
2019

1
00:00:00,000 --> 00:00:02,780
[music throughout]

2
00:00:02,800 --> 00:00:04,460
My name is Sean Healey,

3
00:00:04,480 --> 00:00:06,620
I study forest dynamics.

4
00:00:06,640 --> 00:00:09,390
I study changes in carbon,

5
00:00:09,410 --> 00:00:12,200
changes in forest structure when they are disturbed,

6
00:00:12,220 --> 00:00:14,010
that is burned or cut down.

7
00:00:14,030 --> 00:00:15,090
I also study recovery,

8
00:00:15,110 --> 00:00:21,570
which is what we see a lot of following the eruption of Mount St. Helens.

9
00:00:21,590 --> 00:00:25,570
I visited it for the first time 20 years after, it was like a moonscape.

10
00:00:25,590 --> 00:00:27,490
A lot of it was still like a moonscape:

11
00:00:27,510 --> 00:00:30,140
you know, pieces of pumice on the ground, no vegetation.

12
00:00:30,160 --> 00:00:36,142
It has been a place of extraordinary change over the last forty years.

13
00:00:36,580 --> 00:00:40,990

From really beautiful old growth forest to a moonscape.

14
00:00:41,010 --> 00:00:43,180
And then back again to a lot of unbroken

15
00:00:43,200 --> 00:00:48,680
sort-of twenty year-old forests, pretty high canopy cover.

16
00:00:48,700 --> 00:00:51,390
Uh, a lot of trees there now.

17
00:00:51,410 --> 00:00:57,460
From the fringes of the blast zone,

18
00:00:57,480 --> 00:01:00,220
you definitely see patterns of revegetation.

19
00:01:00,240 --> 00:01:03,740
They start slowly, with a little bit of greening,

20
00:01:03,760 --> 00:01:05,340
but by the time you get to the end of the time series,

21
00:01:05,360 --> 00:01:07,670
it looks pretty dark green. And you see the same thing on the ground.

22
00:01:07,690 --> 00:01:10,910
You see you know maybe not a forty year old forest,

23
00:01:10,930 --> 00:01:12,580
but something that looks thirty years old.

24
00:01:12,600 --> 00:01:17,660
And in this part of the country, trees are pretty tall after thirty years.

25
00:01:17,680 --> 00:01:22,320
What we’re looking at is Mount St. Helens

26
00:01:22,340 --> 00:01:26,670
in southwestern Washington, in 1973.

27
00:01:26,690 --> 00:01:29,270
Snow cover is what you see as white there,

28
00:01:29,290 --> 00:01:30,810
right in the middle of the mountain.

29
00:01:30,830 --> 00:01:35,090
It’s surrounded by some dark, deep reddish forests,

30
00:01:35,110 --> 00:01:40,320
which is basically how this MSS imagery sees older growth forests.

31
00:01:40,340 --> 00:01:45,060
To the east of it we se a lot of very active timber harvests.

32
00:01:45,080 --> 00:01:50,400
All of those patches of blue are recent clear cuts.

33
00:01:50,420 --> 00:01:52,820
Just to the north of the mountain, there,

34
00:01:52,840 --> 00:01:52,980
you see a very large clear cut.

35
00:01:53,000 --> 00:01:57,870
That one happens to be about two square miles,

36
00:01:57,890 --> 00:02:01,850
which is really really large by today’s standards.

37
00:02:01,870 --> 00:02:06,650
And then Spirit Lake, just to the northeast of the volcano.

38
00:02:06,670 --> 00:02:09,410

You will see that the shape of that lake will change,

39
00:02:09,430 --> 00:02:12,530
radically, after the volcano erupts.

40
00:02:12,550 --> 00:02:14,870
Well, in this image, I mean, if you remember that large clear cut

41
00:02:14,890 --> 00:02:21,040
that I pointed out you can see that it is starting to go from that bluish cast

42
00:02:21,060 --> 00:02:24,290
to having more red, which indicates, you know, recovery following harvest.

43
00:02:24,310 --> 00:02:30,287
And six years has passed, so you would definitely expect that

44
00:02:32,410 --> 00:02:33,240
in a very productive forest like this one.

45
00:02:33,260 --> 00:02:38,340
And it has been joined by a lot more clear cuts in that area, too.

46
00:02:38,360 --> 00:02:41,440
I have looked at a lot of Landsat scenes.

47
00:02:41,460 --> 00:02:46,730
This is the biggest change from one image to another that I can think of.

48
00:02:46,750 --> 00:02:52,730
Forests and everything else, many miles to the north, were just incinerated.

49
00:02:53,400 --> 00:02:58,920
The blast and the heat and the ash really levelled a lot.

