
LANDSAT 8
A DECADE OF SERVICE

1
00:00:04,204 --> 00:00:08,675
For 50 years, the Landsat mission
has kept a watchful eye over earth,

2
00:00:08,675 --> 00:00:13,246
providing the longest continuous record
of our planet from space and bolstering

3
00:00:13,246 --> 00:00:17,550
our understanding of land use,
urbanization, climate change and more.

4
00:00:18,418 --> 00:00:22,522
This February marks the 10th anniversary
of the launch of Landsat 8,

5
00:00:23,089 --> 00:00:25,425
launched by NASA in 2013

6
00:00:25,425 --> 00:00:28,962
and operated by the U.S. Geological Survey.

7
00:00:28,962 --> 00:00:33,900
Equipped with its Operational Land Imager
and Thermal Infrared Sensor instruments,

8
00:00:33,900 --> 00:00:38,004
Landsat 8 represented a significant
advance in remote sensing technology

9
00:00:38,338 --> 00:00:40,673
and was the first to allow everyone in the world

10
00:00:40,774 --> 00:00:44,511
fully free and open access to
its data from first light.

11
00:00:45,278 --> 00:00:47,313
In celebration of a decade of service,

12
00:00:47,680 --> 00:00:50,283
Let's take a look back at some
of the remarkable ways

13
00:00:50,283 --> 00:00:55,922
Landsat 8 has fundamentally altered
the way we see our world.

14
00:00:57,724 --> 00:00:59,926
No, this isn't the Northern Lights.

15
00:01:00,060 --> 00:01:03,063
This is a phytoplankton bloom in Lake Erie,

16
00:01:03,063 --> 00:01:05,965
captured by Landsat 8 in September 2017.

17
00:01:06,833 --> 00:01:11,604
This massive concentration of microscopic
aquatic plants is a regular occurrence in

18
00:01:11,604 --> 00:01:16,676
bodies of water worldwide and can present
serious harm to humans and wildlife.

19
00:01:17,444 --> 00:01:20,713
Though water is notoriously difficult
to study from space,

20
00:01:20,713 --> 00:01:25,819
engineering improvements to the sensitivity
of OLI allowed Landsat 8 to identify

21
00:01:25,819 --> 00:01:30,156
these blooms in greater detail
and help water managers inform the public.

22
00:01:31,124 --> 00:01:35,662

Lake Erie is no stranger to these types
of blooms, particularly during the summer,

23
00:01:35,662 --> 00:01:37,997
when warm temperatures
and agricultural runoff

24
00:01:37,997 --> 00:01:41,868
frequently cause phytoplankton blooms
that can last months at a time.

25
00:01:42,335 --> 00:01:45,271
This particular bloom lasted
from July to September.

26
00:01:47,207 --> 00:01:50,210
From the Great Lakes,
we traveled to Utah's Great Salt Lake,

27
00:01:50,443 --> 00:01:54,080
the largest saline lake in the country
and the eighth largest in the world.

28
00:01:54,781 --> 00:01:58,551
This image, captured in June 1985 by Landsat 5,

29
00:01:58,585 --> 00:02:00,487
shows the lake at its highest level.

30
00:02:00,487 --> 00:02:04,057
Following a string of years of record
rainfall and snowmelt runoff.

31
00:02:04,624 --> 00:02:10,697
Flash forward 27 years later to this image
captured in July 2022 by Landsat 8

32
00:02:10,830 --> 00:02:14,534
showing the lake at its lowest
water level elevation on record.

33
00:02:14,968 --> 00:02:17,403
So what happened to all the water?

34
00:02:17,403 --> 00:02:18,138
The answer?

35
00:02:18,138 --> 00:02:22,041
A decades long megadrought
and, at least in part, us.

36
00:02:22,575 --> 00:02:26,312
The diverting of water for housing
and agriculture in the surrounding area

37
00:02:26,546 --> 00:02:29,082
has been standard practice
for almost a century.

38
00:02:29,382 --> 00:02:32,418
But the increase in population
around Salt Lake City

39
00:02:32,418 --> 00:02:35,555
caused these diversions
to intensify in recent decades.

40
00:02:36,322 --> 00:02:40,627
The Great Salt Lake's shrinking shoreline
is a great example of just how critical

41
00:02:40,627 --> 00:02:43,496
the effective management of
our planet's water resources

42
00:02:43,496 --> 00:02:45,098
will be in the coming decades.

43
00:02:45,532 --> 00:02:46,833

After precipitation,

44
00:02:46,833 --> 00:02:50,770
the second largest component of the water
cycle is evapotranspiration.

45
00:02:51,171 --> 00:02:52,772
The process through which water leaves

46
00:02:52,772 --> 00:02:56,409
plants, soils and other surfaces
and returns to the atmosphere

47
00:02:57,143 --> 00:02:58,711
for the agricultural industry.

48
00:02:58,711 --> 00:03:02,849
Knowing evapotranspiration rates
helps them to use water more efficiently

49
00:03:03,349 --> 00:03:08,254
and yes, combining OLI and TIRS data
from Landsat 8 can help with that.

