Climate Change- Wildland Fire and Forest Management in Alaska

Western States Land Commissioners Association 2017 Summer Meeting

Anchorage, AK

John “Chris” Maisch

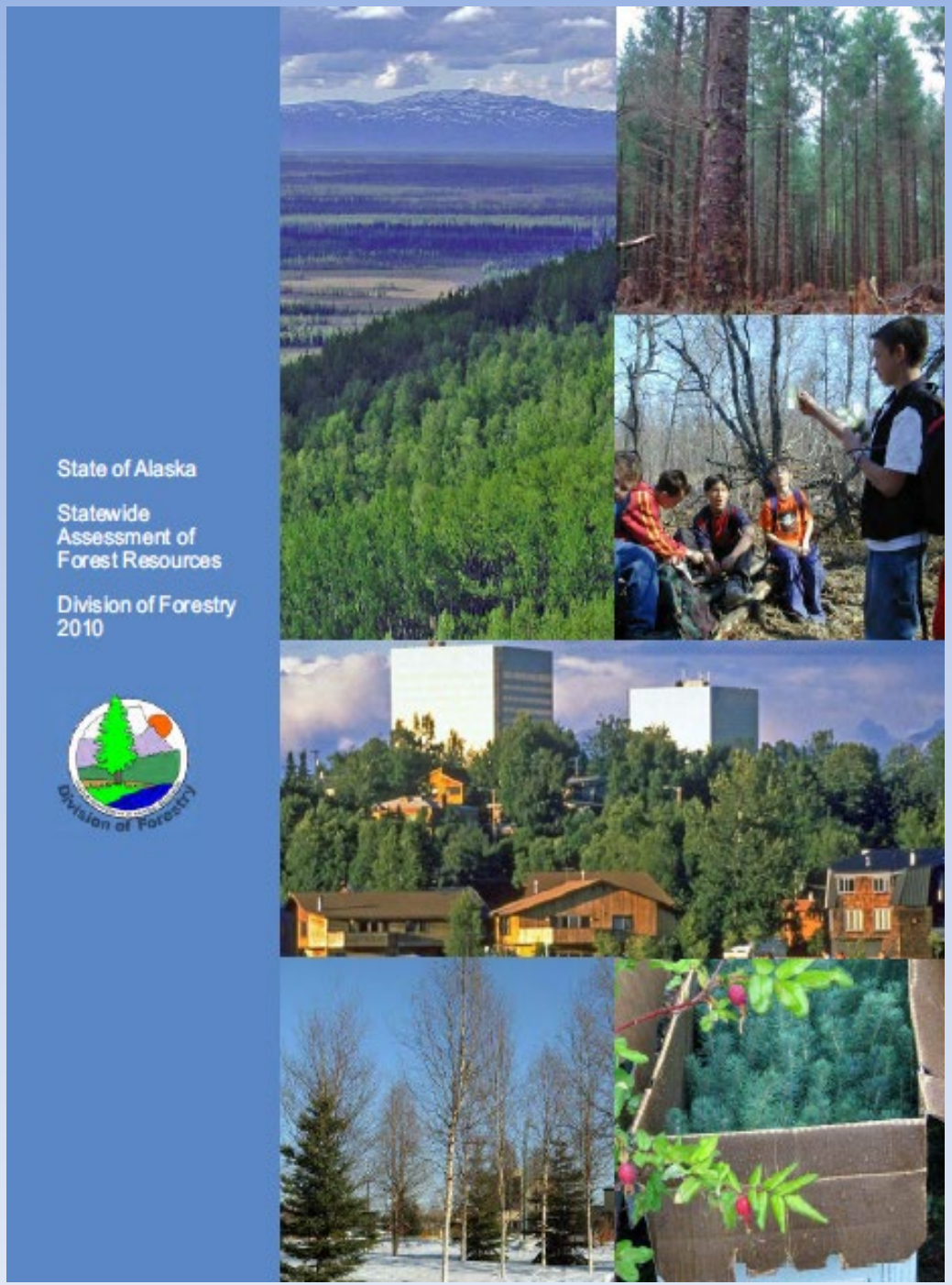
State Forester

Why Do We Care About Climate Change?

- Changing Wildland Fire Regime- increased acreage burned, length of season, burn severity, fire return interval and vegetative changes
- Climate Issues- permafrost changes and associated GHG releases from wildland fire
- Woody Biomass and Energy Projects – sustainability of fuel supplies in both urban and rural communities

Statewide Assessment

- Wildland Fire
- Sustainable Forest Products
- Biomass and Energy
- Forest Health Protection
- Community Benefits from Trees and Forests



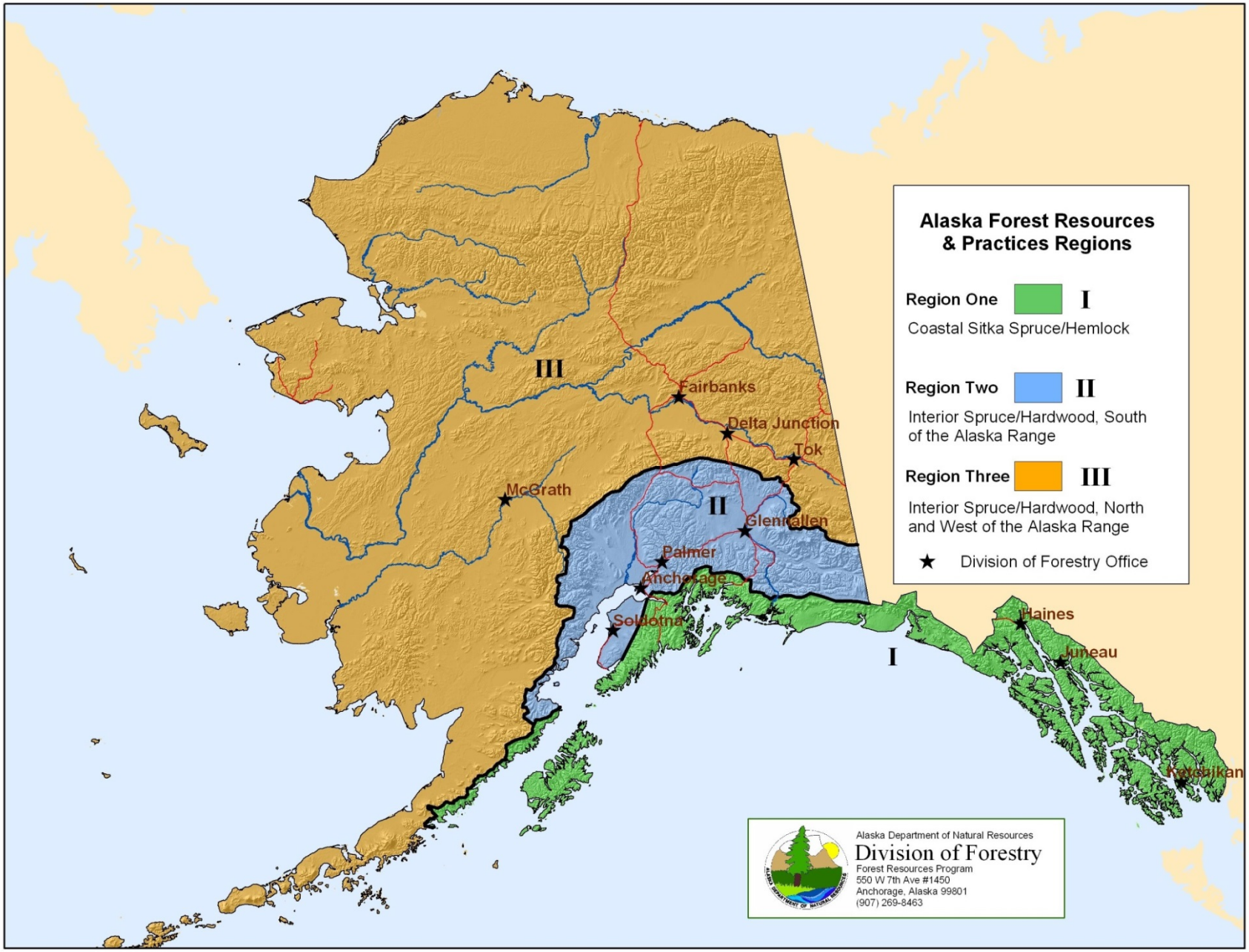
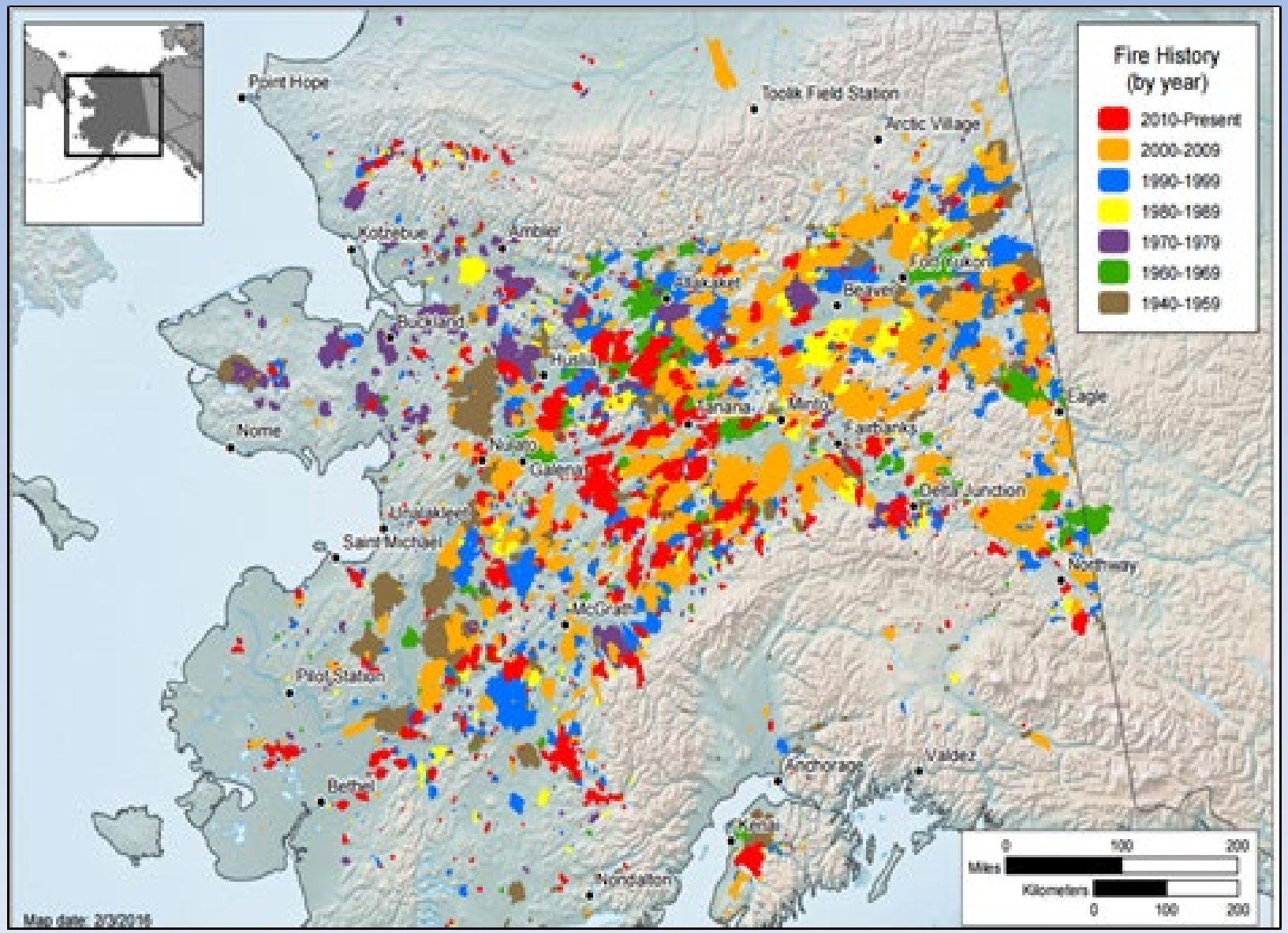

