NASA SILICON VALLEY

PODCAST

1
00:00:00,399 --> 00:00:04,650
Host (Matthew Buffington): Welcome to NASA
in Silicon Valley, Episode 63.

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00:00:04,650 --> 00:00:07,990
With me again for the intro is Miss Abby Tabor.

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00:00:07,990 --> 00:00:08,990
Welcome, Abby!

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00:00:08,990 --> 00:00:10,070
Abby Tabor: Hi Matt, thank you!

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00:00:10,070 --> 00:00:11,950
Host: Tell us a little about our guest today.

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00:00:11,950 --> 00:00:16,670
Abby Tabor: Okay, so today we're talking
with Chris Potter, who is one of these biologists

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00:00:16,670 --> 00:00:20,740
by training, who didn't know he could someday
end up working at NASA.

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00:00:20,740 --> 00:00:28,689
He studied ecology, and today he is an Earth
Scientist at NASA Ames, and he's been simulating

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00:00:28,689 --> 00:00:32,720
global systems, Earth's climate system,
working on modeling that sort of thing.

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00:00:32,720 --> 00:00:36,830
But also more recently he's been looking
at specific areas of the globe, and how are

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00:00:36,830 --> 00:00:39,560
they changing more quickly than others.

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00:00:39,560 --> 00:00:41,880
For example, he’s been up in Alaska.

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00:00:41,880 --> 00:00:46,530
And he’s on the ground, out in the forests
of Alaska, looking at how wildfires, which

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00:00:46,530 --> 00:00:51,120
have gotten more intense and are burning hotter,
are changing the landscape there.

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00:00:51,120 --> 00:00:55,960
So he’s there, looking at how the permafrost
is melting because the fires have burnt everything

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00:00:55,960 --> 00:00:56,960
down to the surface.

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00:00:56,960 --> 00:01:01,300
And he’s digging in the solid and taking
thermal images and sticking probes in the

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00:01:01,300 --> 00:01:04,660
ground to explore how the Earth is changing
up there.

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00:01:04,660 --> 00:01:06,960
Host: Super relevant for today.

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00:01:06,960 --> 00:01:12,150
We recorded this episode awhile back, but
you know, speaking of all the crazy forest

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00:01:12,150 --> 00:01:15,115
fires happening in Northern California, it’s
all very relevant to what we’re living right

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00:01:15,115 --> 00:01:16,115
now.

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00:01:16,115 --> 00:01:17,115
Abby Tabor: Really intense, yeah.

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00:01:17,115 --> 00:01:20,850
Host: So before we jump into the episode,
a little bit of housekeeping.

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00:01:20,850 --> 00:01:25,090
We would love to hear your comments about
the podcast and ways we can improve things.

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00:01:25,090 --> 00:01:28,000
We are on social media using the hashtag #NASASiliconValley.

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00:01:28,000 --> 00:01:33,890
We also have a phone line you can now call
in on, that's (650) 604-1400.

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00:01:33,890 --> 00:01:39,940
And a reminder, we are a NASA podcast, but
we are not the only NASA podcast!

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00:01:39,940 --> 00:01:44,601
Our friends over at Johnson Space Center have
one called Houston We Have a Podcast, our

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00:01:44,601 --> 00:01:48,640
friends over at Headquarters, and really it
has content from all over the agency have

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00:01:48,640 --> 00:01:53,310
one called This Week at NASA that's both
on YouTube, and also there's an audio version,

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00:01:53,310 --> 00:01:58,610
and we have a big RSS feed called NASA Casts
where you can catch all of the NASA content

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00:01:58,610 --> 00:02:00,909
in one big feed.

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00:02:00,909 --> 00:02:05,580
We would love it if you guys leave us a review,
we're on iTunes, Google Play Music, SoundCloud,

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00:02:05,580 --> 00:02:09,009
and we just started putting up audio versions
on YouTube.

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00:02:09,009 --> 00:02:13,650
Of course, the RSS feed, you can plug it into
any podcast app and that all works.

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00:02:13,650 --> 00:02:17,260
The reviews are really a cool way to help
other people find the podcast.

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00:02:17,260 --> 00:02:20,760
But, that's enough of the housekeeping,
but for today's episode…

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00:02:20,760 --> 00:02:25,109
Abby Tabor: For today, let's listen to Chris
Potter.

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00:02:25,109 --> 00:02:35,700
[Music]

41
00:02:35,700 --> 00:02:38,000
Host: How did you end up joining NASA?

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00:02:38,010 --> 00:02:40,290
How did you end up in this area, in Silicon
Valley?

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00:02:40,290 --> 00:02:47,040
Chris Potter: I joined NASA in 1991 as a NASA
post-doc.

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00:02:47,040 --> 00:02:52,019
There's been a program here for a long time
to bring new PhDs into NASA.

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00:02:52,019 --> 00:02:59,370
I came out here to join one of the earth scientists
who was working here, named Pam Matson.

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00:02:59,370 --> 00:03:01,260
She's since gone on to Stanford.

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00:03:01,260 --> 00:03:04,650
She's the Dean of Earth Science at Stanford,
but she worked here.

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00:03:04,650 --> 00:03:10,450
I came here to work with her, and develop
some computer simulation models of the earth

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00:03:10,450 --> 00:03:14,269
system, which didn't exist at the time.

