NOAA 2021 Arctic Report Card

Rapid and pronounced warming continues to drive the evolution of the Arctic environment

Dr. Richard Spinrad

Editors: Twila Moon, Matthew Druckenmiller, Rick Thoman
Panelists: Twila Moon, Lawrence Mudryk, Gabriel Wolken and Kaare Sikuaq Erickson

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Rapid and pronounced warming continues to drive the evolution of the Arctic environment

- **111 Authors from 12 countries**
- **14 essays, including a highlight on** *COVID-19 impacts on food access for Alaska Natives*

Vital Signs

Surface Air Temperature
Terrestrial Snow Cover
Greenland Ice Sheet
Sea Ice
Sea Surface Temperature
Arctic Ocean Primary Productivity
Tundra Greenness

Indicators

River Discharge
Ocean Acidification
Beaver Engineering

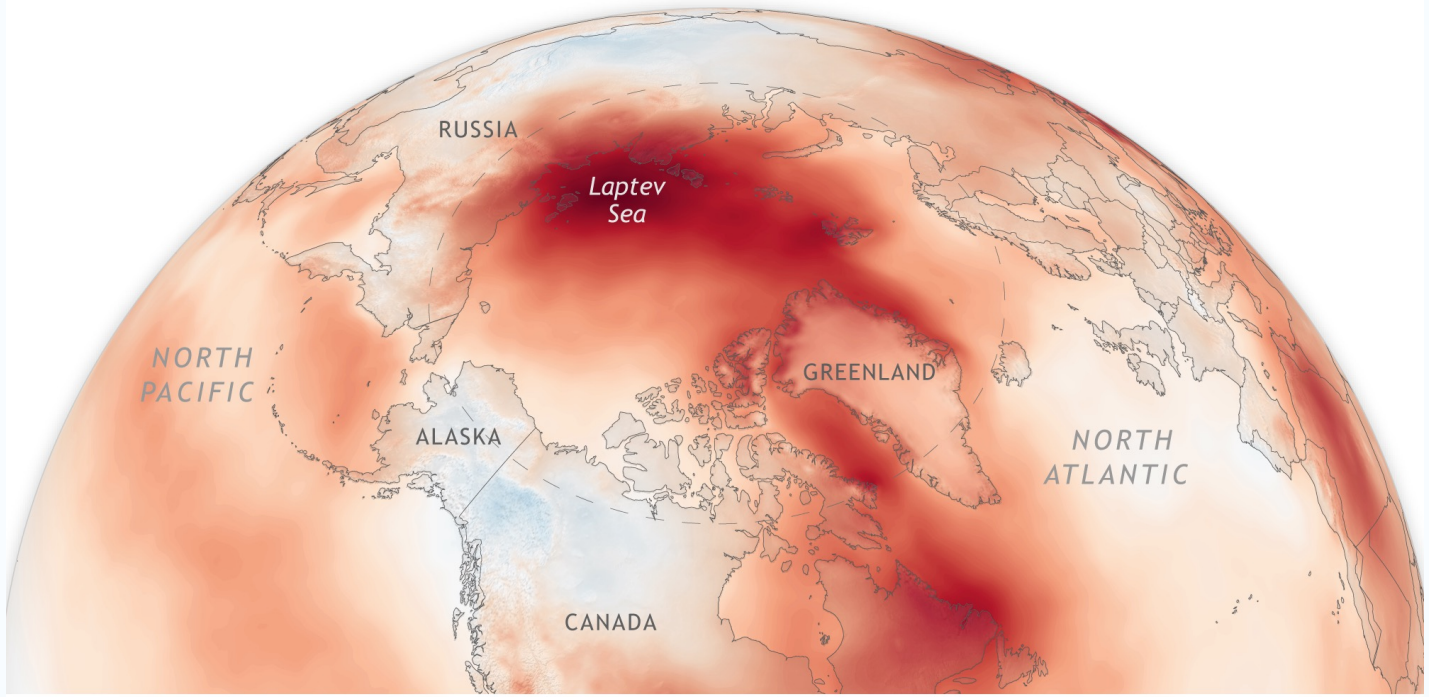
Frost Bites

The Changing Arctic Marine Soundscape
Foreign Marine Debris in Bering Strait
Permafrost and Glacial Hazards
COVID-19 & Alaska Native Food Access

NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

NOAA ARCTIC REPORT CARD

2021 WAS ARCTIC'S 7th-WARMEST YEAR ON RECORD



Oct 2020–Sep 2021

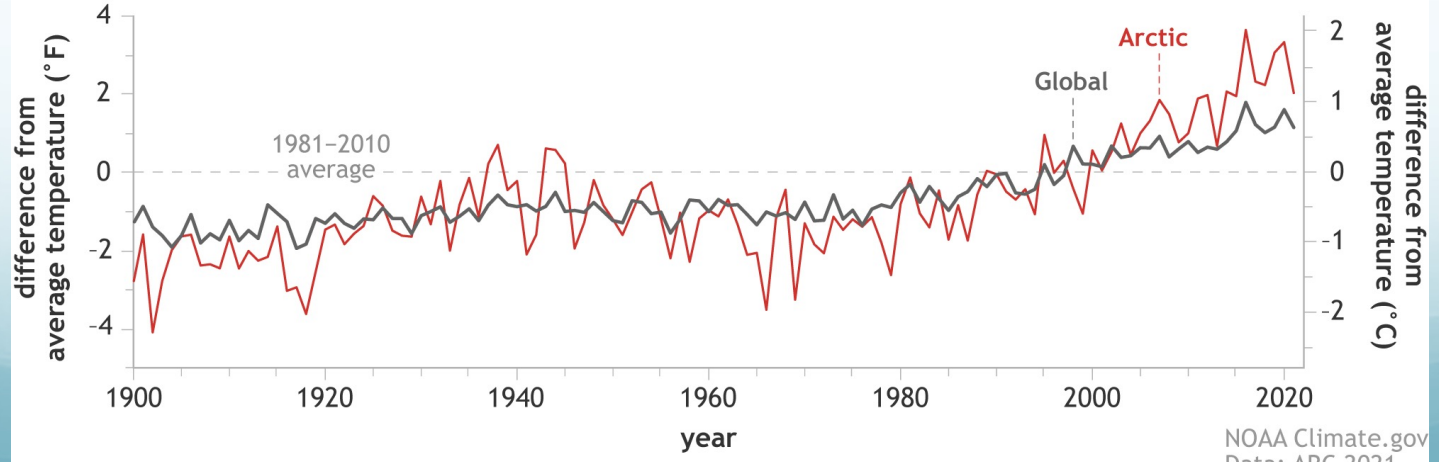
Difference from average temperature

−6 0 6°F

−3.3 0 3.3°C

NOAA Climate.gov
Data: C3S ERA5

ARCTIC WARMING NEARLY 3°C (5°F) SINCE THE MID-1960s



NOAA Climate.gov
Data: ARC 2021

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2021 Arctic-wide highlights

Tundra greening
2021 Pan-Arctic tundra vegetation greenness second-highest in 39-year record.

Arctic rivers
Long-term increasing river discharge reveals intensifying water cycle.

