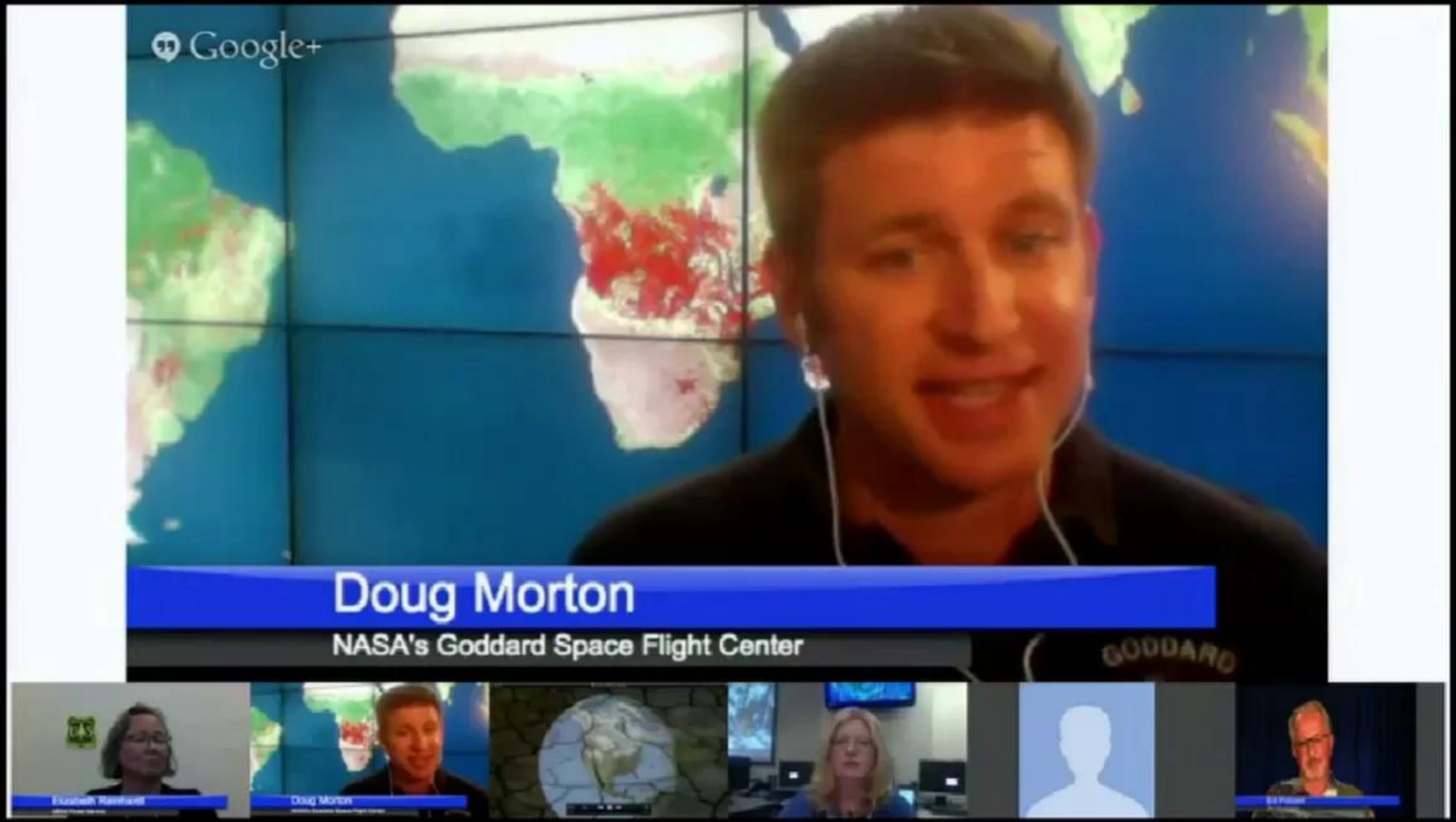
Google+
Doug Morton
NASA's Goddard Space Flight Center
GODDARD
Elizabeth Reinhardt
Doug Morton

