



1  
00:00:22,150 --> 00:00:19,910

[Music]

2  
00:00:26,550 --> 00:00:22,160  
seen from space the blue earth is

3  
00:00:30,870 --> 00:00:28,630  
standing at the shore the ocean looks

4  
00:00:33,030 --> 00:00:30,880  
endless and empty

5  
00:00:35,030 --> 00:00:33,040  
but below the surface the ocean is

6  
00:00:37,990 --> 00:00:35,040  
actually brimming with microscopic

7  
00:00:40,389 --> 00:00:38,000  
plants called phytoplankton

8  
00:00:44,229 --> 00:00:40,399  
if you were to take a empty coke can and

9  
00:00:46,630 --> 00:00:44,239  
go scoop up some water from the shore in

10  
00:00:49,910 --> 00:00:46,640  
the coke can you would have between

11  
00:00:50,680 --> 00:00:49,920  
order 75 to 100 million phytoplankton in

12  
00:00:52,150 --> 00:00:50,690  
that cocaine

13  
00:00:54,470 --> 00:00:52,160

[Music]

14

00:00:57,110 --> 00:00:54,480

this invisible forest to phytoplankton

15

00:00:58,869 --> 00:00:57,120

is critical to life on earth

16

00:01:02,069 --> 00:00:58,879

phytoplankton provide the base of the

17

00:01:05,590 --> 00:01:02,079

marine food web

18

00:01:07,750 --> 00:01:05,600

they also help our planet breathe

19

00:01:10,070 --> 00:01:07,760

through photosynthesis phytoplankton

20

00:01:12,230 --> 00:01:10,080

generate one half of the oxygen produced

21

00:01:15,830 --> 00:01:12,240

on earth that all animals including

22

00:01:20,870 --> 00:01:17,910

the blooms of phytoplankton also take

23

00:01:23,190 --> 00:01:20,880

carbon dioxide out of the surface waters

24

00:01:25,429 --> 00:01:23,200

making the ocean an important carbon

25

00:01:27,830 --> 00:01:25,439

sink

26  
00:01:31,270 --> 00:01:27,840  
like plants on land phytoplankton needs

27  
00:01:33,109 --> 00:01:31,280  
sunlight water and nutrients to grow

28  
00:01:35,510 --> 00:01:33,119  
they thrive in surface waters where the

29  
00:01:38,310 --> 00:01:35,520  
sun's rays reach and their nutrients

30  
00:01:40,390 --> 00:01:38,320  
come from many places

31  
00:01:42,230 --> 00:01:40,400  
cold waters carry essential nutrients

32  
00:01:46,230 --> 00:01:42,240  
from the ocean's lower depths to the

33  
00:01:50,230 --> 00:01:47,990  
the trillions of phytoplankton in the

34  
00:01:52,069 --> 00:01:50,240  
ocean are critical to study

35  
00:01:55,990 --> 00:01:52,079  
but how do researchers track these

36  
00:02:00,469 --> 00:01:58,789  
ships move too slowly for a job this big

37  
00:02:02,550 --> 00:02:00,479  
so researchers look at global

38  
00:02:06,310 --> 00:02:02,560

distributions of phytoplankton from

39

00:02:10,389 --> 00:02:08,309

over the past decade scientists have

40

00:02:13,589 --> 00:02:10,399

deployed earth observing satellites to

41

00:02:15,910 --> 00:02:13,599

remotely monitor the color of the oceans

42

00:02:17,750 --> 00:02:15,920

by detecting ocean color from space

43

00:02:20,309 --> 00:02:17,760

satellites monitor the abundance of

44

00:02:22,390 --> 00:02:20,319

phytoplankton in the water

45

00:02:24,309 --> 00:02:22,400

the reason that it's so important to

46

00:02:26,710 --> 00:02:24,319

study the phytoplankton from space is

47

00:02:28,869 --> 00:02:26,720

because it's the only way we can get a

48

00:02:31,350 --> 00:02:28,879

perspective of actually what's happening

49

00:02:33,270 --> 00:02:31,360

on the entire planet over an entire year

50

00:02:35,750 --> 00:02:33,280

every day in and out

51  
00:02:37,830 --> 00:02:35,760  
and by doing this over many years

52  
00:02:39,670 --> 00:02:37,840  
we can actually see how the earth is

53  
00:02:42,390 --> 00:02:39,680  
changing changing

54  