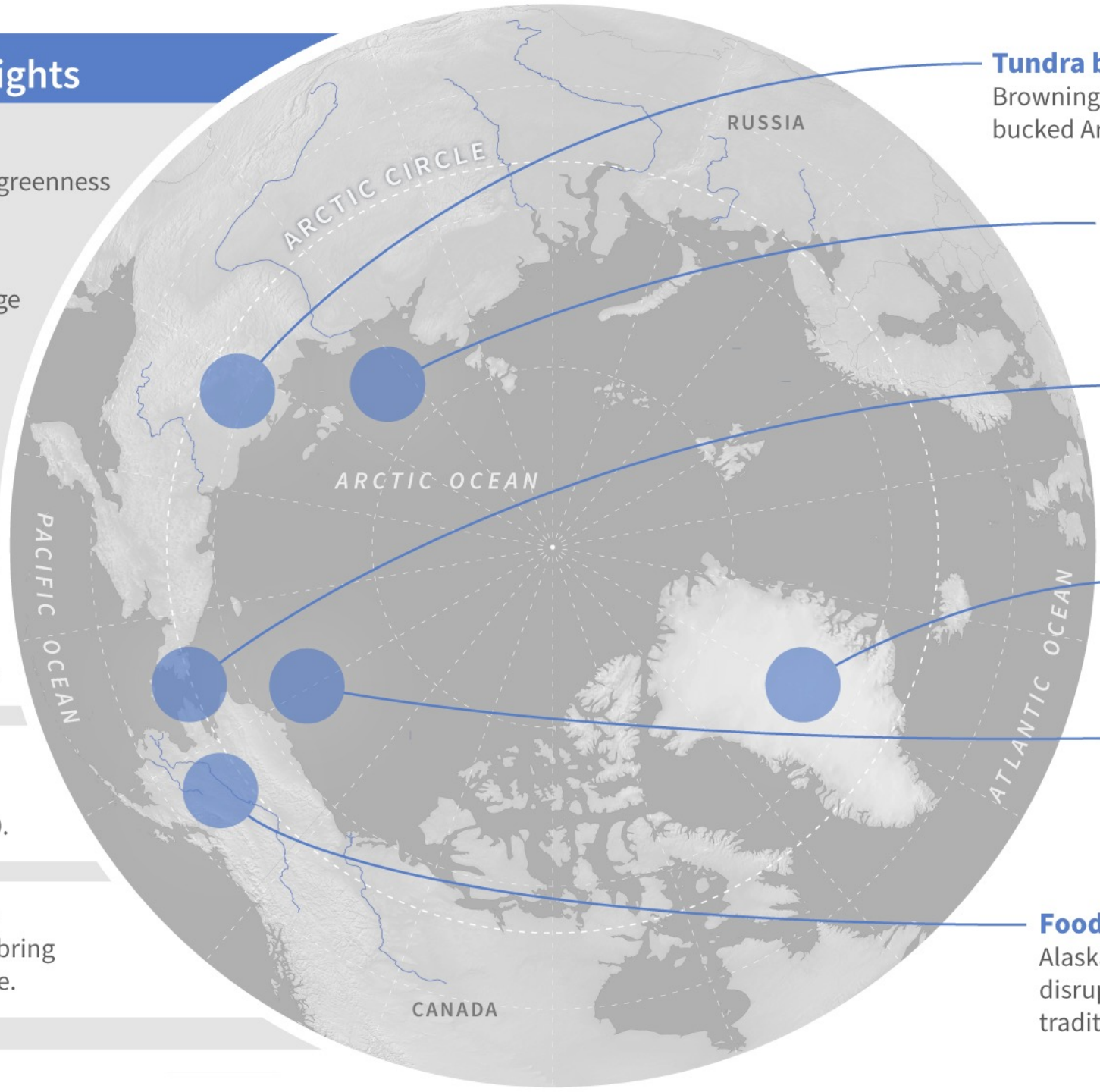
Sea ice volume
Sea ice volume in April lowest observed since records began in 2010.

EMERGING DISRUPTIONS

Ocean noise
Sea ice loss, more ship traffic are increasing underwater noise.

Beaver range expansion
Beaver ponds on Alaskan tundra doubled in most areas since 2000.

Glacier, permafrost hazards
Glacier retreat, permafrost thaw bring landslides, infrastructure collapse.



Tundra browning
Browning in East Siberia region bucked Arctic-wide greening trend.

Laptev Sea
Early thaw led to record-low sea ice extent.

Marine garbage
Unprecedented amount of foreign trash from fishing vessels washed ashore in 2020.

Greenland summit rain
Rain—not snow—observed for first time at Greenland summit.

Beaufort & Chukchi Seas
Wind-driven sea ice pileup reduced melt, kept temperatures cool.

Food access
Alaska Natives faced COVID-19 disruptions to accessing traditional foods.

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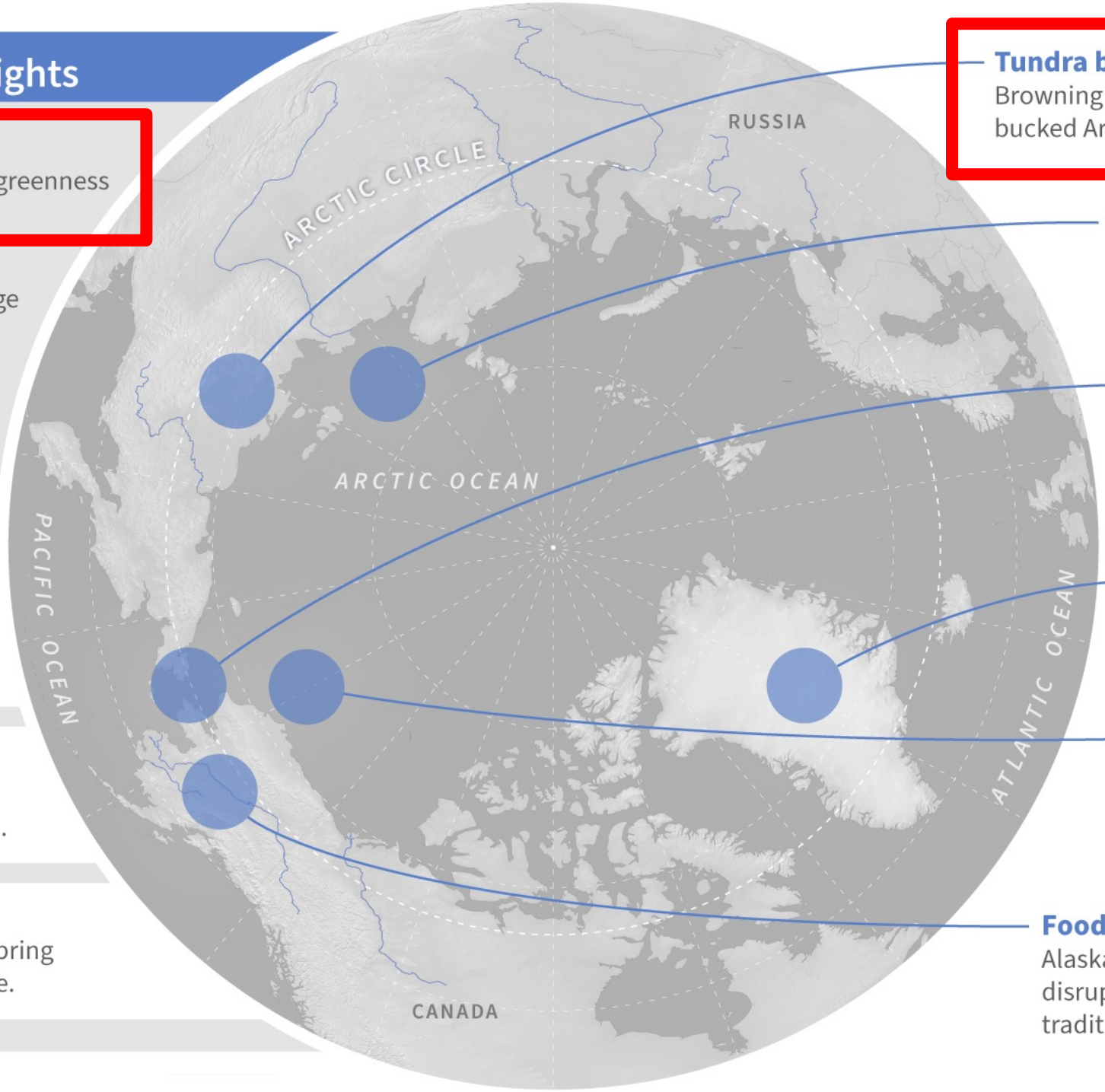