1
00:00:04,150 --> 00:00:02,149
i'm here at nasa goddard's space flight

2
00:00:06,390 --> 00:00:04,160
center in greenbelt maryland we're going

3
00:00:08,230 --> 00:00:06,400
to be discussing the wildfires for about

4
00:00:11,350 --> 00:00:08,240
the next hour we're taking your

5
00:00:14,230 --> 00:00:11,360
questions at the hashtag nasafire or

6
00:00:15,589 --> 00:00:14,240
also using the hashtag ask nasa you can

7
00:00:17,430 --> 00:00:15,599
also type your questions into the

8
00:00:20,630 --> 00:00:17,440
youtube comments box or here on the

9
00:00:23,670 --> 00:00:20,640
google plus page um joining us for this

10
00:00:25,349 --> 00:00:23,680
wildfire hangout are a number of experts

11
00:00:27,830 --> 00:00:25,359
here at nasa goddard in a different

12
00:00:30,070 --> 00:00:27,840
building than where i am is doug morton

13
00:00:32,549 --> 00:00:30,080

he is a research scientist here at nasa

14
00:00:34,549 --> 00:00:32,559
goddard and a fire specialist joining us

15
00:00:36,950 --> 00:00:34,559
from nasa's jet propulsion laboratory

16
00:00:39,270 --> 00:00:36,960
out in california is bill patzert he's a

17
00:00:41,510 --> 00:00:39,280
climatologist and then also joining us

18
00:00:43,430 --> 00:00:41,520
from the u.s forest service is elizabeth

19
00:00:45,750 --> 00:00:43,440
rinehart she's the assistant director

20
00:00:47,350 --> 00:00:45,760
for fire and aviation management there

21
00:00:48,790 --> 00:00:47,360
at the forest service

22
00:00:51,110 --> 00:00:48,800
we know we have a number of viewers

23
00:00:53,270 --> 00:00:51,120
today this is also going to be archived

24
00:00:55,110 --> 00:00:53,280
on youtube but as we're doing it right

25
00:00:56,709 --> 00:00:55,120
now please submit your questions send

26
00:00:57,910 --> 00:00:56,719
them in we have a body of people who are

27
00:00:59,830 --> 00:00:57,920
getting them and pulling them in and

28
00:01:01,830 --> 00:00:59,840
i'll be reading them on the air

29
00:01:03,430 --> 00:01:01,840
just to kick things off right away i

30
00:01:06,469 --> 00:01:03,440
want to go right to bill patzert out

31
00:01:08,630 --> 00:01:06,479
there at nasa's jpl lab to talk about

32
00:01:12,390 --> 00:01:08,640
what essentially it takes to start a

33
00:01:14,870 --> 00:01:12,400
wire wildfire take it away bill well

34
00:01:17,350 --> 00:01:14,880
good morning everybody uh

35
00:01:20,789 --> 00:01:17,360
first thing to understand is that fire

36
00:01:23,510 --> 00:01:20,799
is a very natural part of our ecosystems

37
00:01:26,630 --> 00:01:23,520
and uh here in the american west our

38
00:01:28,789 --> 00:01:26,640

history has been written in great fires

39
00:01:31,590 --> 00:01:28,799
but the nature of fires and their

40
00:01:33,030 --> 00:01:31,600
behavior has changed over the past few

41
00:01:35,190 --> 00:01:33,040
decades

42
00:01:39,109 --> 00:01:35,200
fire seasons are longer

43
00:01:41,109 --> 00:01:39,119
the number of acres of fire of

44
00:01:44,950 --> 00:01:41,119
wildland that has burned has increased

45
00:01:48,310 --> 00:01:44,960
dramatically costs are up fatalities are

46
00:01:51,350 --> 00:01:48,320
up and there's more and more costs for

47
00:01:54,149 --> 00:01:51,360
things like aviation now now just to

48
00:01:55,670 --> 00:01:54,159
start at the 101 level at the simplest

49
00:01:57,830 --> 00:01:55,680
level

50
00:01:59,190 --> 00:01:57,840
fire equals

51
00:02:01,270 --> 00:01:59,200
fuel

52
00:02:03,510 --> 00:02:01,280
plus ignition

53
00:02:06,550 --> 00:02:03,520
it's a pretty simple formula

54
00:02:09,109 --> 00:02:06,560
but that formula can be changed by lots

55
00:02:12,390 --> 00:02:09,119
of things for instance fires create

56
00:02:14,070 --> 00:02:12,400
their own meteorology their own winds

57
00:02:15,350 --> 00:02:14,080
and accompanied by

58
00:02:17,270 --> 00:02:15,360
driving

59
00:02:18,790 --> 00:02:17,280
forceful winds like here in southern

60
00:02:20,869 --> 00:02:18,800
california

61
00:02:22,390 --> 00:02:20,879
fires really become

62
00:02:24,390 --> 00:02:22,400
unmanageable

63
00:02:25,430 --> 00:02:24,400

and you really can't fight them all

64
00:02:26,790 --> 00:02:25,440
right

65
00:02:29,830 --> 00:02:26,800
and uh

66
00:02:32,550 --> 00:02:29,840
the other issue is is that uh we fight a

67
00:02:33,670 --> 00:02:32,560
lot of fires in the united states

68
00:02:35,350 --> 00:02:33,680
and uh

69
00:02:37,350 --> 00:02:35,360
some people think

70
00:02:40,309 --> 00:02:37,360
we fight too many fires

71
00:02:43,030 --> 00:02:40,319
and so what happens it becomes uh

72
00:02:46,390 --> 00:02:43,040
these great national uh forests

73
00:02:49,350 --> 00:02:46,400
naturally burn every 20 to 30 years

74
00:02:52,070 --> 00:02:49,360
but when you fight too many fires you

75
00:02:55,030 --> 00:02:52,080
get too much old-growth forest

76
00:02:57,990 --> 00:02:55,040
and it becomes a problem in itself so

77
00:03:01,110 --> 00:02:58,000
you set yourself up for super fires

78
00:03:04,309 --> 00:03:01,120
and then another factor is is that

79
00:03:05,990 --> 00:03:04,319
people have moved into the lands

80
00:03:08,470 --> 00:03:06,000
in the united states

81
00:03:10,070 --> 00:03:08,480
and so there are more people living in

82
00:03:13,110 --> 00:03:10,080
harm's way

83
00:03:15,589 --> 00:03:13,120
and you know my simple formula is is if

84
00:03:17,030 --> 00:03:15,599
you put people in a wild land or

85
00:03:19,430 --> 00:03:17,040
grasslands

86
00:03:20,790 --> 00:03:19,440
that guarantees fire

87
00:03:23,110 --> 00:03:20,800
and of course the thing we'd like to

88
00:03:25,910 --> 00:03:23,120

talk about here is

89
00:03:28,070 --> 00:03:25,920
what's the impact of climate change

90
00:03:31,190 --> 00:03:28,080
we're living in a warmer world

91
00:03:33,350 --> 00:03:31,200
in the west it's a drier world

92
00:03:35,350 --> 00:03:33,360
the population center of the country has

93
00:03:37,750 --> 00:03:35,360
switched from the midwest and the

94
00:03:40,869 --> 00:03:37,760
northeast into the west

95
00:03:42,309 --> 00:03:40,879
and so we've seen more fires larger

96
00:03:47,270 --> 00:03:42,319
fires

97
00:03:49,910 --> 00:03:47,280
of sets the background and of course

98
00:03:51,030 --> 00:03:49,920
nasa is trying to study all these

99
00:03:53,670 --> 00:03:51,040
factors

100
00:03:55,670 --> 00:03:53,680
the things that set you up for fire

101
00:03:58,309 --> 00:03:55,680
how fires behave

102
00:03:59,509 --> 00:03:58,319
and what the future of fires are for the

103
00:04:00,949 --> 00:03:59,519
west

104
00:04:02,550 --> 00:04:00,959
um elizabeth i'd love to see if you

105
00:04:04,789 --> 00:04:02,560
could chime in here you're at the u.s

106
00:04:05,750 --> 00:04:04,799
forest service and that seems to be part

107
00:04:08,390 --> 00:04:05,760
of the

108
00:04:10,630 --> 00:04:08,400
story we're telling about wildfires now

109
00:04:13,429 --> 00:04:10,640
is um the idea that there's been so much

110
00:04:15,670 --> 00:04:13,439
fire suppression for so many years

111
00:04:17,830 --> 00:04:15,680
i wonder if you could bring up my um

112
00:04:20,069 --> 00:04:17,840
slide that shows the trend of acres

113
00:04:22,230 --> 00:04:20,079

burned over time

114
00:04:23,350 --> 00:04:22,240
uh so that i could talk to that a little

115
00:04:24,790 --> 00:04:23,360
bit

116
00:04:27,189 --> 00:04:24,800
you know um

117
00:04:29,430 --> 00:04:27,199
bill's formula that he showed i

118
00:04:31,430 --> 00:04:29,440
i i certainly agree with it and we have

119
00:04:33,670 --> 00:04:31,440
another simple formula we talk about a

120
00:04:35,830 --> 00:04:33,680
lot in the forest service

121
00:04:37,830 --> 00:04:35,840
not that visual but it was a bar chart

122
00:04:40,469 --> 00:04:37,840
showing acres burned if you can find

123
00:04:44,070 --> 00:04:42,550
we have another uh simple formula we

124
00:04:46,310 --> 00:04:44,080
talk about in the forest service a lot

125
00:04:48,550 --> 00:04:46,320
and that's the fire behavior triangle

126
00:04:50,390 --> 00:04:48,560
and the three factors that really can

127
00:04:51,990 --> 00:04:50,400
troll fire behavior

128
00:04:53,990 --> 00:04:52,000
are topography

129
00:04:54,830 --> 00:04:54,000
weather and fuels

130
00:04:58,469 --> 00:04:54,840
so

131
00:05:01,270 --> 00:04:58,479
um uh in a given landscape topography is

132
00:05:04,070 --> 00:05:01,280
a constant and whether we have strong

133
00:05:07,110 --> 00:05:04,080
indications is currently very conducive

134
00:05:09,430 --> 00:05:07,120
to active fire behavior so that leaves

135
00:05:10,469 --> 00:05:09,440
the one angle of the fire behavior

136
00:05:12,790 --> 00:05:10,479
triangle

137
00:05:15,110 --> 00:05:12,800
that we can possibly impact which is

138
00:05:17,270 --> 00:05:15,120

fuels and vegetation

139
00:05:21,110 --> 00:05:17,280
it's certainly true that fuels

140
00:05:22,629 --> 00:05:21,120
accumulate in the absence of disturbance

141
00:05:25,430 --> 00:05:22,639
most of our

142
00:05:28,150 --> 00:05:25,440
wild lands in the united states 94 of

143
00:05:30,629 --> 00:05:28,160
them fire plays a fundamental ecological

144
00:05:33,909 --> 00:05:30,639
role and when that role is interrupted

145
00:05:34,870 --> 00:05:33,919
or removed it has consequences

146
00:05:37,510 --> 00:05:34,880
um

147
00:05:39,350 --> 00:05:37,520
it's difficult to know

148
00:05:41,670 --> 00:05:39,360
to what extent

149
00:05:44,550 --> 00:05:41,680
the current increases in fire we're

150
00:05:47,270 --> 00:05:44,560
seeing are climate driven or fuel driven

151
00:05:50,150 --> 00:05:47,280
certainly we know that post-world war ii

152
00:05:53,270 --> 00:05:50,160
there was a dramatic reduction in acres

153
00:05:55,430 --> 00:05:53,280
burned around the west that reduction

154
00:05:57,909 --> 00:05:55,440
was partially due to our increased

155
00:05:59,510 --> 00:05:57,919
capability to suppress fires it was

156
00:06:01,510 --> 00:05:59,520
partially due also to the fact that

157
00:06:02,629 --> 00:06:01,520
those happen to be relatively cool wet

158
00:06:04,550 --> 00:06:02,639
decades

159
00:06:07,510 --> 00:06:04,560
so um

160
00:06:09,670 --> 00:06:07,520
since uh actually 25 years ago i think

161
00:06:12,469 --> 00:06:09,680
of as sort of the the point of

162
00:06:14,870 --> 00:06:12,479
inflection in our fire occurrence curve

163
00:06:17,909 --> 00:06:14,880

when we started uh seeing much more

164
00:06:20,710 --> 00:06:17,919
acreage burned and that increase has

165
00:06:22,870 --> 00:06:20,720
increased over time

166
00:06:25,270 --> 00:06:22,880
some of that may be due to the fact that

167
00:06:27,590 --> 00:06:25,280
we entered that period in a fire deficit

168
00:06:30,469 --> 00:06:27,600
so to speak some of the areas hadn't

169
00:06:32,550 --> 00:06:30,479
been visited by fire as often as maybe

170
00:06:35,270 --> 00:06:32,560
they were historically adapted to so

171
00:06:37,350 --> 00:06:35,280
fuels had accumulated whether that's

172
00:06:39,270 --> 00:06:37,360
because we were so successful at

173
00:06:41,350 --> 00:06:39,280
suppressing them or because those happen

174
00:06:43,830 --> 00:06:41,360
to be cool wet decades it's a little bit

175
00:06:44,790 --> 00:06:43,840
hard to say and in retrospect

176
00:06:46,710 --> 00:06:44,800
um

177
00:06:48,629 --> 00:06:46,720
well we can only go forward from here

178
00:06:50,469 --> 00:06:48,639
and our tools for going forward are to

179
00:06:51,909 --> 00:06:50,479
manage that vegetation

180
00:06:57,749 --> 00:06:51,919
in

181
00:06:59,350 --> 00:06:57,759
fire to play its natural ecological role

182
00:07:01,350 --> 00:06:59,360
um i want to bring doug morton into the

183
00:07:03,830 --> 00:07:01,360
conversation and also describe where i

184
00:07:06,150 --> 00:07:03,840
am right now um doug let me throw it

185
00:07:08,469 --> 00:07:06,160
right to you this over doug shoulder you

186
00:07:10,390 --> 00:07:08,479
can see almost a visualization of fires

187
00:07:12,550 --> 00:07:10,400
doug can you sort of explain

188
00:07:14,150 --> 00:07:12,560

what these visualizations show when it

189
00:07:16,629 --> 00:07:14,160
comes to fires

190
00:07:18,469 --> 00:07:16,639
sure at nasa we have about 14 different

191
00:07:20,390 --> 00:07:18,479
satellites that are observing the earth

192
00:07:22,550 --> 00:07:20,400
and many of those fires are very useful

193
00:07:24,309 --> 00:07:22,560
for identifying actively burning fires

194
00:07:25,990 --> 00:07:24,319
uh mapping out the burn scars that come

195
00:07:27,830 --> 00:07:26,000
from those fires and of course studying

196
00:07:29,589 --> 00:07:27,840
how the smoke and the greenhouse gasses

197
00:07:31,350 --> 00:07:29,599
that get released from fires contribute

198
00:07:33,189 --> 00:07:31,360
to global warming and also altering

199
00:07:34,950 --> 00:07:33,199
other components of the earth's system

200
00:07:37,029 --> 00:07:34,960
behind me you can see an animation

201
00:07:38,629 --> 00:07:37,039
showing some of the active fires

202
00:07:40,070 --> 00:07:38,639
this is one of the hallmarks of the way

203
00:07:41,670 --> 00:07:40,080
in which nasa satellites provide

204
00:07:43,110 --> 00:07:41,680
information obviously to resource

205
00:07:45,189 --> 00:07:43,120
management groups including the forest

206
00:07:47,110 --> 00:07:45,199
service but also to other protected area

207
00:07:48,710 --> 00:07:47,120
and park managers around the world

208
00:07:50,629 --> 00:07:48,720
these actively burning fires can be

209
00:07:53,110 --> 00:07:50,639
transmitted within 30 minutes of a

210
00:07:55,430 --> 00:07:53,120
satellite overpass by text message or on

211
00:07:57,830 --> 00:07:55,440
a smartphone to park managers around the

212
00:08:00,150 --> 00:07:57,840
world including in australia or south

213
00:08:02,950 --> 00:08:00,160

africa it's one of the vital roles that

214
00:08:04,390 --> 00:08:02,960
nasa data play for looking at fire and

215
00:08:05,909 --> 00:08:04,400
fire management

216
00:08:08,070 --> 00:08:05,919
certainly as a scientist i'm interested

217
00:08:10,070 --> 00:08:08,080
in using more than just the today's

218
00:08:11,670 --> 00:08:10,080
actively burning fires but also looking

219
00:08:13,510 --> 00:08:11,680
at how those fires have changed those

220
00:08:14,950 --> 00:08:13,520
trends have changed over time to

221
00:08:17,430 --> 00:08:14,960
understand how the combination of

222
00:08:19,189 --> 00:08:17,440
factors that bill and um elizabeth

223
00:08:21,749 --> 00:08:19,199
pointed out before the combined

224
00:08:24,390 --> 00:08:21,759
influence of human activity and climate

225
00:08:27,350 --> 00:08:24,400
change uh as way as the way that fires

226
00:08:28,790 --> 00:08:27,360
are playing out in the landscape

227
00:08:30,070 --> 00:08:28,800
thanks doug i want to remind everybody

228
00:08:31,350 --> 00:08:30,080
and we're getting some great questions

229
00:08:33,269 --> 00:08:31,360
and now i'll be reading them in just a

230
00:08:35,589 --> 00:08:33,279
second you can ask questions either in

231
00:08:36,870 --> 00:08:35,599