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00:03:14,269 --> 00:03:22,209
I had a background in the modeling of what
we call the "terrestrial" part of the earth,

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00:03:22,209 --> 00:03:26,699
the land surfaces, the ecosystems on land.

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00:03:26,699 --> 00:03:30,549
And that's what they wanted, so I came out
here to fill that position and stayed.

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00:03:30,549 --> 00:03:32,829
We just really liked it out here.

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00:03:32,829 --> 00:03:37,849
I had to commute from the city for a few years,

but that was okay.

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00:03:37,849 --> 00:03:38,849
We made it work.

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00:03:38,849 --> 00:03:40,260
And then we eventually moved to the Silicon Valley.

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00:03:40,260 --> 00:03:43,829
Host: Did you do your post-doctoral work in earth science?

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00:03:43,829 --> 00:03:44,829
Chris Potter: Mm-hmm.

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00:03:44,829 --> 00:03:49,999
Host: When you were growing up as a kid, did you always have an eye focused towards wanting

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00:03:49,999 --> 00:03:52,739
to work for NASA, dealing with space?

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00:03:52,739 --> 00:03:54,609
How does all of that play into it?

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00:03:54,609 --> 00:04:00,340
Chris Potter: No, I didn't ever think that I'd work for NASA when I was studying biology,

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00:04:00,340 --> 00:04:03,260
which is what my background is in.

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00:04:03,260 --> 00:04:07,959
All my degrees are in biology, and ecology in particular.

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00:04:07,959 --> 00:04:13,189
But like a lot of people back then, I didn't

think NASA was the place to do that.

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00:04:13,189 --> 00:04:17,900
I thought if I was going to work for the government,
maybe I'd work for the Parks Service or the

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00:04:17,900 --> 00:04:19,920
Host: Yeah, the Bureau of Land Management
or something.

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00:04:19,930 --> 00:04:20,930
Chris Potter: Well, maybe not.

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00:04:20,930 --> 00:04:25,130
I didn't even know that they existed back
then, because I grew up in the east.

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00:04:25,130 --> 00:04:28,750
But, you know, the Environmental Protection
Agency -- something like that.

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00:04:28,750 --> 00:04:34,780
As it turns out, NASA has the biggest environmental
science budget of, arguably, any agency in

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00:04:34,780 --> 00:04:36,280
the world.

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00:04:36,280 --> 00:04:43,819
We are number one in terms of funding both
basic research in earth sciences and in, of

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00:04:43,819 --> 00:04:48,819
course, providing all the technology that
it takes to get that job done: the satellites,

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00:04:48,819 --> 00:04:56,970
the aircraft, the data systems, storage, which
is a huge part of the whole endeavor at this

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00:04:56,970 --> 00:04:57,970
point.

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00:04:57,970 --> 00:05:00,389
Host: It's one of those things where it's
two-fold.

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00:05:00,389 --> 00:05:05,419
One thing I always think of is: when you're
looking at exoplanets, if you're looking at

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00:05:05,419 --> 00:05:12,930
the other planets in our solar system, it's
really helpful to understand our own planet.

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00:05:12,930 --> 00:05:19,550
We're sitting on top of one big example of
life that works and that exists, and if you're

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00:05:19,550 --> 00:05:24,010
out looking for life, if you don't fundamentally
understand what our own planet looks like,

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00:05:24,010 --> 00:05:26,520
then how do you even know what you're looking
for?

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00:05:26,520 --> 00:05:31,020
Also, on the flipside, a lot of the earth
science stuff involves sending satellites

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00:05:31,020 --> 00:05:32,020
up.

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00:05:32,020 --> 00:05:37,180
There's not a lot of government agencies that
are particularity skilled in sending satellites

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00:05:37,180 --> 00:05:39,770

up -- I mean, obviously NASA and I'm sure
the Air Force.

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00:05:39,770 --> 00:05:45,889
But it's one of those things where to put
things in the air, it's a very particular

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00:05:45,889 --> 00:05:46,990
set of skills.

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00:05:46,990 --> 00:05:49,070
Chris Potter: Yeah, it is.

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00:05:49,070 --> 00:05:57,219
NASA has been at it for a long time, and so
has NOAA, the National Oceanic and Atmospheric

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00:05:57,219 --> 00:06:04,550
Administration, who are always close partners
with NASA because they have the weather satellites.

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00:06:04,550 --> 00:06:10,520
It's not NASA's job to forecast the weather
or monitor the weather, but it is NASA's role

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00:06:10,520 --> 00:06:12,599
to look in the long-term.

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00:06:12,599 --> 00:06:15,569
That's the difference between weather and
climate, of course.

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00:06:15,569 --> 00:06:18,969
Climate is weather over hundreds of years.

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00:06:18,969 --> 00:06:21,500
And so that's what we're supposed to be doing.

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00:06:21,500 --> 00:06:29,220

We're supposed to be monitoring the long-term
changes in the earth, and looking for new,

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00:06:29,220 --> 00:06:34,669
undiscovered phenomenon that are going on
with our climate system, or ocean chemistry,

99
00:06:34,669 --> 00:06:40,550
or land-use change patterns, in the same way
we would be looking for them if we were looking

100
00:06:40,550 --> 00:06:41,550
at Mars.