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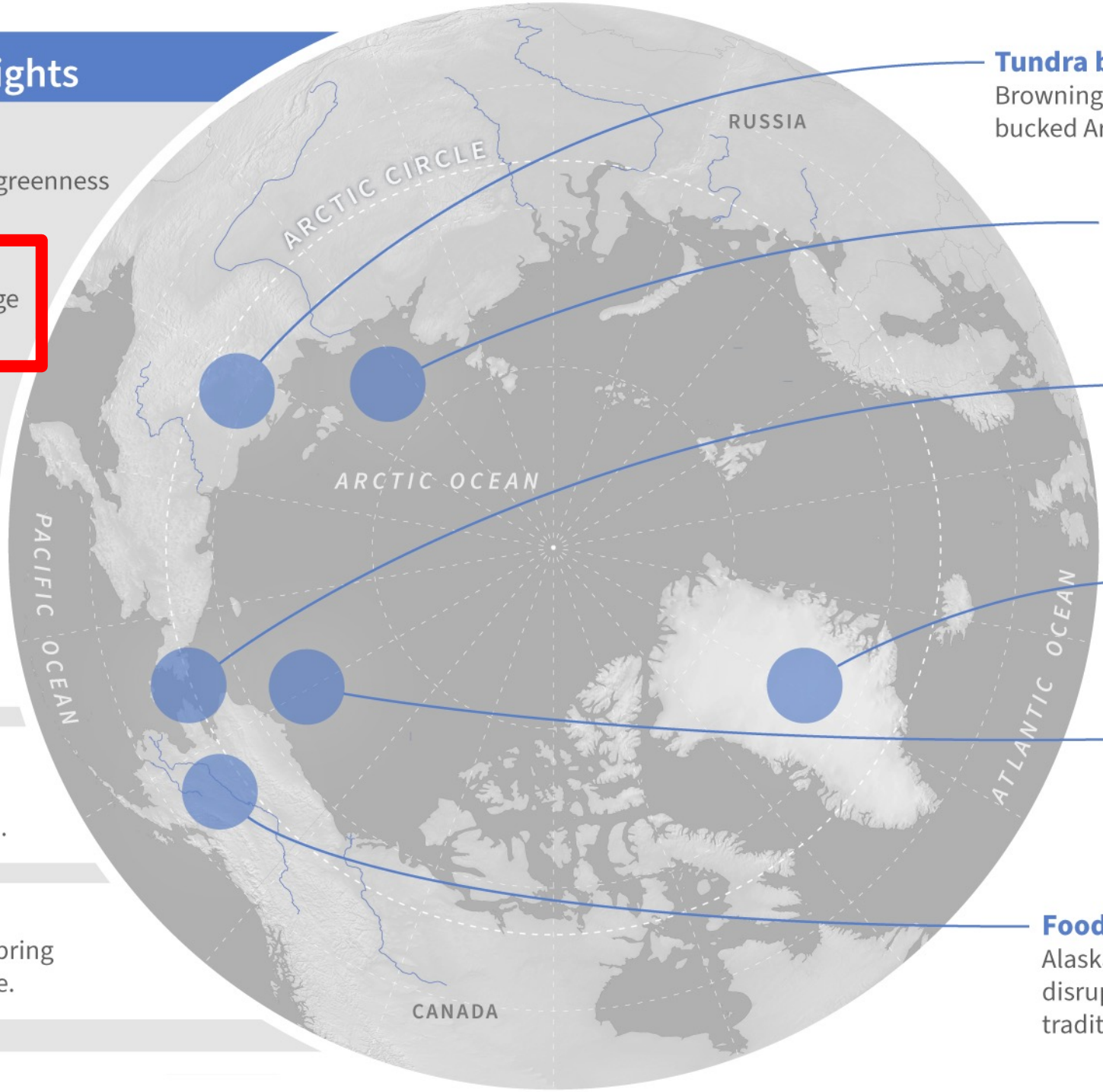

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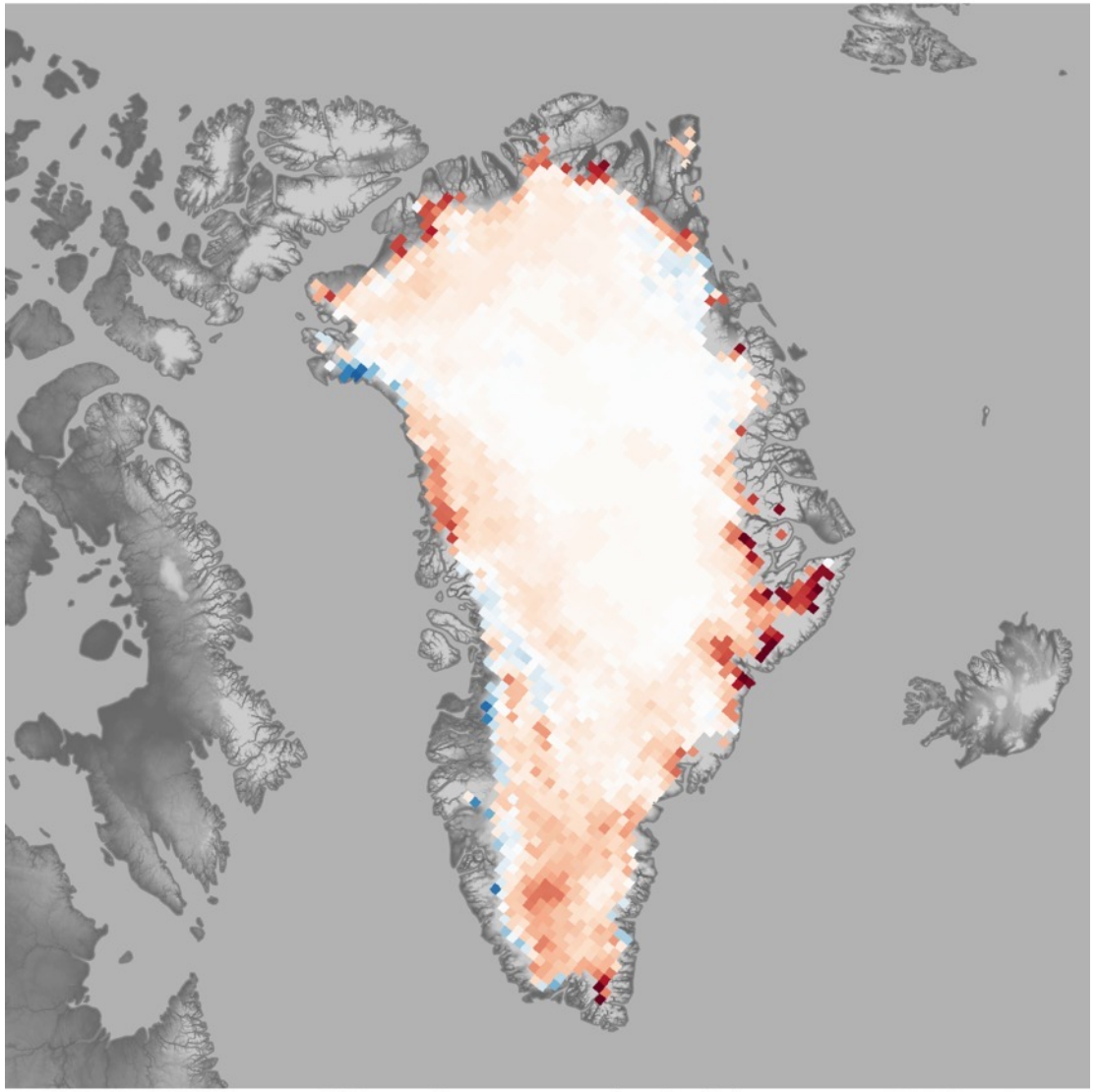
LATE-SUMMER SPIKE EXTENDED 2021 SURFACE MELT SEASON