the youtube comments box or by using the

232
00:08:40,709 --> 00:08:36,880
hashtag

233
00:08:42,790 --> 00:08:40,719
nasafires or nasafire or also ask nasa

234
00:08:43,990 --> 00:08:42,800
we're keeping an eye on all of them um i

235
00:08:46,230 --> 00:08:44,000
also want to point out where i'm

236
00:08:47,750 --> 00:08:46,240
situated here at nasa goddard is one of

237
00:08:49,750 --> 00:08:47,760
the places where the satellite data

238
00:08:51,670 --> 00:08:49,760

comes in that doug was talking about i'm

239
00:08:53,590 --> 00:08:51,680
going to angle my screen back here you

240
00:08:55,190 --> 00:08:53,600
can see a satellite pass

241
00:08:57,190 --> 00:08:55,200
going over essentially greenland and

242
00:08:59,590 --> 00:08:57,200
there's what the satellite passes look

243
00:09:01,829 --> 00:08:59,600
like this is where the data comes in

244
00:09:04,070 --> 00:09:01,839
from many of all of the many of the

245
00:09:06,710 --> 00:09:04,080
earth science satellites that nasa has

246
00:09:08,550 --> 00:09:06,720
terra aqua landsat

247
00:09:10,550 --> 00:09:08,560
and that information comes in here and

248
00:09:12,710 --> 00:09:10,560
then is turned into what essentially are

249
00:09:14,630 --> 00:09:12,720
called level one products that

250
00:09:15,910 --> 00:09:14,640
scientists like doug morton and i

251
00:09:18,389 --> 00:09:15,920
believe bill patzert used in their

252
00:09:20,790 --> 00:09:18,399
computer models um bill i wanted to ask

253
00:09:23,430 --> 00:09:20,800
you when it comes to forecasting fires

254
00:09:25,030 --> 00:09:23,440
in the future how reliable are the

255
00:09:28,230 --> 00:09:25,040
models and how

256
00:09:30,230 --> 00:09:28,240
confident can the people who get ideas

257
00:09:31,990 --> 00:09:30,240
of what wildfires may or may not be in

258
00:09:33,590 --> 00:09:32,000
individual states or counties how

259
00:09:36,230 --> 00:09:33,600
confident can they be about different

260
00:09:37,030 --> 00:09:36,240
fire forecasts

261
00:09:39,430 --> 00:09:37,040
well

262
00:09:42,310 --> 00:09:39,440
you know remember we have great natural

263
00:09:44,630 --> 00:09:42,320

cycles in the climate system and for

264
00:09:47,269 --> 00:09:44,640
instance for the last dozen years the

265
00:09:49,750 --> 00:09:47,279
west has been extremely dry

266
00:09:51,670 --> 00:09:49,760
here in southern california

267
00:09:54,150 --> 00:09:51,680
since january

268
00:09:57,110 --> 00:09:54,160
essentially the rain's just turned off

269
00:09:58,070 --> 00:09:57,120
so we've had a very busy active fire

270
00:10:00,630 --> 00:09:58,080
season

271
00:10:01,910 --> 00:10:00,640
and so a good forecast of fires is

272
00:10:04,389 --> 00:10:01,920
drought

273
00:10:06,070 --> 00:10:04,399
and as we look into the future of the

274
00:10:09,670 --> 00:10:06,080
west

275
00:10:13,269 --> 00:10:09,680
is one of the climate forecasts is for

276
00:10:16,630 --> 00:10:13,279
not only a warmer west but a drier west

277
00:10:18,710 --> 00:10:16,640
and so that definitely translates into a

278
00:10:19,910 --> 00:10:18,720
more fiery west

279
00:10:24,949 --> 00:10:19,920
and

280
00:10:27,110 --> 00:10:24,959
people are moving into harm's way of

281
00:10:33,110 --> 00:10:27,120
these fires

282
00:10:36,310 --> 00:10:34,630
and doug you said you may have something

283
00:10:38,230 --> 00:10:36,320
to add when it comes also about

284
00:10:40,470 --> 00:10:38,240
developing these projections

285
00:10:41,750 --> 00:10:40,480
i think at nasa we're looking

286
00:10:43,750 --> 00:10:41,760
excuse me bill i was just going to chime

287
00:10:44,870 --> 00:10:43,760
in with a follow-on to the points you

288
00:10:46,790 --> 00:10:44,880

were making which is that we're

289
00:10:48,949 --> 00:10:46,800
certainly interested in looking out over

290
00:10:50,710 --> 00:10:48,959
the next century in particular using the

291
00:10:52,630 --> 00:10:50,720
latest generation of climate models to

292
00:10:54,150 --> 00:10:52,640
understand how conditions that do favor

293
00:10:55,910 --> 00:10:54,160
fire activity those hot and dry

294
00:10:57,670 --> 00:10:55,920
conditions bill was mentioning are

295
00:10:59,829 --> 00:10:57,680
likely to play out and certainly as we

296
00:11:01,990 --> 00:10:59,839
look out towards the end of this century

297
00:11:03,829 --> 00:11:02,000
we're seeing years for example like 2012

298
00:11:05,590 --> 00:11:03,839
which was very dry across the front

299
00:11:07,670 --> 00:11:05,600
range of the rockies and the midwest of

300
00:11:09,590 --> 00:11:07,680
the country that kind of a fire season

301
00:11:11,430 --> 00:11:09,600
being the new normal by the end of the

302
00:11:12,870 --> 00:11:11,440
century so certainly a trend towards

303
00:11:15,030 --> 00:11:12,880
hotter and drier conditions and regions

304
00:11:15,990 --> 00:11:15,040
that are already experiencing fires and

305
00:11:18,230 --> 00:11:16,000
even an

306
00:11:19,750 --> 00:11:18,240
increase in those fires in places where

307
00:11:21,750 --> 00:11:19,760
fires haven't historically been all that

308
00:11:23,990 --> 00:11:21,760
important places like the upper midwest

309
00:11:25,670 --> 00:11:24,000
of the u.s or other northern great

310
00:11:27,350 --> 00:11:25,680
plains regions

311
00:11:28,870 --> 00:11:27,360
nasa scientists are also using satellite

312
00:11:31,670 --> 00:11:28,880
data to understand how we can project

313
00:11:33,110 --> 00:11:31,680

fire on a much shorter time scale um

314
00:11:35,590 --> 00:11:33,120
many of the viewers may be familiar with

315
00:11:37,269 --> 00:11:35,600
the influence of cycles like el nino and

316
00:11:38,870 --> 00:11:37,279
how that can contribute to

317
00:11:40,790 --> 00:11:38,880
rainier or drier conditions in different

318
00:11:42,470 --> 00:11:40,800
parts of the world we're certainly using

319
00:11:43,910 --> 00:11:42,480
information like that information that

320
00:11:45,829 --> 00:11:43,920
comes from sea surface temperatures like

321
00:11:47,509 --> 00:11:45,839
the el nino phenomenon as well as uh

322
00:11:49,190 --> 00:11:47,519
variability in the atlantic sea surface

323
00:11:51,750 --> 00:11:49,200
temperatures to try to make projections

324
00:11:53,350 --> 00:11:51,760
of fire activity out just a few months

325
00:11:54,870 --> 00:11:53,360
so for example i'm a part of a research

326
00:11:56,710 --> 00:11:54,880
group that's made a projection of fire

327
00:11:58,470 --> 00:11:56,720
activity in the amazon we made that

328
00:12:00,230 --> 00:11:58,480
projection in may and the peak of the

329
00:12:01,670 --> 00:12:00,240
fire season's yet to come

330
00:12:04,069 --> 00:12:01,680
so those are the ways in which these

331
00:12:05,910 --> 00:12:04,079
tools are providing a lens on future

332
00:12:08,150 --> 00:12:05,920
fire activity over the scale of months

333
00:12:09,509 --> 00:12:08,160
to decades

334
00:12:11,030 --> 00:12:09,519
and elizabeth there at the forest

335
00:12:12,550 --> 00:12:11,040
service how do you take these

336
00:12:14,150 --> 00:12:12,560
projections that come from the research

337
00:12:15,829 --> 00:12:14,160
scientists and apply them into

338
00:12:19,030 --> 00:12:15,839

essentially the real world when it comes

339
00:12:21,829 --> 00:12:19,040
to managing our nation's forests

340
00:12:24,790 --> 00:12:21,839
you know our um preparedness

341
00:12:27,670 --> 00:12:24,800
is um

342
00:12:29,509 --> 00:12:27,680
the the pre-positioning of fire crews

343
00:12:32,310 --> 00:12:29,519
and resources takes these predictions

344
00:12:35,509 --> 00:12:32,320
into account we have our own predictive

345
00:12:38,230 --> 00:12:35,519
services groups that looks at um

346
00:12:39,430 --> 00:12:38,240
weather projections seasonally in

347
00:12:42,069 --> 00:12:39,440
addition to

348
00:12:44,069 --> 00:12:42,079
weather and drought

349
00:12:46,629 --> 00:12:44,079
prevalence of fine fuels is an important

350
00:12:49,350 --> 00:12:46,639
predictor of fire behavior so in some

351
00:12:50,790 --> 00:12:49,360
places where fine fuels are limiting a

352
00:12:53,670 --> 00:12:50,800
wet spring

353
00:12:55,350 --> 00:12:53,680
actually is conducive to fire activity

354
00:12:57,269 --> 00:12:55,360
later in the season when those fine

355
00:12:59,030 --> 00:12:57,279
fields the grasses

356
00:13:00,629 --> 00:12:59,040
begin to dry out

357
00:13:03,350 --> 00:13:00,639
so um

358
00:13:05,430 --> 00:13:03,360
we definitely um take that information

359
00:13:07,110 --> 00:13:05,440
into account in placement and

360
00:13:09,430 --> 00:13:07,120
preparedness of our

361
00:13:10,790 --> 00:13:09,440
firefighting resources

362
00:13:12,150 --> 00:13:10,800
that actually leads us to the first

363
00:13:14,470 --> 00:13:12,160

question we're going to take from the

364
00:13:17,030 --> 00:13:14,480
internet just to remind anybody watching

365
00:13:19,269 --> 00:13:17,040
just write questions in the

366
00:13:21,750 --> 00:13:19,279
youtube comments page in the google plus

367
00:13:24,150 --> 00:13:21,760
page here and also we're monitoring uh

368
00:13:26,790 --> 00:13:24,160
twitter and facebook um she's a hashtag

369
00:13:28,790 --> 00:13:26,800
uh nasafire on twitter and we'll find it

370
00:13:30,550 --> 00:13:28,800
quickly um but

371
00:13:33,509 --> 00:13:30,560
what elizabeth just said about a cooler

372
00:13:38,150 --> 00:13:33,519
spring we got a question in google plus

373
00:13:40,629 --> 00:13:38,160
by nicolo laputi he uh had the question

374
00:13:43,269 --> 00:13:40,639
essentially a summer that starts barely

375
00:13:45,190 --> 00:13:43,279
at the end of july seems not so global

376
00:13:47,990 --> 00:13:45,200
warming explain to me why if i have to

377
00:13:49,750 --> 00:13:48,000
wear a sweater in july that actually

378
00:13:51,750 --> 00:13:49,760
global warming's happening and then it's

379
00:13:53,190 --> 00:13:51,760
actually increasing fires i'm going to

380
00:13:55,030 --> 00:13:53,200
throw that uh not to put you on the spot

381
00:13:57,430 --> 00:13:55,040
but we've got a climatologist right here

382
00:13:59,910 --> 00:13:57,440
so bill can you sort of draw on that

383
00:14:01,750 --> 00:13:59,920
idea of that if it's first that cold and

384
00:14:03,829 --> 00:14:01,760
rainy all the way into july how can it

385
00:14:06,470 --> 00:14:03,839
possibly lead to or show that climate

386
00:14:08,629 --> 00:14:06,480
change and global warming is happening

387
00:14:10,550 --> 00:14:08,639
okay that's a that's a great question

388
00:14:13,990 --> 00:14:10,560

because it's actually pretty been pretty

389
00:14:18,230 --> 00:14:14,000
cool here in la too which we appreciate

390
00:14:20,790 --> 00:14:18,240
but don't confuse weather with climate

391
00:14:23,829 --> 00:14:20,800
climate are long-term trends

392
00:14:26,790 --> 00:14:23,839
and for instance 2012

393
00:14:28,829 --> 00:14:26,800
was the warmest year in the continuous

394
00:14:31,990 --> 00:14:28,839
united states since modern

395
00:14:35,110 --> 00:14:32,000
record-breaking record

396
00:14:37,670 --> 00:14:35,120
keeping has begun all right so you're

397
00:14:40,710 --> 00:14:37,680
definitely living in a warmer world even

398
00:14:43,350 --> 00:14:40,720
though you might be having a cooler july

399
00:14:45,350 --> 00:14:43,360
and the other factors like rising sea

400
00:14:48,550 --> 00:14:45,360
level which is the unequivocal proof of

401
00:14:49,590 --> 00:14:48,560
global warming continues to increase

402
00:14:51,670 --> 00:14:49,600
so

403
00:14:53,350 --> 00:14:51,680
you know weather can give you a break

404
00:14:56,550 --> 00:14:53,360
but in the long run climate's going to

405
00:15:00,470 --> 00:14:58,790
thanks so much bill um sorry to be

406
00:15:02,629 --> 00:15:00,480
laughing about it such a serious topic

407
00:15:04,389 --> 00:15:02,639
but when it comes to uh climate change

408
00:15:05,670 --> 00:15:04,399
it's so interesting to continue to come

409
00:15:07,350 --> 00:15:05,680
up with the difference between

410
00:15:09,670 --> 00:15:07,360
individual weather and climate and

411
00:15:11,350 --> 00:15:09,680
because we talk about forecasts and both

412
00:15:13,509 --> 00:15:11,360
it can be a bit confusing for a lot of

413
00:15:14,949 --> 00:15:13,519

people um i have a question probably for

414
00:15:16,389 --> 00:15:14,959
elizabeth

415
00:15:17,829 --> 00:15:16,399
and people keep these questions coming

416
00:15:20,310 --> 00:15:17,839
in we have a question from the youtube

417
00:15:22,230 --> 00:15:20,320
comments section douglas crandall asks

418
00:15:24,230 --> 00:15:22,240
what's the most common ignition of

419
00:15:25,750 --> 00:15:24,240
wildfires i know that sometimes we hear

420
00:15:27,350 --> 00:15:25,760
about arson sometimes we hear about

421
00:15:29,750 --> 00:15:27,360
lightning can you talk a little bit

422
00:15:31,670 --> 00:15:29,760
elizabeth what causes these wildfires

423
00:15:34,629 --> 00:15:31,680
and is there a way to sort of

424
00:15:37,110 --> 00:15:34,639
limit one or the other oh doug good

425
00:15:39,110 --> 00:15:37,120
question and um i think

426
00:15:42,069 --> 00:15:39,120
i don't know off the top of my head what

427
00:15:44,470 --> 00:15:42,079
percent of our fires are human cause

428
00:15:46,870 --> 00:15:44,480
versus lightning cost but i believe the

429
00:15:48,790 --> 00:15:46,880
majority of them are human caused and we

430
00:15:53,430 --> 00:15:48,800
always take suppression action on

431
00:15:57,269 --> 00:15:56,470
certain parts of the country are more um

432
00:15:59,749 --> 00:15:57,279
are

433
00:16:02,949 --> 00:15:59,759
impacted more by lightning caused fires

434
00:16:06,470 --> 00:16:02,959
and um one thing we're really curious to

435
00:16:08,069 --> 00:16:06,480
observing as climate change plays out is

436
00:16:09,269 --> 00:16:08,079
what will be the impacts of climate

437
00:16:11,509 --> 00:16:09,279
change on

438
00:16:13,189 --> 00:16:11,519

uh prevalence of lightning and wear you

439
00:16:15,829 --> 00:16:13,199
know that's the type of detail that you

440
00:16:18,150 --> 00:16:15,839
think we know things are warming we know

441
00:16:20,870 --> 00:16:18,160
that in a warmer climate regardless of

442
00:16:23,509 --> 00:16:20,880
the precipitation patterns vegetation is

443
00:16:26,150 --> 00:16:23,519
under more moisture stress and so it's

444
00:16:27,910 --> 00:16:26,160
more likely to be dead and dying and

445
00:16:30,389 --> 00:16:27,920
dry and flammable

446
00:16:32,310 --> 00:16:30,399
but some details like oh where will we

447
00:16:34,949 --> 00:16:32,320
experience more lightning storms wow

448
00:16:36,710 --> 00:16:34,959
that is really um one of those cases

449
00:16:38,470 --> 00:16:36,720
where the devil's in the details and i

450
00:16:41,030 --> 00:16:38,480
don't know what projections tell us

451
00:16:45,269 --> 00:16:41,040
about lightning caused ignitions

452
00:16:47,910 --> 00:16:45,279
in a in a wildland that's increasingly

453
00:16:50,230 --> 00:16:47,920
populated we can only expect that

454
00:16:53,269 --> 00:16:50,240
