



1
00:00:13,430 --> 00:00:11,270
water

2
00:00:16,150 --> 00:00:13,440
in the arid western united states it

3
00:00:17,990 --> 00:00:16,160
seems there's almost never enough of it

4
00:00:22,150 --> 00:00:18,000
but the biggest use of water in the west

5
00:00:24,390 --> 00:00:22,160
isn't for drinking it's for growing food

6
00:00:26,310 --> 00:00:24,400
agriculture consumes about 90 percent of

7
00:00:27,509 --> 00:00:26,320
the water diverted by humans in western

8
00:00:29,509 --> 00:00:27,519
states

9
00:00:31,269 --> 00:00:29,519
as the demand for water increases the

10
00:00:34,549 --> 00:00:31,279
pressure's on to make sure every drop

11
00:00:38,709 --> 00:00:36,389
it's tricky business gauging how much

12
00:00:40,389 --> 00:00:38,719
water farm fields are consuming let

13
00:00:42,950 --> 00:00:40,399

alone how much water is seemingly

14

00:00:44,790 --> 00:00:42,960

evaporating into thin air

15

00:00:46,150 --> 00:00:44,800

that's where water specialists tony

16

00:00:47,590 --> 00:00:46,160

morse

17

00:00:49,990 --> 00:00:47,600

rick allen

18

00:00:51,270 --> 00:00:50,000

and bill cramer come in

19

00:00:54,150 --> 00:00:51,280

they're taking a long view of the

20

00:00:57,350 --> 00:00:54,160

problem a very long view

21

00:01:00,310 --> 00:00:57,360

they're studying farms from space

22

00:01:03,189 --> 00:01:00,320

the best general view

23

00:01:04,310 --> 00:01:03,199

that is what remote sensing from space

24

00:01:06,390 --> 00:01:04,320

gives us

25

00:01:09,910 --> 00:01:06,400

we get to see the relationships the

26
00:01:12,710 --> 00:01:09,920
spatial relationships between elements

27
00:01:15,190 --> 00:01:12,720
that are too far apart

28
00:01:17,990 --> 00:01:15,200
for us to see them and understand them

29
00:01:19,990 --> 00:01:18,000
when we're walking around on the ground

30
00:01:21,429 --> 00:01:20,000
landsat satellites take images in the

31
00:01:22,950 --> 00:01:21,439
visible spectrum

32
00:01:25,830 --> 00:01:22,960
but they also capture images in

33
00:01:27,670 --> 00:01:25,840
wavelengths invisible to the naked eye

34
00:01:29,990 --> 00:01:27,680
landsat's thermal imager captures

35
00:01:31,990 --> 00:01:30,000
infrared data which clues scientists in

36
00:01:34,149 --> 00:01:32,000
to how much water agricultural growers

37
00:01:37,590 --> 00:01:34,159
are using

38
00:01:38,789 --> 00:01:37,600

we can map where water is being applied

39

00:01:40,710 --> 00:01:38,799

and used

40

00:01:42,789 --> 00:01:40,720

but we can also see how much water is

41

00:01:46,389 --> 00:01:42,799

being used which is very important for

42

00:01:47,749 --> 00:01:46,399

applications here at water resources

43

00:01:51,030 --> 00:01:47,759

how can something like a thermal

44

00:01:53,109 --> 00:01:51,040

measurement tell us about water use

45

00:01:55,030 --> 00:01:53,119

it's due to a familiar phenomenon

46

00:01:57,830 --> 00:01:55,040

evaporation or in this case

47

00:01:59,910 --> 00:01:57,840

evapotranspiration

48

00:02:02,709 --> 00:01:59,920

the term simply refers to evaporation of

49

00:02:04,389 --> 00:02:02,719

water from the soil plus transpiration

50

00:02:06,950 --> 00:02:04,399

the release of water through plants

51

00:02:10,869 --> 00:02:08,910

as farmers irrigate crops

52

00:02:11,910 --> 00:02:10,879

evapotranspiration causes the field to

53

00:02:13,510 --> 00:02:11,920

cool

54

00:02:16,070 --> 00:02:13,520

the temperature difference is invisible

55

00:02:18,150 --> 00:02:16,080

to the eye but is captured by landsat's

56

