

LANDSAT 8 OLI

Mapping vegetation

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Landsat 8: <https://www.usgs.gov/media/images/landsat-8-image-7>

WHAT IS LANDSAT?

The Landsat program developed by NASA has provided continuous Earth surface observations since 1972. The satellites are widely used to monitor vegetation dynamics, soil conditions, water resources, and urban expansion through multispectral imagery. The datasets are fundamental for agricultural management, environmental mapping, and climate change assessment. With successive improvements in spatial and spectral resolution, Landsat offers accurate and consistent monitoring of terrestrial processes.

Landsat 1-3 (1972-1983)

- 4 bands
- 80m resolution

Landsat 4-5 (1982-2013)

- 7 bands
- 30m resolution

Landsat 6 (1993)

- failed to launch

Landsat 7 (1999-2025)

- 8 bands
- Panchromatic 15m
- IR 60m

Landsat 8 (2013-) and 9 (2021-)

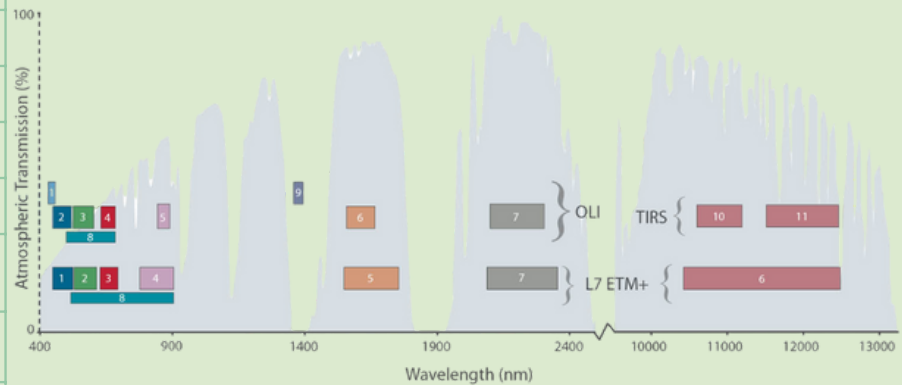
- 10 Bands
- Panchromatic 15m
- Others 30m

BANDS OF LANDSAT 8 AND THEIR USE

Band	Name / Type	Main Uses / Characteristics
1	Coastal/Aerosol	Penetrates water; useful for coastal studies and atmospheric correction.
2	Blue	True-color imaging; water and soil discrimination.
3	Green	Vegetation monitoring; part of true-color images.
4	Red	Vegetation and urban area contrast; also part of true-color images.
5	Near Infrared (NIR)	Key for plant health (NDVI); detects healthy vegetation.
6	SWIR1	Moisture content in soil and vegetation; geology.
7	SWIR2	Burn scars, vegetation types, and rock types
8	Panchromatic (Pan)	Black-and-white, high-resolution (15m) for sharpening images.
9	Cirrus	Detects high-altitude cirrus clouds that can distort measurements.
10	Thermal Infrared (TIR 1)	Measures land surface temperature; used for heat mapping.

landsat 8 Bands ://landsat.gsfc.nasa.gov/satellites/landsat-8/landsat-8-bands/>

GRAPHICAL REPRESENTATION OF LANDSAT 8 BANDS AND ATMOSPHERIC TRANSMISSION



<https://landsat.gsfc.nasa.gov/satellites/landsat-8/>

KEY INDICES FOR VEGETATION (LANDSAT 8/9)

Index	Purpose	Formula	Bands (Landsat 8)
NDVI	Vegetation Health	$(NIR - Red) / (NIR + Red)$	B5 (NIR), B4 (Red)
NBR	Burn Severity	$(NIR - SWIR2) / (NIR + SWIR2)$	B5 (NIR), B7 (SWIR2)
NBRT	Burn Severity + Temperature	$(NIR - (SWIR2 + TIR)) / (NIR + (SWIR2 + TIR))$	B5 (NIR), B7 (SWIR2), B10 (TIR)
NDWI (McFeeters)	Water Bodies	$(Green - NIR) / (Green + NIR)$	B3 (Green), B5 (NIR)
NDWI (Gao)	Vegetation Water Content	$(NIR - SWIR1) / (NIR + SWIR1)$	B5 (NIR), B6 (SWIR1)

CASE STUDY: FOREST RISK MAPPING IN MUĞLA, TÜRKİYE

Forest fire risk mapping with Landsat 8 OLI images: Evaluation of the potential use of vegetation indices

Climate change

Global forest fires

Risk mapping

Why use vegetation indices ?

- right spectral bands (NIR, SWIR, TIR)
- suitable spatial/temporal resolution
- high radiometric sensitivity
- free long-term data

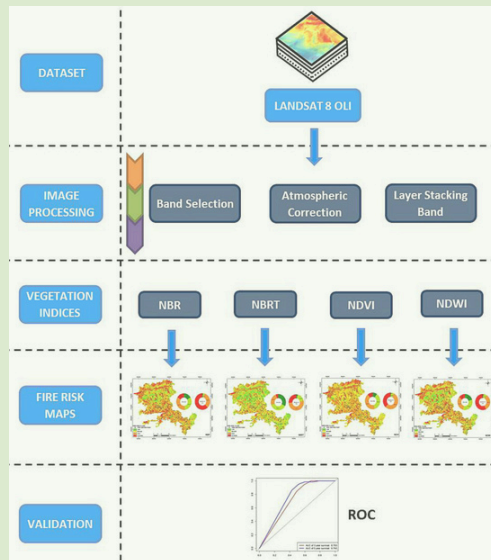
Application to forest management strategies:

- to assist in planning in **places vulnerable** to wildfires
- to optimize **resource allocation**

Key results:

- **NBR** appeared to be the best index for fire risk mapping (ROC analysis)
- Over **90% of forest fires** occurred in areas classified as high or **extremely high** risk based on NBR, NDWI, and NDVI

STUDIE'S FLOW SHART



RISK MAPS OF NBR AND NBRT

