



NOAA 2021 Arctic Report Card

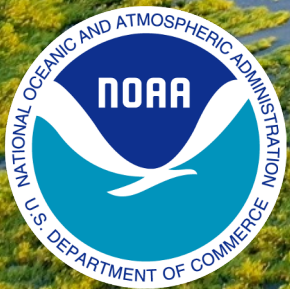
Rapid and pronounced warming continues to drive the evolution of the Arctic environment



Dr. Richard Spinrad

Editors: Twila Moon, Matthew Druckenmiller, Rick Thoman

Panelists: Twila Moon, Lawrence Mudryk, Gabriel Wolken
and Kaare Sikuaq Erickson





NOAA 2021 Arctic Report Card

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

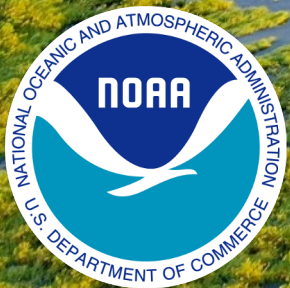
Surface Air Temperature
Terrestrial Snow Cover
Greenland Ice Sheet
Sea Ice
Sea Surface Temperature
Arctic Ocean Primary Productivity
Tundra Greenness

Indicators

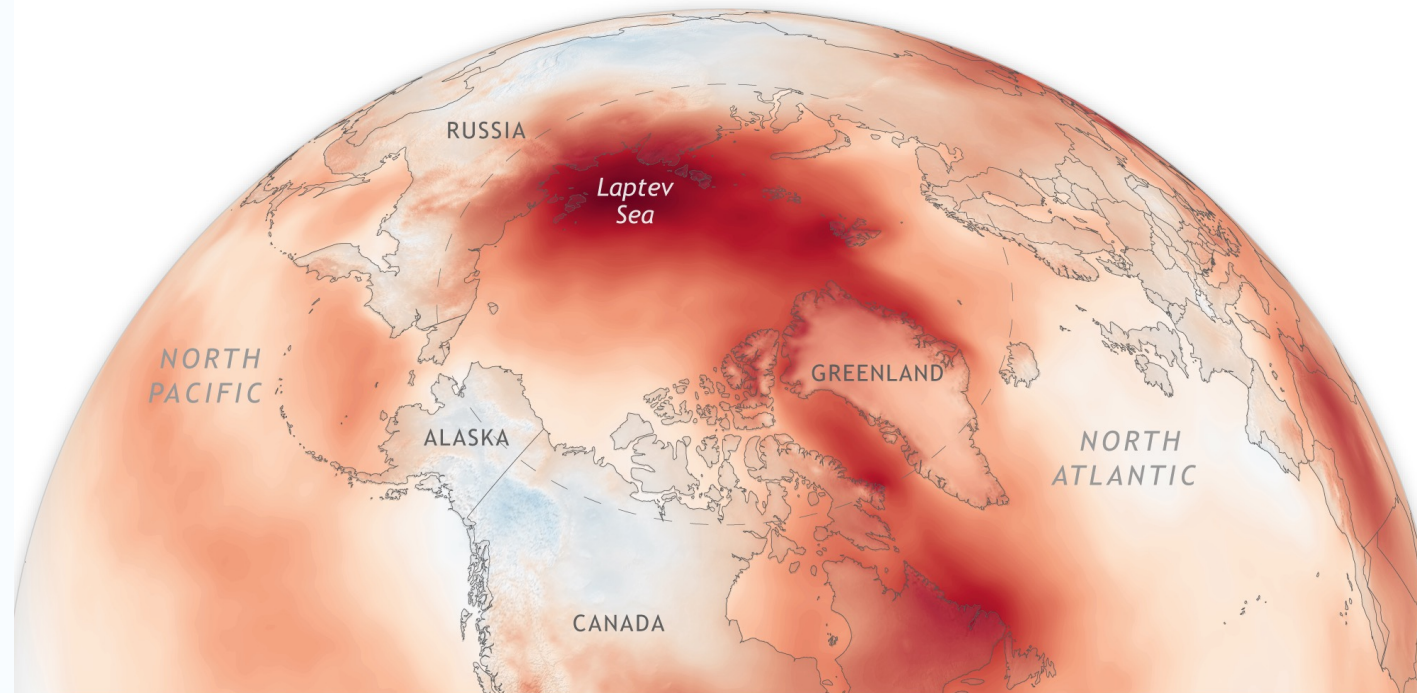
River Discharge
Ocean Acidification
Beaver Engineering

Frost Bites

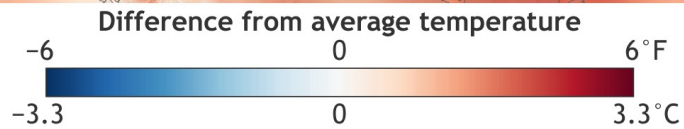
The Changing Arctic Marine Soundscape
Foreign Marine Debris in Bering Strait
Permafrost and Glacial Hazards
COVID-19 & Alaska Native Food Access