50
00:02:58,940 --> 00:03:02,660
It looks from this image like Spirit Lake, just to the northeast of the volcano

51
00:03:02,680 --> 00:03:06,740
is not there, but it is there, it’s covered in logs.

52
00:03:06,760 --> 00:03:12,110
And most of the water in that lake got splashed up six hundred feet or more,

53
00:03:12,130 --> 00:03:17,220
and sort of dragged all of the trees that were on that wall down.

54
00:03:17,240 --> 00:03:19,880
Over the forty years since the eruption,

55
00:03:19,900 --> 00:03:23,010
you know, we do see that recovery happens first

56
00:03:23,030 --> 00:03:26,430
in the places that didn’t have that huge blast of heat

57
00:03:26,450 --> 00:03:31,950
and were not covered with many, many meters of ash or mud.

58
00:03:31,970 --> 00:03:36,270
In ’84, the first Thematic Mapper Landsat was launched.

59
00:03:36,290 --> 00:03:40,260
So that really changes our ability to display this kind of image

60
00:03:40,280 --> 00:03:44,520
in something closer to true color so it’s much more intuitive:

61
00:03:44,540 --> 00:03:46,100
green means green.

62
00:03:46,120 --> 00:03:50,420
So from this point forward you can sort of visualize

63
00:03:50,440 --> 00:03:52,360

the encroaching greenness

64
00:03:52,380 --> 00:03:58,359
which indicates the re-vegetating and re-foresting areas after the eruption.

65
00:03:59,030 --> 00:04:04,460
Well, I'll also point out some of the remaining old growth forest

66
00:04:04,480 --> 00:04:06,120
that you can see in that very dark patch.

67
00:04:06,140 --> 00:04:09,280
In the MSS imagery, that was dark red.

68
00:04:09,300 --> 00:04:12,600
It's just much more intuitive to spot that kind of dark green

69
00:04:12,620 --> 00:04:15,780
when we can display it in true color.

70
00:04:15,800 --> 00:04:19,200
You can see in the early '90s clear cuts starting to pop up.

71
00:04:19,220 --> 00:04:24,170
So basically it looks like it is going from green

72
00:04:24,190 --> 00:04:30,175
to some kind of brownish color.

73
00:04:32,970 --> 00:04:33,650
Even as the outer edge of these clearcuts are growing and filling in,

74
00:04:33,670 --> 00:04:38,390
the inner edges are greening up and turning green.

75
00:04:38,410 --> 00:04:40,290
And by the end of the time series they look pretty green,

76
00:04:40,310 --> 00:04:43,730
even though we just saw them get cut thirty years before that.

77
00:04:43,750 --> 00:04:45,990
So we have basically made a model

78
00:04:46,010 --> 00:04:51,360
that uses the imagery to predict what percent cover there is.

79
00:04:51,380 --> 00:04:54,830
Basically, how thick is the tree canopy here.

80
00:04:54,850 --> 00:04:57,900
And through the time series, you can see much of the blast zone

81
00:04:57,920 --> 00:05:00,750
going from red, which is zero trees,

82
00:05:00,770 --> 00:05:05,920
to pretty green, which is, you know, pretty solid tree cover.

83
00:05:05,940 --> 00:05:11,230
And that is really solid documentation of the recovery of the forest in this area.

84
00:05:11,250 --> 00:05:16,310
You can also see its neighboring places go from green to red

85
00:05:16,330 --> 00:05:20,450
in the opposite direction. Obviously there are harvests happening

86
00:05:20,470 --> 00:05:22,890
and those are taking away forest canopy

87
00:05:22,910 --> 00:05:26,870
at the same time that recovery is adding forest canopy

88
00:05:26,890 --> 00:05:30,770

in the place that was affected by the eruption.

89
00:05:30,790 --> 00:05:34,140
The really unique part about the Landsat record

90
00:05:34,160 --> 00:05:36,940
is the fact that it goes back to the ‘70s.

91
00:05:36,960 --> 00:05:41,420
I can’t imagine what it would be like to describe

92
00:05:41,440 --> 00:05:46,160
what this volcano did without having a time series of Landsat.

93
00:05:46,180 --> 00:05:51,180
We’ve got eight years before the eruption and forty years after the eruption.

94
00:05:51,200 --> 00:05:56,920
There is no other asset in the sky that can show us what Landsat does,

95
00:05:56,940 --> 00:06:00,290
in terms of the effect of the eruption

96
00:06:00,310 --> 00:06:04,210
and also the effect of the recovery following the eruption.

97
00:06:04,230 --> 00:06:09,060
Uh, it’s just amazingly lucky that Landsat was up there