burned area, NDVI, LST, LULC, and forest loss.
- Visualize and export results: maps, time series, statistics.

Burned Area Analysis (2019–2021)

- Burned area calculated using MODIS MCD64A1.

- Active fire points categorized by temperature (FIRMS).

- Annual burned area maps generated.

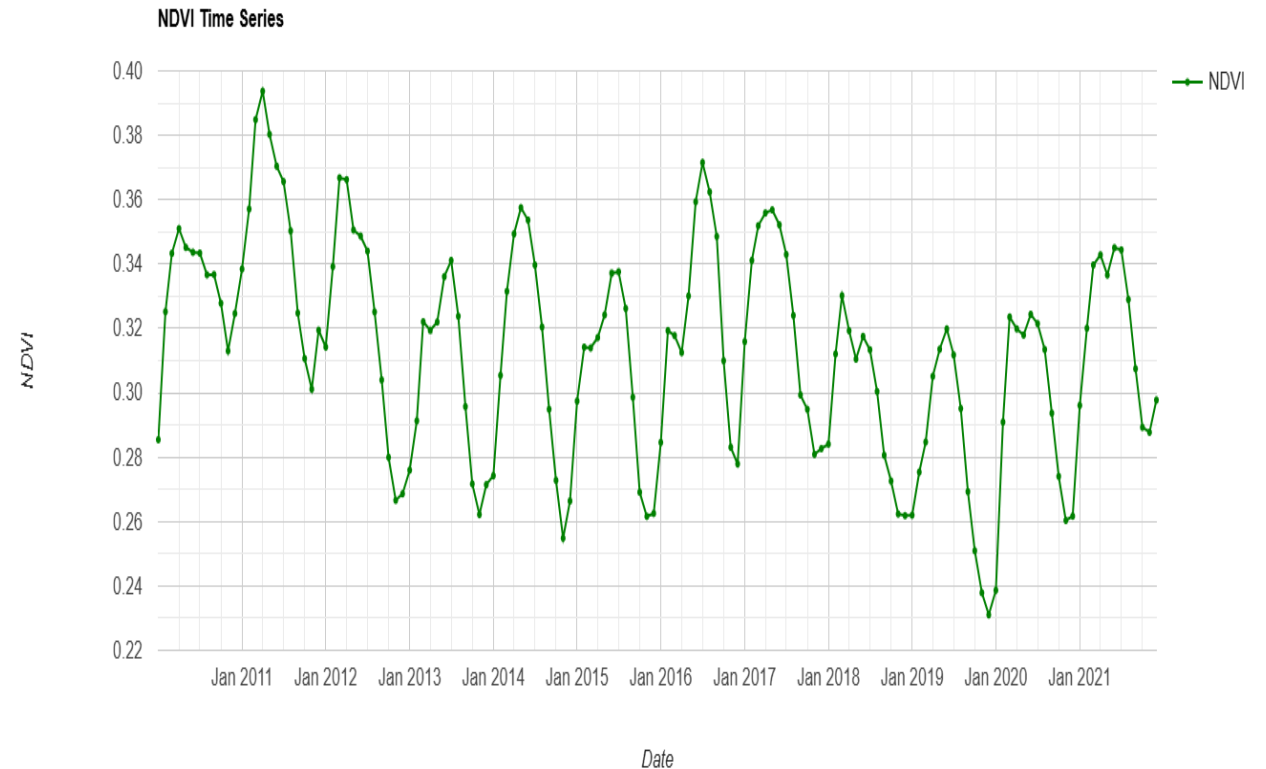- Exported statistics to CSV and files in GeoTIFF.

Burned Area(2019-2022)