101
00:06:41,550 --> 00:06:46,539
We'd be trying to discover something new,
and then share that with the rest of the scientific

102
00:06:46,539 --> 00:06:47,539
community.

103
00:06:47,539 --> 00:06:49,940
We're certainly not alone as a space agency,
too, there.

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00:06:49,940 --> 00:06:54,229
All the developed countries in the world have
large space agencies that are starting to

105
00:06:54,229 --> 00:06:56,289
rival NASA's.

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00:06:56,289 --> 00:07:01,790
The European Space Agency, the Brazilian Space
Agency, the Chinese and the Indian Space Agencies

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00:07:01,790 --> 00:07:05,370
all have satellites that are starting to rival
ours.

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00:07:05,370 --> 00:07:07,770
So we need to keep our game up.

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00:07:07,770 --> 00:07:13,169
But in the meantime, we can benefit from all
the data they're collecting as well, because

110
00:07:13,169 --> 00:07:18,960
as long as there's sharing, open sharing of
these satellite image datasets or measurements

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00:07:18,960 --> 00:07:25,370
of the atmosphere, we can all benefit and
push climate science, or any other sort of

112
00:07:25,370 --> 00:07:27,810
earth science, ahead for the benefit of.

113
00:07:27,810 --> 00:07:28,810
. . you know?

114
00:07:28,810 --> 00:07:30,050
Host: The scientific community?

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00:07:30,050 --> 00:07:34,490
Chris Potter: Well, more practically, negotiating
scientific treaties, treaties among nations,

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00:07:34,490 --> 00:07:41,330
whether it has to do with the use of the oceans,
the use of space, the use of the atmosphere,

117
00:07:41,330 --> 00:07:44,250
or greenhouse gas emission reductions, all
of it.

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00:07:44,250 --> 00:07:50,419
It's our job as scientists, NASA scientists,
to provide the best scientific information

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00:07:50,419 --> 00:07:56,979
so the decision makers and politicians can
make wise decisions that include the data.

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00:07:56,979 --> 00:08:02,469
Host: Going back a little bit, when you first
came to Ames, when you first came to NASA,

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00:08:02,469 --> 00:08:03,999
what exactly were you working on?

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00:08:03,999 --> 00:08:07,560
Obviously something in earth science, but
what was your day-to-day looking like?

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00:08:07,560 --> 00:08:14,370
Chris Potter: When we first got here, our
role was to work with a team of scientists.

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00:08:14,370 --> 00:08:19,189
Some were here at NASA Ames, and there were
other key members at Stanford University and

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00:08:19,189 --> 00:08:26,229
the Carnegie Institution of Washington there
at Stanford, who is a leader in global change

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00:08:26,229 --> 00:08:32,500
policy and science of all kinds, and also
with Goddard Space Flight Center as a partner,

127
00:08:32,500 --> 00:08:33,930
and several other universities.

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00:08:33,930 --> 00:08:40,160
We were working as a team to develop the first
model, global model, of the earth surfaces

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00:08:40,160 --> 00:08:44,290
and the greenhouse gas emissions that they
were contributing to the atmosphere.

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00:08:44,290 --> 00:08:47,220
No one had ever developed one before.

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00:08:47,220 --> 00:08:48,750
That was our challenge.

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00:08:48,750 --> 00:08:53,190
We succeeded in a couple of years to develop
that model, to publish the first paper that

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00:08:53,190 --> 00:09:00,400
used NASA satellite data to make it much more
authentic, true to the ground observations

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00:09:00,400 --> 00:09:05,170
that we were collecting at the time, which
were pretty rudimentary but compared to what

135
00:09:05,170 --> 00:09:06,420
we collect now.

136
00:09:06,420 --> 00:09:11,360
They were still very unique and stunning images
of the earth.

137
00:09:11,360 --> 00:09:16,380
We created what was called the first "Breathing
Earth" model, and animated it.

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00:09:16,380 --> 00:09:19,480
It even made a piece on CNN when it first
came out.

139
00:09:19,480 --> 00:09:20,480
Host: Oh, nice.

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00:09:20,480 --> 00:09:23,850
Chris Potter: Yeah, it must have been a slow
news day.

141
00:09:23,850 --> 00:09:26,700
Host: What is your day-to-day?

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00:09:26,700 --> 00:09:28,200
What are you working on right now?

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00:09:28,200 --> 00:09:35,440
I heard something along the lines of going
to Alaska and having a bear gun, so talk to

144
00:09:35,440 --> 00:09:36,600
me a little bit about that.

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00:09:36,600 --> 00:09:40,460
Chris Potter: Well, we're doing much advanced
versions of the same things I did when I came

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00:09:40,460 --> 00:09:49,110
here, but now we are using much, much more
detailed satellite images and aircraft images

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00:09:49,110 --> 00:09:51,600
of different parts of the world.

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00:09:51,600 --> 00:09:57,300
While we're still simulating the whole globe
as a planet and a global system, more and

149
00:09:57,300 --> 00:10:03,030
more we're trying to isolate specific areas
of the world where we don't have a good understanding

150
00:10:03,030 --> 00:10:04,980
of what's going on there yet.