human-caused ignitions will continue to

455
00:16:56,150 --> 00:16:54,389
and doug

456
00:16:59,749 --> 00:16:56,160
bill go ahead bill

457
00:17:02,389 --> 00:16:59,759
in california 95 of all fires are human

458
00:17:05,189 --> 00:17:02,399
ignited all right

459
00:17:06,470 --> 00:17:05,199
and so my simple formula for fire in

460
00:17:12,470 --> 00:17:06,480
california

461
00:17:16,309 --> 00:17:13,909
sorry for the pause in me i wasn't

462
00:17:17,909 --> 00:17:16,319
expecting uh such a simple formula paul

463
00:17:20,150 --> 00:17:17,919

um when doug can you come in a little

464
00:17:21,909 --> 00:17:20,160
bit too that's an interesting idea on a

465
00:17:24,230 --> 00:17:21,919
possible connection between climate

466
00:17:26,230 --> 00:17:24,240
change increasing

467
00:17:28,069 --> 00:17:26,240
intensity of storms

468
00:17:31,430 --> 00:17:28,079
possibly leading to more lightning which

469
00:17:31,750 --> 00:17:31,440
may cause actually more

470
00:17:34,070 --> 00:17:31,760
well wildfires

471
00:17:35,350 --> 00:17:34,080
fully a coupled system and i think both

472
00:17:36,950 --> 00:17:35,360
bill and elizabeth have pointed to the

473
00:17:39,830 --> 00:17:36,960
important role that humans play in

474
00:17:42,150 --> 00:17:39,840
modifying the fire regime of our planet

475
00:17:43,830 --> 00:17:42,160
um across the u.s it might even be as

476
00:17:45,830 --> 00:17:43,840
much as 70 percent of the fires from

477
00:17:47,669 --> 00:17:45,840
nasa satellites are associated with

478
00:17:49,990 --> 00:17:47,679
fires for forest management or for

479
00:17:51,830 --> 00:17:50,000
agricultural production across places

480
00:17:53,510 --> 00:17:51,840
like the brazilian amazon or maybe even

481
00:17:55,669 --> 00:17:53,520
broadly looking at california that

482
00:17:57,190 --> 00:17:55,679
number is darn close to 100 percent so

483
00:17:58,470 --> 00:17:57,200
clearly humans are an important source

484
00:18:00,630 --> 00:17:58,480
of ignitions

485
00:18:02,630 --> 00:18:00,640
how human activities change and respond

486
00:18:05,510 --> 00:18:02,640
to a changing climate ultimately will

487
00:18:07,029 --> 00:18:05,520
influence how fires will respond as well

488
00:18:08,630 --> 00:18:07,039

those hot and dry conditions those

489
00:18:10,150 --> 00:18:08,640
extreme events that i think are so

490
00:18:12,390 --> 00:18:10,160
critical when we think specifically

491
00:18:14,310 --> 00:18:12,400
about fires certainly there's a wide

492
00:18:16,310 --> 00:18:14,320
range of science and study right now on

493
00:18:18,230 --> 00:18:16,320
the intensity of storms the prevalence

494
00:18:20,710 --> 00:18:18,240
of hurricanes etc but if we think just

495
00:18:22,870 --> 00:18:20,720
about those conditions that favor fires

496
00:18:24,549 --> 00:18:22,880
those extreme events things we consider

497
00:18:25,750 --> 00:18:24,559
now to be a once a decade kind of

498
00:18:27,510 --> 00:18:25,760
activity

499
00:18:29,029 --> 00:18:27,520
those are certainly on the rise whether

500
00:18:30,870 --> 00:18:29,039
we look at major fire regions in the

501
00:18:33,510 --> 00:18:30,880
western u.s whether we look at places

502
00:18:35,029 --> 00:18:33,520
like australia or southern africa

503
00:18:37,430 --> 00:18:35,039
these are places that we'll see more

504
00:18:38,950 --> 00:18:37,440
extreme fire conditions

505
00:18:41,110 --> 00:18:38,960
again an early start to the fire year in

506
00:18:46,150 --> 00:18:41,120
california a very early start to the

507
00:18:48,789 --> 00:18:47,430
thanks so much doug martin just to

508
00:18:50,630 --> 00:18:48,799
remind everybody watching this is a

509
00:18:52,310 --> 00:18:50,640
google plus hangout hosted here at nasa

510
00:18:53,909 --> 00:18:52,320
goddard it's live on youtube now and it

511
00:18:55,590 --> 00:18:53,919
will be archived on youtube so if you're

512
00:18:58,390 --> 00:18:55,600
watching after the fact thank you so

513
00:19:00,630 --> 00:18:58,400

much we're taking questions in live now

514
00:19:01,870 --> 00:19:00,640
um through the hashtag asknasa through

515
00:19:05,270 --> 00:19:01,880
the hashtag

516
00:19:06,950 --> 00:19:05,280
nasafire and also on youtube and here in

517
00:19:09,110 --> 00:19:06,960
the google plus page here's a question

518
00:19:10,950 --> 00:19:09,120
we have from the youtube comments page

519
00:19:13,909 --> 00:19:10,960
and this might put elizabeth a bit on

520
00:19:16,390 --> 00:19:13,919
the spot uh so apologies elizabeth but

521
00:19:18,630 --> 00:19:16,400
um jack ring in the

522
00:19:20,710 --> 00:19:18,640
in on the youtube comment section

523
00:19:22,230 --> 00:19:20,720
asked about when it comes to fuel for

524
00:19:25,029 --> 00:19:22,240
fires is there a difference between

525
00:19:27,909 --> 00:19:25,039
acreage burned in u.s forest service

526
00:19:29,750 --> 00:19:27,919
land versus reservation land he says at

527
00:19:31,750 --> 00:19:29,760
least here in arizona the native

528
00:19:34,070 --> 00:19:31,760
american lands are much better cleared

529
00:19:35,669 --> 00:19:34,080
of underbrush than are the u.s forest

530
00:19:37,830 --> 00:19:35,679
service lands i don't want to put you on

531
00:19:40,070 --> 00:19:37,840
a spot about a particular tract of land

532
00:19:43,190 --> 00:19:40,080
out there but it does lead to the idea

533
00:19:45,350 --> 00:19:43,200
of how to manage forests as a way of

534
00:19:47,029 --> 00:19:45,360
minimizing wildfire

535
00:19:48,150 --> 00:19:47,039
risk

536
00:19:50,549 --> 00:19:48,160
certainly

537
00:19:53,270 --> 00:19:50,559
many tribes have a strong tradition of

538
00:19:55,830 --> 00:19:53,280

active forest management

539
00:19:57,350 --> 00:19:55,840
and certainly many of our national

540
00:19:59,590 --> 00:19:57,360
forests

541
00:20:00,950 --> 00:19:59,600
are in need of fuel management

542
00:20:02,070 --> 00:20:00,960
treatments

543
00:20:03,830 --> 00:20:02,080
however

544
00:20:06,630 --> 00:20:03,840
it's also true that many of our most

545
00:20:08,870 --> 00:20:06,640
devastating wildfires this year have

546
00:20:10,230 --> 00:20:08,880
been on private lands not federal lands

547
00:20:12,230 --> 00:20:10,240
of any kind

548
00:20:14,070 --> 00:20:12,240
so

549
00:20:17,830 --> 00:20:14,080
definitely we take seriously our

550
00:20:19,430 --> 00:20:17,840
responsibility to manage and steward the

551
00:20:23,029 --> 00:20:19,440
national forests which are a public

552
00:20:25,909 --> 00:20:23,039
resource and which we

553
00:20:27,830 --> 00:20:25,919
we value deeply ourselves

554
00:20:29,750 --> 00:20:27,840
um so

555
00:20:31,350 --> 00:20:29,760
i guess i don't have any statistics for

556
00:20:34,789 --> 00:20:31,360
you about

557
00:20:36,549 --> 00:20:34,799
relative fuel conditions on tribal lands

558
00:20:38,149 --> 00:20:36,559
versus national forest lands and i would

559
00:20:40,950 --> 00:20:38,159
certainly expect it to vary

560
00:20:42,310 --> 00:20:40,960
geographically

561
00:20:45,830 --> 00:20:42,320
but there's no question that there's

562
00:20:49,430 --> 00:20:47,669
thank you so much elizabeth we have a

563
00:20:51,590 --> 00:20:49,440

question um coming in through a phone

564
00:20:54,390 --> 00:20:51,600
bridge from a reporter from the futurist

565
00:20:58,710 --> 00:20:54,400
hold on one moment

566
00:21:01,029 --> 00:20:58,720
um

567
00:21:03,830 --> 00:21:01,039
go ahead with your question

568
00:21:06,870 --> 00:21:03,840
all right um yeah i heard doug morton

569
00:21:09,430 --> 00:21:06,880
say that places like the upper midwest

570
00:21:11,029 --> 00:21:09,440
could see more fire activity where those

571
00:21:12,470 --> 00:21:11,039
are places that have not historically

572
00:21:14,149 --> 00:21:12,480
seen a lot of fires

573
00:21:16,230 --> 00:21:14,159
now i'm wondering

574
00:21:17,350 --> 00:21:16,240
not too far from the upper midwest is

575
00:21:20,310 --> 00:21:17,360
canada

576
00:21:21,590 --> 00:21:20,320
so could what should this fire activity

577
00:21:23,750 --> 00:21:21,600
become a

578
00:21:27,270 --> 00:21:23,760
trans national issue for example you

579
00:21:29,909 --> 00:21:27,280
could see more fires crossing to or from

580
00:21:31,909 --> 00:21:29,919
canada and or the us you know since

581
00:21:33,029 --> 00:21:31,919
those many of those forests intersect

582
00:21:35,430 --> 00:21:33,039
and if so

583
00:21:37,590 --> 00:21:35,440
could this end up being a problem that

584
00:21:39,669 --> 00:21:37,600
canada and the united states would have

585
00:21:41,909 --> 00:21:39,679
to cooperatively work together to

586
00:21:42,870 --> 00:21:41,919
address

587
00:21:44,310 --> 00:21:42,880
i think

588
00:21:47,430 --> 00:21:44,320

that's a really good question and

589
00:21:49,110 --> 00:21:47,440
certainly we see areas like that

590
00:21:50,950 --> 00:21:49,120
northern forest boundary between the us

591
00:21:52,549 --> 00:21:50,960
and canada uh as some of those areas

592
00:21:54,630 --> 00:21:52,559
that are projected to dry the most

593
00:21:56,230 --> 00:21:54,640
during the fire season based on this

594
00:21:58,710 --> 00:21:56,240
latest generation of climate models from

595
00:22:00,149 --> 00:21:58,720
the ipcc the intergovernmental panel on

596
00:22:01,909 --> 00:22:00,159
climate change

597
00:22:04,149 --> 00:22:01,919
the trans boundary issue that you bring

598
00:22:06,070 --> 00:22:04,159
up is is pretty important certainly we

599
00:22:07,669 --> 00:22:06,080
think directly about how these fires

600
00:22:09,590 --> 00:22:07,679
forced in particular along that boundary

601
00:22:12,470 --> 00:22:09,600
may be vulnerable to fire but the long

602
00:22:14,230 --> 00:22:12,480
distance transport of the smoke aerosols

603
00:22:15,750 --> 00:22:14,240
that come from those fires is something

604
00:22:17,590 --> 00:22:15,760
we can already point to as being a

605
00:22:19,990 --> 00:22:17,600
pretty significant impact there were

606
00:22:21,669 --> 00:22:20,000
fires in quebec in 2003

607
00:22:23,110 --> 00:22:21,679
the smoke plume from those fires reached

608
00:22:25,029 --> 00:22:23,120
all the way down to where we are here in

609
00:22:27,270 --> 00:22:25,039
maryland in washington dc

610
00:22:29,990 --> 00:22:27,280
when that smoke hit the metro area of dc

611
00:22:31,750 --> 00:22:30,000
there were thousands of 911 calls within

612
00:22:32,870 --> 00:22:31,760
a half an hour because people smelled

613
00:22:34,710 --> 00:22:32,880

smoke

614
00:22:36,070 --> 00:22:34,720
that's just one example i think if you

615
00:22:38,630 --> 00:22:36,080
think also about the way that we as

616
00:22:40,230 --> 00:22:38,640
scientists connect the aerosols the

617
00:22:42,950 --> 00:22:40,240
smoke that's transported from these

618
00:22:44,950 --> 00:22:42,960
fires and its transport up from the u.s

619
00:22:47,350 --> 00:22:44,960
over canada and up into the ice sheets

620
00:22:49,350 --> 00:22:47,360
in regions like greenland those

621
00:22:50,870 --> 00:22:49,360
aerosols and the black carbon that rains

622
00:22:52,310 --> 00:22:50,880
out on the

623
00:22:54,549 --> 00:22:52,320
ice sheets

624
00:22:57,110 --> 00:22:54,559
in greenland has a significant impact on

625
00:23:00,390 --> 00:22:57,120
how quickly that ice is melting and how

626
00:23:03,029 --> 00:23:00,400
rapidly this link between fires and uh

627
00:23:04,310 --> 00:23:03,039
melting ice uh helps play a role in the

628
00:23:08,070 --> 00:23:04,320
global

629
00:23:09,430 --> 00:23:08,080
and doug i have a question when you say

630
00:23:11,270 --> 00:23:09,440
black carbon are we actually just

631
00:23:13,110 --> 00:23:11,280
talking about like literally soot from

632
00:23:14,310 --> 00:23:13,120
these fires or is it something else more

633
00:23:17,190 --> 00:23:14,320
specific

634
00:23:19,110 --> 00:23:17,200
well fires release a range of different

635
00:23:22,230 --> 00:23:19,120
particle emissions that's essentially

636
00:23:23,590 --> 00:23:22,240
little particles of burned vegetation

637
00:23:25,750 --> 00:23:23,600
that's the black carbon piece it's

638
00:23:27,270 --> 00:23:25,760

essentially like very fine charcoal but

639
00:23:30,230 --> 00:23:27,280
you also see the release of carbon

640
00:23:32,549 --> 00:23:30,240
dioxide and methane which are two very

641
00:23:34,230 --> 00:23:32,559
important greenhouse gases and so part

642
00:23:35,830 --> 00:23:34,240
of the research that we do is to take

643
00:23:38,149 --> 00:23:35,840
information about the amount of fuels

644
00:23:40,470 --> 00:23:38,159
that are there in a forest as it burns

645
00:23:42,549 --> 00:23:40,480
we can see some of that damage as

646
00:23:44,630 --> 00:23:42,559
we take nasa imagery of the burn scar

647
00:23:46,710 --> 00:23:44,640
after the fire passes and we can also

648
00:23:48,549 --> 00:23:46,720
take measurements of the smoke plume and

649
00:23:50,549 --> 00:23:48,559
the greenhouse gases in the atmosphere

650
00:23:52,310 --> 00:23:50,559
with other nasa satellites we can put

651
00:23:54,470 --> 00:23:52,320
those two pieces together in a model to

652
00:23:55,990 --> 00:23:54,480
understand how fires overall are

653
00:23:57,110 --> 00:23:56,000
contributing to the problem of global

654
00:23:58,950 --> 00:23:57,120
warming

655
00:24:00,630 --> 00:23:58,960
thanks for clearing it up for me um

656
00:24:02,310 --> 00:24:00,640
elizabeth reinhart with the u.s forest

657
00:24:04,630 --> 00:24:02,320
service i was wondering if you could

658
00:24:06,390 --> 00:24:04,640
comment a little bit about the idea of

659
00:24:08,149 --> 00:24:06,400
fires crossing borders i mean of course

660
00:24:09,830 --> 00:24:08,159
fires don't actually care what side of a

661
00:24:11,909 --> 00:24:09,840
fence they're on and how does the u.s

662
00:24:14,070 --> 00:24:11,919
forest service work with canada when it

663
00:24:15,430 --> 00:24:14,080

comes to fires that might be along the

664
00:24:16,950 --> 00:24:15,440
border

665
00:24:19,990 --> 00:24:16,960
you know we work closely with our

666
00:24:21,990 --> 00:24:20,000
canadian neighbors and we also have

667
00:24:25,110 --> 00:24:22,000
agreements with other countries as well

668
00:24:28,470 --> 00:24:25,120
we work with mexico and we have sent aid

669
00:24:30,070 --> 00:24:28,480
and received aid from australia and i

670
00:24:31,269 --> 00:24:30,080
believe some countries in europe in

671
00:24:33,269 --> 00:24:31,279
times of

672
00:24:36,230 --> 00:24:33,279
need um but you know what's really

673
00:24:37,990 --> 00:24:36,240
interesting i think is to address that

674
00:24:40,230 --> 00:24:38,000
at a much smaller scale and think about

675
00:24:43,590 --> 00:24:40,240
how we work across boundaries that are

676
00:24:45,669 --> 00:24:43,600
just property boundaries rather than um

677
00:24:48,310 --> 00:24:45,679
national boundaries so one thing we've

678
00:24:51,110 --> 00:24:48,320
been working on in the forest service is

679
00:24:53,990 --> 00:24:51,120
trying to make more of an effort to

680
00:24:56,789 --> 00:24:54,000
strategically locate our fuels and

681
00:24:57,669 --> 00:24:56,799