Alaska Forest Resources
& Practices Regions
Region One
I
Coastal Sitka Spruce/Hemlock
Region Two
II
Interior Spruce/Hardwood, South
of the Alaska Range
Region Three
III
Interior Spruce/Hardwood, North
and West of the Alaska Range
Division of Forestry Office
III
II
I
Fairbanks
Delta Junction
Tok
McGrath
Glennallen
Palmer
Anchorage
Soldotna
Haines
Juneau
Ketchikan
Alaska Department of Natural Resources
Division of Forestry
Forest Resources Program
550 W 7th Ave #1450
Anchorage, Alaska 99801
(907) 269-8463

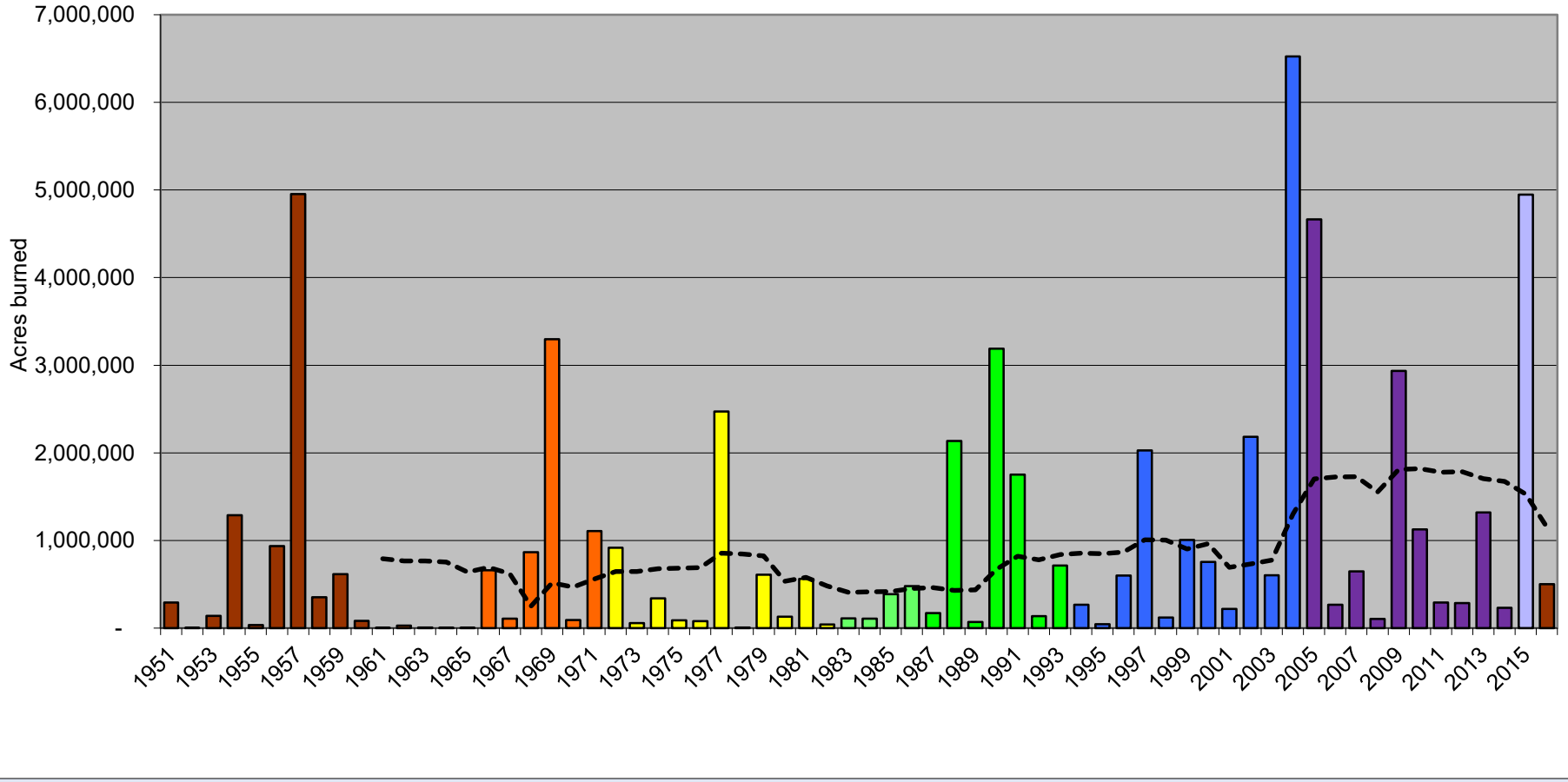
Figure 2 Alaska Forest Land Ownership

Wildland Fire

Fire History 1940-2015



Acreage Burned 1950-2016 With 11-Year Rolling Average



Climate Issues

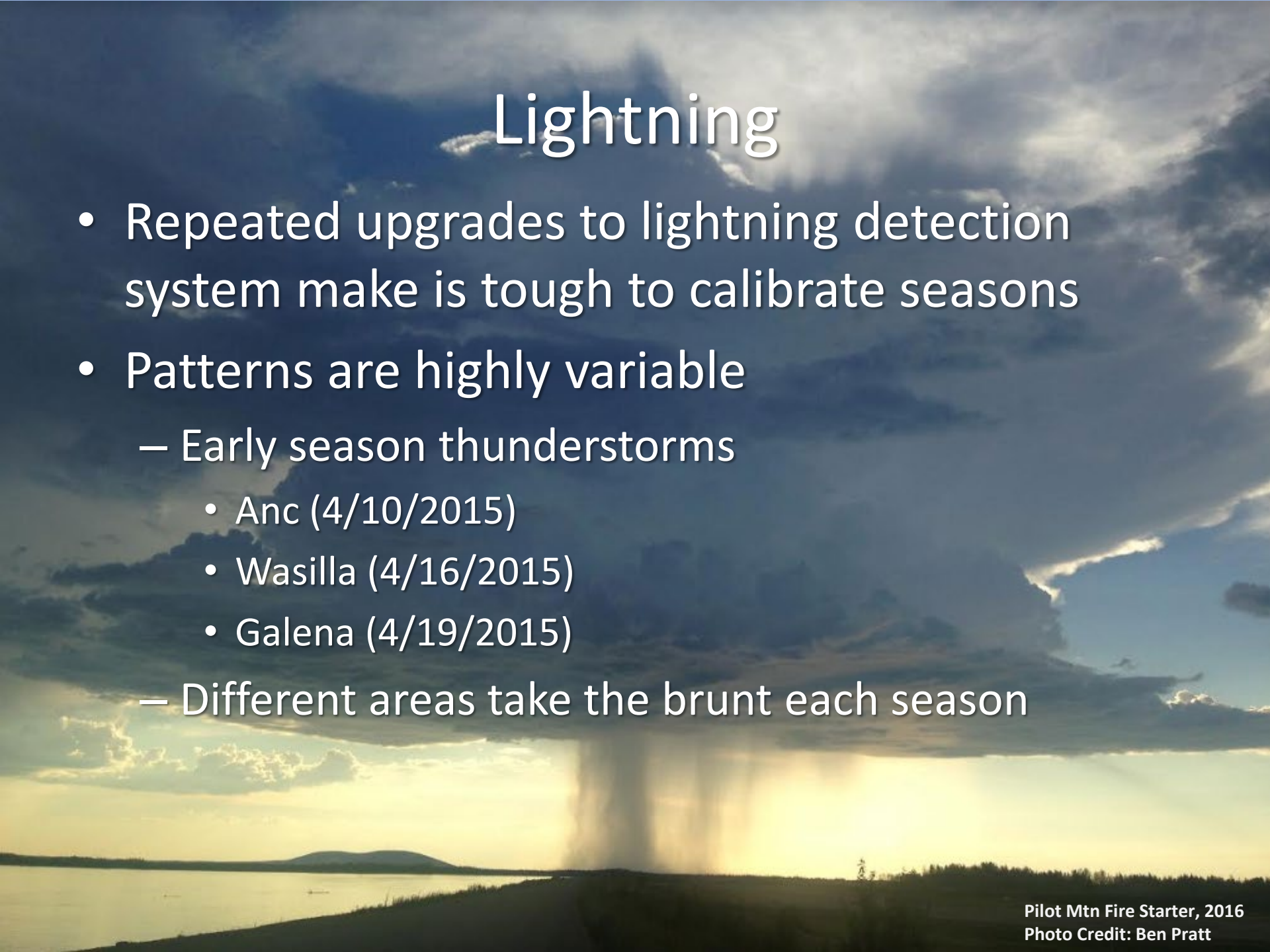
Temp vs Precip

- We know temperatures are increasing in Arctic
- What about precip? It's likely that as temps are hotter, evapotranspiration will increase, but how much?
- Will precip remain similar to now? Convective showers in early summer, stratiform precip in late summer?
- Globally, climate change indicates fewer rain events, but with heavier rainfall on any given occasion

