

Too Much Heat

Part Two— Drought and Wildfire

Compiled by Phil Nelson, 2017



Drought

Attribution confidence for drought: low

Women gathering water in southern West Bengal, 2011



photo by Joydeep Mukherjee, 2016

Bolivia declares state of emergency due to drought, water shortage

Worst drought in 25 years

November 21, 2016 Reuters World News



The dried Ajuan Khota dam, near La Paz Bolivia. Reuters / David Mercado

Mae Chang Reservoir, Thailand, March 2016

Worst drought in decades



NBC News photo by RUNGROJ YONGRIT / EPA

Collecting dried lotus leaves. Phnom Penh, Cambodia, March 2016
Worst drought in at least four decades



NBC News photo by Heng Sinith AP

A man carries animal feed in the Sitti Zone of Ethiopia on April 8,
2016, near the border with Somalia
Worst drought in fifty years



Telegraph News photo by Mulugeta Ayene/AP

Climate change could render Sudan 'uninhabitable'

By Bianca Britton CNN, 8 Dec 2016

Sudan's ecosystems and natural resources are deteriorating. Temperatures are rising, water supplies are scarce, soil fertility is low and severe droughts are common. After years of desertification, its rich biodiversity is under threat and drought has hindered the fight against hunger.

This burden is affecting not only the country's food security and sustainable development, but also the homes of many Sudanese families.



Thousands of displaced Sudanese people have been forced to live in makeshift houses where there's few water points and no food or health services.

Climate change could render Sudan 'uninhabitable'

By Bianca Britton CNN, 8 Dec 2016

Michelle Yonetani, a senior advisor on disasters from IDMC, says 70 percent of the rural population are reliant on traditional rain-fed agriculture -- for both food and livelihood -- while 80 percent of the population rely on rainfall for their water supply.

"Drought aggravates desertification which affects the savannah belt in the northern region -- so these encroaching deserts have been displacing entire villages."



It is estimated 1.9 million people will be affected by reduced agricultural and livestock production -- due to smaller farming areas, poor pastures and limited water availability

Drought and War Heighten Threat of Not Just 1 Famine, but 4

Jeffrey Gettleman, New York Times, 27 March 2017

For the first time since anyone can remember, there is a very real possibility of four famines — in Somalia, South Sudan, Nigeria and Yemen — breaking out at once, endangering more than 20 million lives.



Camp in Baidoa, Somalia. Credit Tyler Hicks/The New York Times

Colorado River Delta, Baja California

Audubon Magazine, 2014



The delta once covered 2 million acres.

Drought and profligate irrigation have slowed the river to a trickle.

Photo Credit: Peter McBride

July 2000

Lake Mead

July 2015

NASA Images of Change



Lake Mead, June 2015

Mark Henle/The Republic



High
Water
Mark

The
lake is
down
150
vertical
feet.

Lake Mead, May 2016

Water level at 1,074 feet, lowest since Hoover dam was built in 1934

Reuters / Mark Blake

In August, Bureau of Reclamation projects
an 11% cut to Arizona in year 2018.



NASA images show Utah's Great Salt Lake shrinking dramatically

by Brad Plumer, Vox, Nov 6, 2016.

But the lake is now in trouble. Ever since the first pioneers arrived in 1847, humans have been diverting more and more water from the rivers and streams that would otherwise feed the Great Salt Lake. Today, about 40 percent of that water gets used instead by farms, cities, and industry — causing the lake to recede.

The problem has only been exacerbated of late by brutal droughts (the sort of droughts, note, that are likely to get worse as global warming continues). Water levels in the lake are currently about 11 feet below their historic levels.