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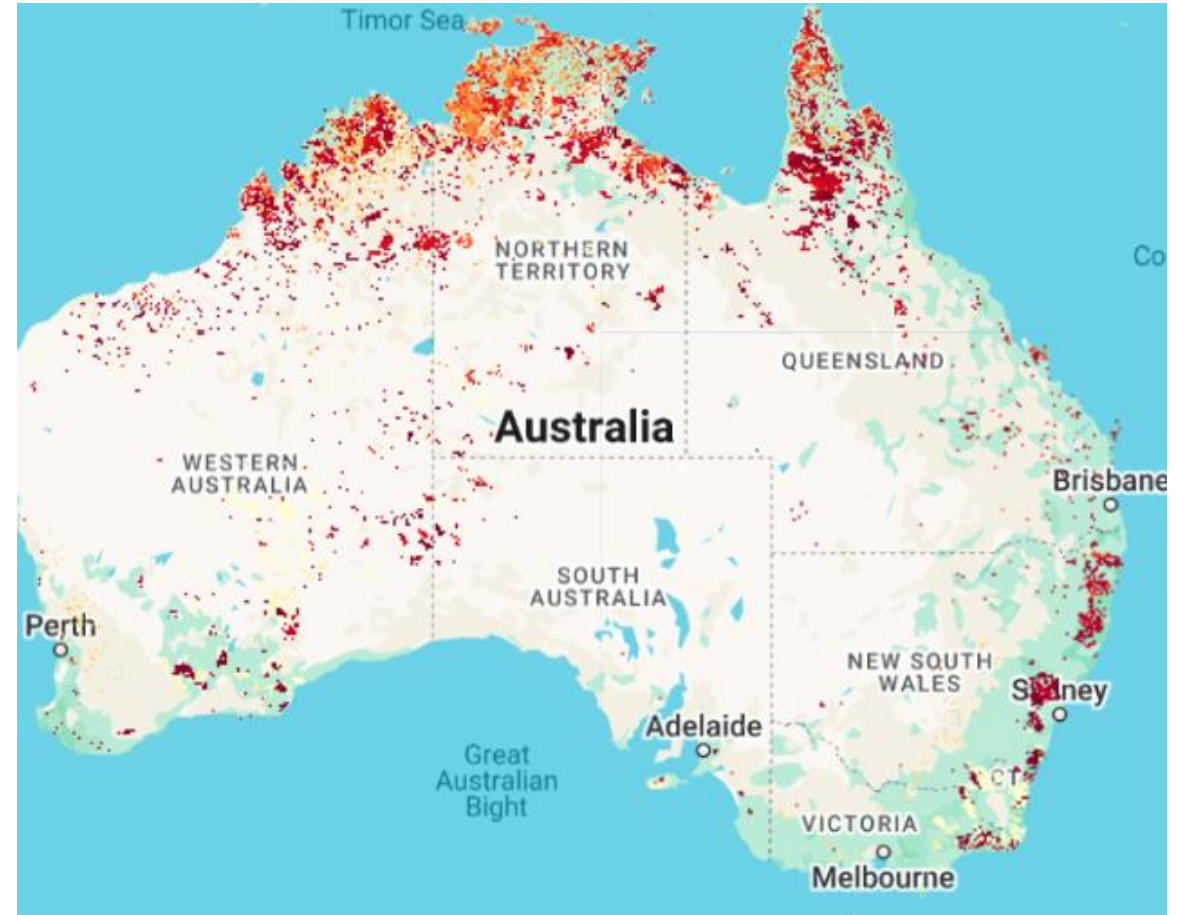