Effects of a rapidly warming climate on the (western) Kenai Peninsula

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Kenai National Wildlife Refuge

ANCHORAGE DAILY NEWS

Weather

Alaska just had its warmest December on record

Author: Annie Zak Updated: January 9, 2018 Published January 8, 2018

A mother polar bear with her triplets in the town of Kaktovik, Alaska, Sept. 5, 2016. Polar bears roam the town during the fall as climate refugees, on land because the sea ice they rely on for hunting seals is receding. Federal wildlife officials on Jan. 9, 2017, called climate change the biggest threat to the survival of the polar bear and warned that without decisive action to combat global warming, the bears would almost certainly disappear from much of the Arctic. (Josh Haner/The New York Times)

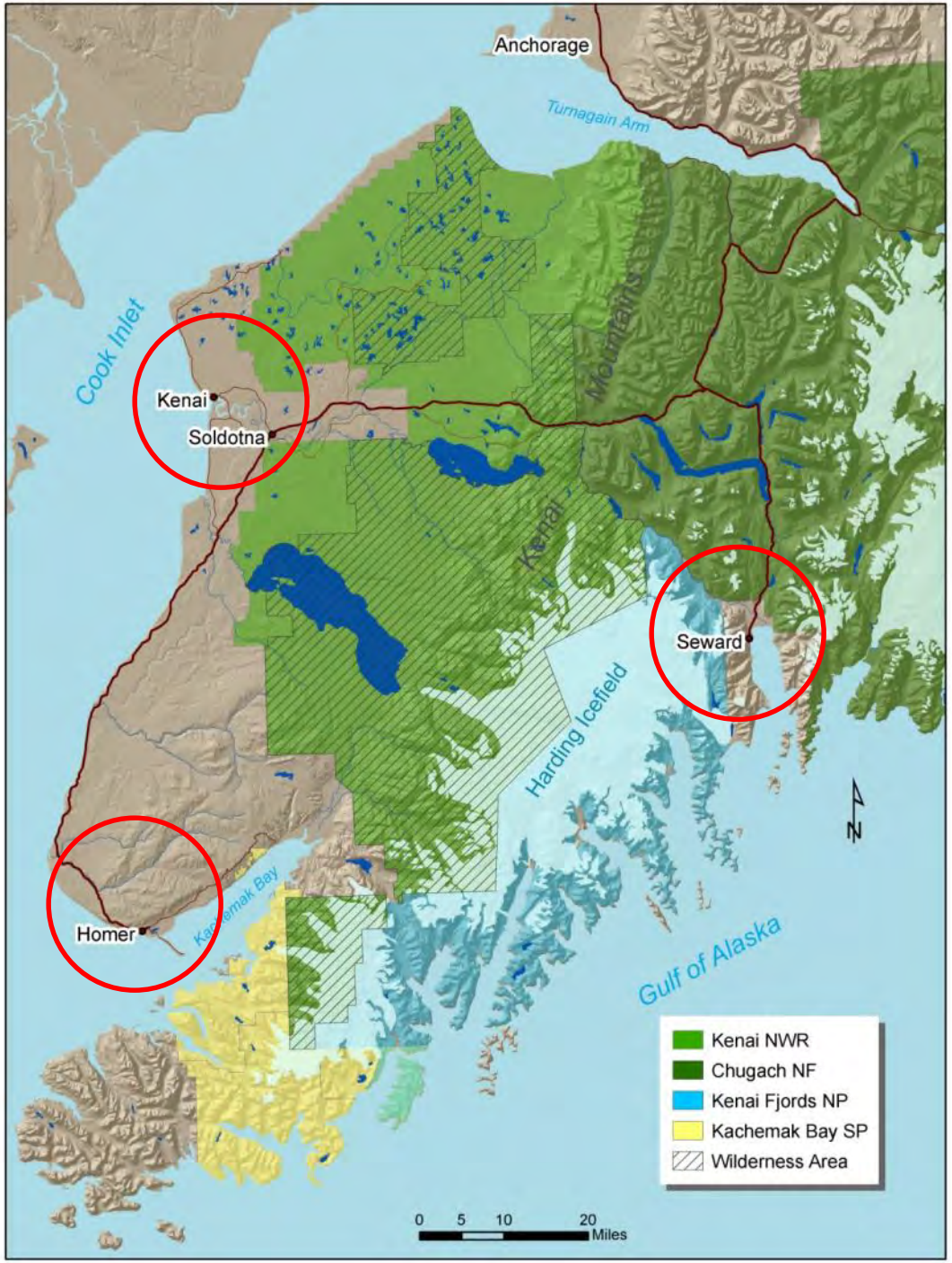
Last month was the warmest December on record in Alaska, according to a federal report released Monday.

The statewide average temperature in December was 19.4 degrees, 15.7 degrees above the 20th century average, the National Oceanic and Atmospheric Administration's report said. Records for Alaska go back to 1925.