151
00:10:04,980 --> 00:10:06,560
Alaska is one of those places.

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00:10:06,560 --> 00:10:12,580
It's warming much more quickly than our part
of the world, the temperate or tropical areas.

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00:10:12,580 --> 00:10:15,850
The ice under the soil and [in] the soil is
melting very quickly.

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00:10:15,850 --> 00:10:20,000
The lakes are not freezing over the way they
used to even 20 years ago.

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00:10:20,000 --> 00:10:24,280
If you ask any Alaskan, they'll tell you,
"It's not like it used to be here.

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00:10:24,280 --> 00:10:28,750
We are having trouble hunting, and fishing,
and doing all the traditional things our ancestors

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00:10:28,750 --> 00:10:34,220
used to do, because we don't know every spring
whether the ice will be frozen or thawing.

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00:10:34,220 --> 00:10:38,890
And we might go right through the ice when
we try to go out to our traditional hunting,

159
00:10:38,890 --> 00:10:40,700
fishing, and trapping grounds."

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00:10:40,700 --> 00:10:46,090
So that's why we're there in Alaska, and NASA
has a program that is funded through its Terrestrial

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00:10:46,090 --> 00:10:48,170

Ecology Program in Washington.

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00:10:48,170 --> 00:10:53,730
It's part of the Earth Science Mission Directorate
there.

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00:10:53,730 --> 00:10:54,790
It's called ABoVE.

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00:10:54,790 --> 00:10:59,530
It stands for the Arctic-Boreal Vulnerability
and Observation Experiment.

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00:10:59,530 --> 00:11:01,770
Host: Because of course there's going to be
an acronym for it.

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00:11:01,770 --> 00:11:03,900
Chris Potter: Of course, and "ABoVE" sounds
pretty good.

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00:11:03,900 --> 00:11:09,760
It's sort of above the latitudes where we
normally live and work, and it covers most

168
00:11:09,760 --> 00:11:14,760
of Alaska -- well, all of Alaska and parts
of Northern Canada, which are also experiencing

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00:11:14,760 --> 00:11:18,370
rapid climate warming.

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00:11:18,370 --> 00:11:21,160
And so there are teams out there every summer.

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00:11:21,160 --> 00:11:28,050
There are aircraft flying over the whole state
right now, even as we speak, trying to understand

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00:11:28,050 --> 00:11:33,230
what's changing, where it's changing, what
the consequences are for both the atmospheric

173
00:11:33,230 --> 00:11:39,750
changes from greenhouse gas emissions that
may be going up as a result of warming -- that's

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00:11:39,750 --> 00:11:45,810
our hypothesis; that's a working hypothesis
-- but also on the ground, there are vulnerabilities

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00:11:45,810 --> 00:11:52,150
to larger and more intense, hotter fires,
wild fires, there in the forest.

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00:11:52,150 --> 00:11:58,510
As these areas burn, it changes the radiation
budget of that area, and it may burn right

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00:11:58,510 --> 00:12:06,000
down into the soil, and disrupt the permafrost,
and cause the entire area to collapse in a

178
00:12:06,000 --> 00:12:07,000
big hole.

179
00:12:07,000 --> 00:12:08,190
Host: Oh, wow.

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00:12:08,190 --> 00:12:11,870
The permafrost, the ice crystals, the frozen.

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00:12:11,870 --> 00:12:13,660
. . I mean, it's propping it up.

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00:12:13,660 --> 00:12:15,040
You know, when water freezes, it expands.

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00:12:15,040 --> 00:12:16,040
It's holding it.

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00:12:16,040 --> 00:12:17,040
It's stable.

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00:12:17,040 --> 00:12:18,040
Chris Potter: Right, yeah.

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00:12:18,040 --> 00:12:19,280
Host: If you get rid of that, you're going
to have a bad time.

187
00:12:19,280 --> 00:12:24,690
Chris Potter: Yeah, it's just like standing
on top of a pond and having all the ice melt

188
00:12:24,690 --> 00:12:26,380
out from under you.

189
00:12:26,380 --> 00:12:30,820
There's a thin layer of soil over the pond,
but as soon as it collapses, you're going

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00:12:30,820 --> 00:12:35,490
to create a very liquid, slushy environment.

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00:12:35,490 --> 00:12:41,350
And the trees collapse into it if they were
on top of it, and so the whole system changes

192
00:12:41,350 --> 00:12:44,270
over night.

193
00:12:44,270 --> 00:12:51,680
That means that what you were using it for
-- in terms of either hunting, or trapping,

194
00:12:51,680 --> 00:12:55,570

or just recreation -- you have to change your plan.

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00:12:55,570 --> 00:13:01,670
Beyond that, the atmosphere is loaded up with these greenhouse gases that were stored in

196
00:13:01,670 --> 00:13:06,440
the soil and the peat moss -- there's a lot of peat moss in most of these forested areas.

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00:13:06,440 --> 00:13:12,360
That's been stored there for tens of thousands of years, and now we are allowing it to come

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00:13:12,360 --> 00:13:19,160
out during the fires -- when I say "we," that assumes, connecting the dots, that people

199
00:13:19,160 --> 00:13:24,780
are responsible for the greenhouse gas emissions, increasing greenhouse gas emissions to the

200
00:13:24,780 --> 00:13:28,340
atmosphere, that are warming the climate, that are causing more fires.