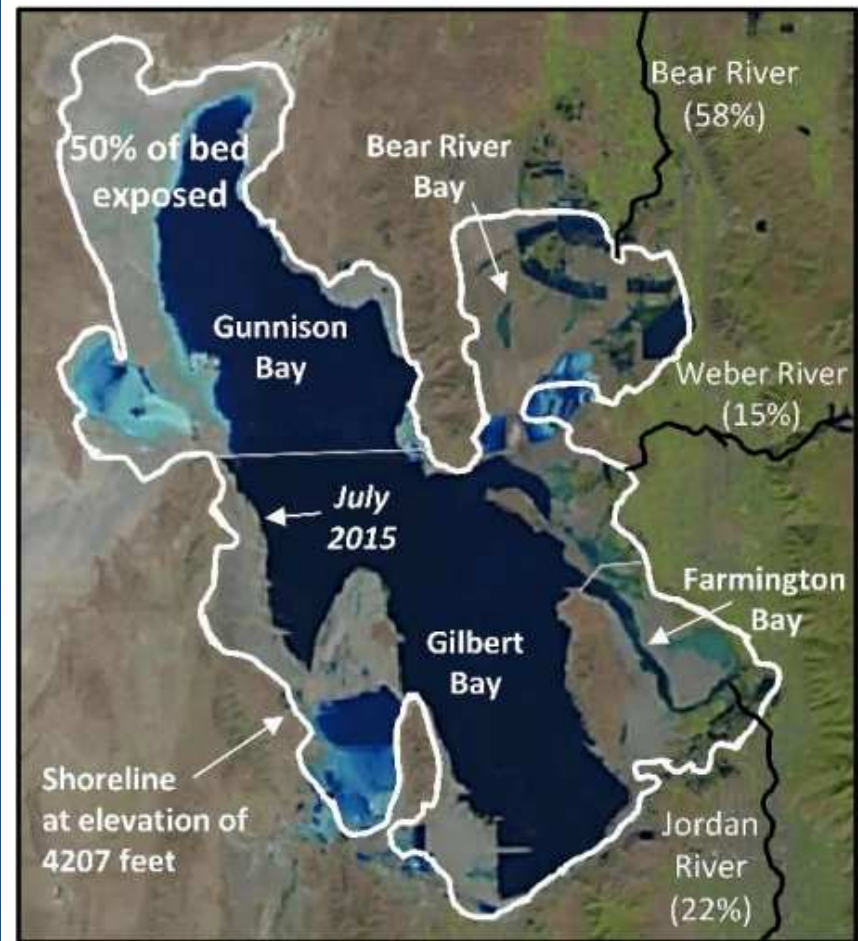


Figure 1. Great Salt Lake showing its major bays and the relative contribution (%) of each of the major river inflows. The white line shows the lake margin at its average natural elevation of 4,207 feet and the July 2015 NASA photograph shows the lake at near record-low levels, exposing half of the lake bed.

Anthropogenic Drought: How Humans Affect the Global Ecosystem

EOS, American Geophysical Union, Nov 2016

we call this *anthropogenic drought*, which is water stress caused or intensified by human activities, including increased demand, outdated water management, climate change from anthropogenic greenhouse gas emissions, growing energy and food production, intensive irrigation, diminished supplies, and land use change.
(Rivers diverted in 1960s by Soviets for agriculture.)



Aral Sea, Kazakstan-Uzbekstan. Credit: NASA. Collage by Producercunningham. [Public domain], via Wikimedia

Wildfires

Attribution confidence for wildfires: low

Forest Fires in Chile: "a nightmare without an end." ,

NASA 4 Feb 2017

A record number of blazes for Chile continue to rage in the country and there doesn't seem to be any way to quell the ever growing flames.

The president of Chile, Michelle Bachelet, commented that this scale of wildfires has never been seen in the history of Chile. Hundreds of thousands of acres have burned in the central and southern parts of Chile.

One blaze ripped through the city of Santa Olga leaving behind only ashes, and burning out the entire town including 1,000 homes. Over 6,000 residents had to flee as the flames rolled through their city.