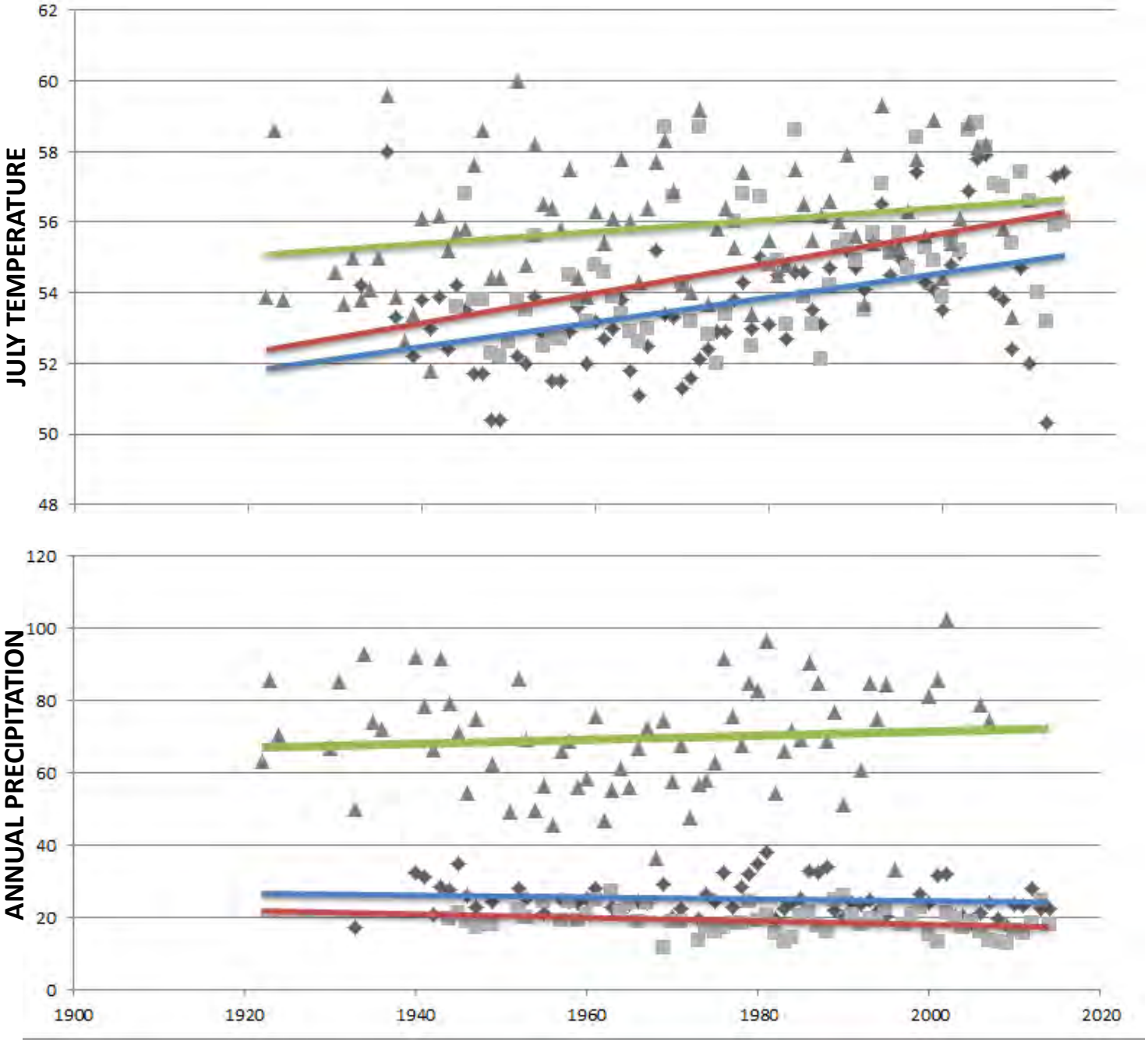
15.7° above 20th century average for Alaska! (since 1925)

"Of course it's concerning. Alaska's changing and it's changing very rapidly. We're going to have to adapt"

- Rick Thoman
Retired NWS manager



- ✓ Alaska is warming at 2-3 X Lower 48 rate
- ✓ Climate warming effects are not masked by other human-caused drivers of change
- ✓ Kenai Peninsula may be best studied locale in AK outside of high arctic