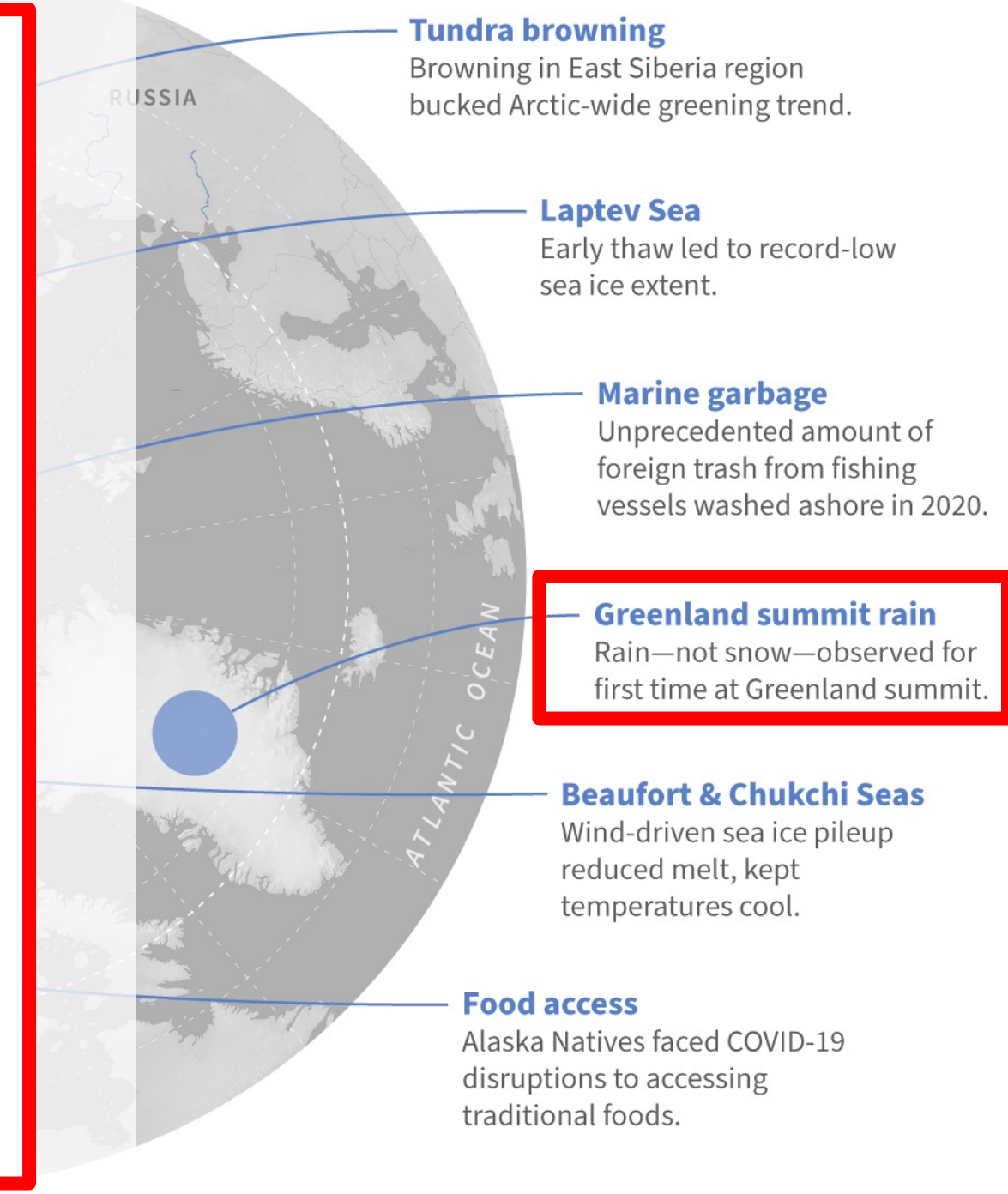


Apr–Oct 2021
compared to 1981–2010

Difference from average number of melt days

-30 0 30

NOAA Climate.gov
Data: NSIDC/Thomas Mote, UGA



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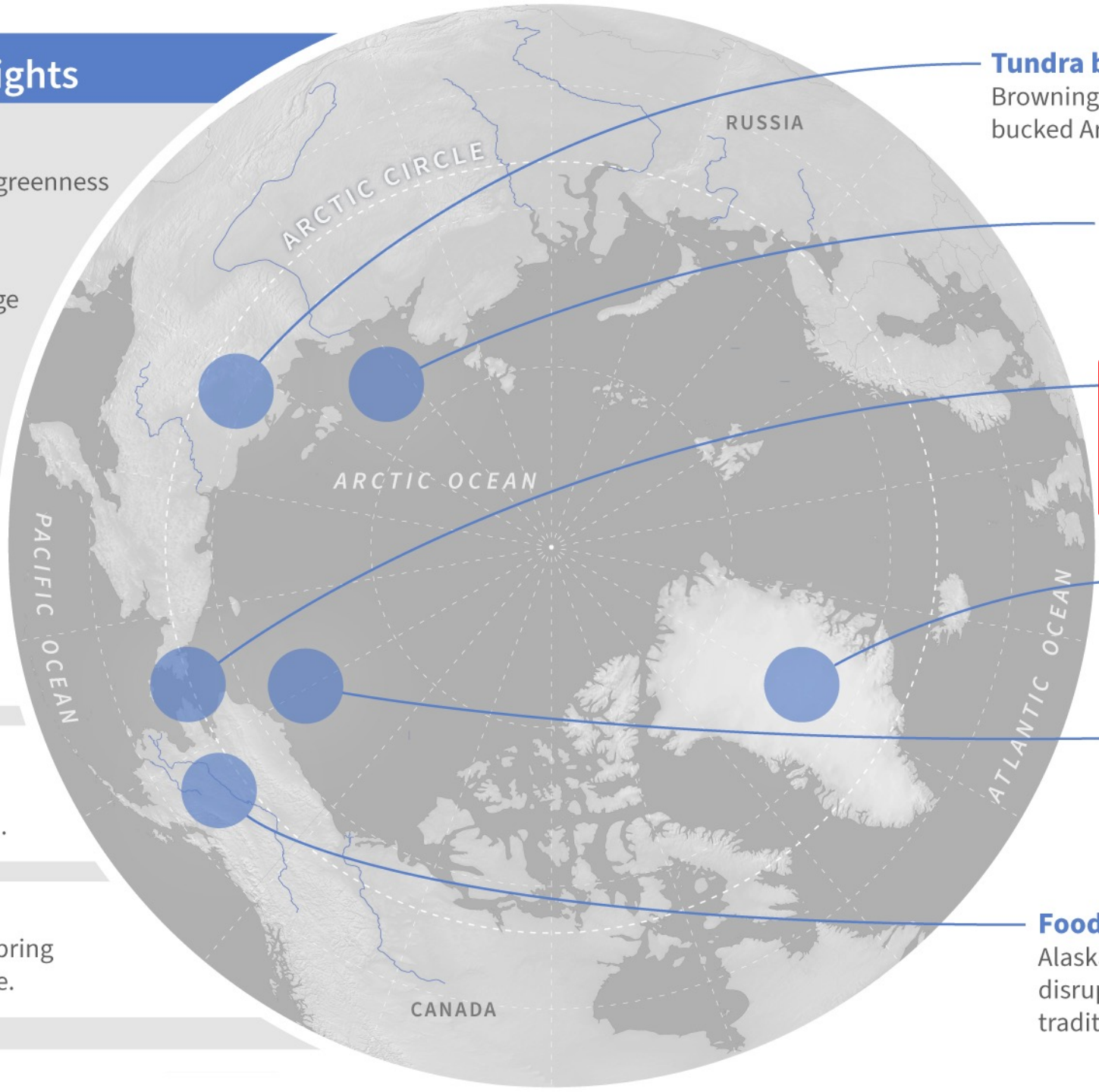

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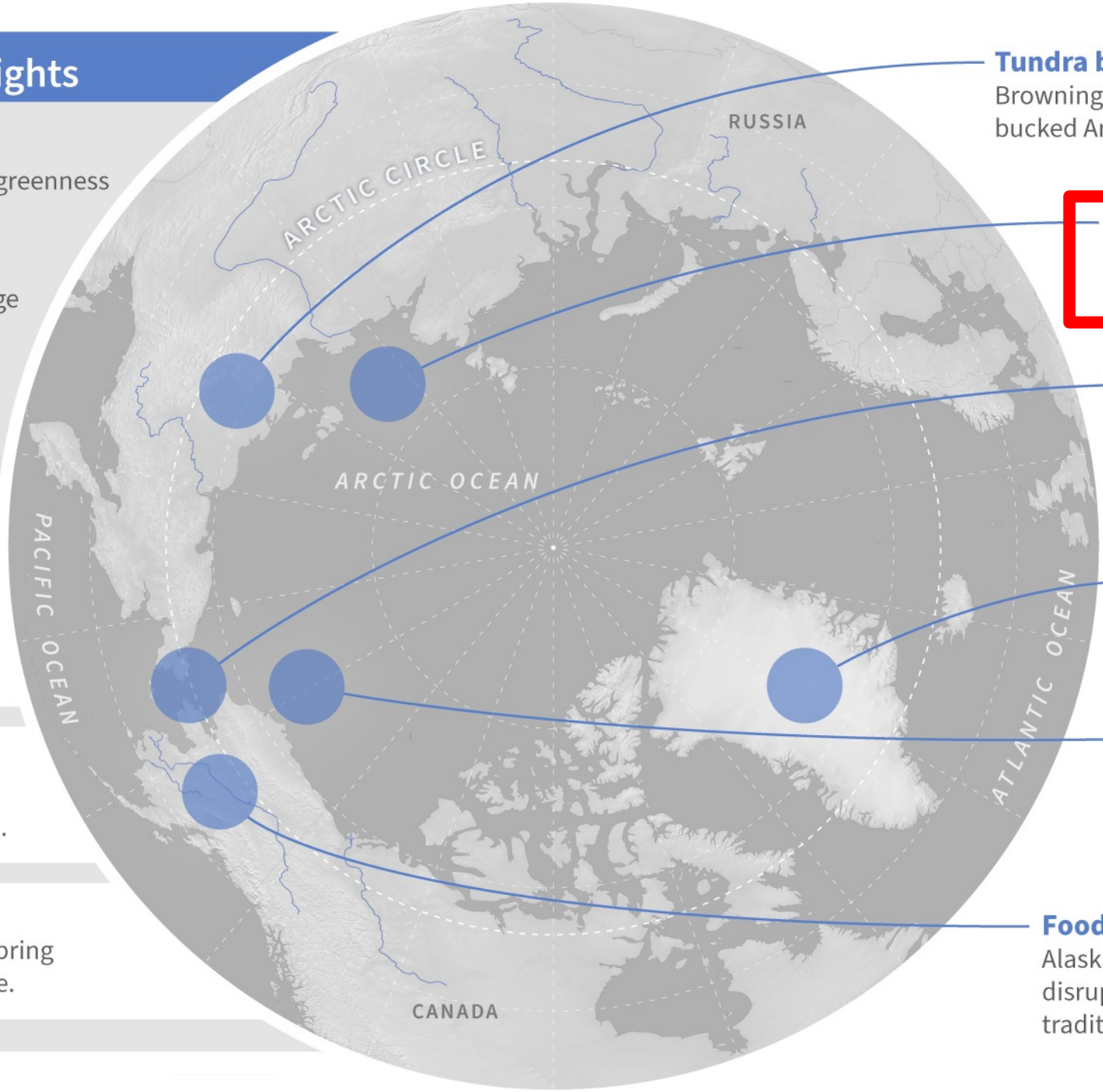