Near Concepcion Chile / Getty

Wildfires blaze in Gatlinburg, TN; thousands evacuated

CNN 29 Nov 2016

Fanned by strong winds and the Southeast's worst drought in nearly a decade, at least 14 wildfires burned in and around Gatlinburg, Tennessee, forcing evacuations from the popular tourist destination and nearby communities. "If you're a person of prayer, we could use your prayers," Gatlinburg Fire Chief Greg Miller said Monday evening as crews battled wind gusts of up to 70 mph.

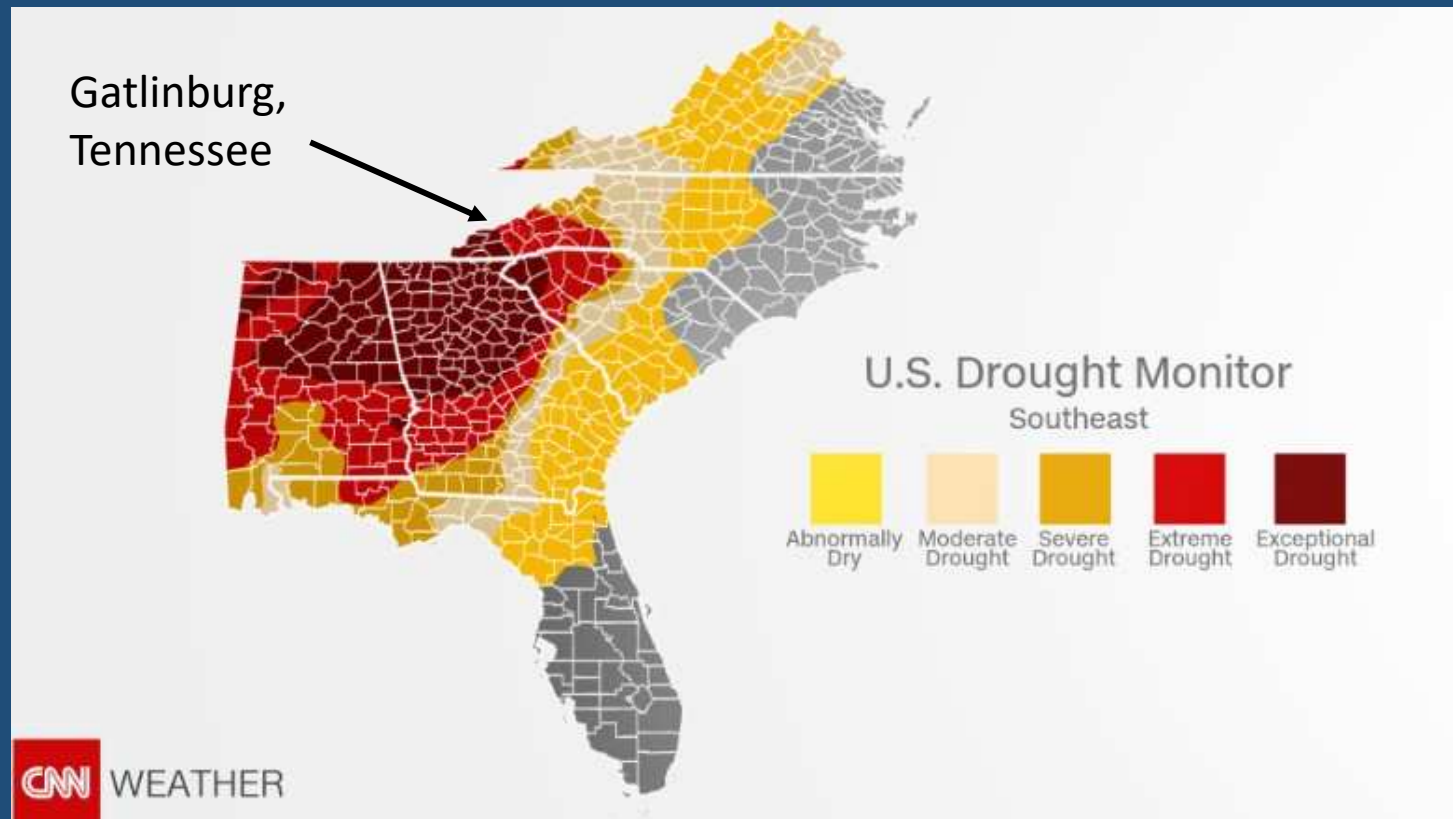


11 deaths

Believed to be human-caused

Climate context: a weird year in the southeast

Mashable 29 Nov 2016



The unusually mild and dry summer and fall ... has played a role in priming the Southeast for wildfires. ...second-warmest Jan through Oct on record (NCEI)...with South and North Carolina and parts of Tennessee having their warmest and driest fall on record.