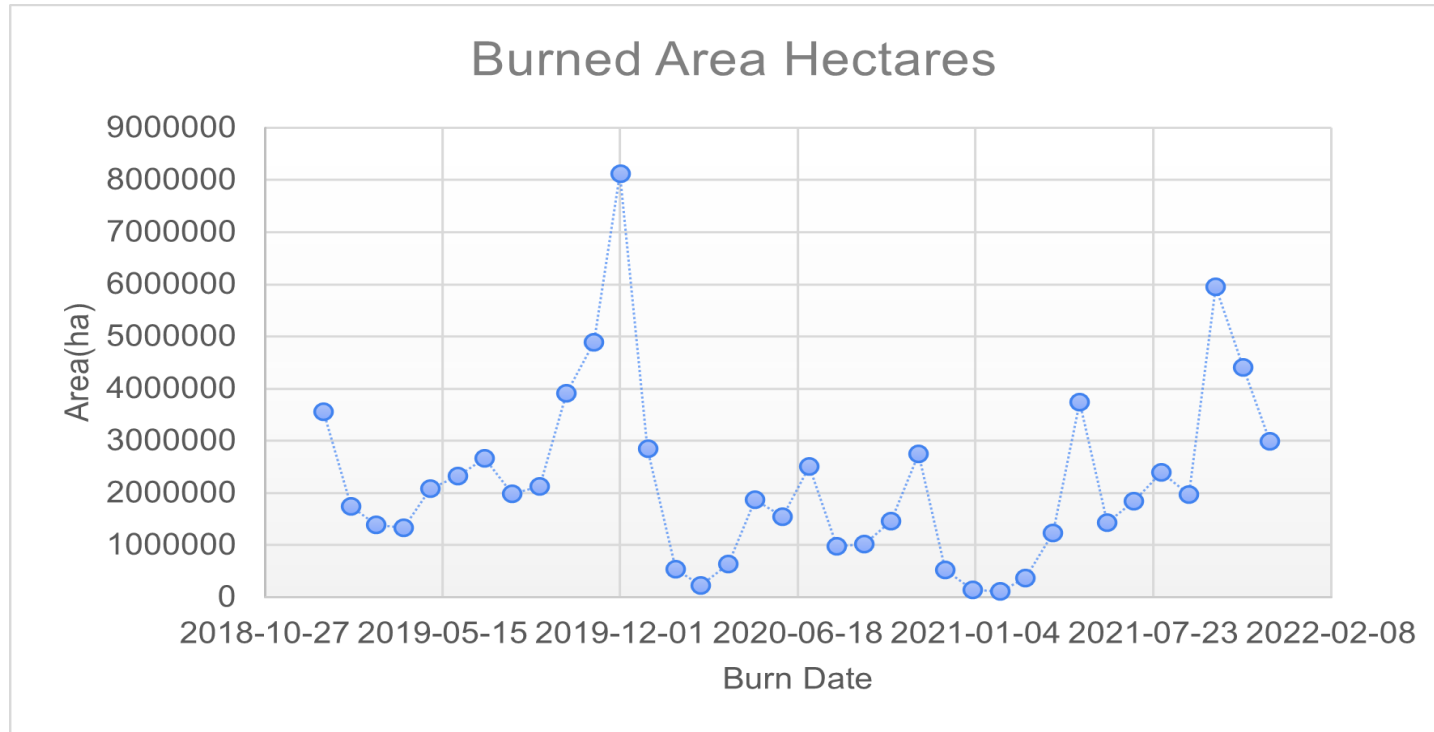
# Vegetation Health & Temperature