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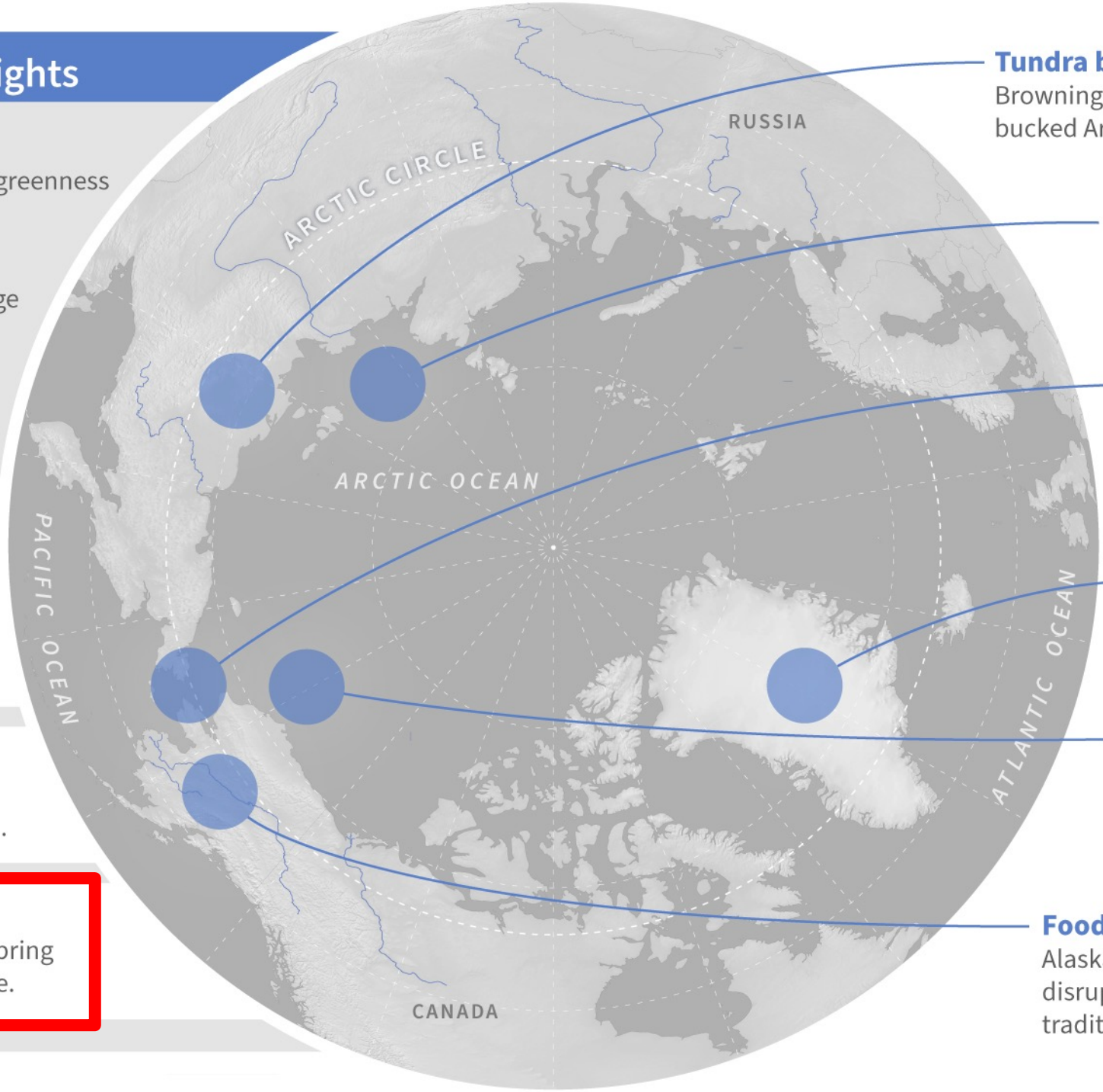

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Subsistence Infrastructure, 2015
Photo by Jeff Erickson

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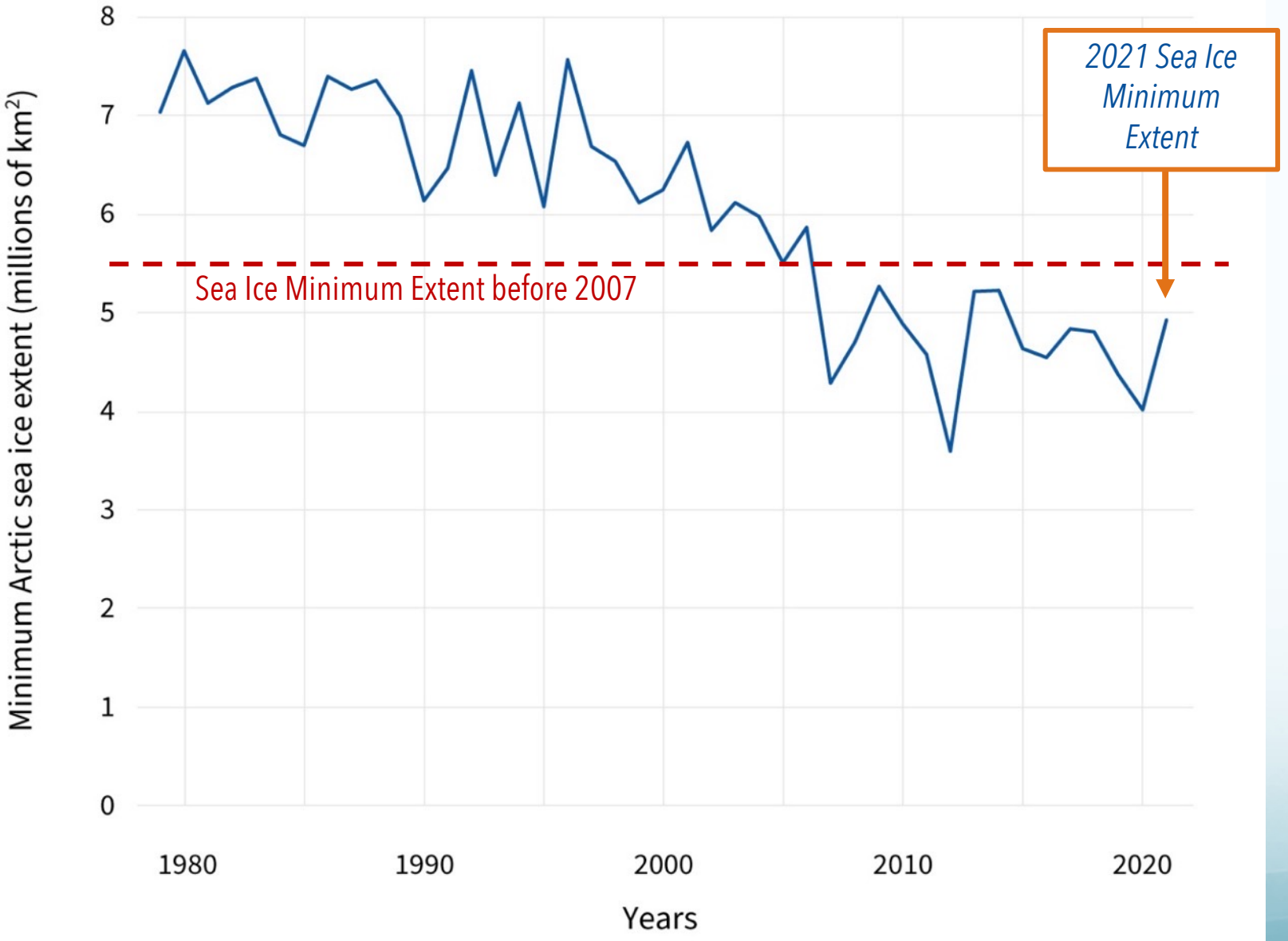
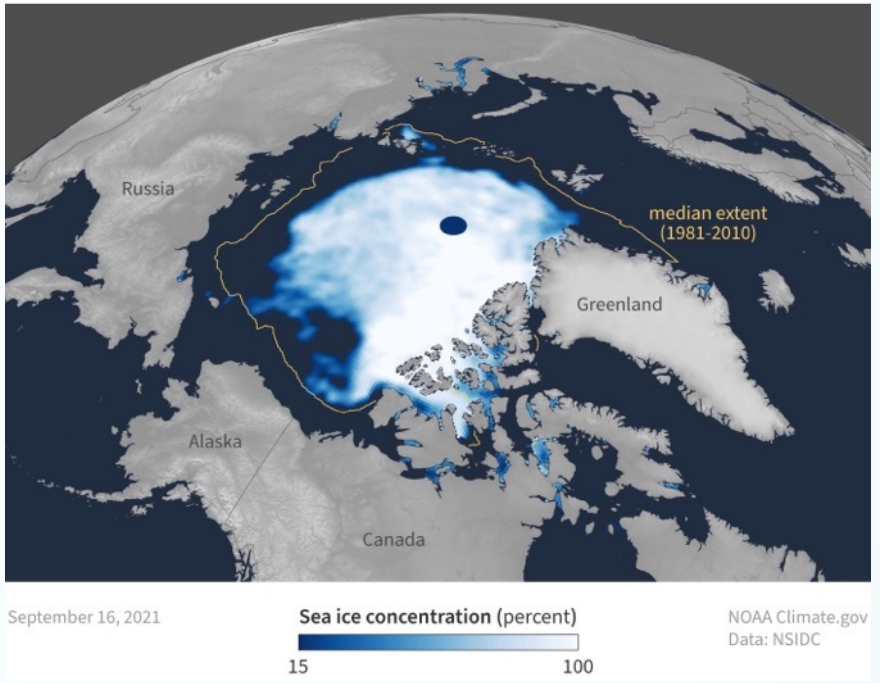
2021 Arctic sea ice yearly minimum