vegetation work in places where there's

682
00:25:07,510 --> 00:24:57,679
a

683
00:25:09,269 --> 00:25:07,520
work

684
00:25:11,590 --> 00:25:09,279
are um

685
00:25:13,750 --> 00:25:11,600
uh i guess enhanced by the effects of

686
00:25:15,269 --> 00:25:13,760
the neighboring work so i think there's

687
00:25:18,390 --> 00:25:15,279
a real opportunity

688
00:25:22,710 --> 00:25:18,400

for us moving forward to coordinate our

689
00:25:24,950 --> 00:25:22,720
work with um neighboring landowners

690
00:25:26,390 --> 00:25:24,960
thank you so much just so anyone tuning

691
00:25:28,630 --> 00:25:26,400
in now that was elizabeth reinhart she's

692
00:25:30,230 --> 00:25:28,640
with the u.s forest service also joining

693
00:25:32,549 --> 00:25:30,240
us just add something here yeah i was

694
00:25:35,669 --> 00:25:32,559
that and joining us also is bill patzert

695
00:25:37,750 --> 00:25:35,679
at jpl bill take it away yeah i just

696
00:25:40,149 --> 00:25:37,760
wanted to point out to everybody

697
00:25:41,750 --> 00:25:40,159
that fires are not only in the west some

698
00:25:43,990 --> 00:25:41,760
of the largest fires we've seen in the

699
00:25:45,909 --> 00:25:44,000
united states have actually occurred in

700
00:25:47,510 --> 00:25:45,919
the midwest in the northeast

701
00:25:49,830 --> 00:25:47,520
historically

702
00:25:51,269 --> 00:25:49,840
and uh the other point i would make is

703
00:25:52,710 --> 00:25:51,279
is that in uh

704
00:25:54,310 --> 00:25:52,720
in the world where the climate is

705
00:25:56,310 --> 00:25:54,320
changing

706
00:25:57,430 --> 00:25:56,320
precipitation patterns temperature

707
00:25:59,590 --> 00:25:57,440
patterns

708
00:26:02,789 --> 00:25:59,600
ecosystems will change

709
00:26:04,710 --> 00:26:02,799
and so what a forest looks like today

710
00:26:07,430 --> 00:26:04,720
is not necessarily what it will look

711
00:26:09,350 --> 00:26:07,440
like in a half a century and we're

712
00:26:11,909 --> 00:26:09,360
already beginning to see this

713
00:26:13,830 --> 00:26:11,919

the great conifer forest in canada are

714
00:26:17,350 --> 00:26:13,840
moving farther north

715
00:26:18,549 --> 00:26:17,360
as the arctic tundra melts we're seeing

716
00:26:22,310 --> 00:26:18,559
more and more

717
00:26:25,269 --> 00:26:22,320
new species develop in the arctic tundra

718
00:26:28,950 --> 00:26:25,279
and even here in the united states

719
00:26:31,590 --> 00:26:28,960
the level the altitude at which various

720
00:26:34,789 --> 00:26:31,600
plants and trees grow

721
00:26:35,909 --> 00:26:34,799
is dramatically changing in some areas

722
00:26:39,269 --> 00:26:35,919
and so

723
00:26:44,870 --> 00:26:39,279
with changing ecosystems it will be an

724
00:26:49,590 --> 00:26:47,190
so um i think that's a really good and

725
00:26:51,909 --> 00:26:49,600
sobering point that you make bill and

726
00:26:53,669 --> 00:26:51,919
one thing that's of concern to us is

727
00:26:55,909 --> 00:26:53,679
that not only

728
00:26:58,710 --> 00:26:55,919
is fire occurrence increasing in terms

729
00:27:01,909 --> 00:26:58,720
of acreage burn but that we receive many

730
00:27:03,430 --> 00:27:01,919
anecdotal accounts of fire severity and

731
00:27:06,070 --> 00:27:03,440
intensity

732
00:27:08,549 --> 00:27:06,080
outside the range of people's experience

733
00:27:11,750 --> 00:27:08,559
which really adds to the potential risk

734
00:27:14,310 --> 00:27:11,760
to firefighters to the public and to

735
00:27:16,470 --> 00:27:14,320
ecological systems if they're being

736
00:27:19,269 --> 00:27:16,480
stressed with a a kind of disturbance

737
00:27:23,669 --> 00:27:19,279
that's outside the range of the historic

738
00:27:26,630 --> 00:27:25,029

thank you for anyone joining us i'm

739
00:27:28,230 --> 00:27:26,640
aries keck here at nasa goddard space

740
00:27:29,669 --> 00:27:28,240
flight center and as you can see behind

741
00:27:31,750 --> 00:27:29,679
me this is where some of the data comes

742
00:27:33,430 --> 00:27:31,760
in from our nasa satellites and joining

743
00:27:36,470 --> 00:27:33,440
us are a panel of experts we're also

744
00:27:40,310 --> 00:27:36,480
taking questions um on uh twitter at the

745
00:27:42,390 --> 00:27:40,320
hashtag ask nasa or the hashtag nasafire

746
00:27:44,310 --> 00:27:42,400
also in the youtube comment section and

747
00:27:46,470 --> 00:27:44,320
here on the google plus page we have a

748
00:27:48,390 --> 00:27:46,480
question here from twitter um it's from

749
00:27:51,110 --> 00:27:48,400
katie campbell she's a multimedia

750
00:27:54,310 --> 00:27:51,120
journalist at kcts9

751
00:27:57,110 --> 00:27:54,320
out in seattle and she asked uh is there

752
00:28:00,070 --> 00:27:57,120
any mapping or tracking of smoke or air

753
00:28:01,430 --> 00:28:00,080
quality decline related to wildfires i'm

754
00:28:02,870 --> 00:28:01,440
going to throw that to doug morton first

755
00:28:04,549 --> 00:28:02,880
because i know he's standing and it's

756
00:28:07,110 --> 00:28:04,559
essentially sitting in front of a wall

757
00:28:09,590 --> 00:28:07,120
of computer models but i believe keaty's

758
00:28:11,510 --> 00:28:09,600
katie campbell's question is more about

759
00:28:13,269 --> 00:28:11,520
ground level pollution and not

760
00:28:15,909 --> 00:28:13,279
necessarily the kind of pollution that

761
00:28:18,070 --> 00:28:15,919
you studied doug or do you study both

762
00:28:20,710 --> 00:28:18,080
well the pollution that we see that

763
00:28:22,470 --> 00:28:20,720

comes from fires impacts us here and the

764
00:28:24,470 --> 00:28:22,480
air we breathe in the lower boundary

765
00:28:27,269 --> 00:28:24,480
layer but obviously also at times can

766
00:28:28,950 --> 00:28:27,279
get transported around the entire globe

767
00:28:30,470 --> 00:28:28,960
and so yes i'm sitting in front of an

768
00:28:32,470 --> 00:28:30,480
image showing fires from the last 10

769
00:28:34,149 --> 00:28:32,480
days and you can see the

770
00:28:36,549 --> 00:28:34,159
extent of fires especially in southern

771
00:28:38,310 --> 00:28:36,559
africa those are low intensity savannah

772
00:28:39,510 --> 00:28:38,320
fires these are regions that burn every

773
00:28:41,269 --> 00:28:39,520
year

774
00:28:43,190 --> 00:28:41,279
yes one of the important things that we

775
00:28:45,110 --> 00:28:43,200
do track and where nasa satellite data

776
00:28:47,190 --> 00:28:45,120
are provided not just to nasa scientists

777
00:28:49,750 --> 00:28:47,200
but also to the naval research lab it's

778
00:28:50,950 --> 00:28:49,760
looking at operational meteorology and

779
00:28:52,389 --> 00:28:50,960
navigation

780
00:28:57,430 --> 00:28:52,399
as well as the fact that we're following

781
00:29:01,430 --> 00:28:59,430
interesting and slash dangerous uh

782
00:29:03,190 --> 00:29:01,440
plumes of both dust and smoke that come

783
00:29:05,350 --> 00:29:03,200
from fires in africa and transit the

784
00:29:07,669 --> 00:29:05,360
atlantic and uh influence the amazon

785
00:29:09,750 --> 00:29:07,679
region as well as fires and industrial

786
00:29:12,070 --> 00:29:09,760
pollution that crosses the pacific ocean

787
00:29:13,510 --> 00:29:12,080
from areas of southeast asia just

788
00:29:15,909 --> 00:29:13,520

recently there have been two

789
00:29:18,630 --> 00:29:15,919
important examples one with fires in

790
00:29:20,789 --> 00:29:18,640
sumatra inundating areas of singapore

791
00:29:23,110 --> 00:29:20,799
with the kinds of dense

792
00:29:24,950 --> 00:29:23,120
smoke and dangerous levels of

793
00:29:27,430 --> 00:29:24,960
particulate matter and surface level

794
00:29:28,630 --> 00:29:27,440
ozone in terms of public health impacts

795
00:29:30,789 --> 00:29:28,640
the kinds of things that haven't been

796
00:29:32,470 --> 00:29:30,799
seen since the late 1990s in a very

797
00:29:35,830 --> 00:29:32,480
large el nino

798
00:29:38,070 --> 00:29:35,840
event in 1997 1998 so that juxtaposition

799
00:29:40,870 --> 00:29:38,080
of having large cities in regions where

800
00:29:42,950 --> 00:29:40,880
wildfires especially wildfires that can

801
00:29:45,269 --> 00:29:42,960
generate quite a bit of smoke

802
00:29:47,590 --> 00:29:45,279
really drives home this issue of how

803
00:29:49,590 --> 00:29:47,600
fires are impacting people in the local

804
00:29:51,510 --> 00:29:49,600
scale and that those same aerosols can

805
00:29:58,470 --> 00:29:51,520
be transported globally impacting

806
00:30:02,149 --> 00:29:59,990
excellent we have we have another

807
00:30:03,750 --> 00:30:02,159
question coming in from youtube um it's

808
00:30:05,830 --> 00:30:03,760
jack ring again

809
00:30:07,590 --> 00:30:05,840
and that question is have the models

810
00:30:10,470 --> 00:30:07,600
used to project the next

811
00:30:12,630 --> 00:30:10,480
few decades of wildfires been used to

812
00:30:14,389 --> 00:30:12,640
look backwards over the last 50 years to

813
00:30:16,230 --> 00:30:14,399

actually see if they predicted the

814
00:30:18,149 --> 00:30:16,240
reality i mean after that question first

815
00:30:19,350 --> 00:30:18,159
to doug but then i imagine that uh bill

816
00:30:21,430 --> 00:30:19,360
and elizabeth may have something to say

817
00:30:23,510 --> 00:30:21,440
about that as well i think it also sums

818
00:30:25,110 --> 00:30:23,520
up on just how do you check that your

819
00:30:29,669 --> 00:30:25,120
forecasts and your models are actually

820
00:30:33,350 --> 00:30:31,510
well we talked today about how fire in

821
00:30:35,350 --> 00:30:33,360
some ways is a simple equation and other

822
00:30:37,830 --> 00:30:35,360
ways fire is a complex equation i mean

823
00:30:39,750 --> 00:30:37,840
some place right now is burning

824
00:30:41,269 --> 00:30:39,760
and that's true this year like every

825
00:30:42,710 --> 00:30:41,279
other year it's one of the reasons why

826
00:30:44,230 --> 00:30:42,720
it's so valuable to have a fleet of

827
00:30:46,070 --> 00:30:44,240
satellites that are observing fires

828
00:30:47,669 --> 00:30:46,080
around the globe

829
00:30:49,430 --> 00:30:47,679
that said there are certainly conditions

830
00:30:51,510 --> 00:30:49,440
and things which we feel are much more

831
00:30:52,789 --> 00:30:51,520
predictable if you get santa ana winds

832
00:30:54,549 --> 00:30:52,799
in southern california you're very

833
00:30:56,310 --> 00:30:54,559
likely to have fires

834
00:30:58,230 --> 00:30:56,320
and again if we look out of regions and

835
00:31:00,230 --> 00:30:58,240
across the globe areas that are

836
00:31:02,870 --> 00:31:00,240
projected to get hotter and drier are

837
00:31:04,789 --> 00:31:02,880
certainly areas where the conditions are

838
00:31:06,230 --> 00:31:04,799

set the climate piece of the fire

839
00:31:07,669 --> 00:31:06,240
triangle that elizabeth talked about or

840
00:31:09,750 --> 00:31:07,679
the fire equation that the bill

841
00:31:11,830 --> 00:31:09,760
mentioned um that's almost out of the

842
00:31:13,430 --> 00:31:11,840
picture now if you imagine that humans

843
00:31:15,669 --> 00:31:13,440
and their role in

844
00:31:17,750 --> 00:31:15,679
igniting these fires are also increasing

845
00:31:19,510 --> 00:31:17,760
in some of these fire prone areas

846
00:31:21,190 --> 00:31:19,520
you certainly think that there's a

847
00:31:24,149 --> 00:31:21,200
pretty strong set of indicators that

848
00:31:26,149 --> 00:31:24,159
we're headed for a world with more fire

849
00:31:27,510 --> 00:31:26,159
how do we check that information again

850
00:31:29,269 --> 00:31:27,520
one of the unique things about having

851
00:31:30,470 --> 00:31:29,279
this long history of nasa satellite data

852
00:31:32,789 --> 00:31:30,480
is that we can actually go back and

853
00:31:34,470 --> 00:31:32,799
compare this year to previous years and

854
00:31:36,789 --> 00:31:34,480
how much fire we've seen in any one

855
00:31:38,070 --> 00:31:36,799
specific part of the globe

856
00:31:39,990 --> 00:31:38,080
i mentioned some of the work we do in

857
00:31:41,909 --> 00:31:40,000
the brazilian amazon and that is a case

858
00:31:44,070 --> 00:31:41,919
where we make a projection of how much

859
00:31:46,070 --> 00:31:44,080
fire activity we expect to see based on

860
00:31:48,549 --> 00:31:46,080
how the climate system has set up which

861
00:31:50,549 --> 00:31:48,559
regions are drier today than they are

862
00:31:52,870 --> 00:31:50,559
normally and so those areas are primed

863
00:31:54,630 --> 00:31:52,880

for for more fire in places where where

864
00:31:56,149 --> 00:31:54,640
fuels the kinds of things that you know

865
00:31:57,750 --> 00:31:56,159
we talk a lot about in the western us

866
00:31:59,350 --> 00:31:57,760
but is important in all regions for

867
00:32:01,269 --> 00:31:59,360
fires fuels are not limiting in a

868
00:32:02,789 --> 00:32:01,279
tropical rainforest you just need

869
00:32:04,710 --> 00:32:02,799
conditions that are dry enough to let

870
00:32:06,549 --> 00:32:04,720
those fires burn so we can actually go

871
00:32:09,430 --> 00:32:06,559
back and check so our projections from

872
00:32:11,110 --> 00:32:09,440
last year for uh the previous year were

873
00:32:12,549 --> 00:32:11,120
for a below average fire year and it

874
00:32:14,230 --> 00:32:12,559
turns out that the fires we observed

875
00:32:15,269 --> 00:32:14,240
with nasa satellites told that same

876
00:32:16,710 --> 00:32:15,279
story

877
00:32:19,190 --> 00:32:16,720
this is a year where we projected

878
00:32:21,190 --> 00:32:19,200
actually a much higher fire year for the

879
00:32:22,149 --> 00:32:21,200
brazilian amazon and parts of the living

880
00:32:23,909 --> 00:32:22,159
amazon

881
00:32:25,590 --> 00:32:23,919
and we'll wait and see certainly that's

882
00:32:27,190 --> 00:32:25,600
the kind of information we're sharing

883
00:32:29,750 --> 00:32:27,200
broadly with people as we expect this

884
00:32:31,350 --> 00:32:29,760
region to be at higher risk of fires

885
00:32:33,269 --> 00:32:31,360
and then the nasa satellite data will

886
00:32:37,590 --> 00:32:33,279
tell the story about how this year

887
00:32:41,190 --> 00:32:39,750
thanks so much doug people we continue

888
00:32:44,149 --> 00:32:41,200

to bring the questions in we have quite

889
00:32:46,630 --> 00:32:44,159
a few coming in uh this one is from the

890
00:32:48,070 --> 00:32:46,640
comment section of youtube and i'm going

891
00:32:50,710 --> 00:32:48,080
to throw it to bill patzer our

892
00:32:52,310 --> 00:32:50,720
climatologist there at nasa's jpl lab

893
00:32:57,029 --> 00:32:52,320
out in california

894
00:32:58,870 --> 00:32:57,039
iron 69 iron 69 asks is elevated co2

895
00:33:01,750 --> 00:32:58,880
going to increase the rate of plant

896
00:33:03,350 --> 00:33:01,760
growth significantly and then i imagine

897
00:33:05,110 --> 00:33:03,360
that that could have an effect on

898
00:33:06,950 --> 00:33:05,120
wildfires bill

899
00:33:09,509 --> 00:33:06,960
is increased co2 going to actually

900
00:33:10,710 --> 00:33:09,519
change plant growth around the world

901
00:33:12,950 --> 00:33:10,720
well you know that's a that's an

902