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

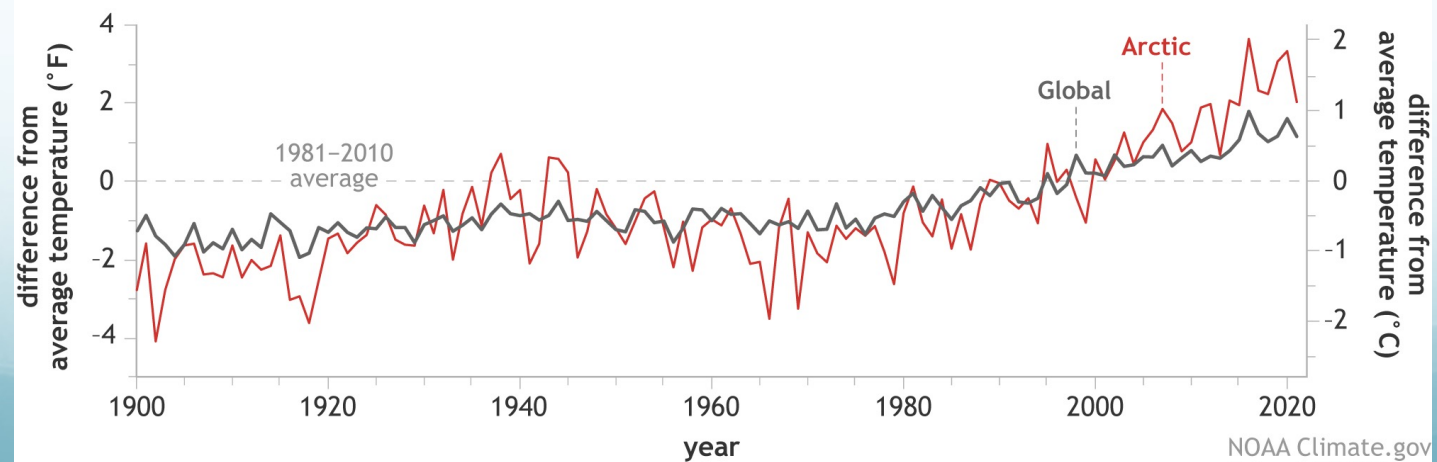


Oct 2020–Sep 2021



NOAA Climate.gov
Data: C3S ERA5

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



NOAA Climate.gov
Data: ARC 2021



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

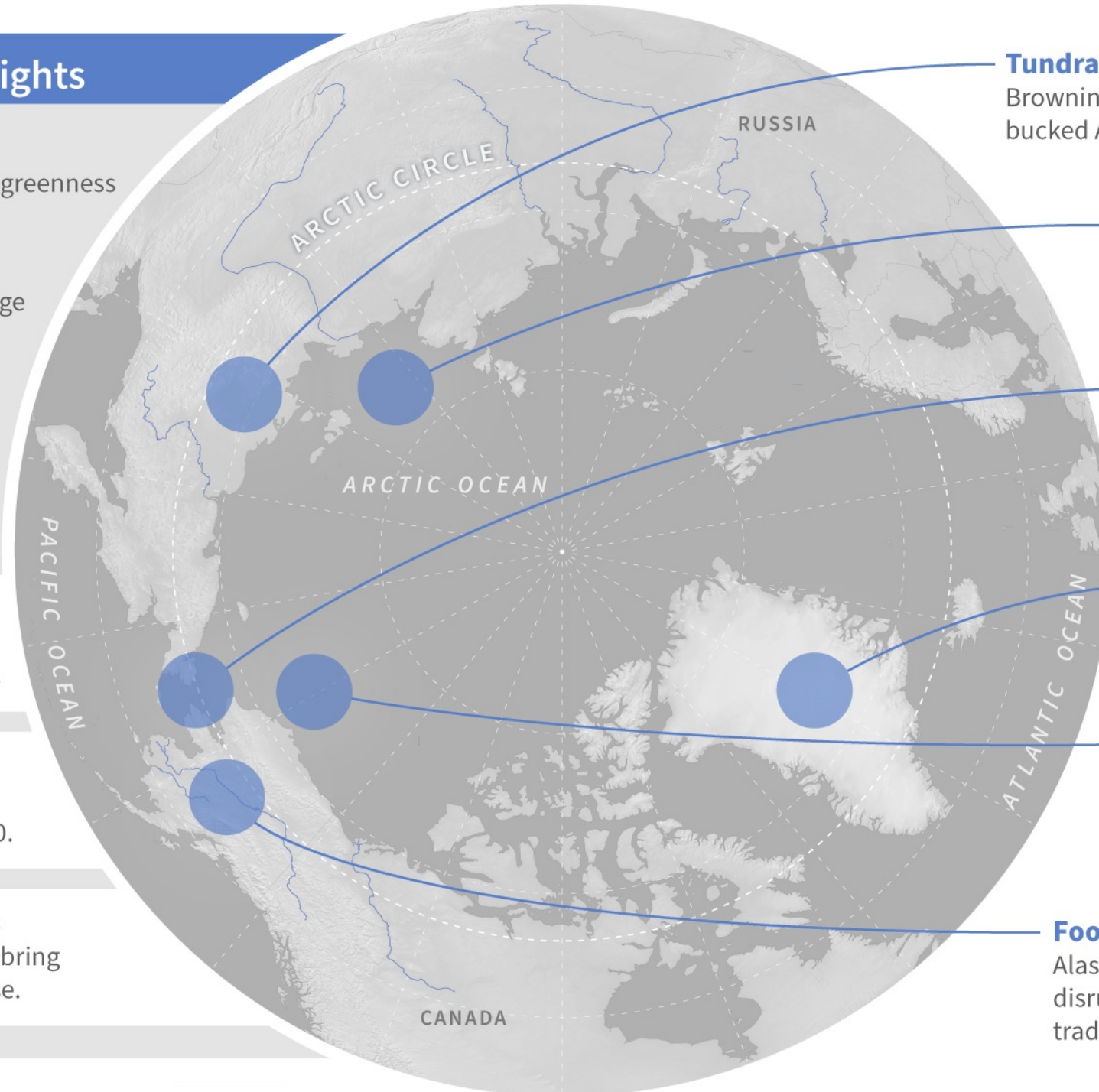
Sea ice loss, more ship traffic are increasing underwater noise.