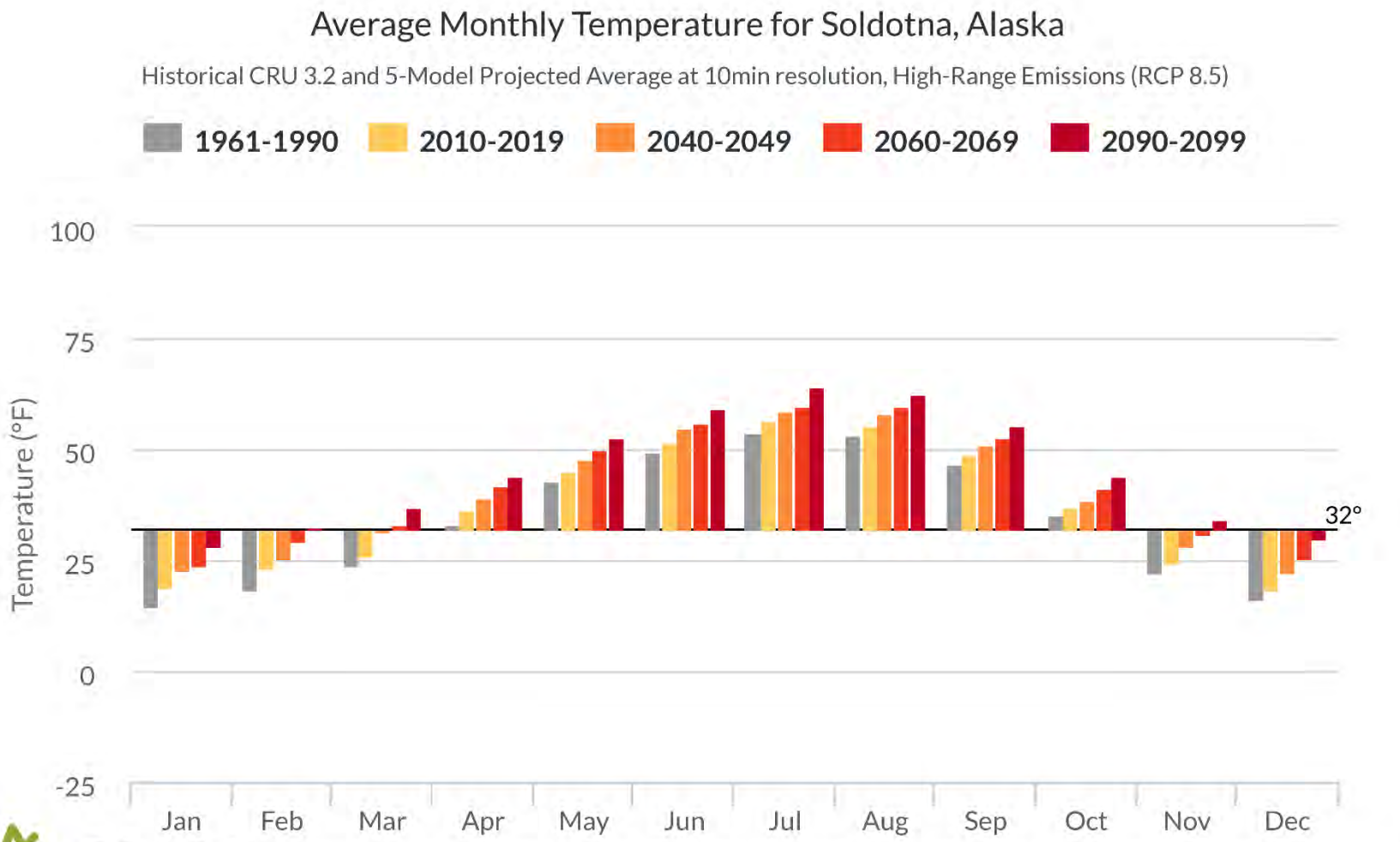


SEWARD

KENAI

HOMER

Winter (average temperatures < freezing) in Soldotna decrease from 5 to 3 months by 2100…



SNAP

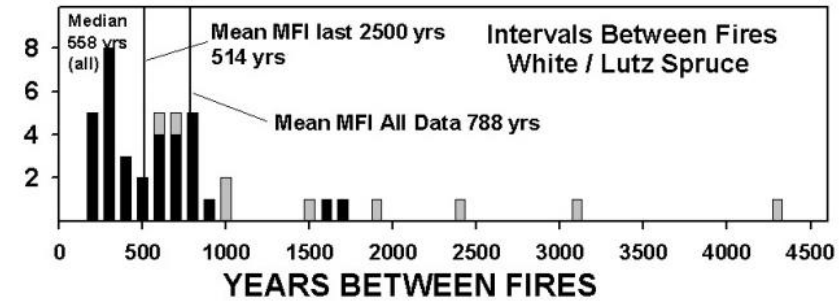
Due to variability among climate models and among years in a natural climate system, these graphs are useful for examining trends over time, rather than for precisely predicting monthly or yearly values.