00:33:15,750 --> 00:33:12,960
excellent question i just read a really

903
00:33:17,669 --> 00:33:15,760
good paper about uh when you look at the

904
00:33:20,789 --> 00:33:17,679
growth of co2

905
00:33:22,630 --> 00:33:20,799
it has a very strong annual signal

906
00:33:25,110 --> 00:33:22,640
where there's uh in the northern

907
00:33:26,470 --> 00:33:25,120
hemisphere there's a tremendous amount

908
00:33:31,350 --> 00:33:26,480
of

909
00:33:34,310 --> 00:33:31,360
and in the northern hemisphere winter

910
00:33:36,470 --> 00:33:34,320
just the opposite there's a

911
00:33:38,549 --> 00:33:36,480
co2 that's

912
00:33:41,909 --> 00:33:38,559
gas to the atmosphere so

913
00:33:44,230 --> 00:33:41,919

they characterize it that rise and dip

914
00:33:47,190 --> 00:33:44,240
is becoming larger in other words the

915
00:33:48,789 --> 00:33:47,200
earth is taking deeper breaths

916
00:33:49,909 --> 00:33:48,799
of co2

917
00:33:50,870 --> 00:33:49,919
all right

918
00:33:54,470 --> 00:33:50,880
and

919
00:33:55,590 --> 00:33:54,480
so the nature of the cycle is changing

920
00:33:56,870 --> 00:33:55,600
all right

921
00:33:59,110 --> 00:33:56,880
but uh

922
00:34:00,950 --> 00:33:59,120
the the fact is is that it's slowly

923
00:34:04,230 --> 00:34:00,960
increasing you know

924
00:34:05,590 --> 00:34:04,240
this year co2 finally reached 400 parts

925
00:34:09,589 --> 00:34:05,600
per million

926
00:34:12,310 --> 00:34:09,599
and that's a that's almost a 40 increase

927
00:34:14,149 --> 00:34:12,320
in co2 in my lifetime

928
00:34:17,510 --> 00:34:14,159
which is because i'm the oldest person

929
00:34:18,629 --> 00:34:17,520
here i can say that right but the

930
00:34:22,790 --> 00:34:18,639
so

931
00:34:25,510 --> 00:34:22,800
co2 is having a huge impact

932
00:34:26,470 --> 00:34:25,520
because of course it's making a warmer

933
00:34:28,470 --> 00:34:26,480
world

934
00:34:31,589 --> 00:34:28,480
most of that heat is being

935
00:34:33,909 --> 00:34:31,599
absorbed by the oceans and so rising sea

936
00:34:35,430 --> 00:34:33,919
level which has been eight inches in the

937
00:34:37,190 --> 00:34:35,440
past century

938
00:34:40,869 --> 00:34:37,200

and so the

939
00:34:42,230 --> 00:34:40,879
the nature of all the major cycles is

940
00:34:45,349 --> 00:34:42,240
changing now

941
00:34:47,909 --> 00:34:45,359
the ascent and ecosystem the nature of

942
00:34:51,430 --> 00:34:47,919
ecosystems are changing and so we'll

943
00:34:56,629 --> 00:34:54,470
now the national cohesive wildland fire

944
00:34:58,470 --> 00:34:56,639
strategy has apparently three goals

945
00:35:00,390 --> 00:34:58,480
resilient landscapes

946
00:35:03,270 --> 00:35:00,400
fire adapted communities and an

947
00:35:04,950 --> 00:35:03,280
effective inefficient wildfire response

948
00:35:07,030 --> 00:35:04,960
elizabeth reinhardt there at the u.s

949
00:35:08,550 --> 00:35:07,040
ford's forest service can you talk a

950
00:35:11,430 --> 00:35:08,560
little bit about what it would mean to

951
00:35:13,430 --> 00:35:11,440
have a fire adapted community i imagine

952
00:35:14,950 --> 00:35:13,440
it's more than just keeping your house

953
00:35:17,910 --> 00:35:14,960
particularly wet

954
00:35:21,829 --> 00:35:17,920
right a fire adapted community like a

955
00:35:23,670 --> 00:35:21,839
fire resilient landscape is one that can

956
00:35:27,270 --> 00:35:23,680
experience wildfire and not be

957
00:35:29,829 --> 00:35:27,280
devastated by it so um you know in the

958
00:35:31,829 --> 00:35:29,839
fire management community historically

959
00:35:34,470 --> 00:35:31,839
we're very very good at putting out

960
00:35:37,589 --> 00:35:34,480
fires and in fact our initial attack

961
00:35:40,630 --> 00:35:37,599
um success rate is like 98 or something

962
00:35:42,829 --> 00:35:40,640
that means that 98 of the starts that we

963
00:35:44,550 --> 00:35:42,839

respond to we just put them right out

964
00:35:46,870 --> 00:35:44,560
but

965
00:35:49,349 --> 00:35:46,880
experience is beginning to show us that

966
00:35:51,990 --> 00:35:49,359
that long success rate

967
00:35:53,910 --> 00:35:52,000
um may not be completely sustainable

968
00:35:55,990 --> 00:35:53,920
that those few fires that escape and the

969
00:35:56,790 --> 00:35:56,000
proportion that escapes is not seeming

970
00:35:59,349 --> 00:35:56,800
to

971
00:36:02,069 --> 00:35:59,359
grow but what is happening is that the

972
00:36:03,990 --> 00:36:02,079
ones that escape are bigger than they've

973
00:36:06,230 --> 00:36:04,000
been in the past we're having more big

974
00:36:08,310 --> 00:36:06,240
fires and the big fires are getting

975
00:36:12,630 --> 00:36:08,320
bigger that's what's causing our great

976
00:36:15,030 --> 00:36:12,640
increases in acres burn so we really

977
00:36:17,349 --> 00:36:15,040
have to plan not just to respond to

978
00:36:18,310 --> 00:36:17,359
fires not just to put fires out

979
00:36:21,910 --> 00:36:18,320
but

980
00:36:23,430 --> 00:36:21,920
we need to be proactive about planning

981
00:36:27,030 --> 00:36:23,440
for

982
00:36:28,390 --> 00:36:27,040
face of fire

983
00:36:30,870 --> 00:36:28,400
and in

984
00:36:33,030 --> 00:36:30,880
in an ecological sense that that makes

985
00:36:33,910 --> 00:36:33,040
total sense because we know most of our

986
00:36:37,990 --> 00:36:33,920
wild

987
00:36:39,670 --> 00:36:38,000
ecosystems evolved as fire adapted so 94

988
00:36:42,390 --> 00:36:39,680

of our wildlands

989
00:36:44,710 --> 00:36:42,400
fireplace a fundamental ecological role

990
00:36:48,069 --> 00:36:44,720
so if we manage those forests to be

991
00:36:49,910 --> 00:36:48,079
healthy they can withstand fire and come

992
00:36:52,950 --> 00:36:49,920
back and continue to be healthy but what

993
00:36:55,270 --> 00:36:52,960
about communities we as people also need

994
00:36:57,670 --> 00:36:55,280
to learn to be fire adapted just as

995
00:36:59,349 --> 00:36:57,680
ponderosa pine trees might be and what

996
00:37:01,349 --> 00:36:59,359
does that involve it involves a number

997
00:37:03,030 --> 00:37:01,359
of things it involves managing the

998
00:37:04,790 --> 00:37:03,040
vegetation

999
00:37:07,510 --> 00:37:04,800
immediately around

1000
00:37:09,750 --> 00:37:07,520
your residence and it involves

1001
00:37:12,069 --> 00:37:09,760
constructing homes out of less flammable

1002
00:37:13,910 --> 00:37:12,079
materials little things like having

1003
00:37:15,750 --> 00:37:13,920
closed gutters instead of gutters that

1004
00:37:20,230 --> 00:37:15,760
are full of pine needles can make a big

1005
00:37:24,150 --> 00:37:22,069
another aspect of our adapted

1006
00:37:27,109 --> 00:37:24,160
communities is planning um

1007
00:37:29,670 --> 00:37:27,119
communications ahead of time and also

1008
00:37:32,310 --> 00:37:29,680
planning so that there's access in and

1009
00:37:34,630 --> 00:37:32,320
out of the community uh a community that

1010
00:37:37,349 --> 00:37:34,640
only has one access road going into it

1011
00:37:40,470 --> 00:37:37,359
doesn't tend to be very well adapted to

1012
00:37:44,150 --> 00:37:42,390
thank you so much elizabeth for anyone i

1013
00:37:45,430 --> 00:37:44,160

could add something to that please go

1014
00:37:46,790 --> 00:37:45,440
right ahead um let me just remind

1015
00:37:49,910 --> 00:37:46,800
everyone please keep the questions

1016
00:37:51,910 --> 00:37:49,920
coming in both on youtube and on twitter

1017
00:37:54,230 --> 00:37:51,920
and we'll be uh just we're following

1018
00:37:55,750 --> 00:37:54,240
along on hashtag nasafire and i'm going

1019
00:37:57,589 --> 00:37:55,760
to pass it right off to bill patzer

1020
00:37:59,510 --> 00:37:57,599
there at nasa's jpl lab he's our

1021
00:38:01,990 --> 00:37:59,520
climatologist joining us today go ahead

1022
00:38:04,310 --> 00:38:02,000
bill well there's a growing tendency in

1023
00:38:06,470 --> 00:38:04,320
the american west for more and more

1024
00:38:09,589 --> 00:38:06,480
urban and suburban development

1025
00:38:10,630 --> 00:38:09,599
not only near wildlands but into wild

1026
00:38:13,030 --> 00:38:10,640
lands

1027
00:38:15,109 --> 00:38:13,040
all right and this is what i call high

1028
00:38:17,430 --> 00:38:15,119
risk zoning

1029
00:38:19,910 --> 00:38:17,440
all right people that like to build

1030
00:38:22,950 --> 00:38:19,920
their communities in things that look

1031
00:38:23,750 --> 00:38:22,960
like national forests all right

1032
00:38:25,829 --> 00:38:23,760
and

1033
00:38:27,030 --> 00:38:25,839
that's a that's a dangerous business

1034
00:38:29,430 --> 00:38:27,040
because

1035
00:38:31,510 --> 00:38:29,440
all these lands were made to burn every

1036
00:38:34,310 --> 00:38:31,520
20 to 30 years

1037
00:38:35,589 --> 00:38:34,320
now you can protect yourself

1038
00:38:39,109 --> 00:38:35,599

by having

1039
00:38:41,270 --> 00:38:39,119
more stringent construction standards in

1040
00:38:43,670 --> 00:38:41,280
other words you can build to protect

1041
00:38:44,630 --> 00:38:43,680
yourself against fire

1042
00:38:48,710 --> 00:38:44,640
and

1043
00:38:49,750 --> 00:38:48,720
not

1044
00:38:52,550 --> 00:38:49,760
zoned

1045
00:38:54,310 --> 00:38:52,560
they're not legalized and so they're at

1046
00:38:56,790 --> 00:38:54,320
high risk the other thing is in

1047
00:38:59,510 --> 00:38:56,800
california you're required to build

1048
00:39:01,750 --> 00:38:59,520
defensible areas if you live near

1049
00:39:03,109 --> 00:39:01,760
grasslands and wildlands

1050
00:39:04,230 --> 00:39:03,119
and that's another thing that's not

1051
00:39:06,870 --> 00:39:04,240
enforced

1052
00:39:08,710 --> 00:39:06,880
and so the consequence of this is that

1053
00:39:11,990 --> 00:39:08,720
there is just too much

1054
00:39:13,589 --> 00:39:12,000
expensive firefighting going on in the

1055
00:39:16,870 --> 00:39:13,599
american west

1056
00:39:18,630 --> 00:39:16,880
defending homes that 30 years ago this

1057
00:39:19,910 --> 00:39:18,640
was wild land

1058
00:39:21,430 --> 00:39:19,920
now it's

1059
00:39:23,030 --> 00:39:21,440
it's uh

1060
00:39:25,349 --> 00:39:23,040
it's expensive

1061
00:39:27,190 --> 00:39:25,359
uh communities

1062
00:39:29,349 --> 00:39:27,200
that

1063
00:39:31,270 --> 00:39:29,359

30 years ago were not allowed to exist

1064
00:39:32,550 --> 00:39:31,280
in these wild areas

1065
00:39:35,190 --> 00:39:32,560
and so uh

1066
00:39:39,670 --> 00:39:35,200
you know this is uh it's dangerous it's

1067
00:39:43,190 --> 00:39:41,430
thank you so much phil um just from

1068
00:39:44,710 --> 00:39:43,200
people dialing now i'm aries keck here

1069
00:39:46,310 --> 00:39:44,720
at nasa goddard space flight center and

1070
00:39:48,790 --> 00:39:46,320
we're joined by bill patzert out at

1071
00:39:51,190 --> 00:39:48,800
nasa's jpl lab he's a climatologist doug

1072
00:39:53,430 --> 00:39:51,200
morton also here at nasa goddard and

1073
00:39:55,190 --> 00:39:53,440
elizabeth reinhardt who's with the u.s

1074
00:39:56,790 --> 00:39:55,200
forest service

1075
00:39:59,109 --> 00:39:56,800
we have a question coming in and i'd

1076
00:40:01,190 --> 00:39:59,119
like to sort of throw this to doug

1077
00:40:04,790 --> 00:40:01,200
that question is uh could you comment a

1078
00:40:07,109 --> 00:40:04,800
little bit doug on the use of nd ndvi

1079
00:40:09,270 --> 00:40:07,119
for anyone listening that is a measure

1080
00:40:10,710 --> 00:40:09,280
of vegetation and then also soil

1081
00:40:13,510 --> 00:40:10,720
moisture

1082
00:40:15,510 --> 00:40:13,520
to asset to assess drought impacts and

1083
00:40:16,710 --> 00:40:15,520
pine beetle infestations i talk i'm

1084
00:40:18,230 --> 00:40:16,720
going to ask you to back out a little

1085
00:40:19,589 --> 00:40:18,240
bit from going right into those two

1086
00:40:21,670 --> 00:40:19,599
particular

1087
00:40:23,670 --> 00:40:21,680
fields of data and pine beetles and just

1088
00:40:24,390 --> 00:40:23,680

talk a little bit about how nasa has

1089
00:40:29,910 --> 00:40:24,400
been

1090
00:40:31,990 --> 00:40:29,920
satellites and then going more specific

1091
00:40:34,310 --> 00:40:32,000
about how possibly effects like pine

1092
00:40:35,910 --> 00:40:34,320
beetles and soil moisture can be

1093
00:40:38,470 --> 00:40:35,920
measured from space and then used in

1094
00:40:40,470 --> 00:40:38,480
these wildfires

1095
00:40:43,190 --> 00:40:40,480
take a deep breath that's a lot to think

1096
00:40:44,790 --> 00:40:43,200
about but it's true that we do use our

1097
00:40:46,710 --> 00:40:44,800
satellites to study the health and

1098
00:40:48,550 --> 00:40:46,720
productivity of vegetation that's in

1099
00:40:50,470 --> 00:40:48,560
part what you understand from the idea

1100
00:40:52,790 --> 00:40:50,480
if you can see green vegetation you can

1101
00:40:54,150 --> 00:40:52,800
see brown or dried out vegetation and

1102
00:40:56,230 --> 00:40:54,160
the way that we use our satellites from

1103
00:40:57,990 --> 00:40:56,240
space that helps us to understand quite

1104
00:40:59,670 --> 00:40:58,000
a bit about the vulnerability of some of

1105
00:41:01,190 --> 00:40:59,680
these forested landscapes in particular

1106
00:41:03,750 --> 00:41:01,200
to fire

1107
00:41:05,829 --> 00:41:03,760
ndvi is just one measure of how much

1108
00:41:07,109 --> 00:41:05,839
green vegetation we have and that's a

1109
00:41:09,589 --> 00:41:07,119
measurement we've been making for

1110
00:41:11,829 --> 00:41:09,599
decades now since the launch of the

1111
00:41:13,589 --> 00:41:11,839
earliest satellites in the early 1970s

1112
00:41:15,190 --> 00:41:13,599
so we have an idea about how our

1113
00:41:16,950 --> 00:41:15,200

planet's changing which areas are

1114
00:41:19,430 --> 00:41:16,960
responding to the variability we see in

1115
00:41:21,430 --> 00:41:19,440
climate by growing more vegetation or in

1116
00:41:23,990 --> 00:41:21,440
areas like the driest parts of the

1117
00:41:25,829 --> 00:41:24,000
mountain west areas where those same

1118
00:41:28,550 --> 00:41:25,839
beetles are killing large areas of

1119
00:41:30,710 --> 00:41:28,560
forest making that tinder dry region

1120
00:41:32,390 --> 00:41:30,720
that much more vulnerable to fires

1121
00:41:34,230 --> 00:41:32,400
we have a couple of new satellites that

1122
00:41:36,470 --> 00:41:34,240
we've been using now for only the last

1123
00:41:38,230 --> 00:41:36,480
decade to look at how water is stored in

1124
00:41:39,910 --> 00:41:38,240
the landscape

1125
00:41:42,550 --> 00:41:39,920
i will point anyone who's interested to

1126
00:41:44,470 --> 00:41:42,560
learn more from the grace satellites

1127
00:41:45,750 --> 00:41:44,480
a really amazing set of tools that allow

1128
00:41:47,589 --> 00:41:45,760
us to look at how

1129
00:41:50,390 --> 00:41:47,599
water that's stored in the ground is

1130
00:41:52,870 --> 00:41:50,400
changing season to season year to year

1131
00:41:54,710 --> 00:41:52,880
so for very large river basins like the

1132
00:41:56,390 --> 00:41:54,720
mississippi or the amazon we can

1133
00:41:58,630 --> 00:41:56,400
actually see whether this is a drought