The **15** lowest minimum extents have all occurred in the last **15** years

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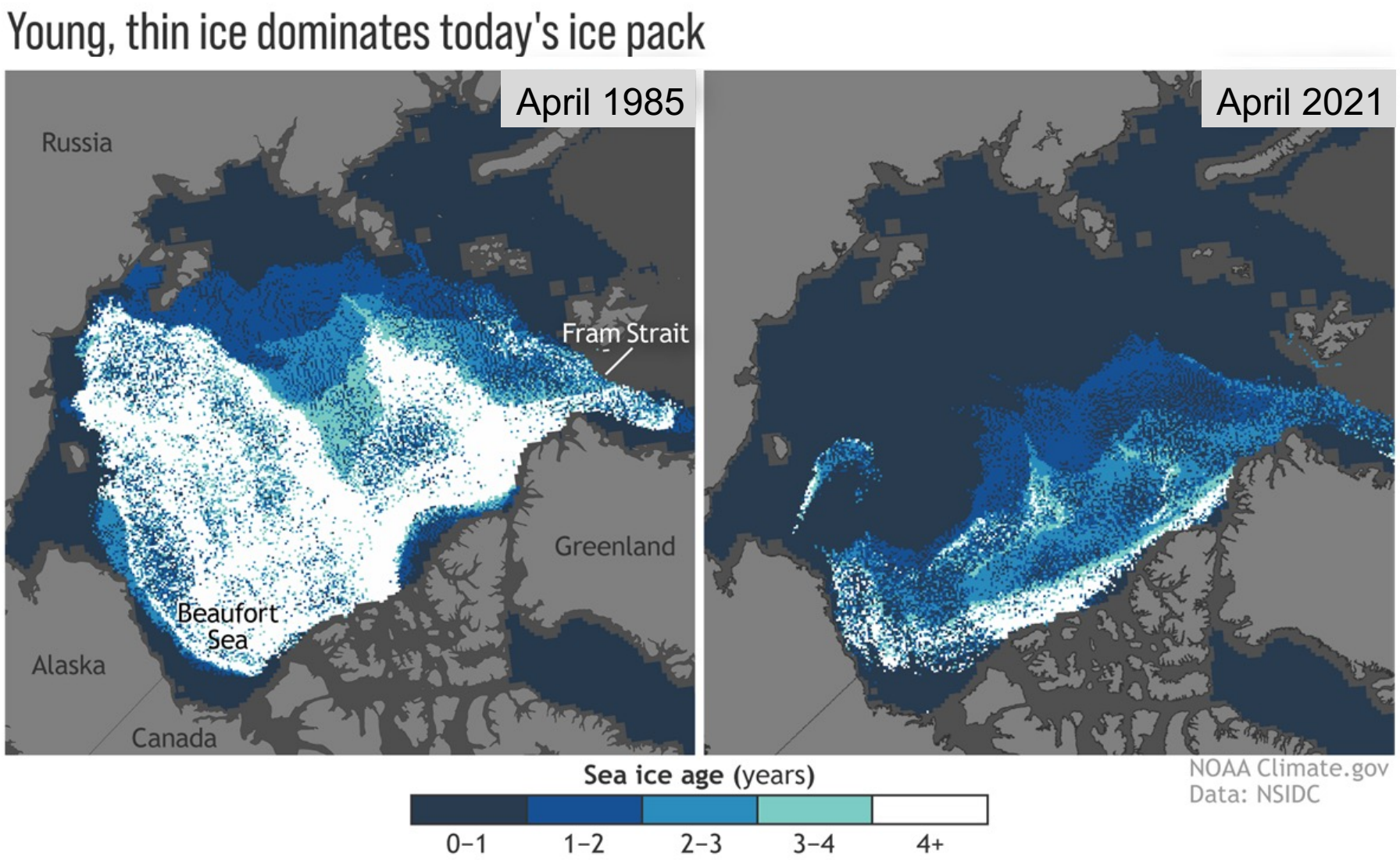
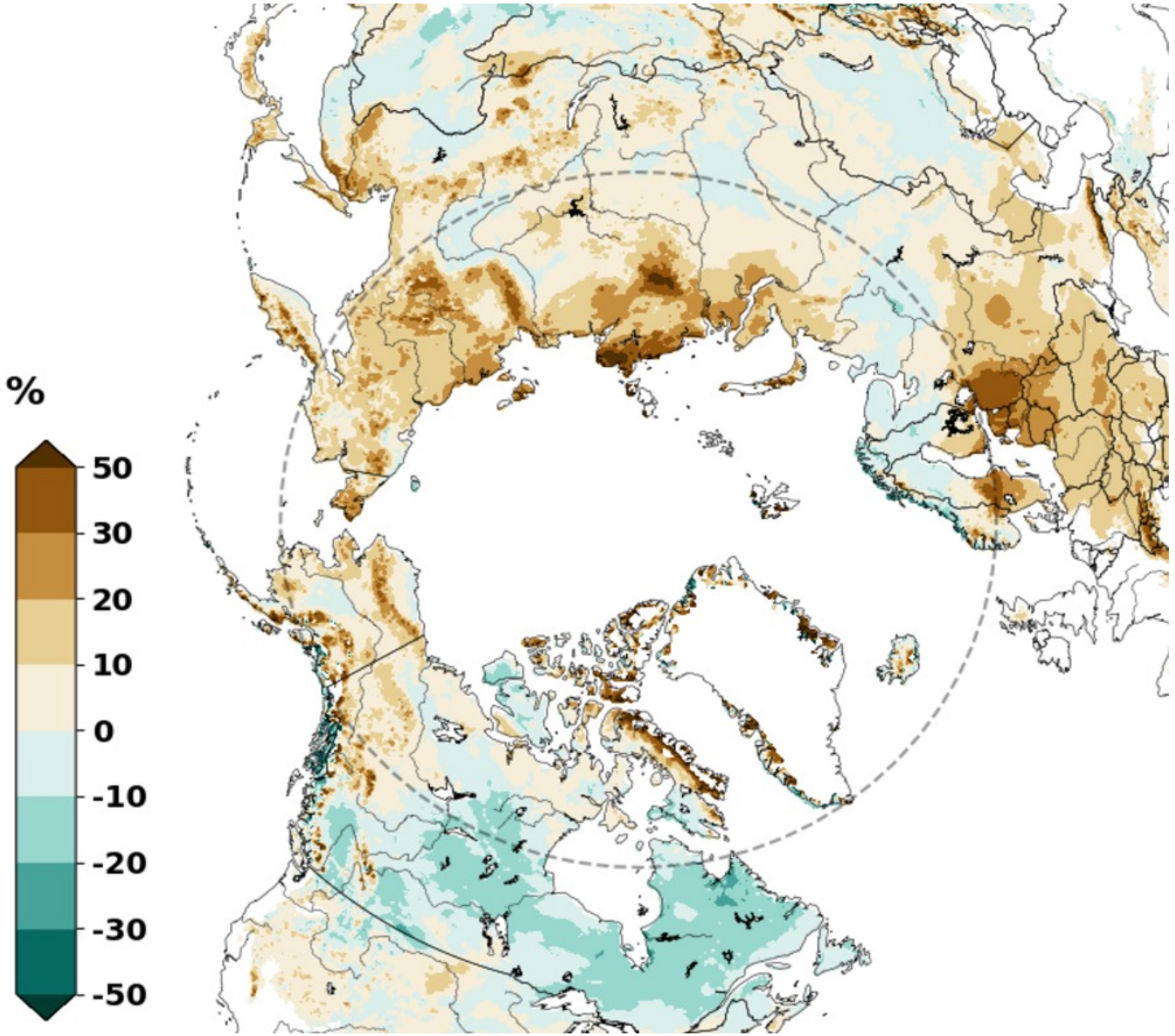