High Park wildfire, Fort Collins, June 2012

People evacuated from 11
residential areas

259 homes destroyed

Fire danger was extreme



Started by lightning

80,284 acres burned (136 sq mi)

Recognized as a model of
coordinated response

Waldo Canyon wildfire, Colorado Springs, June 2012



32,000 people evacuated

\$454 million in insurance claims

346 homes destroyed

Record temp of 101 F June 26



Human caused

18,250 acres burned (29 sq mi)

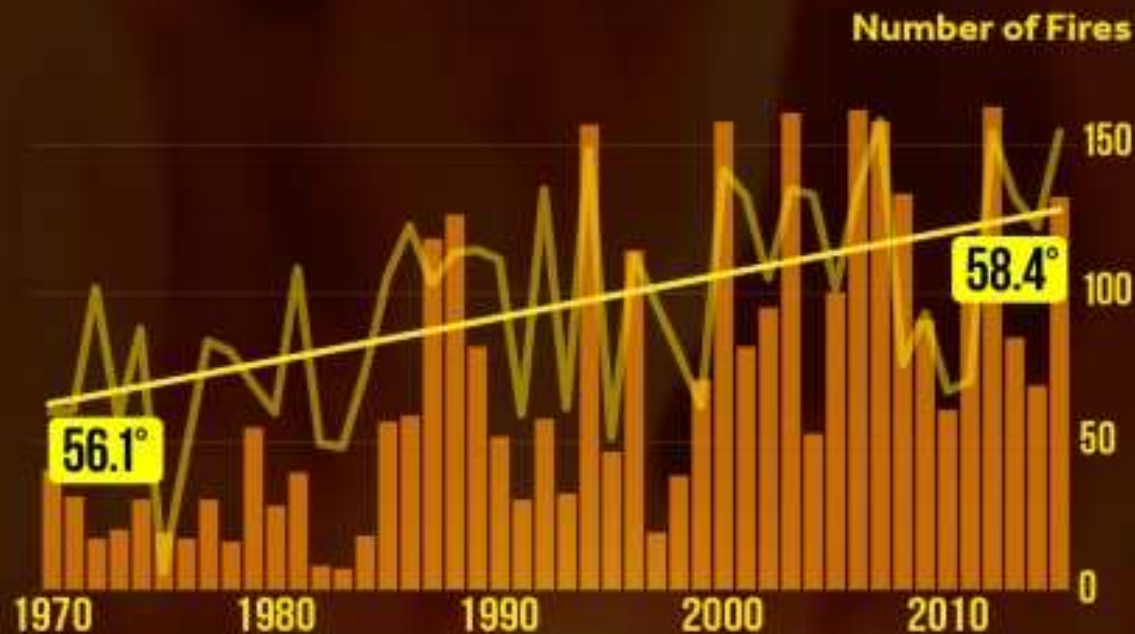
65 mph wind gusts

Fire moved at 2 miles per hour

The 2015 wildfire season was the worst on record in the U.S., with more than 10 million acres burned



Hotter Years, More Fires Western States



Source: NCEI Climate at a Glance (spring and summer temperature)
Climate Central analysis of U.S. Forest Service Records (fires)