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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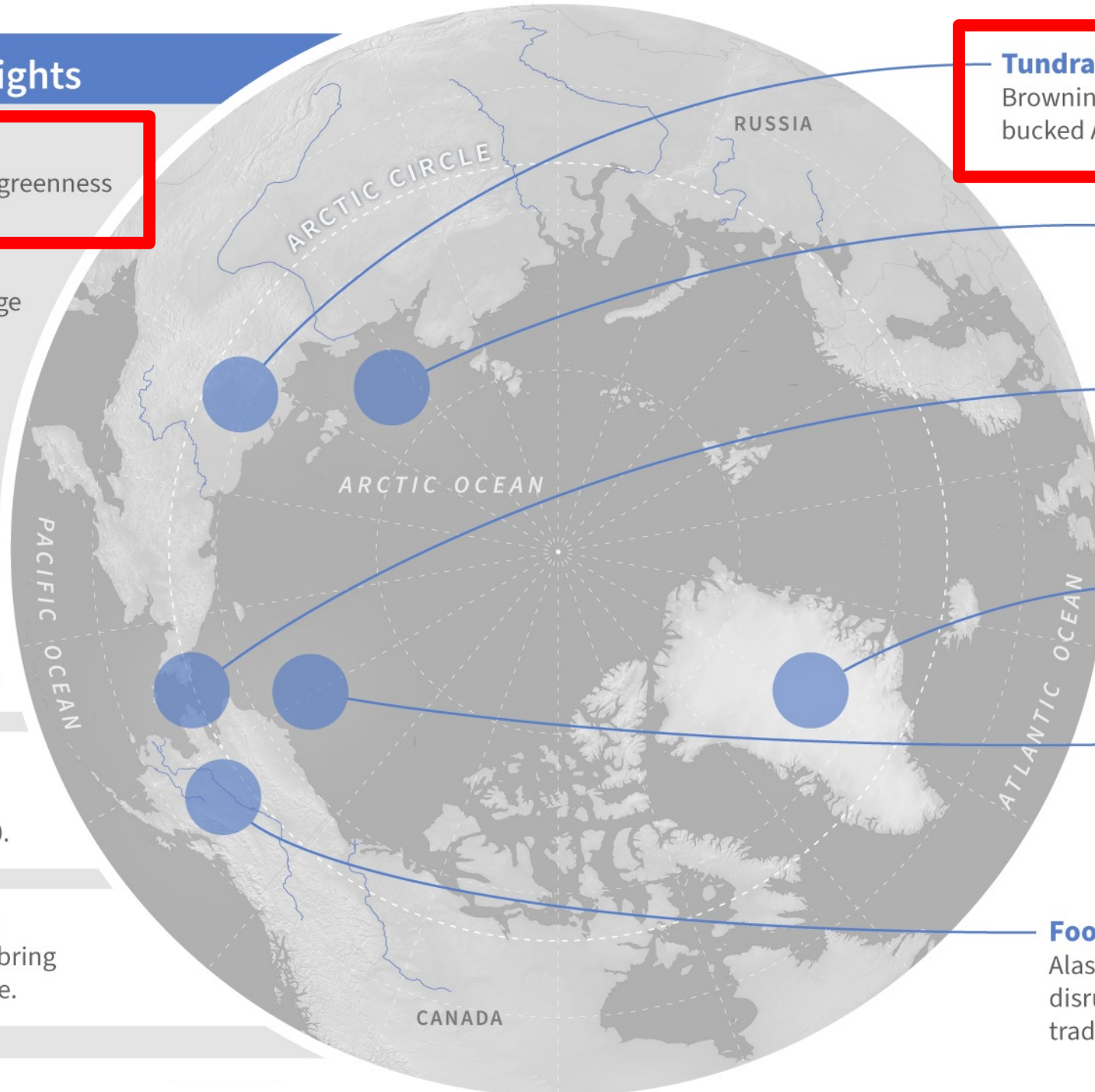