Combined loss of ice extent and thickness resulted in the lowest seasonal ice maximum in 2021

Summer 2020 saw the longest **snow-free** period across Arctic Eurasia in at least **22 years**



The 2020 snow-free period was up to 50% longer across Arctic Eurasia compared to average

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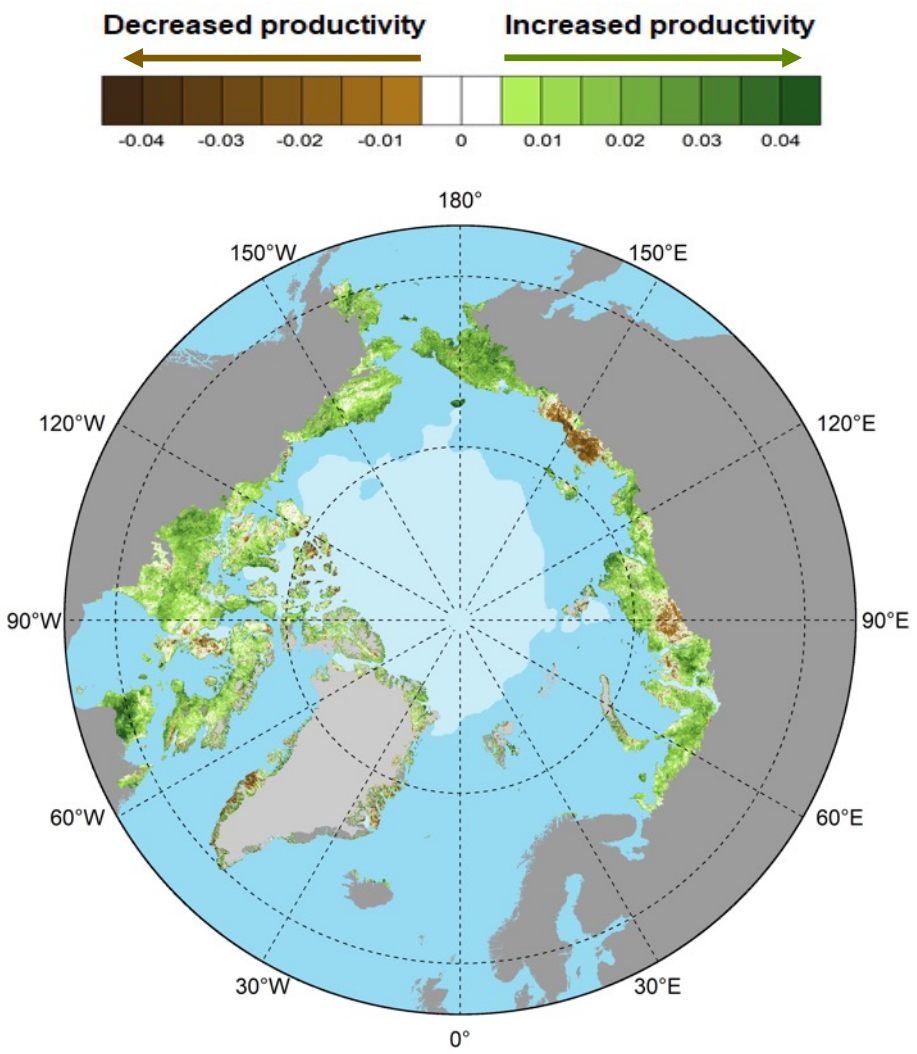
June snow extent has been below normal **14** out of the past **15** years



Arctic midsummer terrestrial productivity has increased

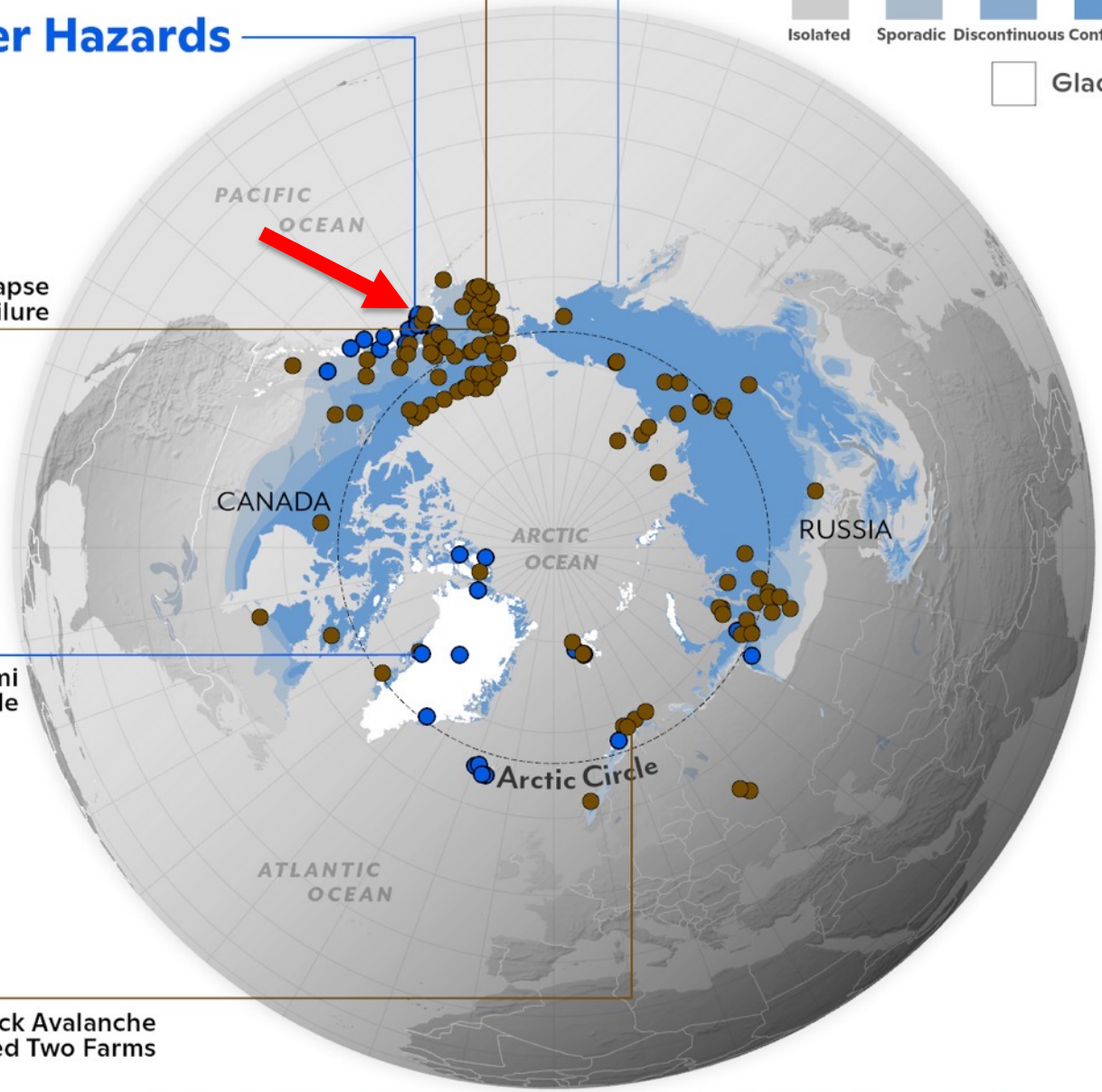
Implications of earlier snow melt include ***tundra greening*** *and increased potential for* ***wildfire***

Frozen Calf Fire , July 2019
Photo by S. Harrel

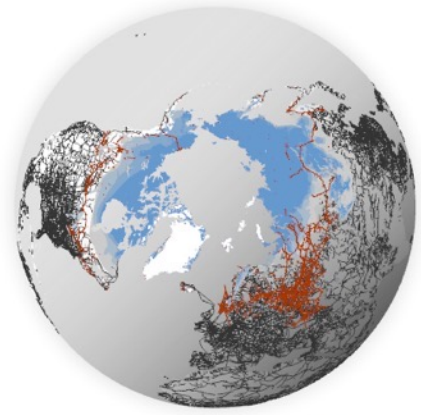
2021
Point Lay Permafrost Collapse
Complete Water System Failure

2017
Karrat Fjord Tsunami
Killed Four People

2008
Signaldalen Rock Avalanche
Endangered Two Farms

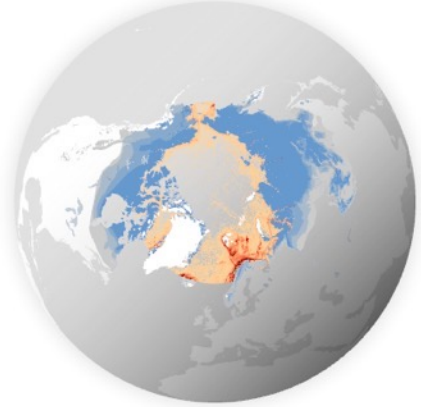


SOURCES: PERMAFROST, BROWN ET AL. (1997) CITIES AND GLACIERS, NATURAL EARTH DATA. INFRASTRUCTURE, OPEN STREET MAP. HAZARD DATA, LEO NETWORK. SHIPPING, BERKMAN ET AL. (2020) HYDRANT PHOTO, G. HAGLE. TSUNAMI PHOTO, JOINT ARCTIC COMMAND 2021. AVALANCHE PHOTO, R. FRAUENFELDER.