- NDVI monthly time series from 2010 to 2021.

- Mean LST visualized using MOD11A1 for 2019.


NDVI Time Series

- NDVI anomaly analysis (2020 vs 2021) detects post-fire recovery.

- Vegetation degradation and regrowth visualized spatially.

  - Indicate a decline in vegetation health cover in 2021 compared to 2020.

  - Indicate vegetation regrowth or improvement, possibly due to recovery post-fire.
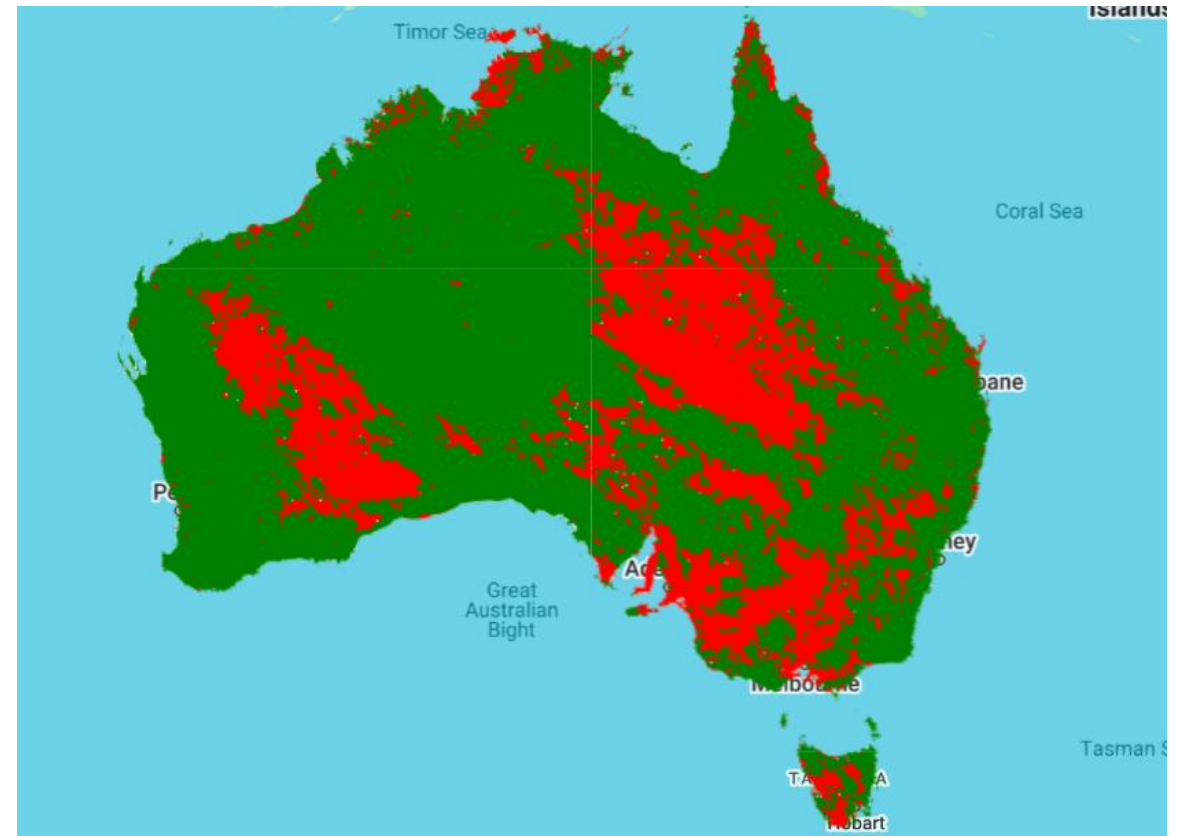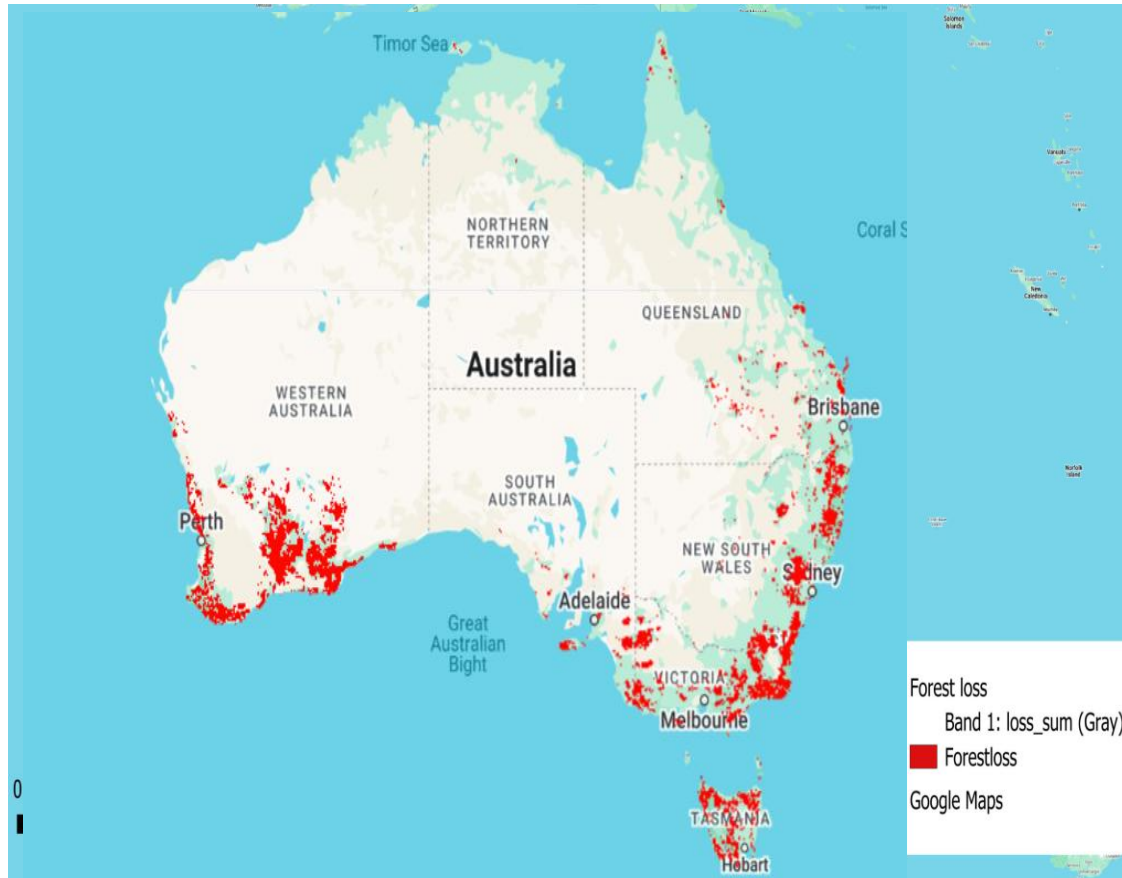
Land Cover and Forest Change