Interior downpour, 2014
Photo Credit: Strader

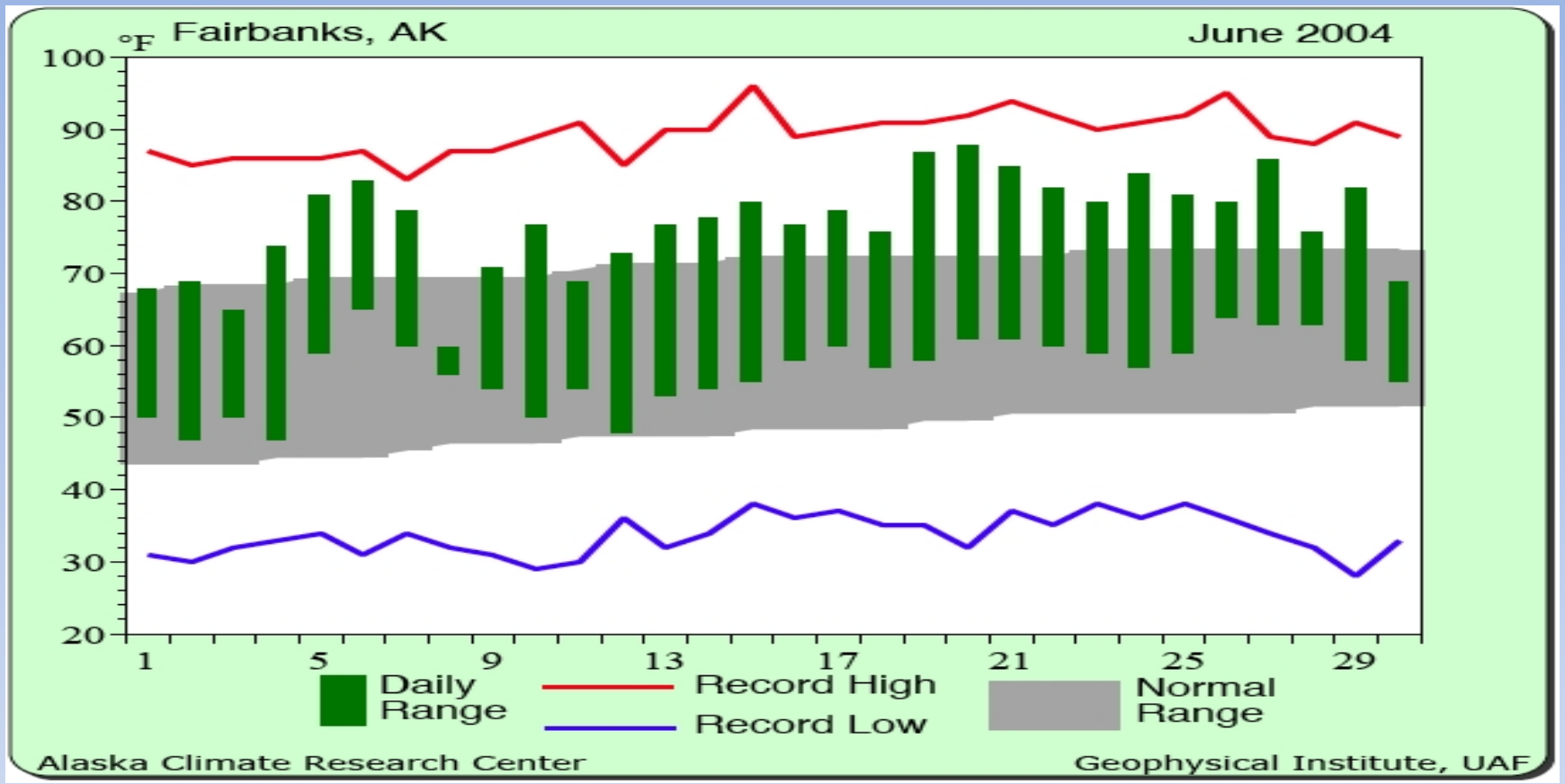
Lightning

- Repeated upgrades to lightning detection system make is tough to calibrate seasons
- Patterns are highly variable
  - Early season thunderstorms
    - Anc (4/10/2015)
    - Wasilla (4/16/2015)
    - Galena (4/19/2015)
  - Different areas take the brunt each season