50
00:03:08,888 --> 00:03:13,726
Enter OpenET, a web based platform
developed with NASA's support,

51
00:03:13,726 --> 00:03:16,629
which uses data from satellites like Landsat 8

52
00:03:16,629 --> 00:03:20,133
to provide information on water
consumption and crop water requirements

53
00:03:20,466 --> 00:03:22,802
in areas as small as a quarter of an acre.

54
00:03:22,835 --> 00:03:25,572

at daily, monthly and yearly intervals.

55
00:03:26,472 --> 00:03:28,875
This helps farmers make data-driven decisions

56
00:03:28,875 --> 00:03:31,911
on how to manage their
increasingly scarce water resources.

57
00:03:32,779 --> 00:03:36,482
And just as Landsat 8 data are used
to help manage water resources,

58
00:03:36,749 --> 00:03:40,553
it's also used to track the growth
of the crops that use those resources.

59
00:03:41,054 --> 00:03:44,924
Tracking and estimating of crop types
and yields are tall tasks

60
00:03:44,924 --> 00:03:48,861
for agencies such as the USDA's
Cropland Data Layer program.

61
00:03:49,529 --> 00:03:51,698
To meet the challenge,
they looked skyward.

62
00:03:51,931 --> 00:03:55,001
Employing the services of satellites
including Landsat 8

63
00:03:55,268 --> 00:03:58,938
to help monitor dozens of crops
across the lower 48 states.

64
00:03:59,572 --> 00:04:04,210
The detail offered by Landsat 8 helps
the USDA track crops in real time,

65
00:04:04,377 --> 00:04:08,181
allowing farmers and traders
to estimate crop yields, set prices,

66
00:04:08,448 --> 00:04:11,017
and even highlight shifting
trends in crop selection.

67
00:04:11,618 --> 00:04:15,555
And when disaster hits, such as in 2019,
when heavy spring

68
00:04:15,555 --> 00:04:18,791
rains flooded millions of acres
of farmland across the country,

69
00:04:19,158 --> 00:04:22,762
the USDA can turn to data from satellites
like Landsat 8

70
00:04:22,996 --> 00:04:27,267
to highlight the areas most affected
and provide accurate yield estimates

71
00:04:28,801 --> 00:04:31,537
From the rural corn and wheat fields
of America's heartland.

72
00:04:31,571 --> 00:04:35,942
We turn our eyes towards the city.
Lacking in sufficient tree cover,

73
00:04:36,009 --> 00:04:39,245
our cities can be prone to suffering
from the heat island effect

74
00:04:39,579 --> 00:04:43,750
as an excess of impervious surfaces
absorb and remit the sun's heat.

75
00:04:44,117 --> 00:04:47,053
Trees have plenty to offer
in the way of environmental benefits,

76
00:04:47,220 --> 00:04:50,223
capturing carbon dioxide and
reducing stormwater runoff.

77
00:04:50,857 --> 00:04:54,761
Research also shows that a lack of trees
could not only affect the temperature,

78
00:04:54,894 --> 00:04:57,363
but our overall health and well-being.

79
00:04:57,363 --> 00:04:59,232
Using data from Landsat 8,

80
00:04:59,232 --> 00:05:03,303
researchers studied vegetation
coverage in urban areas around the U.S.,

81
00:05:03,503 --> 00:05:05,471
which revealed
that a significant disparity

82
00:05:05,471 --> 00:05:09,108
in tree cover across urban
neighborhoods leads to differences

83
00:05:09,108 --> 00:05:12,812
in temperatures and health outcomes.

84
00:05:13,646 --> 00:05:17,250
Landsat 8 has proven again and again
that in times of crisis,

85
00:05:17,250 --> 00:05:18,618

it can be relied on to provide

86
00:05:18,618 --> 00:05:21,054
emergency responders with critical data

87
00:05:21,054 --> 00:05:24,057
before, during and after disaster strikes.

88
00:05:24,590 --> 00:05:26,793
As climate change continues to evolve,

89
00:05:26,926 --> 00:05:31,397
North America's fire season has increased
both in frequency and intensity.

90
00:05:32,065 --> 00:05:36,235
The 2018 Camp Fire captured by
Landsat 8’s OLI instrument,

91
00:05:36,235 --> 00:05:40,373
was the deadliest and most destructive
wildfire in California's history.

92
00:05:40,540 --> 00:05:44,711
Raging for 18 days before
finally being contained by firefighters.

93
00:05:45,378 --> 00:05:48,281
Using thermal data from
Landsat 8’s TIRS instrument.

94
00:05:48,414 --> 00:05:50,850
We can even delve
beneath the smoke to witness

95
00:05:50,850 --> 00:05:53,319
the blistering temperatures
of the fires below.

96

00:05:53,886 --> 00:05:58,091
Landsat data such as this can be used
by fire management programs to document

97
00:05:58,091 --> 00:06:02,095
severity and regrowth of burned areas,
providing crucial information

98
00:06:02,095 --> 00:06:05,131
for better management
of forests and natural resources.