201
00:13:28,340 --> 00:13:37,750
That's the chain of indirect effects that lead us back to the human nature of more intense

202
00:13:37,750 --> 00:13:42,770
and hotter wild fires throughout the whole West, from California, Southern California,

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00:13:42,770 --> 00:13:46,070
all the way up to Alaska.

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00:13:46,070 --> 00:13:47,990
Host: Obviously you'll be there on the ground.

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00:13:47,990 --> 00:13:50,090
You mentioned the airplanes flying over.

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00:13:50,090 --> 00:13:53,510
Is this a combination of all the different
data points?

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00:13:53,510 --> 00:13:57,630
I'm imagining -- and tell me if I'm wrong
-- you have satellites that are taking some

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00:13:57,630 --> 00:14:04,670
measurements as they can, as they end up passing
over, but combining that data with airborne

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00:14:04,670 --> 00:14:08,780
data, combining that with data you grab on
the ground, and that all of those, with their

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00:14:08,780 --> 00:14:13,880
powers combined, help paint a good mosaic
of what's going on.

211
00:14:13,880 --> 00:14:15,360
Chris Potter: Right, right.

212
00:14:15,360 --> 00:14:22,660
It's basically scaling down from the satellite
image, which NASA's best image would give

213
00:14:22,660 --> 00:14:30,110
you a ground resolution data point that is
about the size of a tennis court.

214
00:14:30,110 --> 00:14:31,920
That's our best satellite for that.

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00:14:31,920 --> 00:14:36,690

But airborne data can get you down to a few feet resolution on the ground, so you can

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00:14:36,690 --> 00:14:41,120
start to see individual patches, and trees, and little ponds.

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00:14:41,120 --> 00:14:46,170
And then, of course, right on the ground, we'll measure it at a few centimeters resolution.

218
00:14:46,170 --> 00:14:49,870
We want to put all the pieces together, and make sure -- as we reassemble them from the

219
00:14:49,870 --> 00:14:55,740
ground, to the aircraft, to the satellite -- that it all averages [out] again.

220
00:14:55,740 --> 00:14:59,350
That way, we much better understand what our satellite is giving us.

221
00:14:59,350 --> 00:15:03,290
The satellite that we use for this study, for the most part, is the Landsat satellite.

222
00:15:03,290 --> 00:15:09,340
We're on the eighth Landsat satellite since it was launched in the early 1970s.

223
00:15:09,340 --> 00:15:14,410
It's considered a national asset, and is not subject to budget cuts.

224
00:15:14,410 --> 00:15:20,540
Pretty soon, we'll launch Landsat 9, so there's continuity in the program going forward, if

225
00:15:20,540 --> 00:15:22,780

anything happens to Landsat 8.

226
00:15:22,780 --> 00:15:28,530
We've had over 30 years now of continuous
observations every two weeks.

227
00:15:28,530 --> 00:15:33,490
The satellite goes over every two weeks, and
gives us, hopefully, a clear image.

228
00:15:33,490 --> 00:15:40,490
In Alaska, it's very cloudy at times, so we're
happy to get a clear image every month.

229
00:15:40,490 --> 00:15:46,230
That's usually adequate for us to monitor,
certainly from year-to-year, what has happened

230
00:15:46,230 --> 00:15:50,720
to the surfaces, and the forest cover, and
the tundra cover, which is north of where

231
00:15:50,720 --> 00:15:52,120
I'm going to go.

232
00:15:52,120 --> 00:15:55,650
I'm going to the interior of Alaska, where
the forests are being affected.

233
00:15:55,650 --> 00:16:00,240
But north of there, the shrubs are really
doing well.

234
00:16:00,240 --> 00:16:05,820
They're growing into the tundra area, and
making it even greener in those areas.

235
00:16:05,820 --> 00:16:09,780
So that's changing the habitat for all kinds
of wildlife.

236
00:16:09,780 --> 00:16:15,370
Host: What does your day-to-day look like
as you're on the ground dealing with stuff?

237
00:16:15,370 --> 00:16:16,740
Chris Potter: During this trip?

238
00:16:16,740 --> 00:16:17,740
Host: Yeah, yeah.

239
00:16:17,740 --> 00:16:19,340
What do you have to prepare for?

240
00:16:19,340 --> 00:16:20,340
What do you anticipate?

241
00:16:20,340 --> 00:16:27,990
Chris Potter: We need to get in our mode of
transportation in the morning, and travel

242
00:16:27,990 --> 00:16:33,420
maybe five miles out from the town we're staying
in to get to an area that we can see, from

243
00:16:33,420 --> 00:16:35,210
the satellite imagery, had been burned.

244
00:16:35,210 --> 00:16:40,540
And there were large, large fires up there,
unprecedentedly large and hot fires, in 2015.

245
00:16:40,540 --> 00:16:43,460
Now we're two years after that.

246
00:16:43,460 --> 00:16:47,080
And so we will go to those areas we can see
on the satellite imagery that had different

247
00:16:47,080 --> 00:16:51,680
stages of the burns, barely burned versus
burned to the ground and charred.