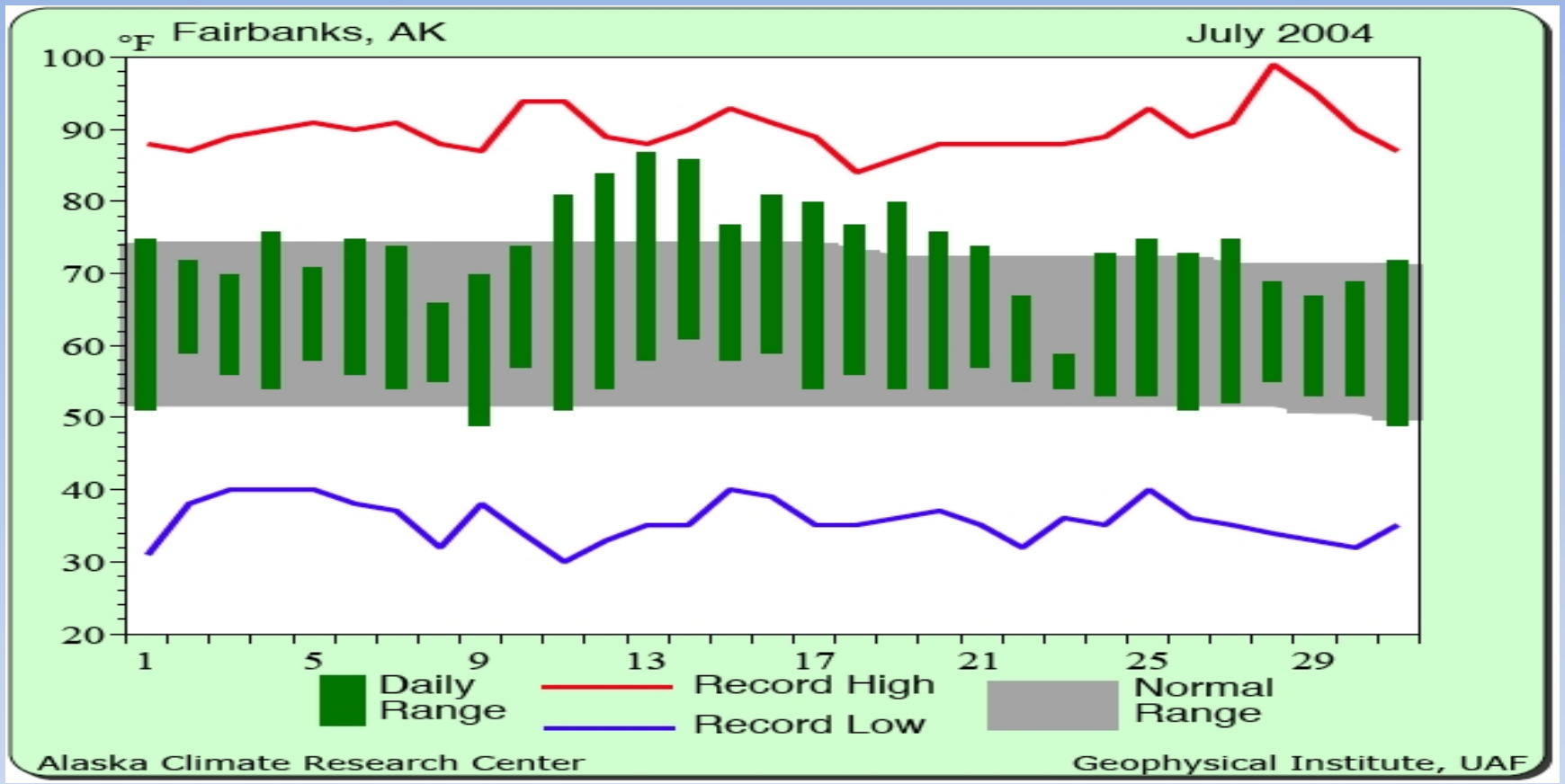


Pilot Mtn Fire Starter, 2016
Photo Credit: Ben Pratt

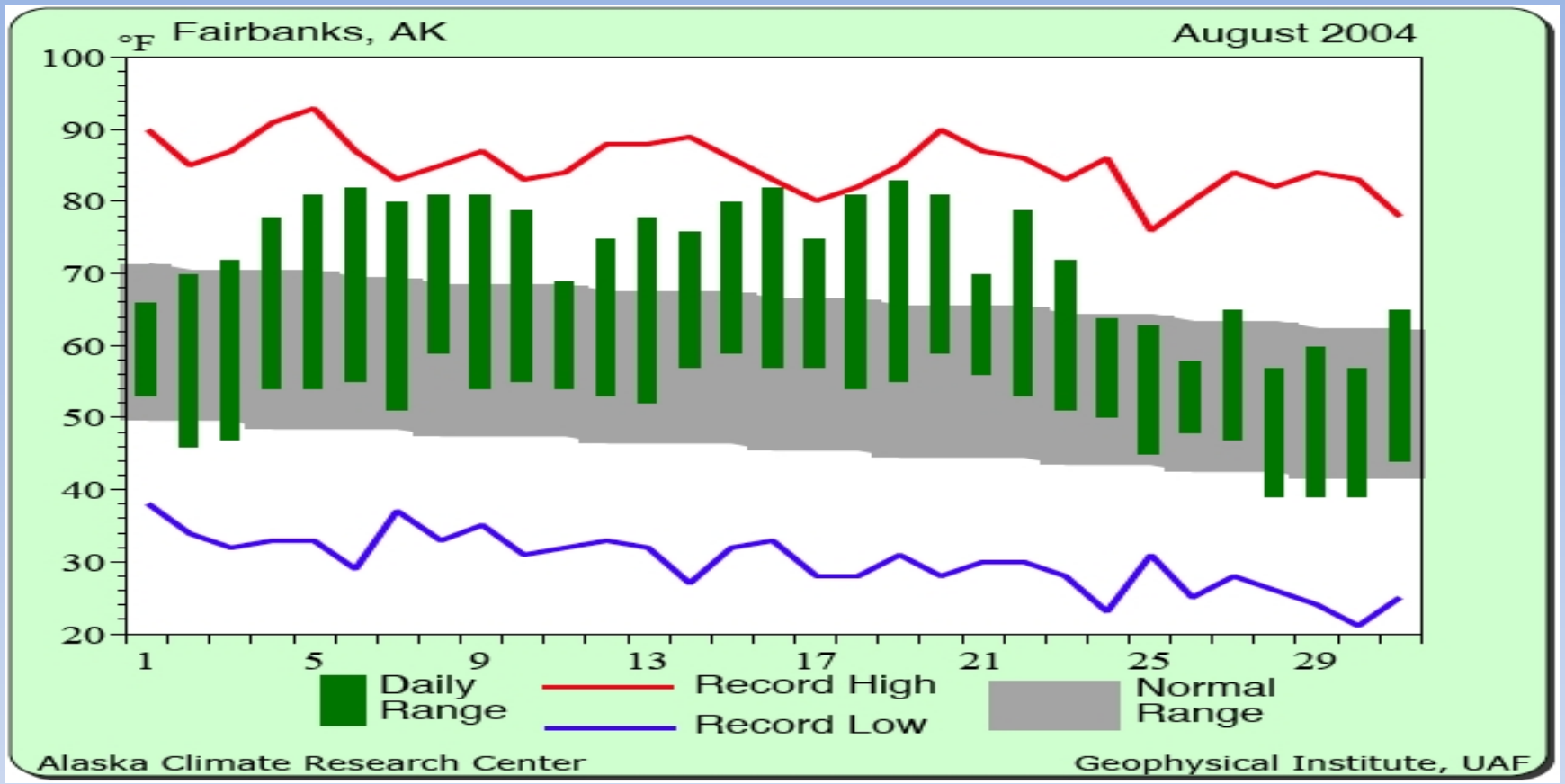
2004



Temperature above average in late June
Low rainfall: 22% of normal
Early June below normal fire activity



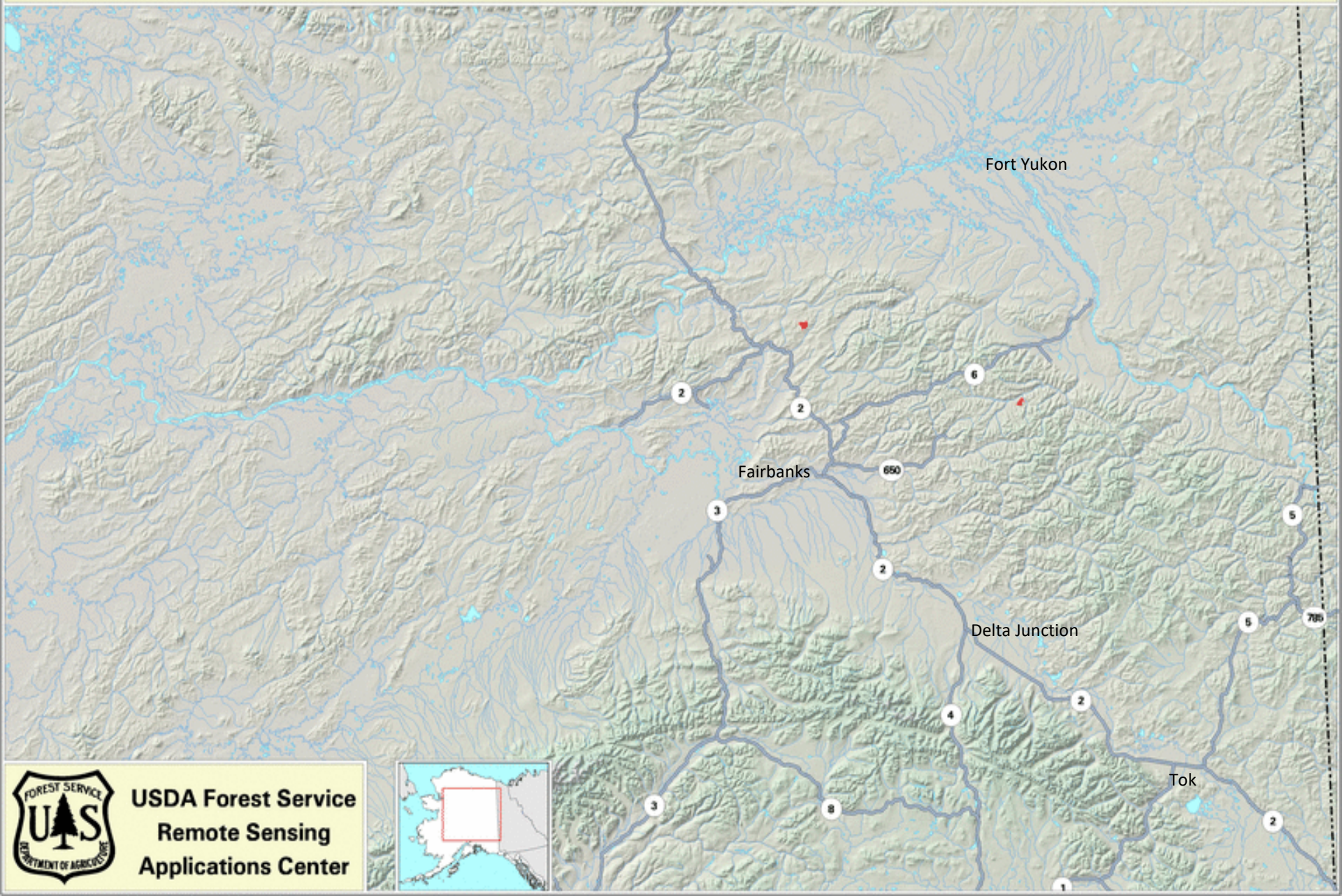
Near normal temperatures
Below normal precipitation – 35%
    Rain occurred early in month, drying trend mid-month
Continued high fire activity



Warmest since 1952
40% of normal precipitation
Persistent high fire activity

Interior Alaska MODIS Fire Detections

June 10, 2004

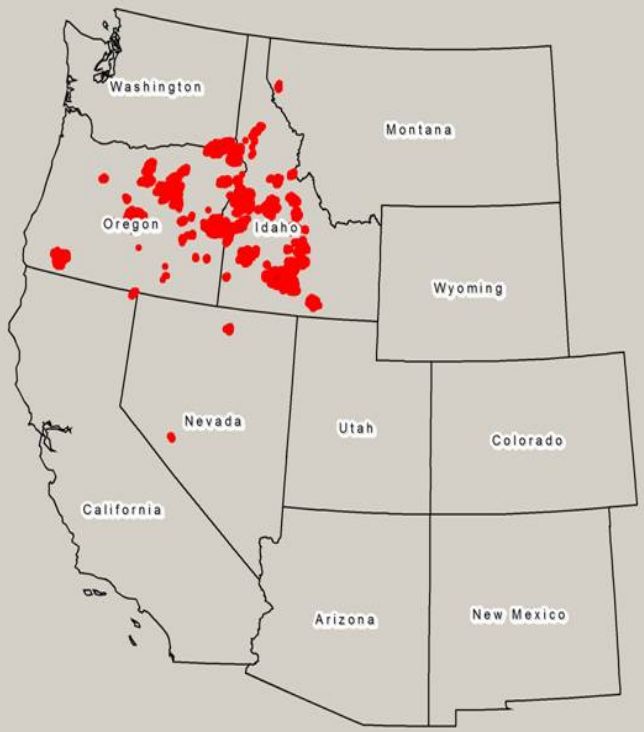


2004 Alaska Fires

Bolgen Creek Crazy Dall City Deer Creek Billy Creek Chicken Porcupine Gardiner Creek

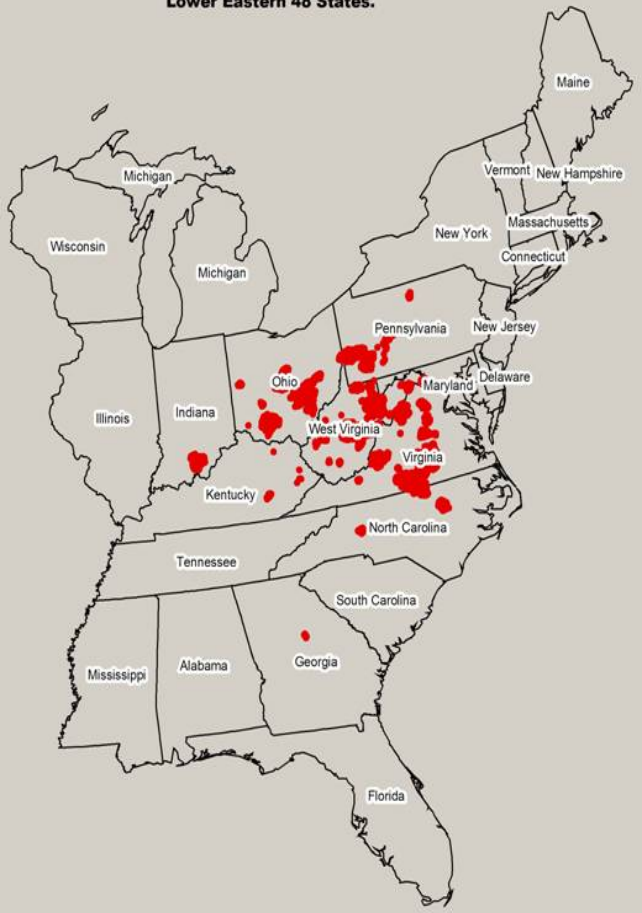
Boundary Tors Wolf Creek Camp Creek Lucky Creek King Creek American Summit

Listed Statewide Alaska Fires as they would be distributed if they would have occurred in the Lower Western 48 States.



The data represented in this map were gathered from multiple sources, which may vary in accuracy, scale and date. This map is for display purpose only.