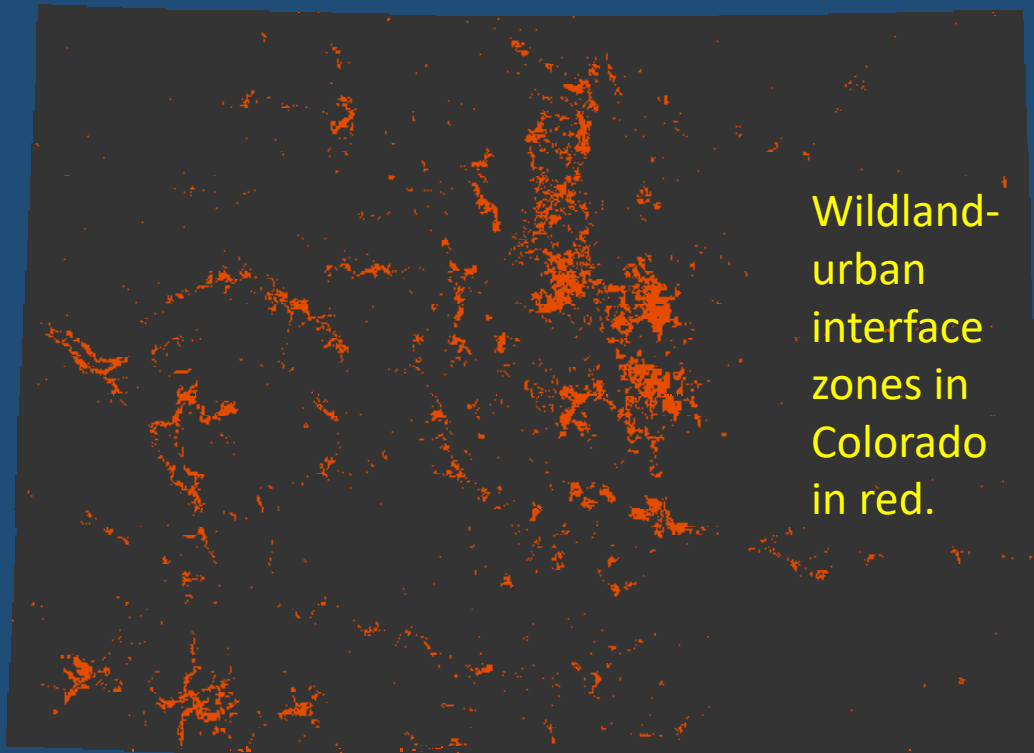
CLIMATE CENTRAL

There are now three times more large wildfires burning across the West each year than in the 1970s.

The annual area burned in these wildfires has increased six-fold. And wildfire season is now an average of 105 days longer than it was in the 1970s.

41% of Coloradans live in the wildland-urban interface

Reveal News.org 8 Oct 2016

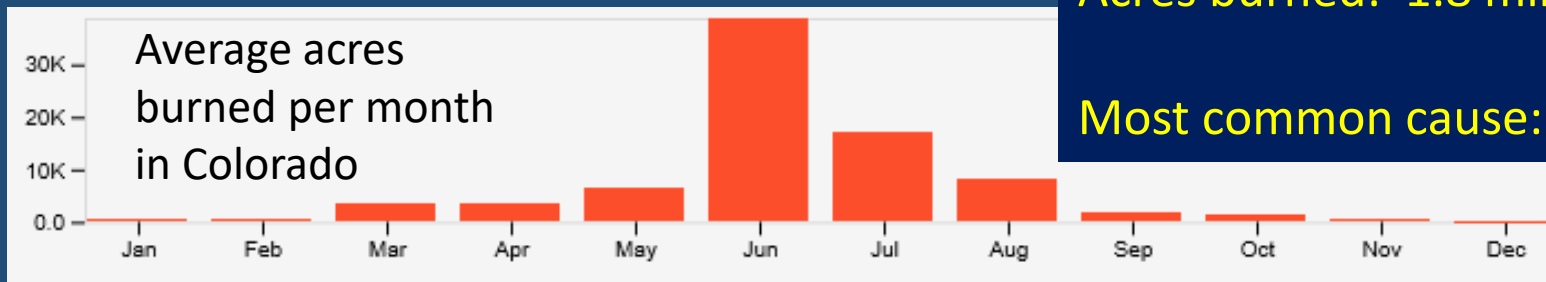


Wildfires, long considered a problem exclusive to the West, now threaten many other parts of the country as extreme weather becomes more commonplace and more people live in areas at risk for wildfire.