248
00:16:51,680 --> 00:16:56,580
We'll sample in all these different places
-- sample the soils, sample the thermal signature

249
00:16:56,580 --> 00:17:03,250
with thermal cameras -- and take probes and
put them into the ground, and then, in bags,

250
00:17:03,250 --> 00:17:07,110
take samples of the soil itself back to measure
the carbon in the soil.

251
00:17:07,110 --> 00:17:10,800
And then we'll go to the next site, and we'll
just keep doing this over and over again until

252
00:17:10,800 --> 00:17:17,690
we get a statistically large enough dataset
to compare to the satellite and airborne imagery.

253
00:17:17,690 --> 00:17:20,949
Host: What is your timeline looking like?

254
00:17:20,949 --> 00:17:22,899
So breaking the fourth wall a little bit.

255
00:17:22,899 --> 00:17:26,300
. . Right now, we're in the middle of July.

256
00:17:26,300 --> 00:17:27,640
Is a trip happening in September?

257
00:17:27,640 --> 00:17:29,450
Chris Potter: No, it's happening in a week.

258
00:17:29,450 --> 00:17:31,210
Host: Oh, it happens in a week.

259
00:17:31,210 --> 00:17:37,170
But you're later on anticipating getting results,
getting things, coming in, and writing papers,

260
00:17:37,170 --> 00:17:38,480
or however that works out?

261
00:17:38,480 --> 00:17:39,550
Chris Potter: Absolutely, yeah.

262
00:17:39,550 --> 00:17:44,521
I've designed this one so that we can collect
most of the data, 90 percent of it, there

263
00:17:44,521 --> 00:17:49,700
right in the field, write it down or have
it in our digital devices.

264
00:17:49,700 --> 00:17:54,191
And then I'll just immediately download it
back to my computer that night, and put it

265
00:17:54,191 --> 00:17:56,120
all on a flash drive to bring back.

266
00:17:56,120 --> 00:18:00,120
But if the soil samples take a little bit
longer, we'll have to transport them back

267
00:18:00,120 --> 00:18:02,000
here, and they'll be analyzed in a month.

268
00:18:02,000 --> 00:18:06,910
So by January, when there's the next big team
meeting of this ABoVE project, we'll take

269
00:18:06,910 --> 00:18:12,470
the results there, present it to our colleagues,
be writing the papers, sharing all the results,

270
00:18:12,470 --> 00:18:18,050
and comparing with other folks' perspectives
and findings on the same kind of topics.

271
00:18:18,050 --> 00:18:21,680
There are working groups on fire, on carbon,
on animal movement.

272
00:18:21,680 --> 00:18:23,320
It's a big project.

273
00:18:23,320 --> 00:18:27,280
It involves many universities across the country
and in Alaska.

274
00:18:27,280 --> 00:18:32,110
Host: I anticipate that we'll release this
episode in the future, so people are hearing

275
00:18:32,110 --> 00:18:35,190
us from the past.

276
00:18:35,190 --> 00:18:39,790
By the time this airs, you will have already
come back from your trip, and started working

277
00:18:39,790 --> 00:18:41,270
on some of that data and some of those results.

278
00:18:41,270 --> 00:18:45,190
Chris Potter: Sure, we'll be working on the
data for the next couple of months after I

279
00:18:45,190 --> 00:18:46,580
get back.

280
00:18:46,580 --> 00:18:51,170
It should go quickly, because we've set it
all up for over a year now, and we know exactly

281
00:18:51,170 --> 00:18:54,792
how we're going to plug it into our plan and
our formulas.

282
00:18:54,792 --> 00:19:00,800
We need to have it ready by the end of the
year for a presentation to scientific conferences.

283
00:19:00,800 --> 00:19:04,310
We still publish papers in scientific journals.

284
00:19:04,310 --> 00:19:11,420
That is one of the main ways we get evaluated
as scientists still at NASA.

285
00:19:11,420 --> 00:19:15,690
Even though those journals are all digital
and online, we still have to go through the

286
00:19:15,690 --> 00:19:22,570
"peer review process" we call it, and pass
muster with our colleagues, and get their

287
00:19:22,570 --> 00:19:25,940
comments, and feedback, and improvements on
what we're doing.

288
00:19:25,940 --> 00:19:28,270
That'll happen in the next couple of months.

289
00:19:28,270 --> 00:19:33,800
Host: Talk about the different groups that
you have to work with to do something like

290

00:19:33,800 --> 00:19:34,800
this.

291
00:19:34,800 --> 00:19:36,740
I'm imagining there's the Bureau of Land Management.

292
00:19:36,740 --> 00:19:39,030
There is probably Alaska's government.

293
00:19:39,030 --> 00:19:41,560
Are there other groups, other things?

294
00:19:41,560 --> 00:19:43,860
Is this an interagency thing that you're working
with?

295
00:19:43,860 --> 00:19:48,430
Chris Potter: Yeah, ABoVE is all across Alaska,
and it's even into Canada.

296
00:19:48,430 --> 00:19:52,380
You have to work with Canadian agencies as
well, to some degree.

297
00:19:52,380 --> 00:19:57,100
But in Alaska, the players are the Department
of Interior, which includes the Fish and Wildlife

298
00:19:57,100 --> 00:20:00,190
Service and the Bureau of Land Management.