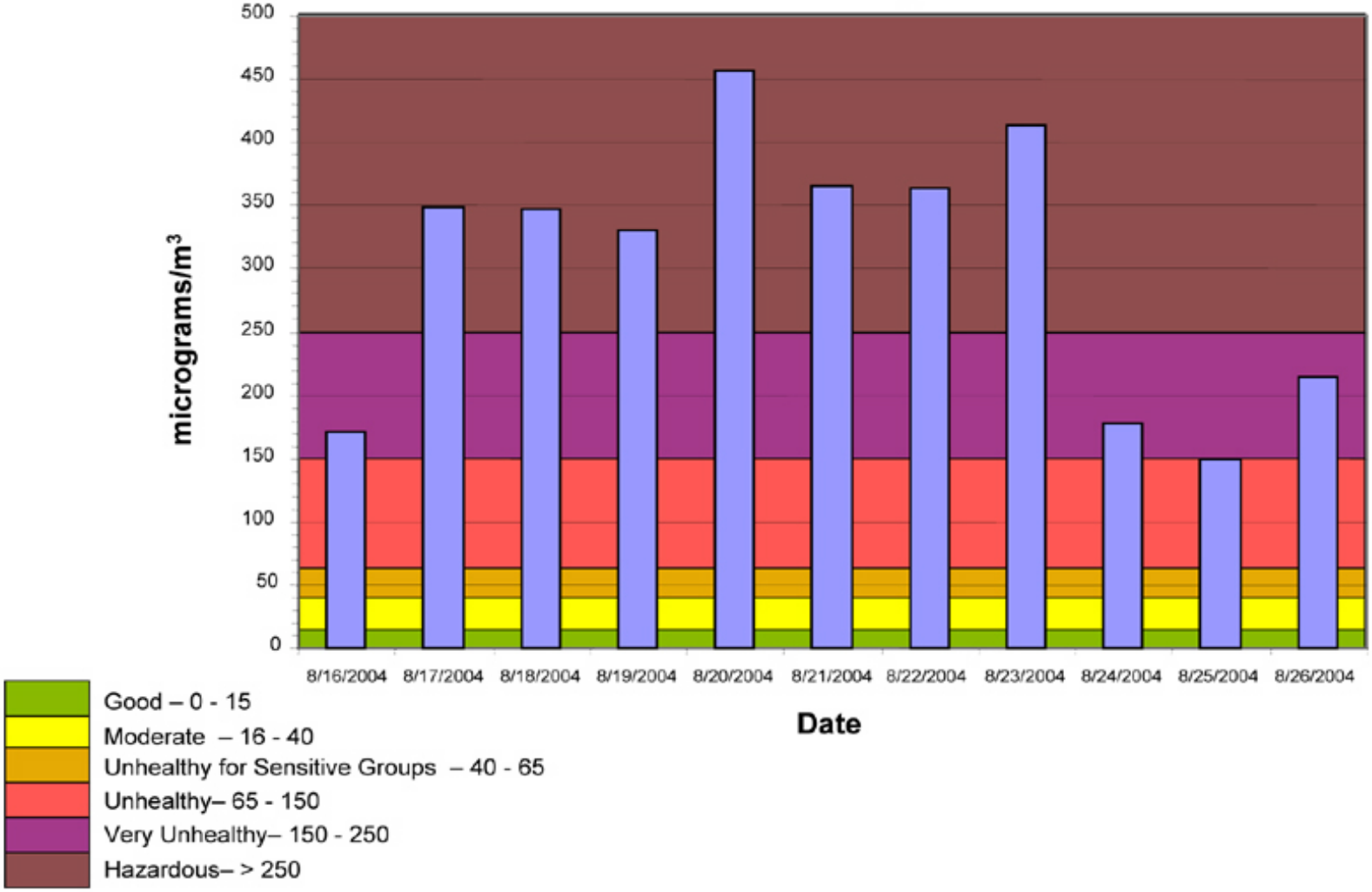
Listed Statewide Alaska Fires as they would be distributed if they would have occurred in the Lower Eastern 48 States.



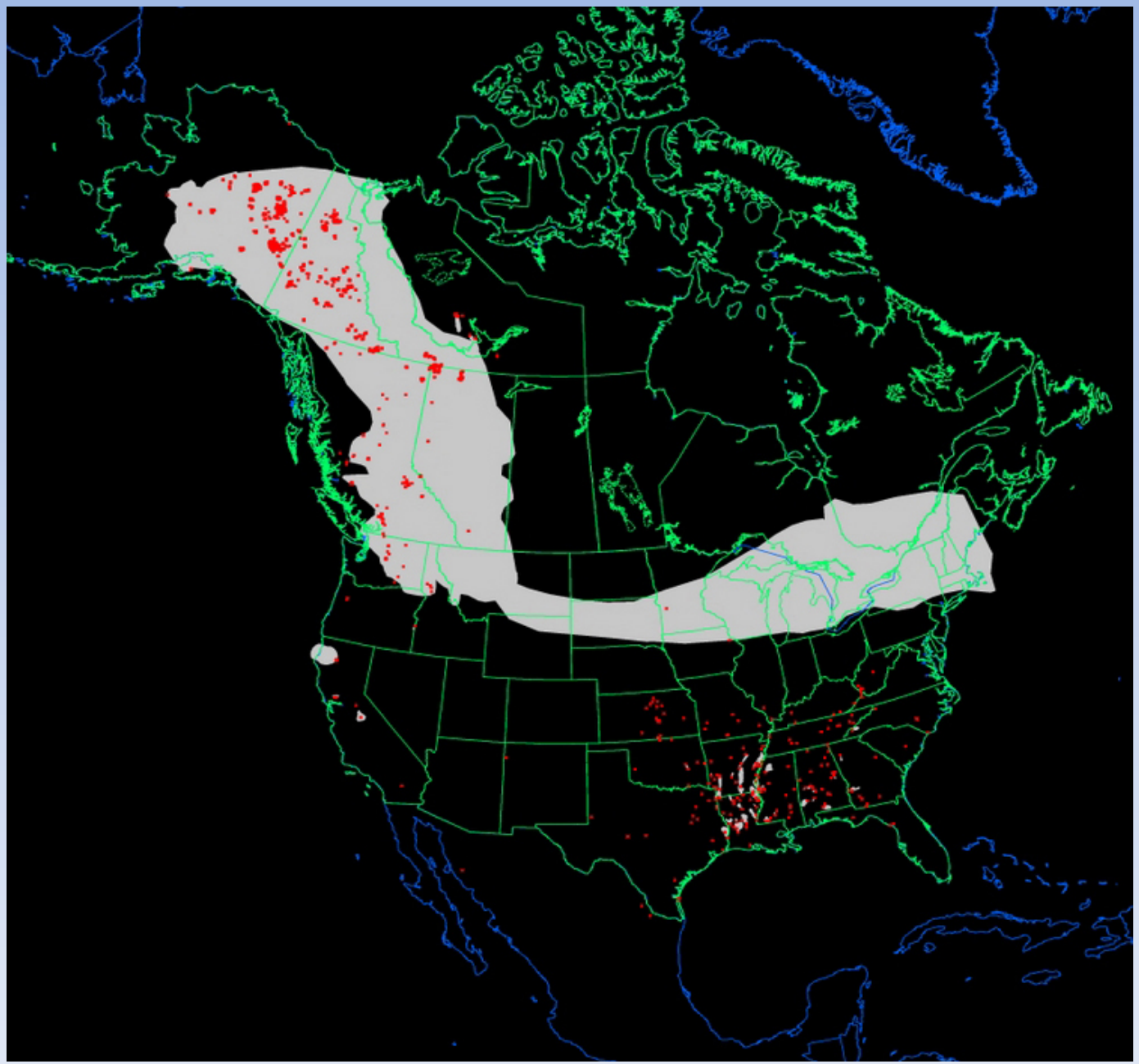
Dawson 31 Woodchopper Evansville Fort Hamlin Hills Lower Mouth Pingo Winter Trail