99
00:06:06,132 --> 00:06:08,334
Fires aren't the only natural disasters

100
00:06:08,334 --> 00:06:10,370
North America contends with each summer -

101
00:06:10,870 --> 00:06:14,006
Hurricane season
kicks off every year on June 1st,

102
00:06:14,207 --> 00:06:17,510
and as ocean temperatures
trend upward due to climate change,

103
00:06:17,510 --> 00:06:21,748
so have hurricanes ability to lay
waste to island and coastal communities.

104
00:06:22,448 --> 00:06:27,053
On September 20th, 2017, Hurricane
Maria slammed into Puerto Rico

105
00:06:27,053 --> 00:06:30,590
with ferocious winds that stripped a third of its forests bare.

106
00:06:31,224 --> 00:06:35,027
A year later, data captured by Landsat
8’s OLI instrument over

107
00:06:35,027 --> 00:06:37,463
Puerto Rico's El Yunque National Park,

108
00:06:37,463 --> 00:06:40,867
an area particularly devastated by Maria's high winds,

109
00:06:40,867 --> 00:06:44,036
clearly demonstrates nature's
innate ability to heal itself

110
00:06:44,904 --> 00:06:47,440
as Puerto Rico's forests
bounce back from disaster.

111
00:06:47,573 --> 00:06:51,177
Some of the world's other natural features
have not been so resilient.

112
00:06:51,878 --> 00:06:55,281
Landsat’s ability to track changes
to the Earth's surface over time

113
00:06:55,515 --> 00:06:58,785
has proven a useful tool
for observing climate change’s effects

114
00:06:58,785 --> 00:07:02,588
on the planet, especially
in Alaska's Glacier Bay National Park,

115
00:07:02,955 --> 00:07:06,726
whose famous inhabitants
have fallen victim to glacial retreating.

116
00:07:07,527 --> 00:07:11,631
The park's Grand Plateau Glacier once
reached almost all the way to the ocean.

117

00:07:11,831 --> 00:07:15,201
But this image, captured 35 years later
by Landsat eight,

118
00:07:15,468 --> 00:07:18,738
reveals the true magnitude of the retreat
affecting the glacier.

119
00:07:19,472 --> 00:07:23,443
Evidence suggests that the loss of ice
from ice sheets and glaciers has been

120
00:07:23,443 --> 00:07:27,180
the largest contributor to sea level rise
over the past three decades.

121
00:07:27,880 --> 00:07:32,285
Landsat 8's technological advances have
enabled tools such as the NASA-funded

122
00:07:32,552 --> 00:07:35,855
Global Land Ice Velocity Extraction (GoLIVE) project

123
00:07:35,855 --> 00:07:39,192
to map the pace at which glaciers
move and helping researchers

124
00:07:39,192 --> 00:07:44,030
study what causes ice masses to change
and how much ice will flow into the ocean.

125
00:07:45,031 --> 00:07:47,867
Thanks to the nature of its
polar orbit and thermal data,

126
00:07:48,100 --> 00:07:52,605
Landsat 8 is always on hand to capture
extraordinary events, especially during

127
00:07:52,605 --> 00:07:55,875

polar winters, when there's no visible
light to see what's happening.

128
00:07:56,709 --> 00:07:59,245
But thermal data from Landsat’s TIRS instrument

129
00:07:59,245 --> 00:08:01,214
observed the difference in surface temperature

130
00:08:01,214 --> 00:08:06,519
between Antarctica's Larsen C Ice Shelf
and the surrounding water in July 2017,

131
00:08:06,986 --> 00:08:10,890
revealing the moment this trillion tonne
slab of ice the size of Delaware

132
00:08:11,190 --> 00:08:15,728
broke away, forming iceberg A68.

133
00:08:16,195 --> 00:08:19,098
Ten years in, it's abundantly clear
that Landsat 8

134
00:08:19,098 --> 00:08:22,568
has made profound contributions
to not just the scientific community

135
00:08:22,835 --> 00:08:24,337
but the world at large.

136
00:08:24,337 --> 00:08:28,574
And, with its original design life of five
years firmly in its rearview mirror,

137
00:08:28,841 --> 00:08:30,309
Landsat 8 is still going strong,

138
00:08:30,309 --> 00:08:34,046

and operating in tandem with
its younger sibling, Landsat 9,

139
00:08:34,347 --> 00:08:38,885
which joined it in orbit in 2021 to
provide an 8-day revisit time.

140
00:08:39,285 --> 00:08:42,989
And the next phase of the Landsat
mission, aptly named Landsat Next,

141
00:08:42,989 --> 00:08:47,293
is already on the horizon, with plans
to launch a trio of smaller satellites

142
00:08:47,293 --> 00:08:49,161
offering enhanced spectral coverage,

143
00:08:49,161 --> 00:08:53,199
finer spatial resolution
and a shortened revisit time.

144
00:08:53,466 --> 00:08:57,036
So hats off to you Landsat 8
and best of luck on your journey,