Total wildfires in Colorado (1999-2013): 33,033

Acres burned: 1.8 million

Most common cause: lightning



Climate change has been making western forest fires worse for decades, study says

Washington Post, 11 Oct 2016



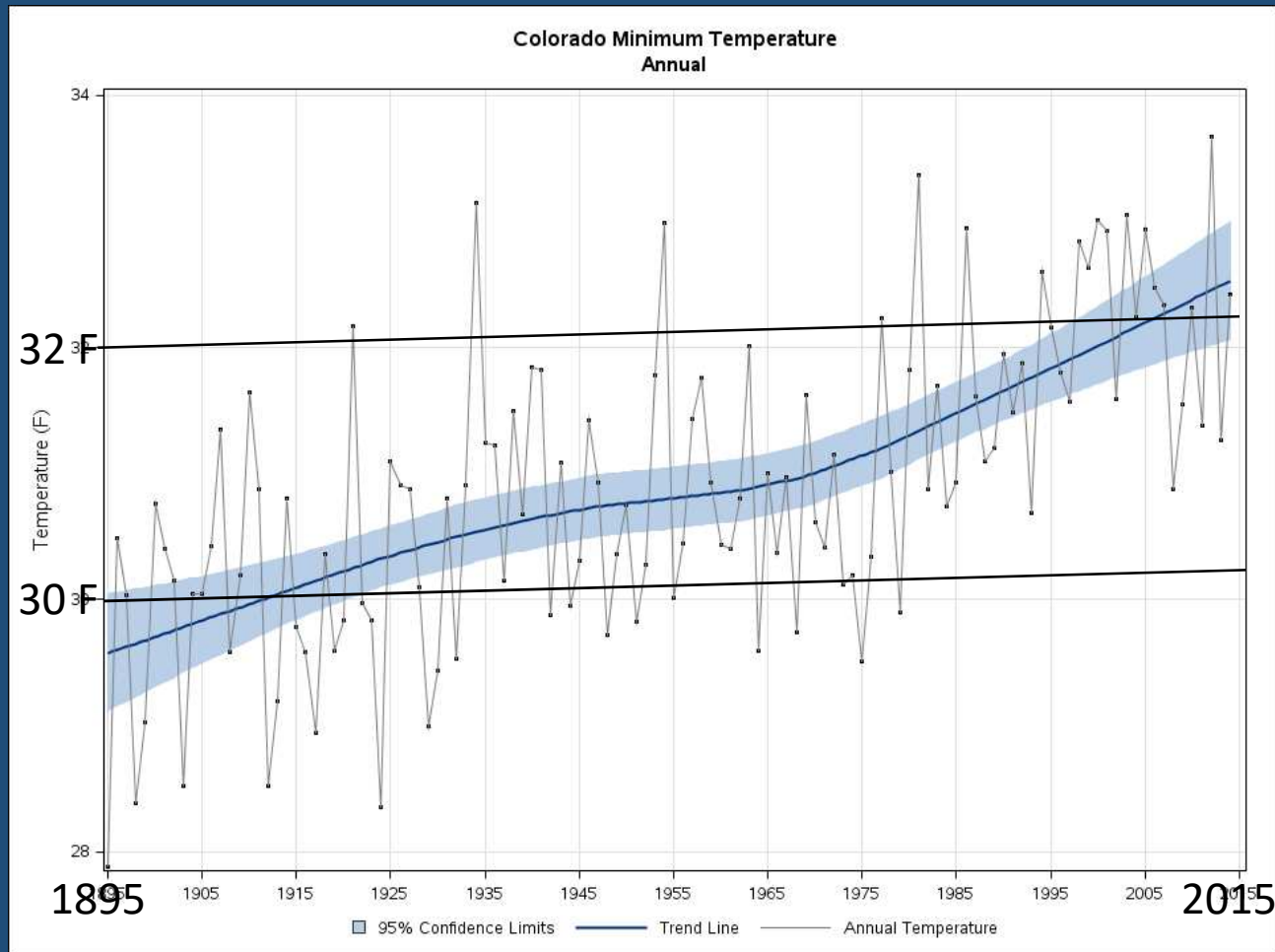
Bluecut Fire in the San Bernardino National Forest
(Reuters/Gene Blevins)