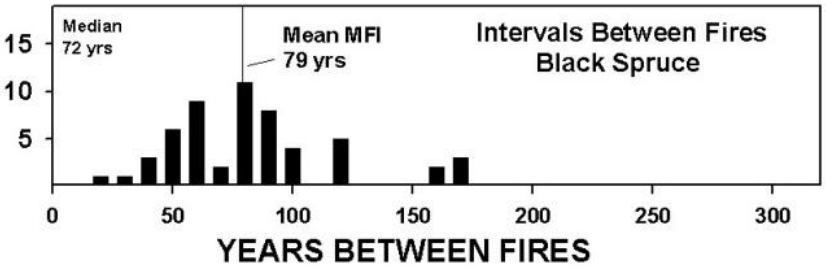
Dramatic ecological responses to rapidly warming climate

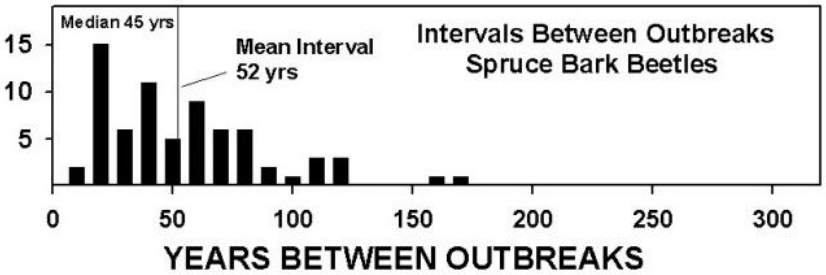
- decreasing available water (60% loss since 1968)
- drying wetlands (6 – 11% per decade)
- receding glaciers (11% surface area, 21m elevation)
+ rising treeline (1m/yr) and shrubline (2.8m/yr)
+ unprecedented SB beetle outbreak (triggered by 2 consecutive warm summers)

Adageirsdottir et al.1998; Berg et al. 2006,2009; Boucher & Mead 2006; Dial et al. 2007,2016; Klein et al. 2005, Rice 1987

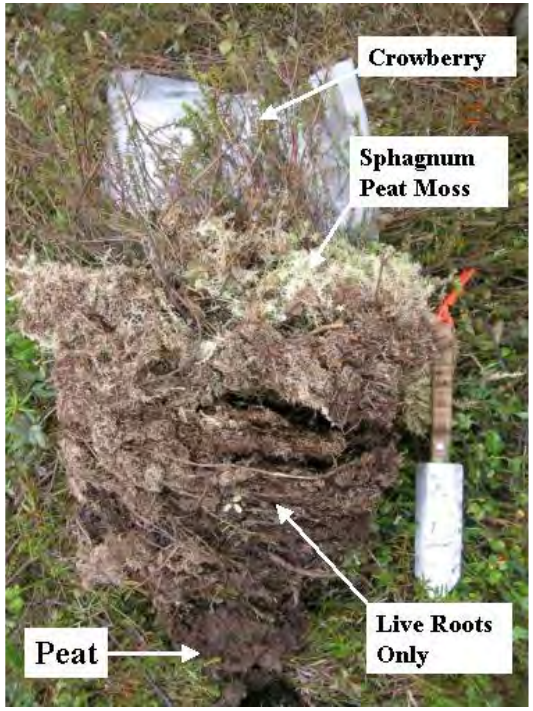
Official fire season is now April 1 instead of May 1