299
00:20:00,190 --> 00:20:04,892
There are scientists from US Geological Survey
in Alaska who are very experienced and who

300
00:20:04,892 --> 00:20:06,320
we collaborate with.

301
00:20:06,320 --> 00:20:10,000

And then there are local and tribal lands
that we work on.

302
00:20:10,000 --> 00:20:17,480
I'm going to be working mostly on local lands
and those that are used by the tribal, native

303
00:20:17,480 --> 00:20:19,620
people in Alaska.

304
00:20:19,620 --> 00:20:24,250
They are very important to -- maybe the most
important people to bring into this whole

305
00:20:24,250 --> 00:20:31,840
discussion, because they are the ones impacted
and using Alaskan wildlife, fisheries, and

306
00:20:31,840 --> 00:20:34,850
are very dependent on the energy resources
coming from all Alaska.

307
00:20:34,850 --> 00:20:40,700
They're also vulnerable to the destruction
or alteration of the infrastructure for pipelines,

308
00:20:40,700 --> 00:20:48,610
and shipping, and all of the things that we
need to get energy resources out of Alaska.

309
00:20:48,610 --> 00:20:53,940
Before I ever went, the first call I made
on this trip was to the tribal leaders in

310
00:20:53,940 --> 00:21:00,540
the town where I was going to, because I wanted
to make sure that they were up front in understanding

311
00:21:00,540 --> 00:21:02,380
what we're doing and involved.

312
00:21:02,380 --> 00:21:03,380
Host: Excellent.

313
00:21:03,380 --> 00:21:08,140
So talking about the interagency stuff, I'd
imagine that's not just for this Alaska trip.

314
00:21:08,140 --> 00:21:12,550
You guys work with them on a regular basis,
especially here in California.

315
00:21:12,550 --> 00:21:14,340
Is there any other stuff that's going on as
well?

316
00:21:14,340 --> 00:21:19,700
Chris Potter: Yeah, some really interesting
interagency agreements we have in place for

317
00:21:19,700 --> 00:21:26,030
research have developed over years and years
of discussions and collaboration.

318
00:21:26,030 --> 00:21:31,750
The one that I'm leading and spend most of
my time on is with the Bureau of Land Management,

319
00:21:31,750 --> 00:21:33,570
which is in the Department of Interior.

320
00:21:33,570 --> 00:21:39,820
They own or are responsible for vast lands
in Southern California and throughout the

321
00:21:39,820 --> 00:21:41,570
desertous Southwest.

322
00:21:41,570 --> 00:21:46,090

There are places in the Mojave Desert, in what's called the Sonoran Desert, or the Lower

323
00:21:46,090 --> 00:21:51,980
Colorado Desert, in Riverside County and Imperial County, where their lands have been used in

324
00:21:51,980 --> 00:21:58,870
the past for activities such as off-road vehicle usage, recreation, hiking, campgrounds, and

325
00:21:58,870 --> 00:22:03,430
that sort of thing -- and grazing, of course, by cattle.

326
00:22:03,430 --> 00:22:10,350
But most recently, at the urging of the state of California and Governor Brown, they have

327
00:22:10,350 --> 00:22:17,530
struck a deal with the energy companies in Southern California, PG&E, and also with environmental

328
00:22:17,530 --> 00:22:24,450
groups across the state, who are very much devoted to preserving the desert as a pristine

329
00:22:24,450 --> 00:22:28,351
ecosystem and the endangered species that live there, such as desert tortoises, and

330
00:22:28,351 --> 00:22:30,080
other birds, and amphibians.

331
00:22:30,080 --> 00:22:31,870
It's called the DRECP.

332
00:22:31,870 --> 00:22:39,280
It was a landmark agreement between the government and the conversation and energy corporations

333
00:22:39,280 --> 00:22:44,040
to lease federal lands for solar energy development.

334
00:22:44,040 --> 00:22:50,750
The governor had a very ambitious goal of
meeting 20 to 30 percent of our electricity

335
00:22:50,750 --> 00:22:55,570
needs as a state in the next decade through
solar and wind energy.

336
00:22:55,570 --> 00:23:01,910
What was to be developed were these large
solar farms, photovoltaic or mirror-based

337
00:23:01,910 --> 00:23:02,990
farms that would.

338
00:23:02,990 --> 00:23:04,440
. . We call them "farms."

339
00:23:04,440 --> 00:23:07,230
They're over many, many acres out in the desert.

340
00:23:07,230 --> 00:23:13,210
They produce solar energy that's transported
mainly back to the Los Angeles area and San

341
00:23:13,210 --> 00:23:16,020
Diego counties.

342
00:23:16,020 --> 00:23:17,020
They are operational.

343
00:23:17,020 --> 00:23:22,770
There have been several big ones built on
BLM lands over the last few years.

344
00:23:22,770 --> 00:23:28,160
It's our job, in cooperation with BLM -- we've
been brought in by them, "invited" if you

345
00:23:28,160 --> 00:23:34,600
will -- to use our remote sensing satellite
imagery to monitor whether those solar energy

346
00:23:34,600 --> 00:23:39,310
developments are having any negative impacts
on the desert environment, because that was

347
00:23:39,310 --> 00:23:42,000
part of the deal that was cut.