00:02:19,589 --> 00:02:18,160

infrared measurements

57

00:02:22,150 --> 00:02:19,599

so by looking at

58

00:02:23,830 --> 00:02:22,160

cool areas and warm areas in some ways

59

00:02:26,229 --> 00:02:23,840

that can tell us whether or not there's

60

00:02:29,030 --> 00:02:26,239

enough water to supply the needs of a

61

00:02:32,229 --> 00:02:29,040

plant whether the plants are dry because

62

00:02:36,550 --> 00:02:34,150

several satellites have thermal imagers

63

00:02:38,949 --> 00:02:36,560

that can help measure evapotranspiration

64

00:02:40,790 --> 00:02:38,959

but landsat offers advantages

65

00:02:42,869 --> 00:02:40,800

landsat instruments capture a wide

66

00:02:44,470 --> 00:02:42,879

enough area to get the big picture

67

00:02:46,309 --> 00:02:44,480

and the spatial resolution is high

68

00:02:48,470 --> 00:02:46,319

enough to not only make out individual

69

00:02:51,830 --> 00:02:48,480

irrigation projects but to discern

70

00:02:54,150 --> 00:02:51,840

individual fields that is so powerful

71

00:02:57,030 --> 00:02:54,160

because we know that every field has its

72

00:02:59,350 --> 00:02:57,040

own behavior its own characteristics its

73

00:03:01,270 --> 00:02:59,360

own rate of development

74

00:03:03,910 --> 00:03:01,280

we are now able to

75

00:03:05,750 --> 00:03:03,920

to pinpoint water consumption on a field

76

00:03:08,309 --> 00:03:05,760

by field basis which has never been

77

00:03:10,229 --> 00:03:08,319

possible before

78

00:03:12,070 --> 00:03:10,239

the information helps farmers and water

79

00:03:14,470 --> 00:03:12,080

managers target fields where water

80

00:03:16,149 --> 00:03:14,480

consumption might exceed water rights

81

00:03:17,830 --> 00:03:16,159

tony rick and bill's measurements have

82

00:03:21,270 --> 00:03:17,840

even been used to help settle water

83

00:03:25,830 --> 00:03:23,110

for their innovative use of the landsat

84

00:03:27,750 --> 00:03:25,840

data the team was awarded a 2009 harvard

85

00:03:29,190 --> 00:03:27,760

university innovations in american

86

00:03:30,789 --> 00:03:29,200

government award

87

00:03:32,630 --> 00:03:30,799

and they're depending on landsat to

88

00:03:35,670 --> 00:03:32,640

deliver information as water becomes

89

00:03:40,390 --> 00:03:38,550

our water supply is going to come under

90

00:03:43,350 --> 00:03:40,400

increasing pressure

91

00:03:44,949 --> 00:03:43,360

from a changing climate and a growing

92

00:03:47,910 --> 00:03:44,959

population

93

00:03:51,110 --> 00:03:47,920

we have to be able to measure

94

00:03:52,550 --> 00:03:51,120

water use in order to be able to manage

95

00:03:55,509 --> 00:03:52,560

it

96

00:03:57,190 --> 00:03:55,519

we are convinced that over the next 20

97

00:03:59,190 --> 00:03:57,200

to 30 years

98

00:04:01,030 --> 00:03:59,200

we will have

99

00:04:02,949 --> 00:04:01,040

millions of people in developing

100

00:04:05,030 --> 00:04:02,959

countries impacted with a more

101
00:04:06,229 --> 00:04:05,040
sustainable food supply

102
00:04:08,789 --> 00:04:06,239
brought

103
00:04:11,670 --> 00:04:08,799
by better management of water

104
00:04:13,589 --> 00:04:11,680
and that water management is going to be

105
00:04:17,430 --> 00:04:13,599
propelled by the use of satellite

106
00:04:21,990 --> 00:04:19,749
as our planet changes landsat's over

107
00:04:23,830 --> 00:04:22,000
25-year thermal record plays a crucial

108
00:04:25,990 --> 00:04:23,840
role in helping us understand how we've

109
00:04:27,670 --> 00:04:26,000
used water up until now