1134
00:42:00,630 --> 00:41:58,640
year or a flood year just by changes in

1135
00:42:02,870 --> 00:42:00,640
gravity since that water and the flow of

1136
00:42:04,470 --> 00:42:02,880
water in those systems is very heavy

1137
00:42:06,230 --> 00:42:04,480
and things like mountains although they

1138
00:42:08,550 --> 00:42:06,240

influence the earth's gravity are pretty

1139
00:42:10,150 --> 00:42:08,560
fixed so we can put those different

1140
00:42:12,630 --> 00:42:10,160
pieces of the puzzle together again

1141
00:42:14,470 --> 00:42:12,640
using nasa satellites to study rainfall

1142
00:42:16,710 --> 00:42:14,480
to look at how that rainfall the memory

1143
00:42:18,630 --> 00:42:16,720
of that rainfall in the lands

1144
00:42:20,230 --> 00:42:18,640
through the measure of soil moisture and

1145
00:42:22,230 --> 00:42:20,240
then how the vegetation on those

1146
00:42:23,750 --> 00:42:22,240
landscapes is responding

1147
00:42:26,150 --> 00:42:23,760
each of those pieces comes together to

1148
00:42:27,670 --> 00:42:26,160
help us understand the risks of fire for

1149
00:42:29,589 --> 00:42:27,680
people living in the mountain west

1150
00:42:31,190 --> 00:42:29,599
beetles are a reality i think that comes

1151
00:42:33,349 --> 00:42:31,200
back again to a point that bill made

1152
00:42:35,430 --> 00:42:33,359
earlier thinking about how climate is

1153
00:42:38,230 --> 00:42:35,440
influen climate change on our warmer

1154
00:42:40,309 --> 00:42:38,240
world uh is altering a wide range of

1155
00:42:42,790 --> 00:42:40,319
systems um

1156
00:42:45,030 --> 00:42:42,800
warmer winters allow beetles to over wet

1157
00:42:47,030 --> 00:42:45,040
over winter and then kill more trees and

1158
00:42:51,589 --> 00:42:47,040
those dead trees are then primed for

1159
00:42:55,829 --> 00:42:53,510
now we have a question coming in from

1160
00:42:57,750 --> 00:42:55,839
twitter it is

1161
00:43:00,069 --> 00:42:57,760
wondering what is possibly the biggest

1162
00:43:01,510 --> 00:43:00,079
misconception that u.s scientists have

1163
00:43:03,589 --> 00:43:01,520

heard about the connection between

1164
00:43:05,190 --> 00:43:03,599
wildfires and climate change i'm going

1165
00:43:06,710 --> 00:43:05,200
to throw it to our climatologists either

1166
00:43:08,950 --> 00:43:06,720
bill first but i'd love to hear what

1167
00:43:10,390 --> 00:43:08,960
elizabeth has to say and doug has to say

1168
00:43:12,390 --> 00:43:10,400
about that too we're talking about

1169
00:43:14,309 --> 00:43:12,400
misconceptions here uh when it comes to

1170
00:43:17,030 --> 00:43:14,319
the connection between climate change

1171
00:43:19,510 --> 00:43:17,040
and wildfires bill

1172
00:43:21,270 --> 00:43:19,520
well you know climate change is is

1173
00:43:23,430 --> 00:43:21,280
definitely the real deal

1174
00:43:24,870 --> 00:43:23,440
we're living in a warmer world

1175
00:43:27,750 --> 00:43:24,880
and

1176
00:43:29,589 --> 00:43:27,760
climate patterns all over the planet are

1177
00:43:30,870 --> 00:43:29,599
subtly changing

1178
00:43:33,030 --> 00:43:30,880
but

1179
00:43:35,430 --> 00:43:33,040
every time you see a fire or you see a

1180
00:43:37,589 --> 00:43:35,440
hurricane or a tornado

1181
00:43:39,670 --> 00:43:37,599
and you turn on the evening news and

1182
00:43:40,630 --> 00:43:39,680
they tell you you're living in a wilder

1183
00:43:42,710 --> 00:43:40,640
world

1184
00:43:45,190 --> 00:43:42,720
because of climate change

1185
00:43:47,510 --> 00:43:45,200
that's not entirely true

1186
00:43:49,829 --> 00:43:47,520
because the other thing that happens

1187
00:43:52,309 --> 00:43:49,839
is that there are more and more of us

1188
00:43:55,349 --> 00:43:52,319

living in harm's way

1189
00:43:57,510 --> 00:43:55,359
anybody that lives within 18 inches of

1190
00:43:59,910 --> 00:43:57,520
sea level on the american gulf coast or

1191
00:44:02,550 --> 00:43:59,920
the east coast all right

1192
00:44:04,950 --> 00:44:02,560
is definitely asking for it where if you

1193
00:44:06,790 --> 00:44:04,960
live outside oklahoma city without a

1194
00:44:10,230 --> 00:44:06,800
storm shelter

1195
00:44:12,630 --> 00:44:10,240
or in the american west if you build in

1196
00:44:14,950 --> 00:44:12,640
wild areas that historically burned

1197
00:44:16,950 --> 00:44:14,960
every 20 to 30 years

1198
00:44:18,069 --> 00:44:16,960
and so a big part of this

1199
00:44:20,069 --> 00:44:18,079
is just

1200
00:44:23,190 --> 00:44:20,079
tremendous growth in population

1201
00:44:24,230 --> 00:44:23,200
population density and people moving

1202
00:44:26,630 --> 00:44:24,240
into

1203
00:44:27,910 --> 00:44:26,640
areas that historically

1204
00:44:29,349 --> 00:44:27,920
have flooded

1205
00:44:31,670 --> 00:44:29,359
and burned

1206
00:44:34,069 --> 00:44:31,680
you know in southern california in 1950

1207
00:44:35,510 --> 00:44:34,079
there were four million people

1208
00:44:37,349 --> 00:44:35,520
now there are more than 20 million

1209
00:44:38,870 --> 00:44:37,359
people between san diego and santa

1210
00:44:40,550 --> 00:44:38,880
barbara

1211
00:44:42,069 --> 00:44:40,560
and more and more of them are living in

1212
00:44:44,790 --> 00:44:42,079
harm's way

1213
00:44:46,870 --> 00:44:44,800

and so climate change is the real deal

1214
00:44:49,510 --> 00:44:46,880
but human behavior

1215
00:44:50,790 --> 00:44:49,520
is the dominant factor

1216
00:44:51,910 --> 00:44:50,800
i'm going to jump in there for a second

1217
00:44:53,750 --> 00:44:51,920
i know i was going to throw it to both

1218
00:44:55,670 --> 00:44:53,760
elizabeth and doug but we have a comment

1219
00:44:59,349 --> 00:44:55,680
question in from youtube that leads to

1220
00:45:01,030 --> 00:44:59,359
this topic um while matt haldane asked

1221
00:45:03,030 --> 00:45:01,040
that uh wildfires have traditionally

1222
00:45:04,950 --> 00:45:03,040
contributed a small amount of damage

1223
00:45:07,030 --> 00:45:04,960
compared to other natural disasters like

1224
00:45:08,470 --> 00:45:07,040
hurricanes and flooding and so we've

1225
00:45:10,230 --> 00:45:08,480
answered this a little bit but i'd like

1226
00:45:12,230 --> 00:45:10,240
to elizabeth address a little more are

1227
00:45:15,030 --> 00:45:12,240
we going to see wildfires becoming sort

1228
00:45:16,790 --> 00:45:15,040
of a greater piece of our overall damage

1229
00:45:18,550 --> 00:45:16,800
pie happening here in the u.s in the

1230
00:45:23,030 --> 00:45:18,560
coming years

1231
00:45:24,870 --> 00:45:23,040
some people certainly think so um and uh

1232
00:45:28,069 --> 00:45:24,880
and to be clear that

1233
00:45:30,069 --> 00:45:28,079
the direct costs of wildfire in terms of

1234
00:45:32,950 --> 00:45:30,079
putting out the fire are only a small

1235
00:45:33,990 --> 00:45:32,960
piece of what wildfire costs society in

1236
00:45:35,990 --> 00:45:34,000
terms of

1237
00:45:37,910 --> 00:45:36,000
damaged watersheds

1238
00:45:40,069 --> 00:45:37,920

subsequent flooding

1239
00:45:43,510 --> 00:45:40,079
and you know damaged utilities things

1240
00:45:44,390 --> 00:45:43,520
like that but um but it's also likely

1241
00:45:46,710 --> 00:45:44,400
that

1242
00:45:48,870 --> 00:45:46,720
other natural hazards may respond to

1243
00:45:50,230 --> 00:45:48,880
climate change with an increased

1244
00:45:52,150 --> 00:45:50,240
signal so

1245
00:45:53,589 --> 00:45:52,160
so i don't really like to speculate but

1246
00:45:55,750 --> 00:45:53,599
i would like to add something to what

1247
00:45:58,390 --> 00:45:55,760
bill said which is that um

1248
00:46:01,030 --> 00:45:58,400
you know any given fire just like any

1249
00:46:03,270 --> 00:46:01,040
storm we can't really say oh this is a

1250
00:46:04,790 --> 00:46:03,280
climate change cause

1251
00:46:06,790 --> 00:46:04,800
it might have you know

1252
00:46:09,670 --> 00:46:06,800
we know that um

1253
00:46:12,710 --> 00:46:09,680
fire in general is episodic and highly

1254
00:46:14,390 --> 00:46:12,720
variable so it's the fires we see

1255
00:46:16,230 --> 00:46:14,400
might have been seen 100 years ago or

1256
00:46:18,630 --> 00:46:16,240
200 years ago

1257
00:46:21,750 --> 00:46:18,640
any individual fire but what i think we

1258
00:46:24,150 --> 00:46:21,760
need to keep our eye on is trends and um

1259
00:46:27,589 --> 00:46:24,160
and when we look at fire occurrence in

1260
00:46:29,829 --> 00:46:27,599
the west we do see a very very strong

1261
00:46:32,870 --> 00:46:29,839
trend in the last 25 years that i think

1262
00:46:36,069 --> 00:46:34,390
doug i'd like to throw a question to you

1263
00:46:37,430 --> 00:46:36,079

especially when it comes to we've been

1264
00:46:38,870 --> 00:46:37,440
talking a lot about climate change in

1265
00:46:44,150 --> 00:46:38,880
the next few

1266
00:46:45,990 --> 00:46:44,160
about the ipcc report that's going to be

1267
00:46:47,910 --> 00:46:46,000
coming out i'd love doug if you could

1268
00:46:49,430 --> 00:46:47,920
talk a little about what is the ipcc

1269
00:46:51,589 --> 00:46:49,440
report for people who haven't heard of

1270
00:46:53,270 --> 00:46:51,599
it and then do you know what it says

1271
00:46:56,230 --> 00:46:53,280
particularly about climate change can

1272
00:46:58,390 --> 00:46:56,240
you give us a bit of a preview about it

1273
00:47:00,950 --> 00:46:58,400
well i first off i'll say that i'm not

1274
00:47:02,470 --> 00:47:00,960
an author of this version of the ipcc

1275
00:47:05,109 --> 00:47:02,480
report the intergovernmental panel on

1276
00:47:07,589 --> 00:47:05,119
climate change is an intergovernmental a

1277
00:47:09,510 --> 00:47:07,599
global effort of the nation's

1278
00:47:11,829 --> 00:47:09,520
top scientists from around the world

1279
00:47:14,470 --> 00:47:11,839
that gathers together to understand and

1280
00:47:16,069 --> 00:47:14,480
synthesize climate research there's also

1281
00:47:18,470 --> 00:47:16,079
a component of that work which is not

1282
00:47:20,309 --> 00:47:18,480
just synthesis but is the fact that we

1283
00:47:21,990 --> 00:47:20,319
as scientists are trying to generate new

1284
00:47:24,309 --> 00:47:22,000
understanding of our climate and how the

1285
00:47:26,470 --> 00:47:24,319
earth is functioning as a system that

1286
00:47:28,069 --> 00:47:26,480
newest latest research is also one of

1287
00:47:30,309 --> 00:47:28,079
the things that people will look for

1288
00:47:31,750 --> 00:47:30,319

when the ipcc releases their fifth

1289
00:47:34,470 --> 00:47:31,760
assessment report

1290
00:47:36,390 --> 00:47:34,480
in the first part of it in september

1291
00:47:38,309 --> 00:47:36,400
no i don't have any of the

1292
00:47:40,309 --> 00:47:38,319
major highlights to share with everybody

1293
00:47:42,950 --> 00:47:40,319
a month in advance but one thing i can

1294
00:47:45,510 --> 00:47:42,960
say is that the climate models that were

1295
00:47:47,670 --> 00:47:45,520
run to help inform that assessment

1296
00:47:49,510 --> 00:47:47,680
report those data are available and so

1297
00:47:52,069 --> 00:47:49,520
when we look at those data we've been

1298
00:47:53,910 --> 00:47:52,079
seeing a visualization of of the dryness

1299
00:47:55,670 --> 00:47:53,920
of the atmosphere over north america

1300
00:47:57,750 --> 00:47:55,680
that's actually derived from those

1301
00:48:00,470 --> 00:47:57,760
latest generation of climate models

1302
00:48:02,550 --> 00:48:00,480
those climate models in aggregate have a

1303
00:48:04,790 --> 00:48:02,560
very similar story that they tell about

1304
00:48:06,790 --> 00:48:04,800
a warming and drying set of conditions

1305
00:48:08,870 --> 00:48:06,800
across the central and northeastern

1306
00:48:10,470 --> 00:48:08,880
portions of north america that area of

1307
00:48:11,910 --> 00:48:10,480
the mountain west all the way out into

1308
00:48:13,190 --> 00:48:11,920
quebec

1309
00:48:14,710 --> 00:48:13,200
one of the things i would come back to

1310
00:48:16,230 --> 00:48:14,720
though that i think is really important

1311
00:48:18,150 --> 00:48:16,240
as we think about fire and climate

1312
00:48:20,550 --> 00:48:18,160
change is the idea that

1313
00:48:23,030 --> 00:48:20,560

climate influences fire in ways that we

1314
00:48:25,270 --> 00:48:23,040
don't always anticipate so a warmer

1315
00:48:26,790 --> 00:48:25,280
night uh may not trigger the public's

1316
00:48:29,270 --> 00:48:26,800
attention but it certainly makes a

1317
00:48:31,510 --> 00:48:29,280
difference for fire fighting a wildfire

1318
00:48:32,950 --> 00:48:31,520
the same is true for a warmer winter

1319
00:48:35,109 --> 00:48:32,960
much of the warming we've seen across

1320
00:48:36,950 --> 00:48:35,119
north america in the last 30 or 40 years

1321
00:48:38,549 --> 00:48:36,960
it's actually been in the winter time

1322
00:48:40,390 --> 00:48:38,559
but i don't need to tell your you know

1323
00:48:41,990 --> 00:48:40,400
the viewers in the mountain west either

1324
00:48:43,670 --> 00:48:42,000
the ones who like to ski in the winter

1325
00:48:45,750 --> 00:48:43,680
or the ones worried about wildfire in

1326
00:48:47,829 --> 00:48:45,760
the summer that less snowpack from

1327
00:48:49,510 --> 00:48:47,839
warmer winters means important things

1328
00:48:52,069 --> 00:48:49,520
like more beetles coming through the

1329
00:48:54,150 --> 00:48:52,079
winter as well as bigger and more

1330
00:48:56,630 --> 00:48:54,160
dangerous wildfires in the summertime so

1331
00:48:57,990 --> 00:48:56,640
i think that idea that the climate and

1332
00:49:00,390 --> 00:48:58,000
the changes in climate we see in a

1333
00:49:02,390 --> 00:49:00,400
warmer world impacts fires in ways we

1334
00:49:04,790 --> 00:49:02,400
don't always think about is certainly an

1335
00:49:06,549 --> 00:49:04,800
important message to convey

1336
00:49:07,910 --> 00:49:06,559
thank you so much doug for anyone tuning

1337
00:49:09,270 --> 00:49:07,920
in i'm aries keck i'm here at nasa

1338
00:49:11,430 --> 00:49:09,280

goddard space flight center and we're

1339
00:49:13,109 --> 00:49:11,440
talking about wildfires and the

1340
00:49:15,030 --> 00:49:13,119
increased amount of them this year and

1341
00:49:16,790 --> 00:49:15,040
also their connections to climate change

1342
00:49:18,950 --> 00:49:16,800
i have a question i'm going to give to

1343
00:49:20,470 --> 00:49:18,960
uh bill patzert there at nasa's jpl

1344
00:49:22,230 --> 00:49:20,480
center because i think it leads to some

1345
00:49:25,109 --> 00:49:22,240
of the misconceptions people have about

1346
00:49:27,670 --> 00:49:25,119
things on uh in youtube comments uh mark

1347
00:49:29,750 --> 00:49:27,680
madrid asked is the sun's magnetic

1348
00:49:31,589 --> 00:49:29,760
change going to affect our weather in

1349
00:49:33,510 --> 00:49:31,599
coming months so bill i'd love to hear

1350
00:49:35,589 --> 00:49:33,520
what you have to say as a climatologist

1351
00:49:37,910 --> 00:49:35,599
about the effects of the sun

1352
00:49:39,109 --> 00:49:37,920
on wildfires here on earth i know

1353
00:49:40,710 --> 00:49:39,119
there's probably some people who think

1354