00:02:44,229 --> 00:02:42,400  
from natural forcings natural factors as

55  
00:02:51,430 --> 00:02:44,239  
well as hopefully being able to detect

56  
00:02:56,309 --> 00:02:53,350  
phytoplankton respond rapidly to

57  
00:02:58,149 --> 00:02:56,319  
environmental changes in the past decade

58  
00:03:00,710 --> 00:02:58,159  
researchers have observed that global

59  
00:03:03,990 --> 00:03:00,720  
levels of phytoplankton tend to decrease

60  
00:03:05,589 --> 00:03:04,000  
as the ocean temperatures warm

61  
00:03:07,589 --> 00:03:05,599  
during normal

62  
00:03:09,430 --> 00:03:07,599  
physical mixing in the ocean nutrients

63  
00:03:12,630 --> 00:03:09,440

come up from the bottom

64

00:03:14,390 --> 00:03:12,640

phytoplankton are fertilized they grow

65

00:03:16,790 --> 00:03:14,400

the nutrients are depleted the

66

00:03:19,910 --> 00:03:16,800

phytoplankton die or eaten by something

67

00:03:22,070 --> 00:03:19,920

else and the process just continues

68

00:03:23,750 --> 00:03:22,080

anything that happens that

69

00:03:26,309 --> 00:03:23,760

slows down

70

00:03:27,670 --> 00:03:26,319

that movement of cold deep water to the

71

00:03:30,149 --> 00:03:27,680

surface

72

00:03:31,350 --> 00:03:30,159

would stop the flow of nutrients which

73

00:03:33,190 --> 00:03:31,360

would

74

00:03:34,229 --> 00:03:33,200

cause the phytoplankton not to grow as

75

00:03:36,229 --> 00:03:34,239

well

76  
00:03:37,509 --> 00:03:36,239  
and what's happened over the past 10

77  
00:03:38,550 --> 00:03:37,519  
years that we've been observing the

78  
00:03:40,789 --> 00:03:38,560  
oceans

79  
00:03:42,470 --> 00:03:40,799  
in large areas of the ocean they've

80  
00:03:45,509 --> 00:03:42,480  
warmed up

81  
00:03:47,030 --> 00:03:45,519  
and what that means is the surface water

82  
00:03:50,070 --> 00:03:47,040  
has warmed

83  
00:03:56,050 --> 00:03:50,080  
and it has essentially put a cap

84  
00:04:01,750 --> 00:03:58,830  
[Music]

85  
00:04:03,429 --> 00:04:01,760  
process as earth's climate is changing

86  
00:04:05,190 --> 00:04:03,439  
so is the ocean

87  
00:04:07,750 --> 00:04:05,200  
lowered levels of phytoplankton have

88  
00:04:09,830 --> 00:04:07,760

implications for the marine food web

89

00:04:12,869 --> 00:04:09,840

the increased carbon dioxide in earth's

90

00:04:15,030 --> 00:04:12,879

atmosphere impacts the ocean's chemistry

91

00:04:19,509 --> 00:04:15,040

the seawater becomes acidic which

92

00:04:22,310 --> 00:04:21,189

every part of the earth

93

00:04:24,070 --> 00:04:22,320

is

94

00:04:26,870 --> 00:04:24,080

interconnected with the earth as a

95

00:04:28,790 --> 00:04:26,880

system the whole earth system

96

00:04:31,189 --> 00:04:28,800

the ocean influences the climate the

97

00:04:33,590 --> 00:04:31,199

climate influences the ocean

98

00:04:38,469 --> 00:04:33,600

land influences the ocean all those

99

00:04:43,110 --> 00:04:40,870

it is more important than ever to track

100

00:04:44,950 --> 00:04:43,120

changes in the ocean from space and new

101

00:04:47,430 --> 00:04:44,960

tools are helping researchers study the

102

00:04:49,909 --> 00:04:47,440

ocean and the phytoplankton that call it

103

00:04:54,390 --> 00:04:52,390

as earth's climate continues to change

104

00:04:56,390 --> 00:04:54,400

researchers will refine their tools and

105

00:04:58,950 --> 00:04:56,400

keep a close eye on these powerful

106

00:05:01,189 --> 00:04:58,960

marine plants from space

107

00:05:03,670 --> 00:05:01,199

who knew that something so small could

108

00:05:06,530 --> 00:05:03,680

provide vital insight into the health of