- Reclassified LULC from MODIS MCD12C1 (2022).

- Area statistics calculated per land cover class (e.g., forest, grass, cropland).

Type	Area km²	Type	Area km²
Forest	260450	Shrubs	4474151
Grasslands	527369	Cropland	1890771
Mixed	348860	Sparse	314
Water	42950	Snow/Ice	143696
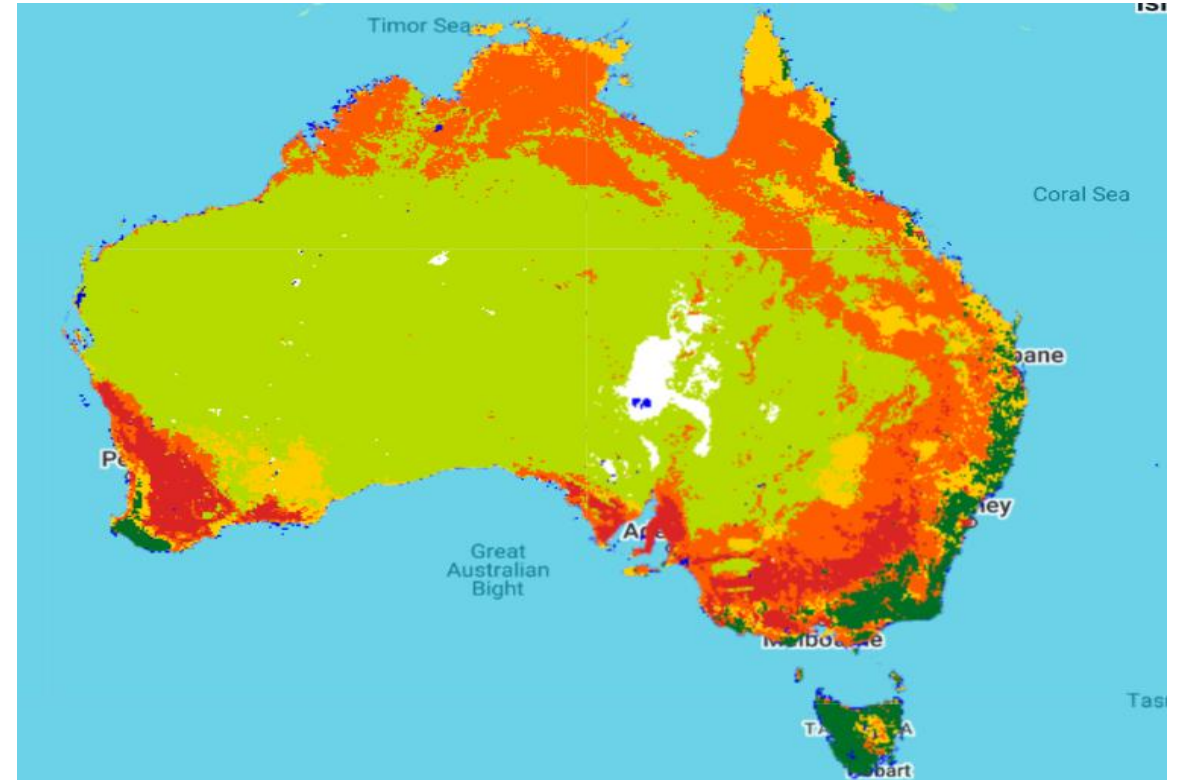
Forest Loss

- Annual forest loss (2002–2022) using Hansen dataset.