Woody shrubs encroach into 8,000 year old Sphagnum peatlands

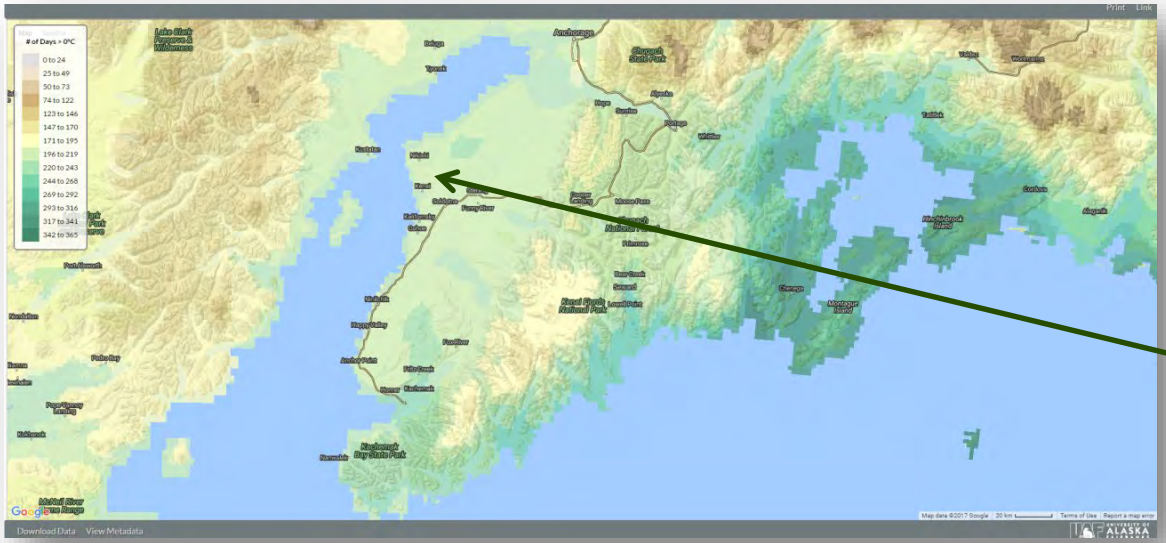


Berg et al. 2009

Western Kenai coastline losing 1 ft/year in past 50 years

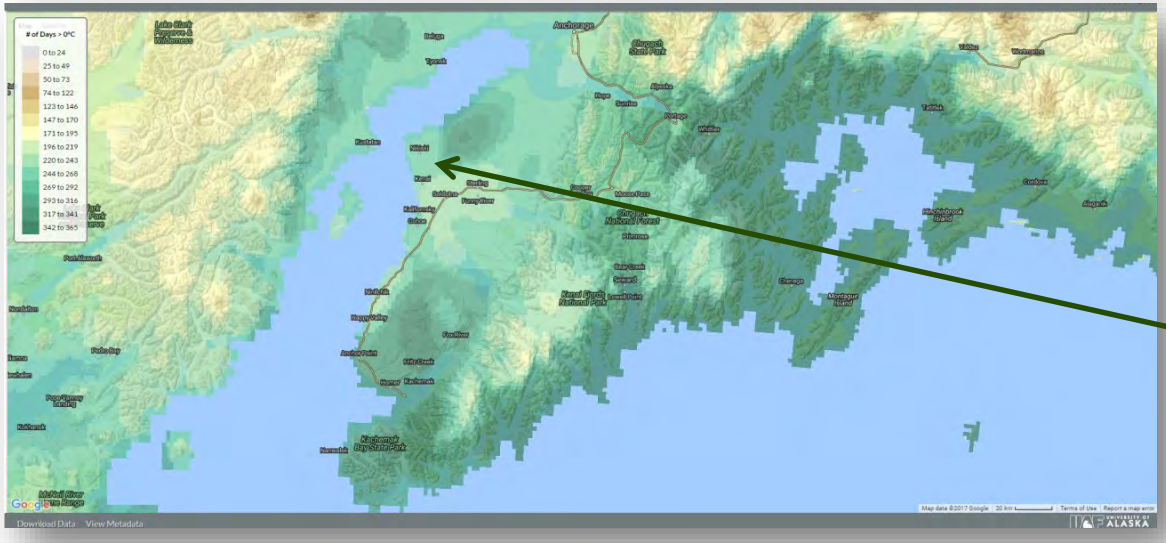
Warming climate will add $3.6 - $6.1 billion (10-20%) by 2030 to public infrastructure costs in AK

Forecasted growing season length (days > 0˚C)*



2010–2019

196-219 days



2090–2099

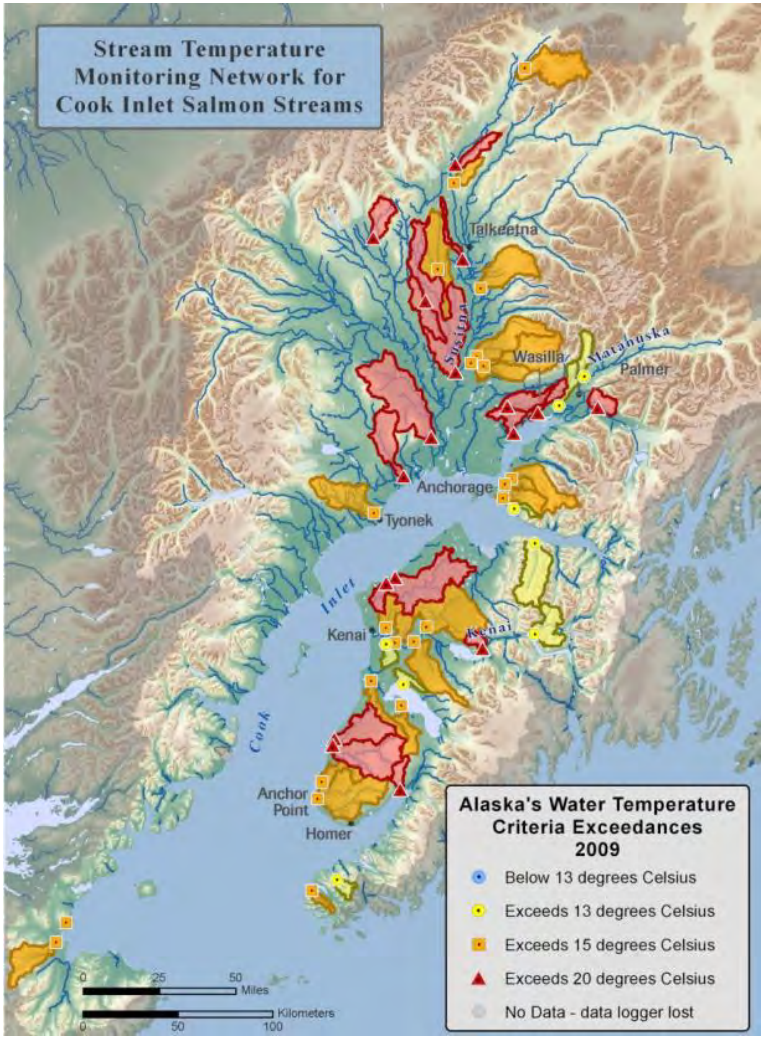
220-243 days

*as 10-year averages assuming mid–range emissions (A1B) from the 5-model average at 2km resolution