348
00:23:42,000 --> 00:23:49,470
BLM had to assure that they could find any
early evidence and monitor any adverse impacts

349
00:23:49,470 --> 00:23:56,040
to endangered species, to air quality -- because
dust is a big problem there when you go up

350
00:23:56,040 --> 00:24:00,220
and down the roads – and install anything
new in the desert, any disturbance to the

351
00:24:00,220 --> 00:24:06,170
fragile soil surfaces there, or desert biological
crust that you can barely see but are very

352
00:24:06,170 --> 00:24:08,570
important for stabilizing the surface.

353
00:24:08,570 --> 00:24:14,000
There are ancient desert pavements that have
been there since before humans were here.

354
00:24:14,000 --> 00:24:16,440

And they need to be preserved.

355
00:24:16,440 --> 00:24:22,510
We are monitoring it month-by-month with,
again, with our Landsat satellite and other

356
00:24:22,510 --> 00:24:28,690
airborne resources we have at our disposal
to help the BLM demonstrate whether there

357
00:24:28,690 --> 00:24:30,500
are or have been any adverse changes.

358
00:24:30,500 --> 00:24:35,920
So far, we don't see many, which is really
good news, because I think we can have solar

359
00:24:35,920 --> 00:24:38,930
energy coexist with -- [background noise]
-- a pristine desert.

360
00:24:38,930 --> 00:24:40,490
Whoops, that was my phone.

361
00:24:40,490 --> 00:24:41,490
Host: Forget it.

362
00:24:41,490 --> 00:24:42,670
We'll leave it in.

363
00:24:42,670 --> 00:24:47,160
Chris Potter: So this energy development can
be environmentally friendly.

364
00:24:47,160 --> 00:24:50,000
It can be environmentally monitored.

365
00:24:50,000 --> 00:24:56,940
We're pretty sure at this point, without tracking

every tortoise out there, that their habitat

366
00:24:56,940 --> 00:24:59,800
is not being adversely impacted.

367
00:24:59,800 --> 00:25:01,930
You do see the solar energy developments.

368
00:25:01,930 --> 00:25:04,090
You can see them from Google Earth.

369
00:25:04,090 --> 00:25:05,890
You can see them because they're very large.

370
00:25:05,890 --> 00:25:08,050
You can see them from, of course, our satellite
imagery.

371
00:25:08,050 --> 00:25:13,929
Or if you're standing out there hiking across
your desert campground, you might see them

372
00:25:13,929 --> 00:25:15,300
in the distance.

373
00:25:15,300 --> 00:25:21,510
They actually cool the desert surface more
than the natural vegetation even does, because

374
00:25:21,510 --> 00:25:25,780
they're designed to absorb the high-energy,
visible radiation.

375
00:25:25,780 --> 00:25:31,660
And so they're turning that visible radiation
into energy rather than re-radiating it back

376
00:25:31,660 --> 00:25:34,000
into the atmosphere, the troposphere.

377
00:25:34,000 --> 00:25:40,120
So they are cooling the desert surface, and
may even provide refuges and habitats for

378
00:25:40,120 --> 00:25:43,800
animals that may otherwise not be able to
find a cool place to hang out.

379
00:25:43,800 --> 00:25:44,860
Host: To step into the shade.

380
00:25:44,860 --> 00:25:45,660
Chris Potter: Right.

381
00:25:45,660 --> 00:25:49,680
They are fenced off, though, from most large
animals, but smaller ones could crawl through

382
00:25:49,690 --> 00:25:52,160
and find some shade in there.

383
00:25:52,170 --> 00:25:55,110
You know, they probably won't be there forever.

384
00:25:55,110 --> 00:26:03,240
They can be removed, unlike a coal mine or
fracking for natural gas.

385
00:26:03,240 --> 00:26:07,030
Their long-term impacts on the environment
will be negligible, because they can always

386
00:26:07,030 --> 00:26:09,620
be taken right back out.

387
00:26:09,620 --> 00:26:14,790
We're also estimating how long it takes for
the desert to recover completely from any

388
00:26:14,790 --> 00:26:16,820
sort of small disturbance like this.

389
00:26:16,820 --> 00:26:21,370
Generally, when a transmission line has been
built through Southern California desert,

390
00:26:21,370 --> 00:26:26,630
within about five years all of the plants
and vegetation around those lines have grown

391
00:26:26,630 --> 00:26:27,630
back in.

392
00:26:27,630 --> 00:26:32,380
So we're pretty confident that it's still
a resilient ecosystem to minor disturbances

393
00:26:32,380 --> 00:26:33,790
like solar development.

394
00:26:33,790 --> 00:26:34,790
Host: Excellent.

395
00:26:34,790 --> 00:26:40,080
For folks who are listening, if you have any
questions for Chris, we are on Twitter @NASAAmes.

396
00:26:40,080 --> 00:26:42,920
We are using the hashtag #NASASiliconValley.

397
00:26:42,920 --> 00:26:44,320
Sends us some questions on over.

398
00:26:44,320 --> 00:26:45,700
We'll hook them back over to Chris.

399

00:26:45,700 --> 00:26:46,540
Thanks for coming.