

Introduction

The Landsat program, jointly managed by NASA and the U.S. Geological Survey (USGS), consists of a series of satellite missions dedicated to **Earth observation**. Launched in 1972, the program is still running with Landsat 9 in operation. Landsat images are **freely accessible by the public** and it is a key resource supporting both **scientific research** and a wide range of **practical applications**.

History of Landsat

The idea for Landsat was proposed in 1965 by **William T. Pecora**, back then the director of the United States Geological Survey. After some obstacles, Nasa got permission to build a satellite in 1970. Initially called Earth Resources Technology Satellites Program, the program was **renamed to Landsat in 1975**.

	Satellite	Sensor	Revisit Time	Retired
1972	Landsat 1	MSS	18 days	1978
1975	Landsat 2	MSS	18 days	1982
1978	Landsat 3	MSS	18 days	1983
1982	Landsat 4	MSS/TM	16 days	1993
1984	Landsat 5	MSS/TM	16 days	2013
1993	Landsat 6	ETM	(16 days)	-
1999	Landsat 7	ETM+	16 days	2025
2013	Landsat 8	OLI/TIRS	16 days	-
2021	Landsat 9	OLI-2/TIRS-2	16 days	-
2031	Landsat Next	VSWIR/TIR	18 days	-

*Landsat 6 failed to reach orbit and was therefore never in use

Sensor	Full Name	Specification
MSS	MultiSpectral Scanner	4-band multispectral scanner
TM	Thematic Mapper	7-band multispectral scanner
ETM(+)	Enhanced Thematic Mapper(+)	8-band multispectral scanner
OLI	Operational Land Imager	11-band multispectral scanner
TIRS	Thermal Infrared Sensor	11-band multispectral scanner
VSWIR	Visible to Short Wave Infrared	21-band multispectral scanner

Applications

- **Mapping Land Cover & Land Use** – Multispectral bands (MSS) allow distinguishing vegetation, soil, and water
- **Monitoring Agriculture & Food Security** – SWIR and thermal bands (TM) allow detecting soil moisture, crop stress, and evapotranspiration
- **Tracking Forests & Fires** – SWIR and TM allow mapping burn severity, detecting fire scars, and monitoring forest loss
- **Assessing Freshwater & Hydrology** – Thermal and visible/NIR bands (TM, OLI, TIRS) allow measuring water temperature, turbidity, and wetland extent
- **Detecting Climate & Environmental Change** – Multispectral indices (MSS, TM, OLI) allow tracking vegetation trends, desertification, and glacier retreat
- **Analyzing Urban Growth & Infrastructure** – Thermal and panchromatic bands (TM, ETM+) allow detecting heat islands, mapping built-up areas, and monitoring sprawl
- **Responding to Hazards & Disasters** – Thermal and multispectral bands (MSS, TM, OLI, TIRS) allow mapping floods, lava flows, fire extent, and earthquake damage

Examples

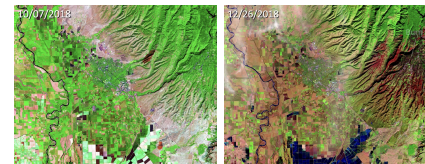
LANDSAT 7 ETM+
R/G/B

Assessing water supply and shrinking of Aral sea
Central Asia from 2000 to 2017



LANDSAT 8 OLI+TIRS
SWIR-1/NIR/B

Monitoring of 2018 Camp Fire in California
(100,000 acres burned)



Future of Landsat

Landsat Next mission was scheduled for launch in late 2030. However, following budget change from President Trump in May 2025, NASA announced that it is "currently assessing **alternate mission architectures** to support **more affordable ways** to maintain the continuity of Landsat imagery."

Comparison of Landsat Spectral Bands