Salmon in 47 of 48 non-glacial streams experience thermal stress in July

Maximum temperatures not to be exceeded:

- **egg & fry incubation = 13°C**
- **spawning areas = 13°C**
- **migration routes = 15°C**
- **rearing areas = 15°C**
- **and may not exceed 20°C at any time**



Mauger 2011, Mauger et al. 2017

Changing migration window in last decade

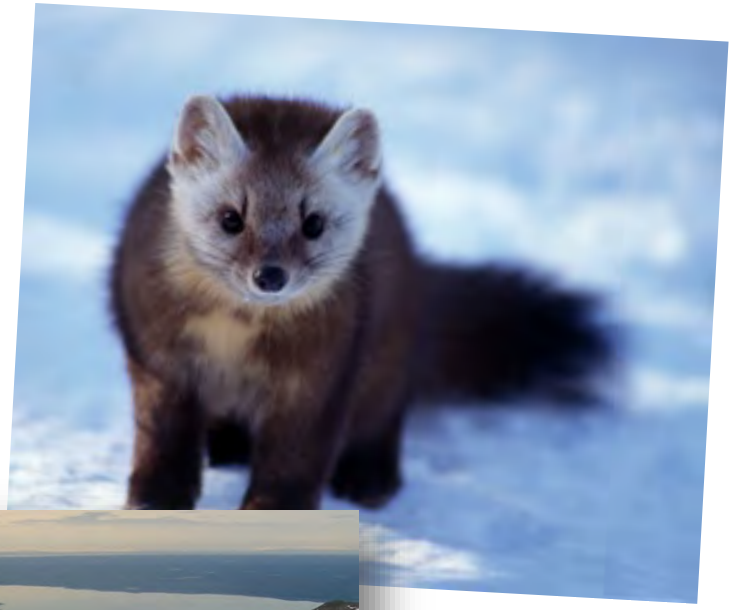
eBird data

- ✓ Earlier arrival records for 33 species
- ✓ Later departure records for 38 species
- ✓ 27 new species since 2007

Eurasian-collared dove*
Redwing*
Jack snipe*
Skylark*
Long-billed murrelet*
Black-tailed godwit*
Northern mockingbird
Spotted towhee
Turkey vulture
Western kingbird
Western meadowlark
Willow flycatcher
Northern wheatear
Western tanager
Yellow-bellied sapsucker
Warbling vireo
Swamp sparrow
Tennessee warbler
Cape May warbler
Nashville warbler
Wilsons's phalarope
Great egret
Willet
Red-footed booby
Black guillemot
Heerman's gull
Lesser black-backed gull