Many scientists have predicted that climate change could cause wildfires to increase in the future. And a new study, just out on Monday, demonstrates just how much it's already been making them worse. ...

And in the last three decades, the study finds climate change played a role in nearly doubling the area hit by forest fires since 1984.

The researchers then applied a climate model to investigate how big a hand human-caused climate change has had in these changes, comparing what the fires look like when climate change is factored in versus what they look like when the effects of such climate changes are excluded. Overall, the researchers found that anthropogenic climate change was responsible for just over half of the total observed increase in fuel dryness since 1979. In turn, this influence has added more than 16,000 square miles of forest fire area to the western United States since 1984 — an area larger than the state of Maryland — nearly doubling the area scientists might have expected without the influence of similar climate change.

In Colorado, an increase in the minimum annual temperature over 120 years.



Jagged brown line—
annual temperature
Solid blue line—
smoothed trend line
Blue shading—95%
confidence interval

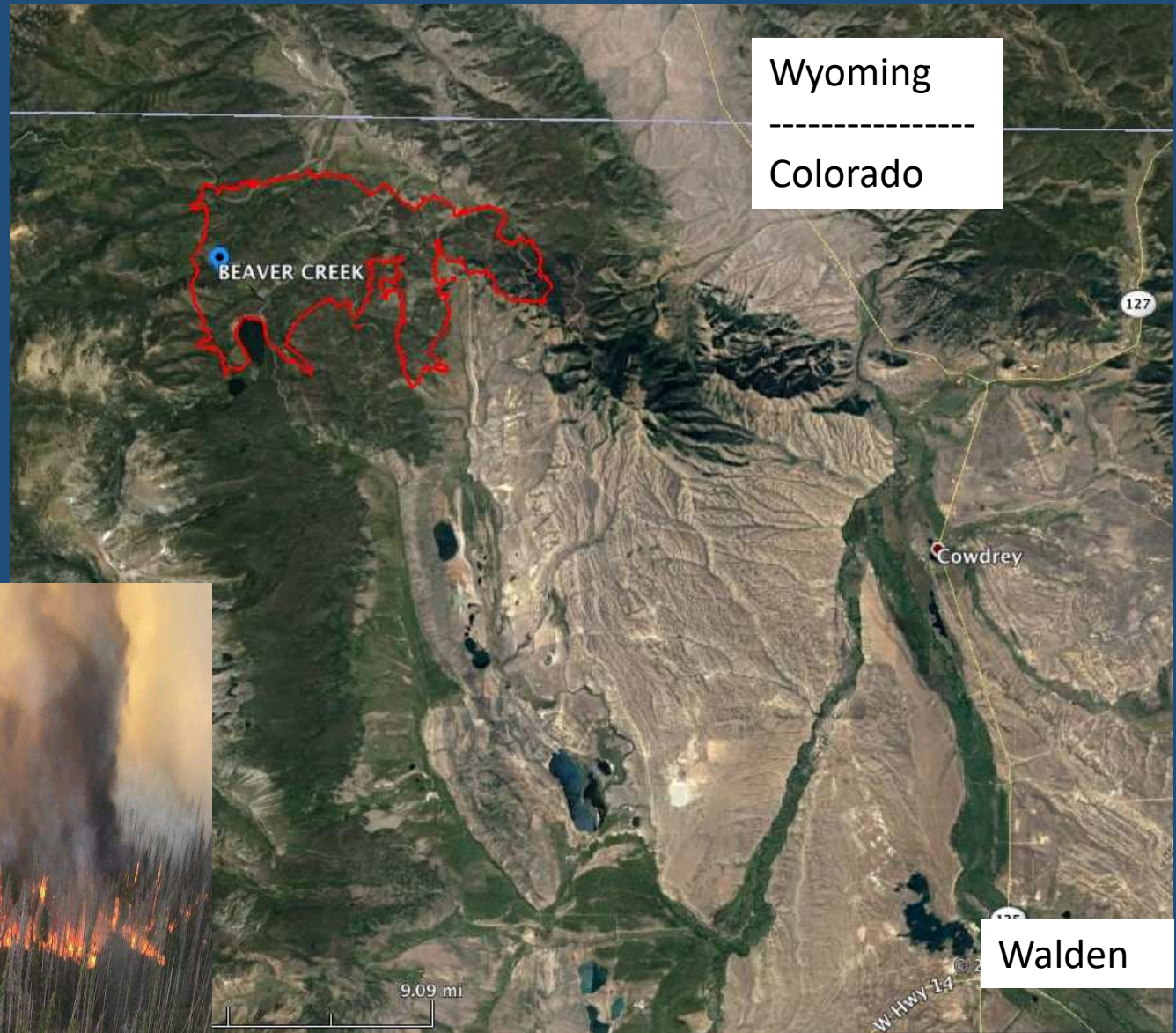
Source: National
Climatic Data Center,
NOAA