Roads and Pipelines

Populated Places



Arctic Shipping

Long-term observations of mountain permafrost & glaciers to understand destructive landslides

Barry Arm Landslide, Alaska, July 2021
Photo by AK DGGS

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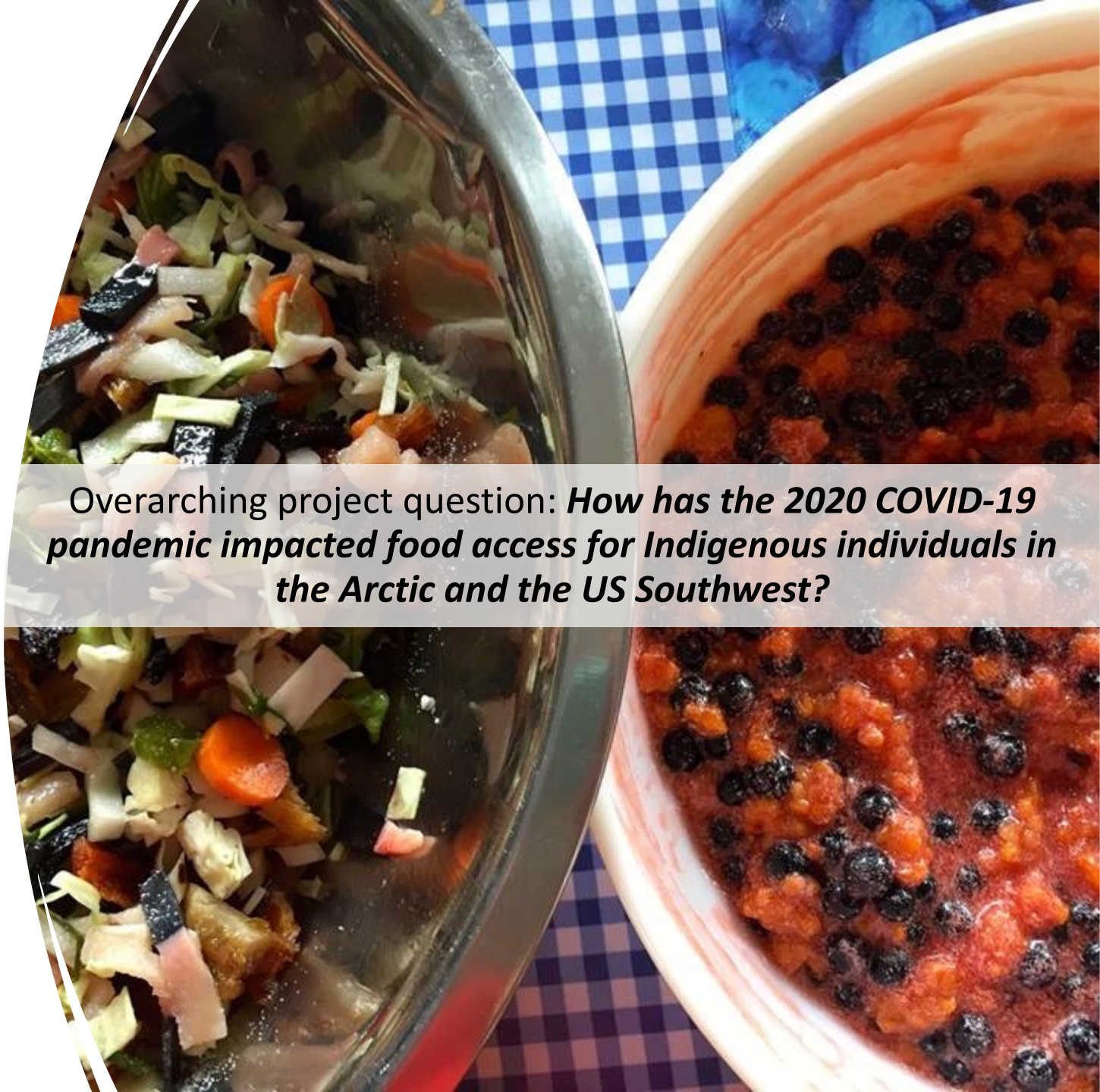
The Impact of COVID-19 on Food Access for Alaska Natives

- Indigenous Foods Knowledges Network and Indigenous RAC
- Historical context of pandemics in the Arctic: Dark history
- Food resources in the Arctic: Inuit Salad example



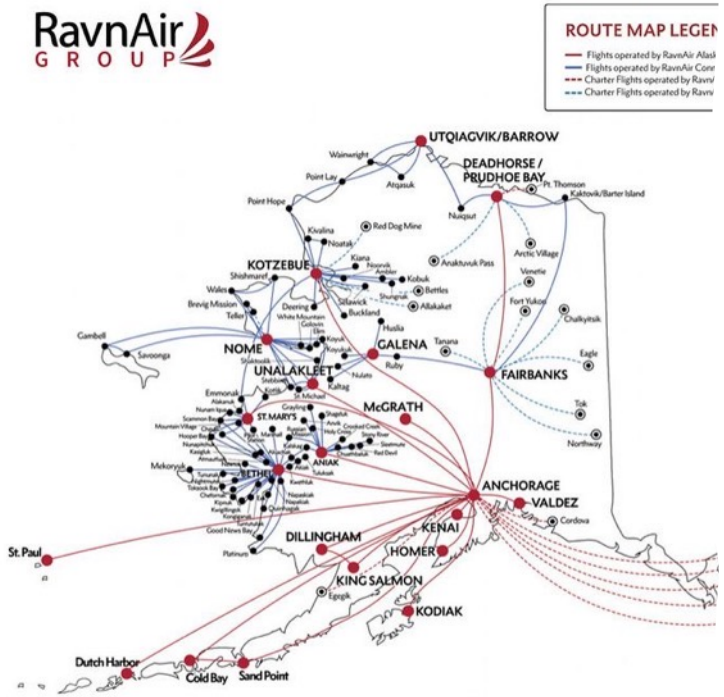
Overarching project question: ***How has the 2020 COVID-19 pandemic impacted food access for Indigenous individuals in the Arctic and the US Southwest?***


Russia
Chukchi Sea
Beaufort Sea
Canada
Utqiaġvik
Point Hope
Inupiaq (8)
Kotzebue
Fort Yukon
Nome
Galena
Tanana
Fairbanks
Nenana
Alaska (USA)
Unalakleet
St. Lawrence Island
St. Mary's
Athabascan/Dene (4)
Bethel
Yup'ik, St. Lawrence Island Yupik, Cup'ik (1)
Bering Sea
Palmer
Anchorage
Kenai
Yakutat
Juneau
Dillingham
Eyak, Haida, Tsimshian, Tlingit (3)
Kodiak
Unangax̂, Alutiiq/Sugpiaq (0)
Ketchikan
Hydaberg
Gulf of Alaska
Unalaska
Map by Climate.gov, adapted from Alaska Native Heritage Center

The Impact of COVID-19 on Food Access for Alaska Natives: ***Challenges***

Example:

- Interregional and statewide travel and cargo halted.
- Rural airlines bankruptcy (e.g. Ravn Air w/ 72 regional and commuter aircraft serving 115 communities)
- Went from limited store-bought food to nothing.
- Interregional gathering to celebrate harvests and to share food were stopped.



Photos Clockwise from top left: Subsistence Infrastructure (J. Erickson); Ravn Air destination map before bankruptcy (Ravn website 2020); Drying meat in quarantine 2020 (D. Katchatag); Makeshift fish rack 2020 (K. Erickson)

The Impact of COVID-19 on Food Access for Alaska Natives: ***Responsive Solutions***

- We learned about responsive solutions, most of which fell back on traditional values.
- Sharing is at the core of who we are.
- This fosters long-term survival for our communities in extreme environments with limited resources.

Photos Clockwise from top left: Restocking the Store (J. Apatiki); Cutting Fish Together (J. Erickson); Ice fishing in spring (F. Doty); Village Garden (D. Katchatag)