Harvested species likely to change in abundance on the Kenai Peninsula

Alpine habitat loss and novel pathogen

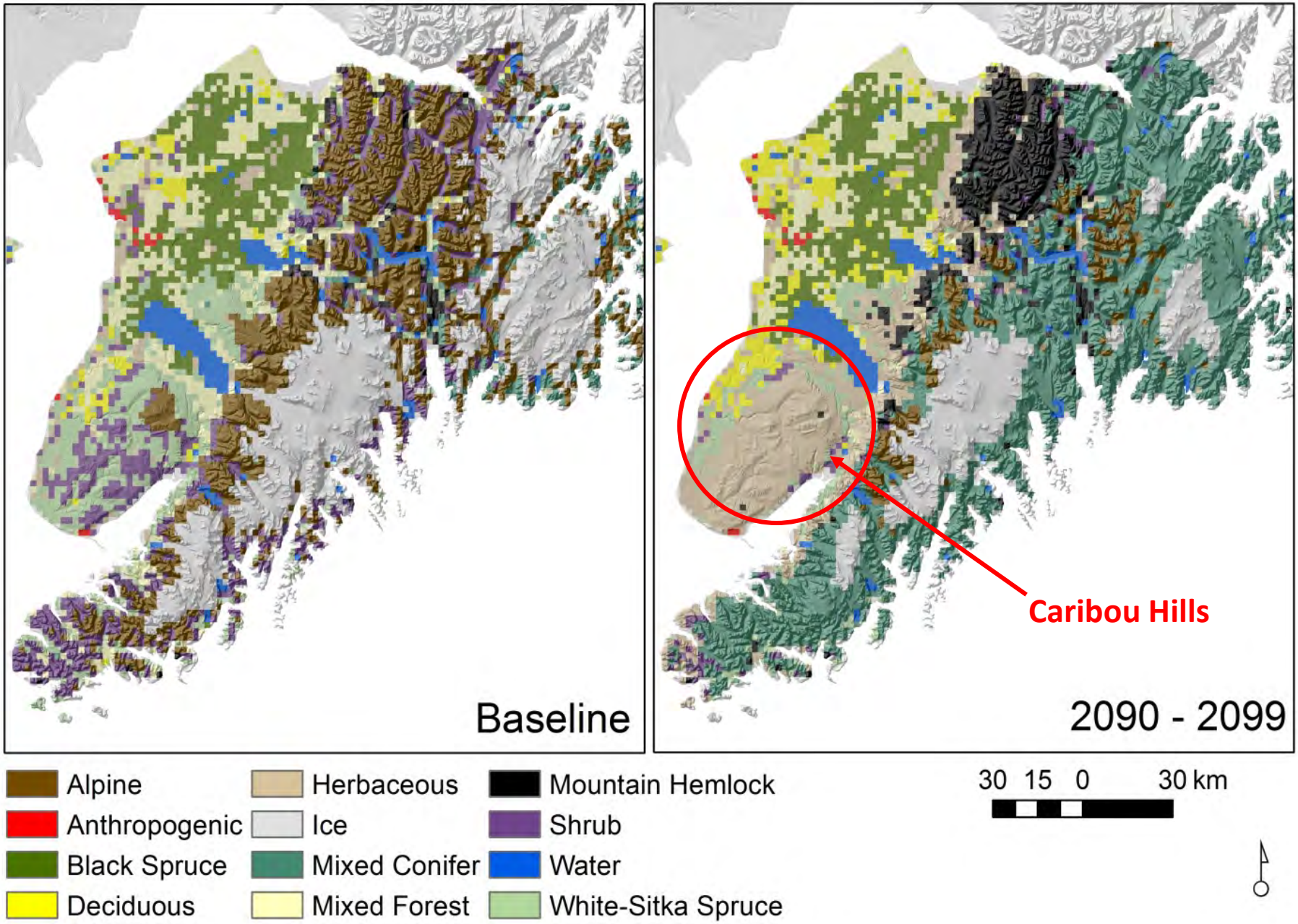


Warmer winter nights in Lowlands

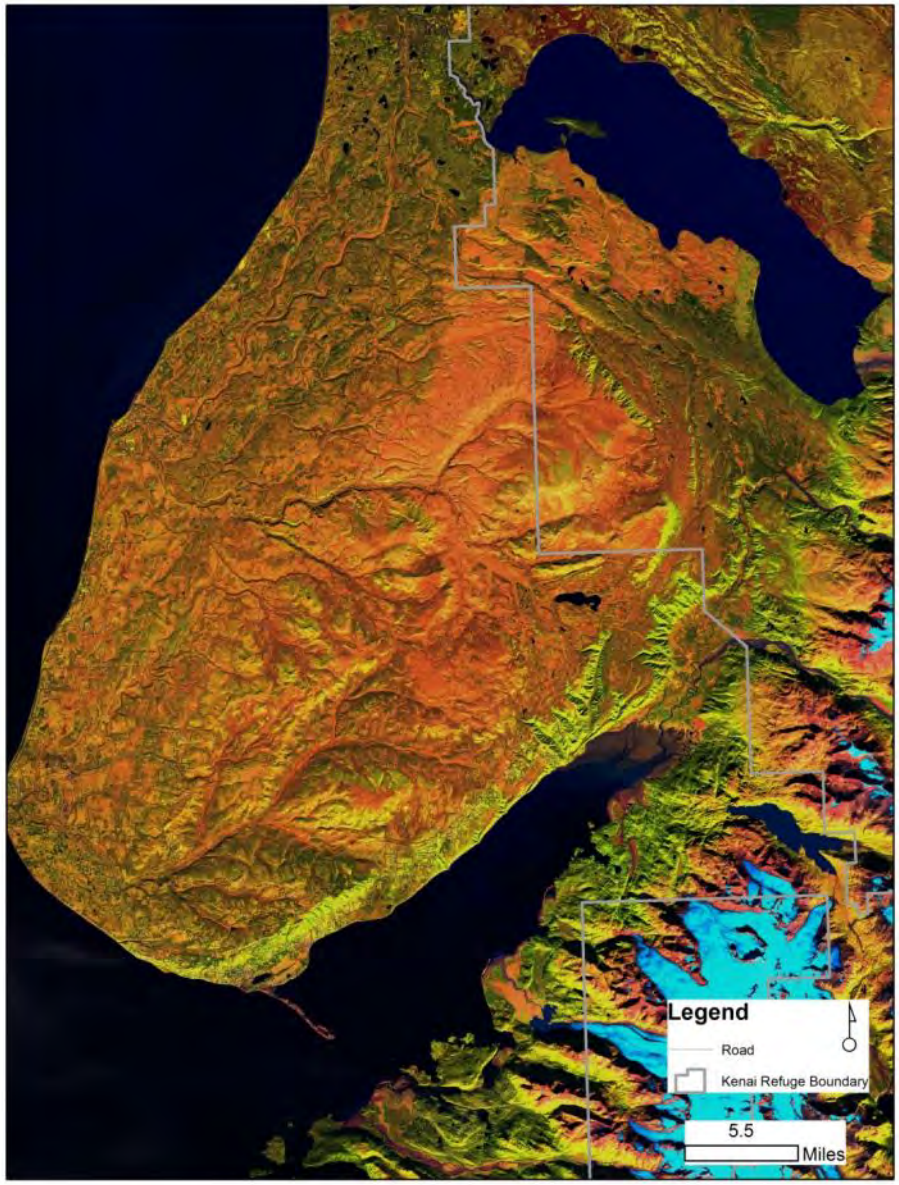
Wetter and more snow at high elevations

Forecasting the Kenai Peninsula's landscape through 2100

- ✓ Climate envelope modeling using Random Forests™
- ✓ A1B scenario decadal averages for temperature, precipitation (SNAP)
- ✓ landcover type with greatest % cover in 2km pixels
