
2010

1
00:00:00,700 --> 00:00:05,870
Forests are always changing. They're a very dynamic ecosystem.

2
00:00:05,890 --> 00:00:08,020
We've used data from the Landsat satellites

3
00:00:08,040 --> 00:00:10,110
to produce a comprehensive look at forest dynamics

4
00:00:10,130 --> 00:00:13,100
on the scale of human management and natural disturbances.

5
00:00:13,120 --> 00:00:16,890
Dark green pixels had no disturbances in the 25 years studied.

6
00:00:16,910 --> 00:00:20,380
Yellow shows where a disturbance happened in a particular year.

7
00:00:20,400 --> 00:00:24,450
At this scale, what really stands out are the large fires in the West

8
00:00:24,470 --> 00:00:29,320
and timber harvesting in the Pacific Northwest, Maine, and all across the Southeast.

9
00:00:29,340 --> 00:00:32,630
We need to know the rate of disturbance and how that rate is changing

10
00:00:32,650 --> 00:00:36,800
in order to understand how carbon is changing across the landscape.

11
00:00:36,820 --> 00:00:40,350
Here we can see the impact of policy decisions on forest dynamics

12
00:00:40,370 --> 00:00:42,980
The various protected areas around Broken Bow Lake

13
00:00:43,000 --> 00:00:44,140

remain largely undisturbed

14
00:00:44,160 --> 00:00:45,750
compared to the surrounding region,

15
00:00:45,770 --> 00:00:50,330
which flickers with the tell-tale patches of timber harvesting.

16
00:00:50,350 --> 00:00:53,310
Any disturbance, whether from fire or hurricanes,

17
00:00:53,330 --> 00:00:57,390
mining or logging, impacts how much carbon the forest can store.

18
00:01:01,000 --> 00:01:02,940
The southern and central Appalachian Mountains,

19
00:01:02,960 --> 00:01:04,190
from Tennessee to West Virginia,

20
00:01:04,210 --> 00:01:05,910
are home to most of the disturbances

21
00:01:05,930 --> 00:01:09,030
resulting from mountaintop removal mining.

22
00:01:09,050 --> 00:01:12,780
Throughout Appalachia, coal mining has been a big industry since the 1860s,

23
00:01:12,800 --> 00:01:17,580
and mountaintop mining became dominant over the last 30 years.

24
00:01:17,600 --> 00:01:21,700
The Hobet Mine in Boone County, West Virginia, existed before 1986

25
00:01:21,720 --> 00:01:25,000
and has continued to expand throughout the course of this study.

26
00:01:28,320 --> 00:01:30,160
The pattern we see at the Hobet Mine is

27
00:01:30,180 --> 00:01:34,970
replicated across the entire southern Appalachia.

28
00:01:37,210 --> 00:01:39,460
We mostly think of hurricanes wreaking houses,

29
00:01:39,480 --> 00:01:41,930
flooding cities, and endangering lives.

30
00:01:41,950 --> 00:01:43,500
But they can also damage forests,

31
00:01:43,520 --> 00:01:46,080
knocking down wide swaths of trees.

32
00:01:46,100 --> 00:01:48,040
Hurricane Hugo was a category 4 storm

33
00:01:48,060 --> 00:01:51,400
when it struck South Carolina in September of 1989,

34
00:01:51,420 --> 00:01:55,130
and the scale of the disturbance shows in the 1990 data.

35
00:01:55,150 --> 00:01:56,780
Four and a half million acres of forest

36
00:01:56,800 --> 00:02:00,380
were affected by wind gusts and storm surges of salt water.

37
00:02:00,400 --> 00:02:01,680
Disturbances of this magnitude

38
00:02:01,700 --> 00:02:03,580

can release large amounts of carbon dioxide

39
00:02:03,600 --> 00:02:07,500
into the atmosphere as the trees decompose.

40
00:02:07,520 --> 00:02:11,390
Tornadoes leave long tracks of damaged forests in their wake

41
00:02:11,410 --> 00:02:14,190
showing as a bright line in the satellite imagery.

42
00:02:14,210 --> 00:02:18,540
These long straight tracks are extremely distinctive of this type of disturbance.

43
00:02:18,560 --> 00:02:20,060
On Mother's Day in 2008,

44
00:02:20,080 --> 00:02:23,840
several tornadoes in Georgia left a track 150 kilometers long

45
00:02:23,860 --> 00:02:27,990
and about 2 kilometers wide.

46
00:02:28,010 --> 00:02:30,320
For many tree species in the Rocky Mountain West,

47
00:02:30,340 --> 00:02:32,240
fire is a natural part of their life cycle,

48
00:02:32,260 --> 00:02:34,780
clearing space for new growth on the forest floor

49
00:02:34,800 --> 00:02:37,320
and releasing seeds from their pinecones.

50
00:02:37,340 --> 00:02:39,100
But climate change is projected to increase

51
00:02:39,120 --> 00:02:41,480
the intensity and frequency of wildfires.

52
00:02:41,500 --> 00:02:43,320
In 1988, Yellowstone National Park

53
00:02:43,340 --> 00:02:45,760
endured the largest fire ever recorded there.

54
00:02:45,780 --> 00:02:49,040
Many individual fires combined to damage 36% of the park,

55
00:02:49,060 --> 00:02:50,720
burning for several months.

56
00:02:50,740 --> 00:02:52,020
The scale of the disturbance

57
00:02:52,040 --> 00:02:55,520
is apparent in the following year's disturbance map.

58
00:02:55,540 --> 00:02:59,280
Less than 30% of the burned area re-gained forest cover by 2008.

59
00:02:59,300 --> 00:03:01,250
and the rate of recovery across Yellowstone

60
00:03:01,270 --> 00:03:02,710
has been quite variable,

61
00:03:02,730 --> 00:03:06,360
depending on the fire intensity and local conditions.

62
00:03:06,380 --> 00:03:07,600
Forests have always dealt with

63
00:03:07,620 --> 00:03:10,250

outbreaks of insects that can damage trees.

64
00:03:10,270 --> 00:03:12,680
Northern Colorado, near Rocky Mountain National Park,

65
00:03:12,700 --> 00:03:13,890
did not have severe damage

66
00:03:13,910 --> 00:03:16,710
from Mountain Pine Beetle before 2003.

67
00:03:16,730 --> 00:03:19,180
But the damage starts appearing in 2004

68
00:03:19,200 --> 00:03:20,500
in low areas,

69
00:03:20,520 --> 00:03:23,810
and spreads to higher elevations over the next few years.

70
00:03:23,830 --> 00:03:25,920
Climage change might result in more frequent episodes

71
00:03:25,940 --> 00:03:28,430
and trees less able to withstand the stress,

72
00:03:28,450 --> 00:03:30,980
but this will vary from region to region.

73
00:03:32,060 --> 00:03:34,190
Forests are a dynamic ecosystem.

74
00:03:34,210 --> 00:03:35,910
And we need to know how fast they change

75
00:03:35,930 --> 00:03:37,740
and what is driving those changes if we ever hope

76
00:03:37,760 --> 00:03:38,830
to track how much carbon

77
00:03:38,850 --> 00:03:40,380
they're pulling out of the atmosphere

78
00:03:40,400 --> 00:03:41,920
and storing for us.

79
00:03:41,940 --> 00:03:44,730
The Landsat archive, and other remote sensing systems,