Smoke Impacts Fairbanks

2.5 Micron Airborne Particulate Matter- Daily Average Values - Downtown Fairbanks August 16-26

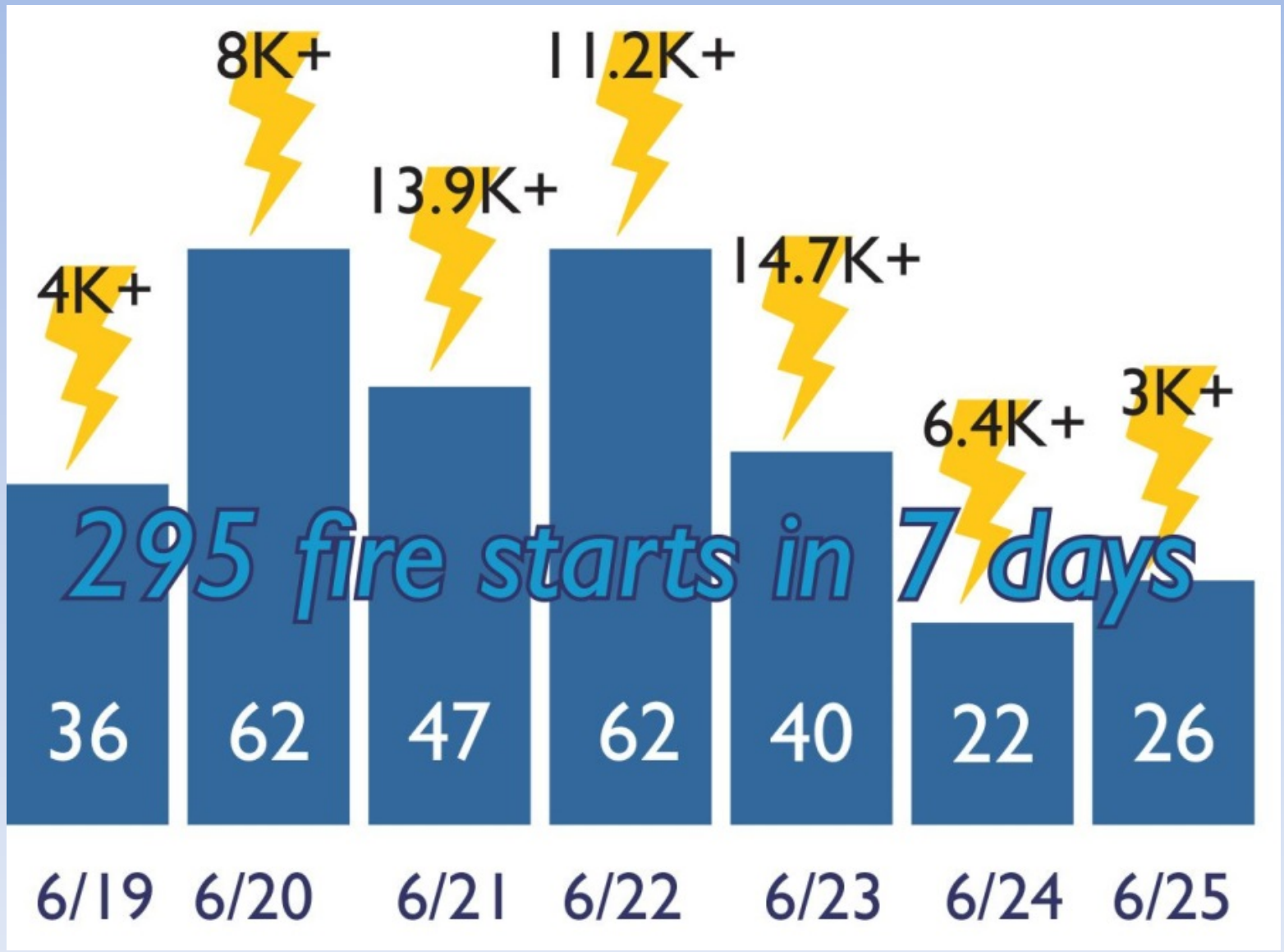


North America Smoke Drift and Fire Locations

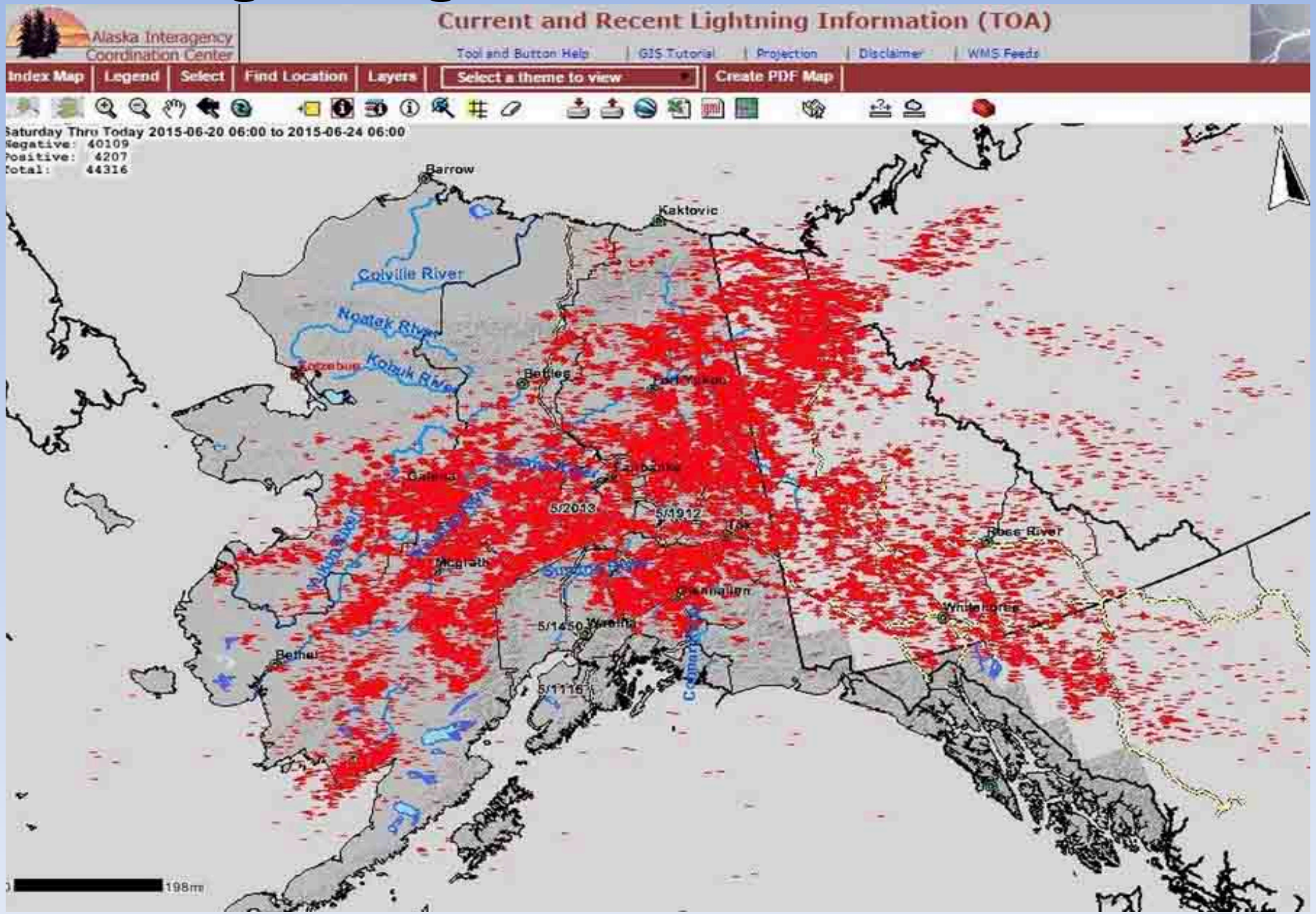


2015

Lightning Strikes 61K in Seven Day Period

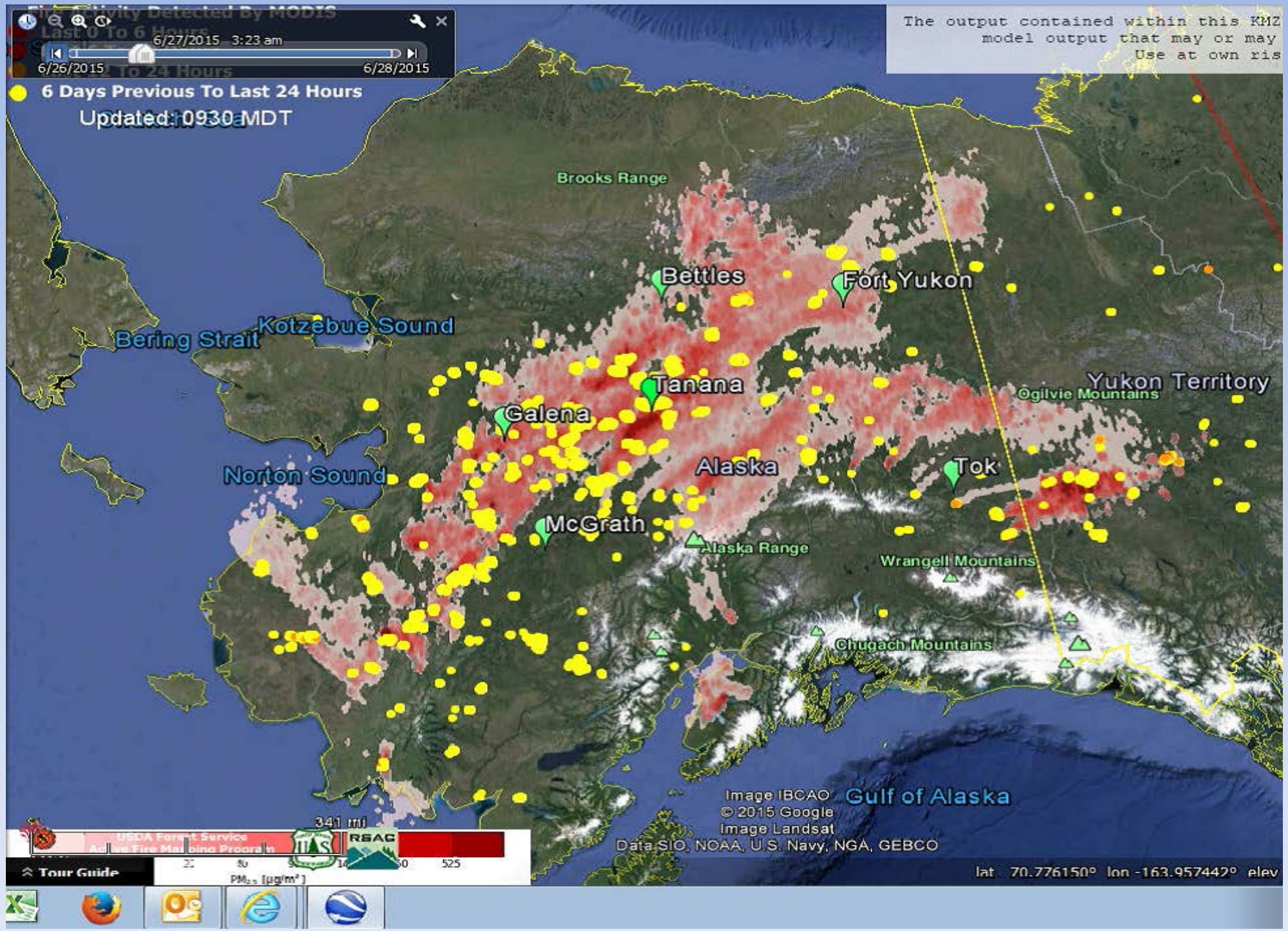


Lightning Strikes 6-20 to 6-24-15



Facebook Post “Gallows Humor”