Beaver Creek wildfire, northern Colorado, July 2016

Cause unknown

Containment
expected in October
2016

Photo by U.S. Forest Service,
14 July 2016



Alaska wildfires linked to climate change

By Elizabeth Jenkins, Alaska's Energy Desk, Juneau 16 Dec 2016

James Partain, a NOAA climatologist, said he can't go anywhere without someone asking about climate change. His dentist, passengers on airline flights — they all want to know what's triggering these unusual weather events around the state?

...he said the unusually dry conditions that caused the wildfires of 2015 to blaze out of control are due to climate change, too. And that's the part which has been linked to the planet heating up, due to an increase of carbon emissions.

"As man-made climate change continues to advance and increase, we expect to see more and more and more of these very strong fire seasons," Partain said.

Flames from the Funny River Wildfire flare up on May 24, 2016 in Soldotna, Alaska. The wildfire started unusually early in the season and burned nearly 200,000 acres on the Kenai Peninsula. (Photo by Rashah McChesney /Peninsula Clarion)





More Water Vapor
and Clouds

Warmer Air,
Warmer Water
(Global Warming)

Atmosphere
Biosphere
Cryosphere
(Climate Change)

HUMAN RESPONSES

Personal

Family, Friends, Neighbors

Town and City

State

National

International

Golden wants Rooney Road soccer fields to share space with solar garden, but needs voter OK first

Josie Klemaier, YourHub, Denver Post, 30 March 2017

Golden's Sustainability Advisory Committee has been exploring the possibility of a community solar garden since 2008 as a way to help meet the goal to have 50 percent of all energy used by the city and its residents come from renewable sources by 2027.

Golden already has solar power for 10 of its city facilities, eight of which are net zero, meaning they get all of their energy from solar power.



The Community Solar Garden would be built near the Rooney Road Sports Complex. On the ballot in November 2017.

On May 11, 2015 City Council approved Lakewood's first community-wide Sustainability Plan

Lakewood.org extracted Feb 2017

Sustainability plan: climate adaptation; energy-water-environment; sustainable economy; zero waste; public health; natural systems; transportation



Sustainability Division (2 permanent staff) in the Planning Department.

CITIES: Sustainable Denver Summit, 14 Nov 2016



Mayor Michel B. Hancock

The Sustainable Denver Summit brought together 580 leaders from across the city's business, nonprofit and civic communities to develop and announce commitments for new and expanded initiatives that will help Denver achieve its ambitious 2020 Sustainability Goals.