- ✓ if previous landcover type for each timestep (2039, 2069, 2099) P >0.5 then stay; if P <0.5 then landcover type with highest probability



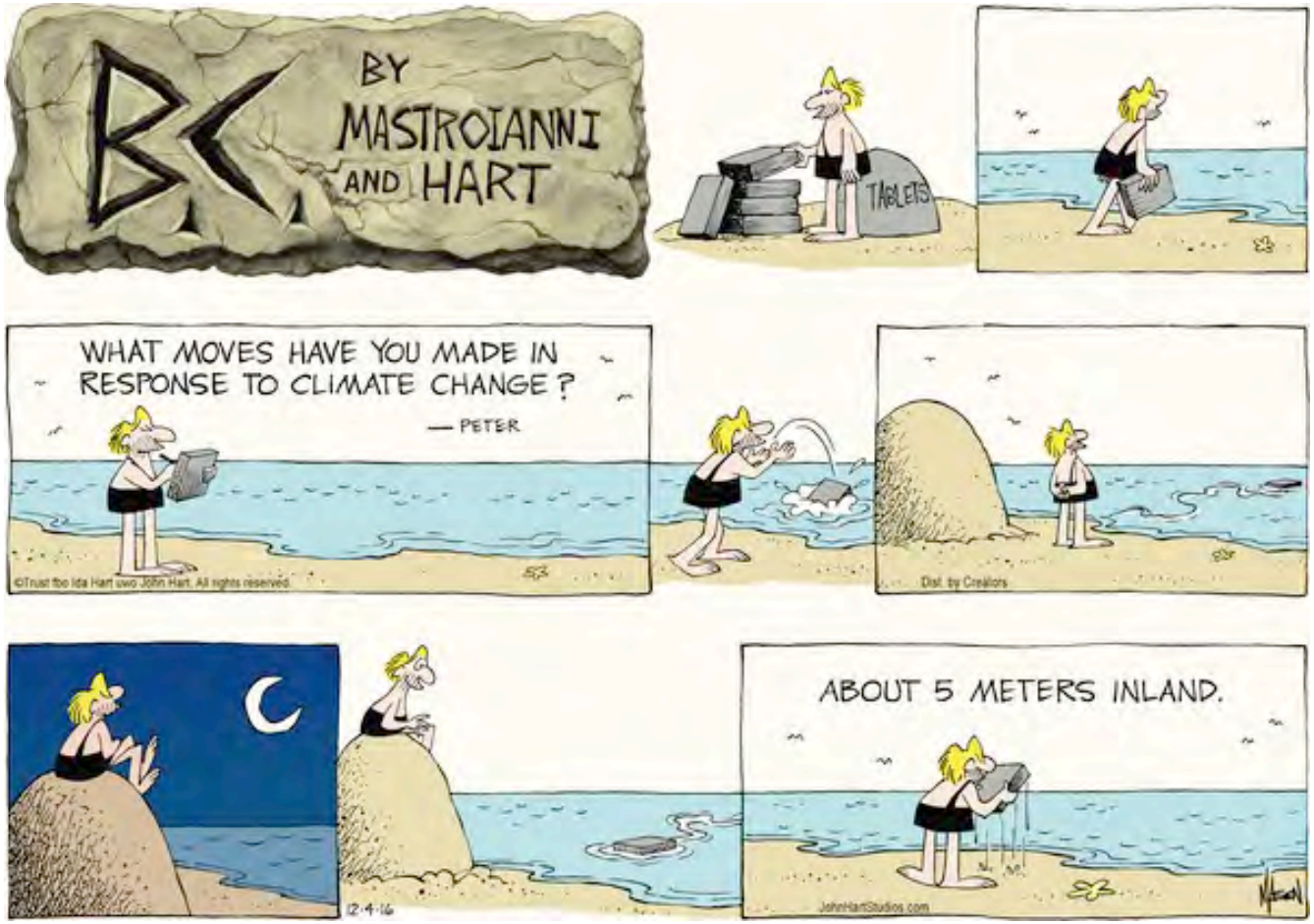
Magness & Morton 2018



SEPT 1985

SEPT 2014

Questions????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BY
MASTROIANNI
AND HART
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WHAT MOVES HAVE YOU MADE IN RESPONSE TO CLIMATE CHANGE?
— PETER
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