- Hotspot map shows spatial distribution of forest loss.

```
2018
→ Forest Loss (ha):
707880.2980646385
```

```
Year:
2019
→ Forest Loss (ha):
3049501.660601857
```
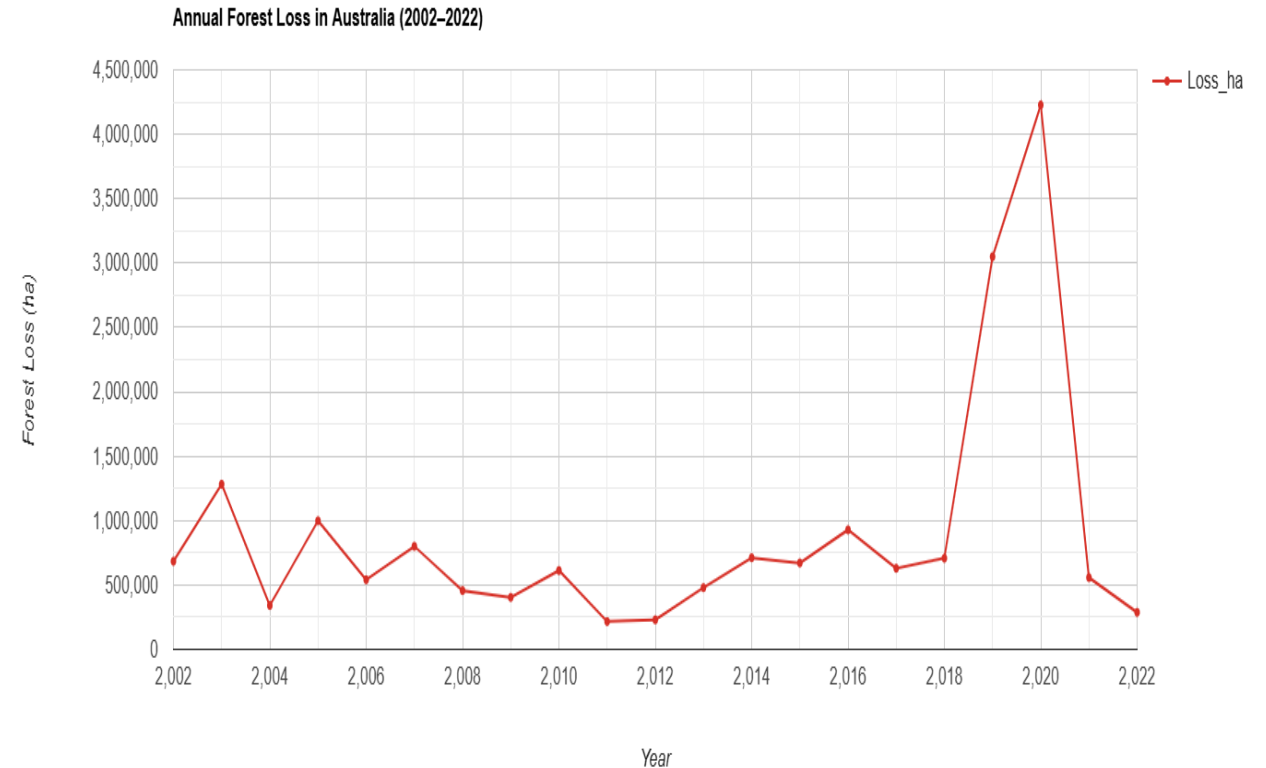
```
Year:
2020
→ Forest Loss (ha):
4227381.148028781
```

Insights and Interpretation

- Fires impacted forest, grasslands and shrub regions the most.

- NDVI anomalies showed clear vegetation loss after 2020.

- Forest loss peaked in 2019–2020; hotspots aligned with fire zones.

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Annual Forest Loss in Australia (2002–2022)

Conclusion & Challenges

- From the analysis, we confirm that around 8,000,000 ha forest was lost during 2019-2021.

- During the Black Summer fire season (late 2019 to early 2020), there's a noticeable spike in burned area, indicating intense fire activity over that period.

- Google Earth Engine efficiently visualized burned are maps with high resolution enabling rapid analysis. However, due to vast data volume and export limitations extracting results were challenging and constrained large scale processing.

THANK YOU