00:49:41,750 --> 00:49:40,720
it could have a lot to do nothing to do

1355
00:49:43,990 --> 00:49:41,760
can you sort of clear up some

1356
00:49:45,589 --> 00:49:44,000
misconceptions there

1357
00:49:47,510 --> 00:49:45,599
well the the

1358
00:49:50,390 --> 00:49:47,520
sun's magnetic field

1359
00:49:53,510 --> 00:49:50,400
switches approximately every 11 years

1360
00:49:56,309 --> 00:49:53,520
it's the great 11-year solar cycle

1361
00:49:59,270 --> 00:49:56,319
and it probably has subtle impacts on

1362
00:50:01,670 --> 00:49:59,280
our climate and our weather but it

1363
00:50:05,270 --> 00:50:01,680

doesn't have major impacts

1364
00:50:09,430 --> 00:50:05,280
and so when we look at the great cycles

1365
00:50:11,430 --> 00:50:09,440
el nino la nina or even decadal scale 10

1366
00:50:14,790 --> 00:50:11,440
to 20 year droughts

1367
00:50:17,030 --> 00:50:14,800
or long-term trends like global warming

1368
00:50:19,750 --> 00:50:17,040
the solar cycle the switch in the

1369
00:50:23,589 --> 00:50:19,760
magnetic field every 11 years is not a

1370
00:50:27,670 --> 00:50:25,589
okay we have now we have a question from

1371
00:50:29,990 --> 00:50:27,680
a reporter from uh climate wire

1372
00:50:31,910 --> 00:50:30,000
nathaniel massey he would like to know

1373
00:50:33,589 --> 00:50:31,920
um i know doug just mentioned snow a

1374
00:50:35,109 --> 00:50:33,599
minute ago he would like to know if we

1375
00:50:37,430 --> 00:50:35,119
could comment a little about a little

1376
00:50:39,750 --> 00:50:37,440
bit about the heat wave and wildfires

1377
00:50:41,270 --> 00:50:39,760
that are being seen in siberia right now

1378
00:50:43,349 --> 00:50:41,280
not a place you would think of having a

1379
00:50:45,990 --> 00:50:43,359
lot of fire nathaniel would like to know

1380
00:50:48,069 --> 00:50:46,000
how far out of the norm are these fires

1381
00:50:50,630 --> 00:50:48,079
what weather systems possibly the jet

1382
00:50:53,349 --> 00:50:50,640
stream might be contributing to them and

1383
00:50:55,750 --> 00:50:53,359
then white the what might these effects

1384
00:50:57,190 --> 00:50:55,760
and impacts do to the albedo in the

1385
00:50:58,630 --> 00:50:57,200
region i'm going to throw that question

1386
00:50:59,829 --> 00:50:58,640
to doug and also i'd love to you could

1387
00:51:02,069 --> 00:50:59,839
back up a little bit doug can you

1388
00:51:04,790 --> 00:51:02,079

explain first for people what is albedo

1389
00:51:06,710 --> 00:51:04,800
and i could repeat the question

1390
00:51:09,190 --> 00:51:06,720
it's a really good set of questions

1391
00:51:11,430 --> 00:51:09,200
around a current event

1392
00:51:13,030 --> 00:51:11,440
there is a heat wave right now over the

1393
00:51:14,710 --> 00:51:13,040
northern portions of russia and the

1394
00:51:16,790 --> 00:51:14,720
siberian region

1395
00:51:19,190 --> 00:51:16,800
that reflects what's called an

1396
00:51:21,030 --> 00:51:19,200
atmospheric blocking event i'll take two

1397
00:51:23,910 --> 00:51:21,040
steps back from that if i can to suggest

1398
00:51:25,430 --> 00:51:23,920
that the the flow of air patterns across

1399
00:51:27,510 --> 00:51:25,440
the northern hemisphere and their

1400
00:51:30,390 --> 00:51:27,520
dominant patterns of that jet stream and

1401
00:51:32,390 --> 00:51:30,400
the flow of the atmosphere is what does

1402
00:51:34,069 --> 00:51:32,400
bring us our typical weather and what we

1403
00:51:35,910 --> 00:51:34,079
think about is changing over time if

1404
00:51:37,109 --> 00:51:35,920
we're looking at changes in in climate

1405
00:51:38,309 --> 00:51:37,119
change

1406
00:51:40,630 --> 00:51:38,319
one of the things that's sort of most

1407
00:51:42,309 --> 00:51:40,640
striking about how uh changes in the

1408
00:51:44,630 --> 00:51:42,319
arctic now i'm thinking about things

1409
00:51:46,230 --> 00:51:44,640
like the melting of sea ice uh

1410
00:51:47,829 --> 00:51:46,240
influences the circulation of our

1411
00:51:49,990 --> 00:51:47,839
atmosphere is that we have seen in

1412
00:51:52,950 --> 00:51:50,000
recent years several episodes where a

1413
00:51:54,470 --> 00:51:52,960

high pressure system over the um the

1414
00:51:57,190 --> 00:51:54,480
arctic and the the northern high

1415
00:51:59,430 --> 00:51:57,200
latitudes can lead to this sort of

1416
00:52:01,270 --> 00:51:59,440
block of hot air that sits over one

1417
00:52:03,270 --> 00:52:01,280
region and allows these fires to burn

1418
00:52:05,030 --> 00:52:03,280
for days and days those kinds of

1419
00:52:06,630 --> 00:52:05,040
conditions those kinds of connections

1420
00:52:08,230 --> 00:52:06,640
are one of the reasons why we here at

1421
00:52:09,430 --> 00:52:08,240
nasa are trying to understand the earth

1422
00:52:11,349 --> 00:52:09,440
as a system

1423
00:52:13,510 --> 00:52:11,359
it's not enough just to look at fire and

1424
00:52:14,870 --> 00:52:13,520
not think about how the adjacent changes

1425
00:52:16,549 --> 00:52:14,880
in the sea surface temperatures that

1426
00:52:19,990 --> 00:52:16,559
bill mentioned or this

1427
00:52:20,950 --> 00:52:20,000
uh melting of arctic sea ice which you

1428
00:52:22,470 --> 00:52:20,960
know we know during the northern

1429
00:52:24,790 --> 00:52:22,480
hemisphere summer is is reaching now

1430
00:52:26,630 --> 00:52:24,800
close to its its minimum this year

1431
00:52:28,950 --> 00:52:26,640
all of those patterns

1432
00:52:30,950 --> 00:52:28,960
influence how our atmosphere circulates

1433
00:52:33,750 --> 00:52:30,960
over the earth the question came back to

1434
00:52:35,190 --> 00:52:33,760
albedo one that for scientists is a

1435
00:52:37,750 --> 00:52:35,200
familiar phenomenon but just really

1436
00:52:39,750 --> 00:52:37,760
reflects pardon the pun how much of the

1437
00:52:42,549 --> 00:52:39,760
sun's incoming radiation gets sent back

1438
00:52:45,109 --> 00:52:42,559

into space so very dark things like the

1439
00:52:46,870 --> 00:52:45,119
open ocean or dark forests

1440
00:52:49,030 --> 00:52:46,880
absorb more of the sun's incoming

1441
00:52:52,069 --> 00:52:49,040
radiation than very bright surfaces

1442
00:52:53,910 --> 00:52:52,079
think about fresh snow or ice and so one

1443
00:52:55,750 --> 00:52:53,920
of the things that both fires and

1444
00:52:57,910 --> 00:52:55,760
changes in sea ice do is they change the

1445
00:52:59,589 --> 00:52:57,920
albedo they change how much energy gets

1446
00:53:01,270 --> 00:52:59,599
absorbed in any one of these locations

1447
00:53:03,510 --> 00:53:01,280
and then how that propagates through the

1448
00:53:04,870 --> 00:53:03,520
earth system that's really why this

1449
00:53:06,870 --> 00:53:04,880
earth system

1450
00:53:09,030 --> 00:53:06,880
is such a complex puzzle

1451
00:53:10,790 --> 00:53:09,040
and one that we are using again most of

1452
00:53:12,710 --> 00:53:10,800
the satellite data we have available to

1453
00:53:15,510 --> 00:53:12,720
us along with these complex computer

1454
00:53:17,349 --> 00:53:15,520
models to try to disentangle

1455
00:53:19,349 --> 00:53:17,359
thank you so much doug i'm also going to

1456
00:53:20,870 --> 00:53:19,359
the next question is for uh

1457
00:53:22,870 --> 00:53:20,880
for elizabeth reinhardt at the u.s

1458
00:53:24,790 --> 00:53:22,880
forest service and it's an interesting

1459
00:53:26,710 --> 00:53:24,800
question it came in through youtube

1460
00:53:29,030 --> 00:53:26,720
raven blackheart probably not a real

1461
00:53:30,950 --> 00:53:29,040
name um asks does anyone know if there's

1462
00:53:33,349 --> 00:53:30,960
any work being done on genetically

1463
00:53:36,230 --> 00:53:33,359

modified trees so they might be able to

1464
00:53:38,150 --> 00:53:36,240
consume more co2 and elizabeth i'd like

1465
00:53:40,069 --> 00:53:38,160
to broaden that out a little bit

1466
00:53:41,510 --> 00:53:40,079
what about also genetically modifying

1467
00:53:43,910 --> 00:53:41,520
trees so they don't catch fire as

1468
00:53:48,870 --> 00:53:46,230
uh

1469
00:53:50,950 --> 00:53:48,880
you know i don't know of any work to

1470
00:53:53,430 --> 00:53:50,960
modify trees so that they don't catch

1471
00:53:55,589 --> 00:53:53,440
fires quickly you know there's a great

1472
00:53:58,470 --> 00:53:55,599
deal of genetic variability in nature

1473
00:54:00,950 --> 00:53:58,480
and differences between species in fire

1474
00:54:03,430 --> 00:54:00,960
resistant or resistance are really the

1475
00:54:05,510 --> 00:54:03,440
management key here and one of the

1476
00:54:07,990 --> 00:54:05,520
reasons we have a fire problem is

1477
00:54:10,630 --> 00:54:08,000
because stands that were formerly very

1478
00:54:12,630 --> 00:54:10,640
fire resistant ponderosa pine have been

1479
00:54:14,630 --> 00:54:12,640
invaded by encroaching douglas fir

1480
00:54:17,750 --> 00:54:14,640
that's much more fire susceptible and so

1481
00:54:20,069 --> 00:54:17,760
on so i think that um

1482
00:54:21,510 --> 00:54:20,079
i don't know if we need to go so far as

1483
00:54:24,870 --> 00:54:21,520
to look for genetic

1484
00:54:27,829 --> 00:54:24,880
genetically modified trees to look at

1485
00:54:31,109 --> 00:54:27,839
genetic variability as part of an answer

1486
00:54:35,200 --> 00:54:31,119
to our fire problem

1487
00:54:36,470 --> 00:54:35,210
now in terms of capturing more co2

1488
00:54:37,829 --> 00:54:36,480

[Music]

1489
00:54:41,349 --> 00:54:37,839
that's another really interesting

1490
00:54:44,710 --> 00:54:42,230
uh

1491
00:54:48,230 --> 00:54:44,720
i don't know the answer force certainly

1492
00:54:50,069 --> 00:54:48,240
play a key role in mitigating co2

1493
00:54:51,510 --> 00:54:50,079
emissions um

1494
00:54:53,990 --> 00:54:51,520
and

1495
00:54:57,109 --> 00:54:54,000
but again rather than looking to a

1496
00:54:58,710 --> 00:54:57,119
genetically modified organism i think

1497
00:55:01,589 --> 00:54:58,720
what we really need is

1498
00:55:03,990 --> 00:55:01,599
uh reforestation of currently unforeseen

1499
00:55:05,829 --> 00:55:04,000
areas it has a lot of potential to

1500
00:55:09,430 --> 00:55:05,839
increase our carbon sequestration

1501
00:55:11,190 --> 00:55:09,440
capacity of forests

1502
00:55:12,710 --> 00:55:11,200
thank you bill i'd love to know as a

1503
00:55:14,230 --> 00:55:12,720
climatologist when it comes to these

1504
00:55:16,470 --> 00:55:14,240
kind of questions we heard doug talk

1505
00:55:17,910 --> 00:55:16,480
about the earth as an entire system is

1506
00:55:19,750 --> 00:55:17,920
there a way of sort of gaming that

1507
00:55:22,230 --> 00:55:19,760
system that you and other climatologists

1508
00:55:23,829 --> 00:55:22,240
could could look forward to to keeping

1509
00:55:25,349 --> 00:55:23,839
us and keeping us possibly more

1510
00:55:26,470 --> 00:55:25,359
resilient to climate change in the

1511
00:55:28,549 --> 00:55:26,480
future

1512
00:55:29,910 --> 00:55:28,559
well you know that is that was really an

1513
00:55:31,430 --> 00:55:29,920

excellent question

1514
00:55:33,349 --> 00:55:31,440
and uh

1515
00:55:34,710 --> 00:55:33,359
my simple answer is that you can't game

1516
00:55:37,109 --> 00:55:34,720
mother nature

1517
00:55:38,150 --> 00:55:37,119
but as climate has changed throughout

1518
00:55:40,870 --> 00:55:38,160
history

1519
00:55:42,950 --> 00:55:40,880
when we look back over the last

1520
00:55:44,470 --> 00:55:42,960
let's say 100 million years

1521
00:55:47,589 --> 00:55:44,480
ecosystems

1522
00:55:51,109 --> 00:55:47,599
have genetically modified themselves

1523
00:55:53,670 --> 00:55:51,119
the composition of his uh ecosystems

1524
00:55:57,190 --> 00:55:53,680
change as climate changes

1525
00:55:59,190 --> 00:55:57,200
and so it's subtle but as we're talking

1526
00:56:01,910 --> 00:55:59,200
here this morning

1527
00:56:03,190 --> 00:56:01,920
is is that ecosystems throughout the

1528
00:56:05,829 --> 00:56:03,200
planet

1529
00:56:07,430 --> 00:56:05,839
are actually in subtle ways modifying

1530
00:56:09,109 --> 00:56:07,440
themselves

1531
00:56:10,069 --> 00:56:09,119
it's called evolution

1532
00:56:11,270 --> 00:56:10,079
all right

1533
00:56:14,470 --> 00:56:11,280
and

1534
00:56:15,750 --> 00:56:14,480
so as we look into the future

1535
00:56:18,789 --> 00:56:15,760
we see the

1536
00:56:22,549 --> 00:56:18,799
distribution of plants trees

1537
00:56:25,349 --> 00:56:22,559
and animals animal species as well

1538
00:56:28,069 --> 00:56:25,359

they're changing in subtle ways and they

1539
00:56:31,109 --> 00:56:28,079
will respond to the changing climate

1540
00:56:34,069 --> 00:56:31,119
and so uh you know the good old days

1541
00:56:36,230 --> 00:56:34,079
whatever it used to be are gone forever

1542
00:56:37,190 --> 00:56:36,240
and so it'll be interesting to see

1543
00:56:38,630 --> 00:56:37,200
because

1544
00:56:40,710 --> 00:56:38,640
climate change is not going to be

1545
00:56:43,990 --> 00:56:40,720
stopping anytime soon

1546
00:56:45,270 --> 00:56:44,000
it's the real deal it's in our future

1547
00:56:47,510 --> 00:56:45,280
and uh

1548
00:56:49,510 --> 00:56:47,520
the

1549
00:56:52,549 --> 00:56:49,520
we don't know exactly where it's going

1550
00:56:54,950 --> 00:56:52,559
but uh i predict that in two to three

1551
00:56:56,390 --> 00:56:54,960
hundred years the great forests as we

1552
00:57:00,150 --> 00:56:56,400
see them today

1553
00:57:04,470 --> 00:57:01,910
well thank you all so much for joining

1554
00:57:07,190 --> 00:57:04,480
us today um that was bill patzert he's

1555
00:57:09,270 --> 00:57:07,200
at nasa's jpl uh jet propulsion lab out

1556
00:57:11,670 --> 00:57:09,280
in pasadena california which actually

1557
00:57:14,230 --> 00:57:11,680
saw its own fire right on its doorstep i

1558
00:57:15,990 --> 00:57:14,240
believe last year um also joining us

1559
00:57:17,990 --> 00:57:16,000
today has been doug morton he's a

1560
00:57:19,829 --> 00:57:18,000
research scientist here at nasa's

1561
00:57:21,670 --> 00:57:19,839
goddard space flight center in greenbelt

1562
00:57:23,750 --> 00:57:21,680
maryland and then also elizabeth

1563
00:57:25,910 --> 00:57:23,760

reinhart who is the assistant director

1564
00:57:27,990 --> 00:57:25,920
of fire and aviation management at the

1565
00:57:30,470 --> 00:57:28,000
u.s forest service she's joined us from

1566
00:57:31,990 --> 00:57:30,480
washington d.c thank you all so much for

1567
00:57:33,510 --> 00:57:32,000
watching we really appreciate all your

1568
00:57:35,670 --> 00:57:33,520
questions and calls this is going to

1569
00:57:36,630 --> 00:57:35,680
remain on youtube as archived versions

1570
00:57:38,549 --> 00:57:36,640
so if you're watching through the

1571
00:57:40,470 --> 00:57:38,559
archive version and you have additional

1572
00:57:43,589 --> 00:57:40,480
questions please just continue to use

1573
00:57:45,270 --> 00:57:43,599
the hashtag nasafire or send a question

1574
00:57:47,349 --> 00:57:45,280
right to the at nasa goddard twitter

1575
00:57:49,430 --> 00:57:47,359
account or put it on our facebook page

1576
00:57:51,430 --> 00:57:49,440
i'm aries keck here at nasa goddard