MODIS 6-Days Previous with Smoke Model



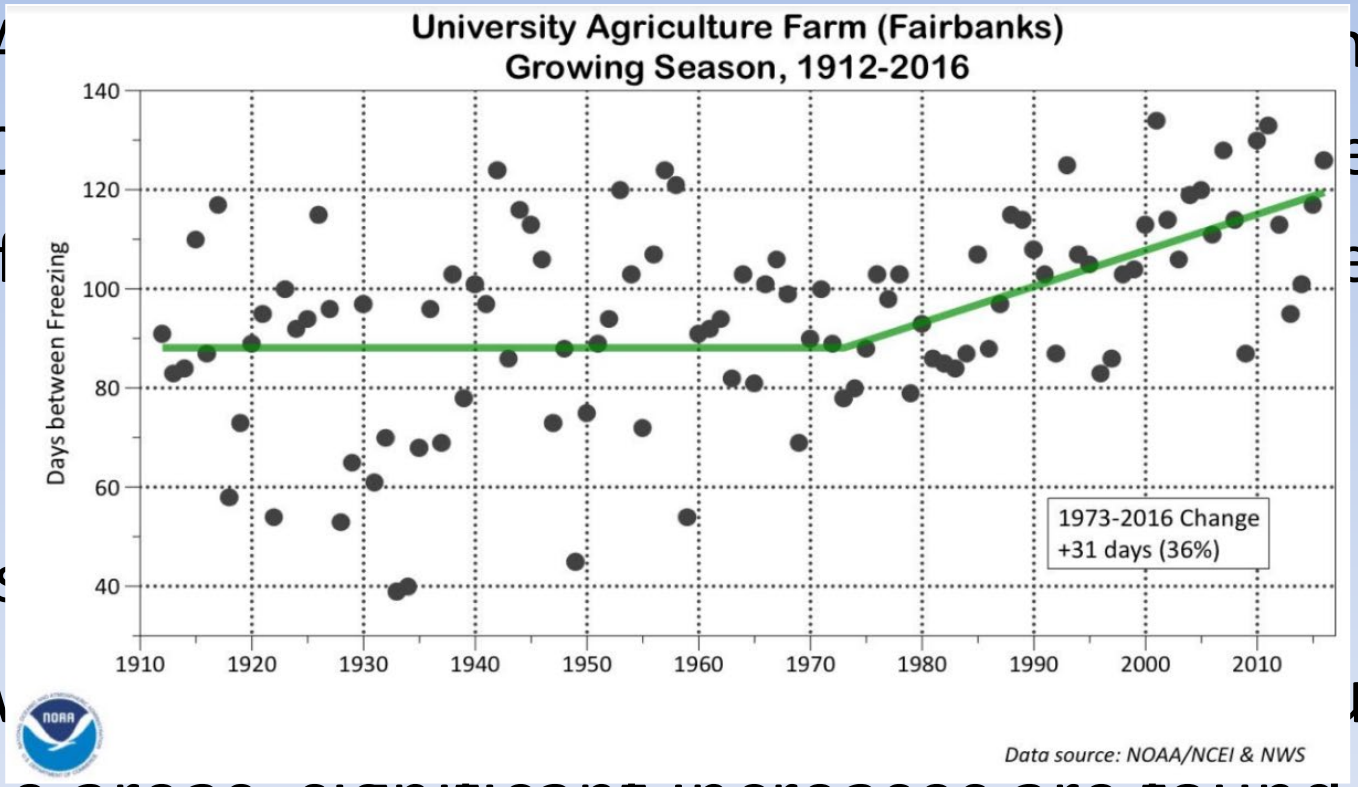
Late and Early Season Fires and Holdover Fires

- Holdover fires burn underground through winter, to re-emerge the next spring or summer
- More common since ~2007
- 2016 had 26 “starts” that were holdovers:
  - Kenai Peninsula, Southwest, Central Interior (2015)
  - Funny River Fire (2014)
- Often show up in unexpected areas, times

Late Season Kodiak Island- Twin Creeks Fire End of August 2015

Longer burning seasons?

- Fire season is starting earlier:
  - RA… …elt
  - 20… …e
  - Of… …e
    m…
- End…
  - Iss…
- Grov… …ut in some areas, significant increases are found



permafrost
loss
temperature
thaw
discontinuous
continuous
warming
yrs
total
release
losses
estimates
surface
changes
carbon
increase
sporadic/isolated
question
change
response
years
released
much
Schneider
time
Gt
ground
survey
al
et
areas
perm
assuming
answer
areal
think
model
likely
estimate
guess
ice
based
feedbacks
extent
area
sporadic
table
soil
degrees
one
depth
assume
also
CH4
CO2
soils
type
emissions
water
emission
important
degradation
McGuire
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Assumes
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uncertain
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stock
short-term
confidence
thermokarst
literature
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period
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even
means
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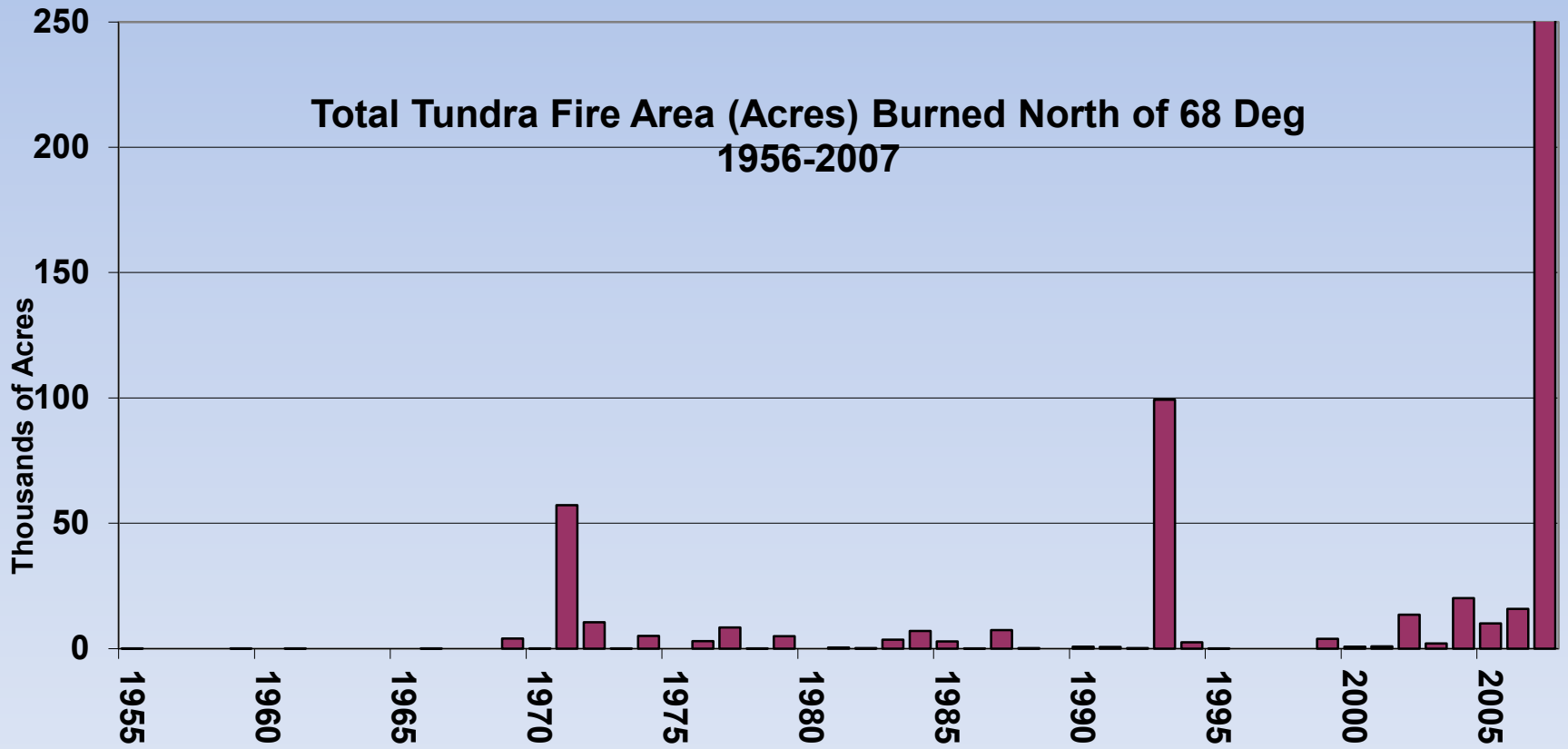
0-3m
due
studies
pool

Tundra Fires



Carbon

- North slope duff is millennial
- Tundra stores ~14% of the world's soil carbon Michelle Mack et. al. (In prep). Climate warming and novel disturbance in arctic tundra: carbon and nitrogen emissions from a large wildfire and its consequences for ecosystem structure
- One year post-burn severely burned sites released 80 g C m-2 while unburned sites absorbed 50 g C m-2 Adrian Rocha, Marine Biological Laboratory
- Burned tundra soil contributes to atmospheric CO2 and global warming

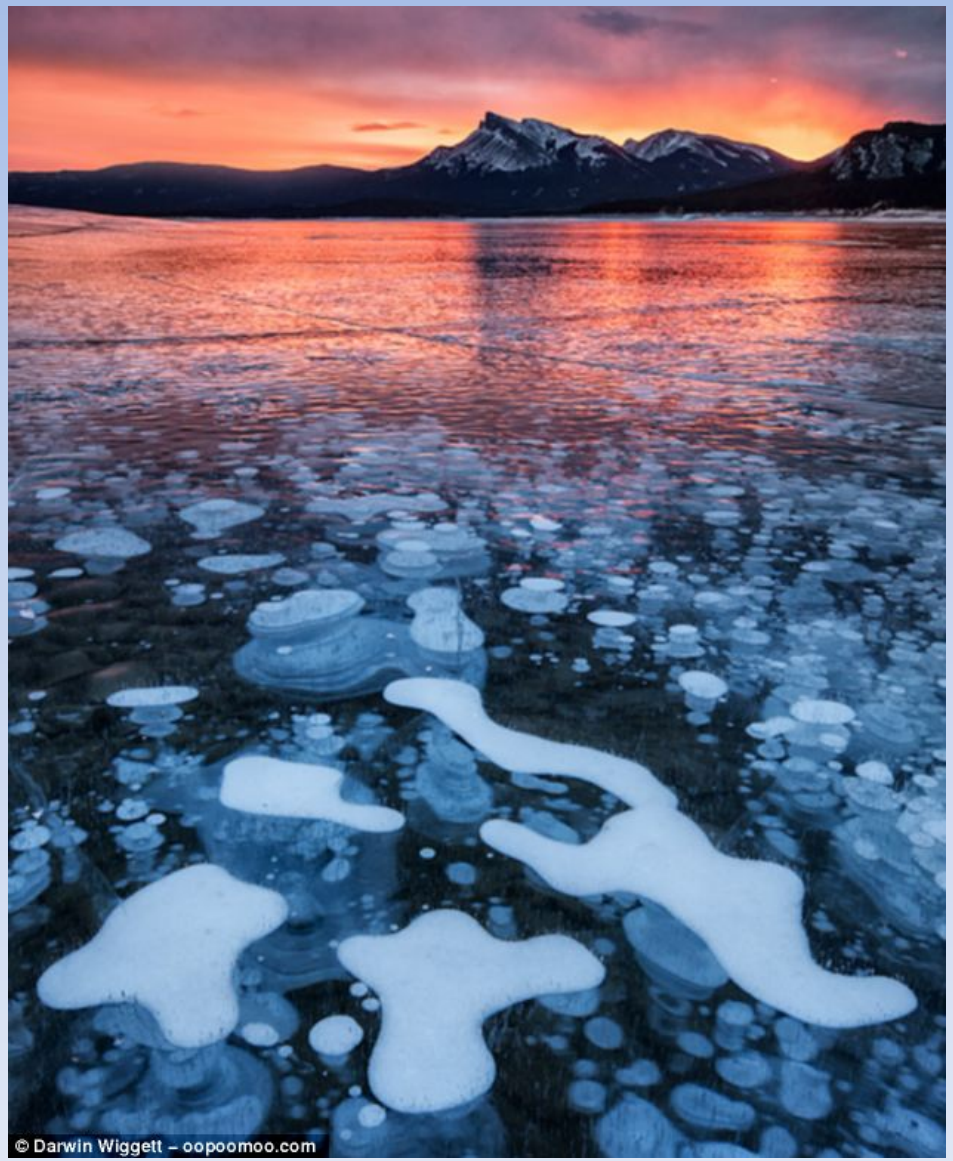
Source: Eric Miller, North Slope Fire a Novel Regime, 2010

Moist Acidic Tundra Anaktuvuk River Fire

- Combustion of duff = 30%
- On average the fire burned off the last 37 years of duff accumulation ~1973 (Bomb signature)
- Produced 2 Tg Carbon ~5% of fire emissions from North American boreal forests
- Michelle Mack et. al. (In prep). Climate warming and novel disturbance in arctic tundra: carbon and nitrogen emissions from a large wildfire and its consequences for ecosystem structure.

Source: Eric Miller, North Slope Fire a Novel Regime, 2010

Methane (CH4) Capture in Frozen Lakes



Methane Flare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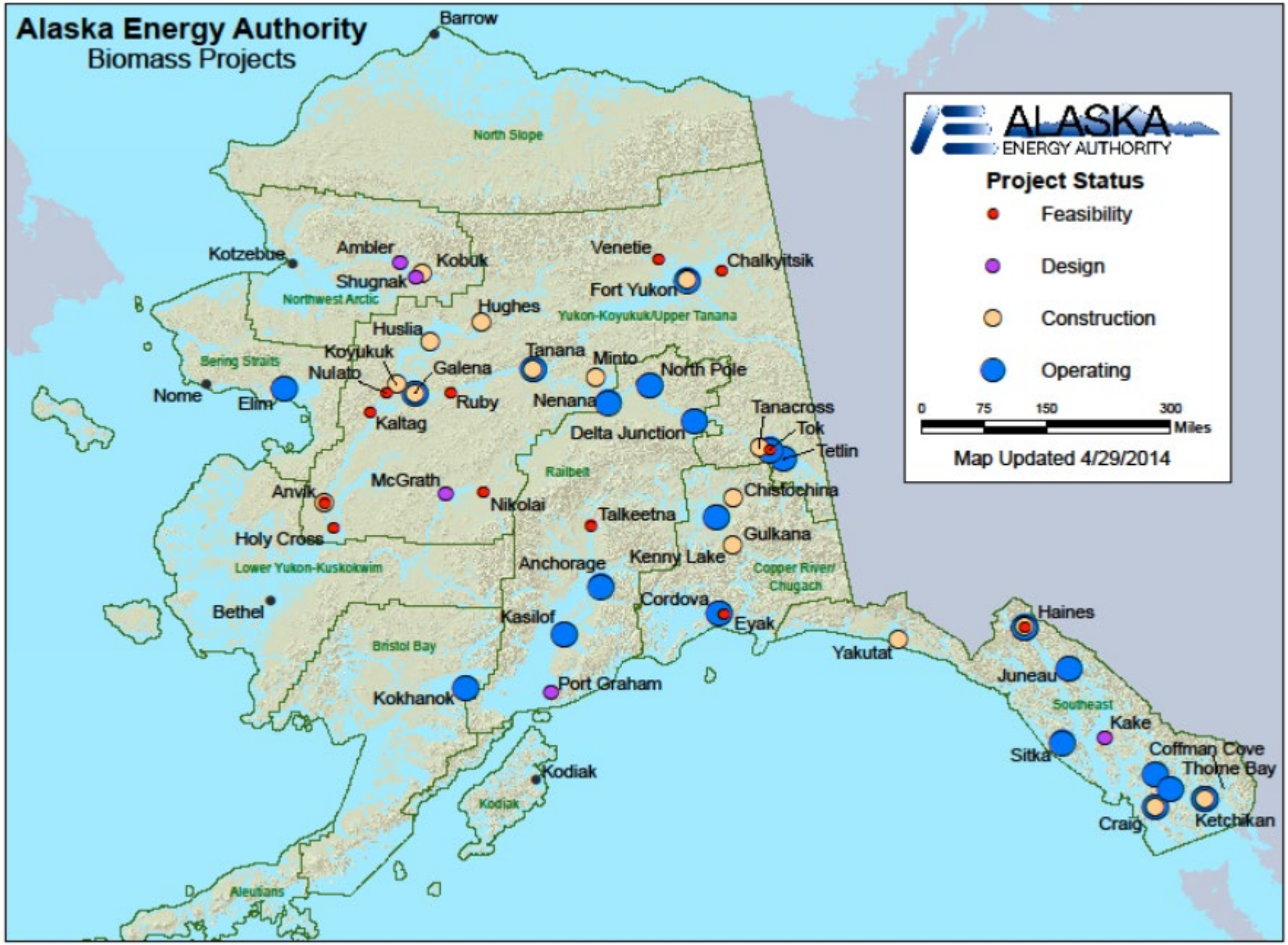
Biomass and Energy

Figure 4.- Example of shaded fuel break and natural barriers working together to reduce wildland fire risk for the community of Nikolai. (Bureau of Indian Affairs and Tanana Chiefs Conference, Inc. project)

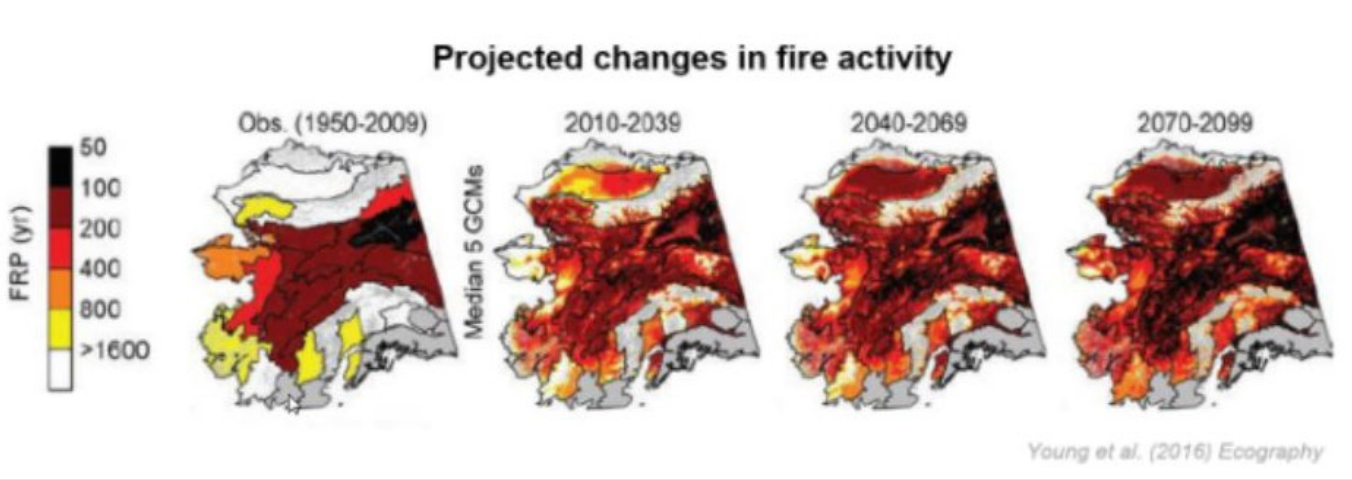

Alaska Energy Authority
Biomass Projects
Barrow
North Slope
Kotzebue
Ambler
Kobuk
Shugnak
Northwest Arctic
Venetie
Chalkyitsik
Fort Yukon
Hughes
Yukon-Koyukuk/Upper Tanana
Huslia
Koyukuk
Nulato
Galena
Ruby
Kaltag
Tanana
Minto
North Pole
Nenana
Delta Junction
Tanacross
Tok
Tetlin
Bering Straits
Nome
Elim
Railbelt
McGrath
Nikolai
Anvik
Holy Cross
Lower Yukon-Kuskokwim
Talkeetna
Chistochina
Gulkana
Kenny Lake
Anchorage
Copper River/
Chugach
Cordova
Eyak
Bethel
Kasilof
Bristol Bay
Yakutat
Haines
Juneau
Southeast
Kake
Sitka
Coffman Cove
Thorne Bay
Craig
Ketchikan
Port Graham
Kokhanok
Kodiak
Kodiak
Aleutians
ALASKA
ENERGY AUTHORITY
Project Status
Feasibility
Design
Construction
Operating
0
75
150
300
Miles
Map Updated 4/29/2014

Wood Chips Space Heating

Tok and Delta Schools
Craig Public Buildings

Research on Climate Change Effects on Alaska Fire Season

- Young et al. 2016 used statistical-correlative models to determine change in fire frequency
- Fire rotation period (FRP) indicates more frequent fires in virtually all of Alaska through this century
- Greatest uncertainty is in tundra, which is also most prone to changes



What we expect the future to bring

- Experience says there will always be a few really big years mixed with a lot of slow years
- Those big years will likely become more severe and more frequent
- With budget cuts, training and preparedness will suffer, which means more potential for disaster
- Increased variability will lead to complacency at times, panic at other times
- It's about timing: of dry fuels and lightning ignitions, combined w/ spread potential & resource availability

Washington Creek Fire, 2016
Photo Credit: Bruce Smith