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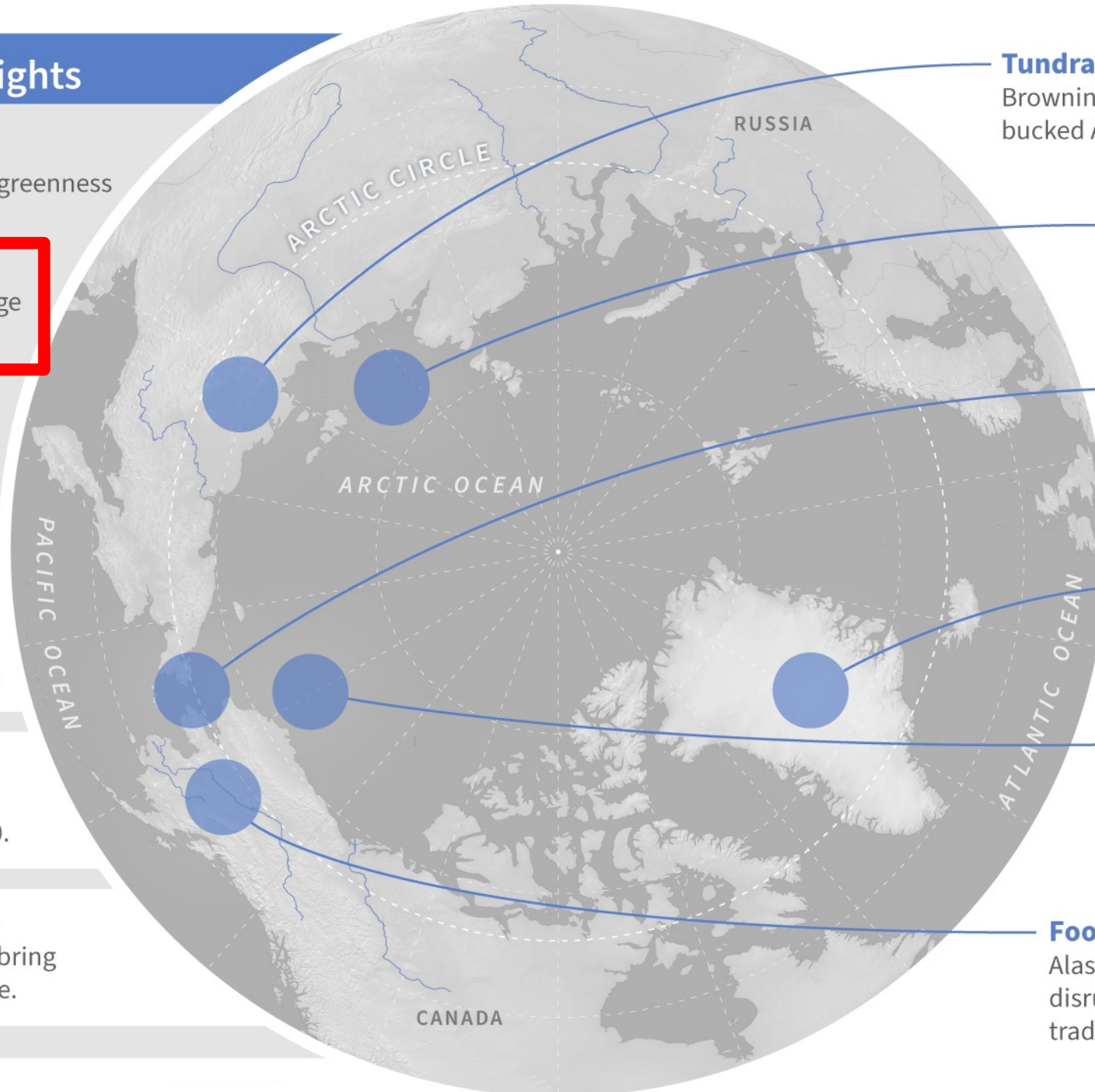
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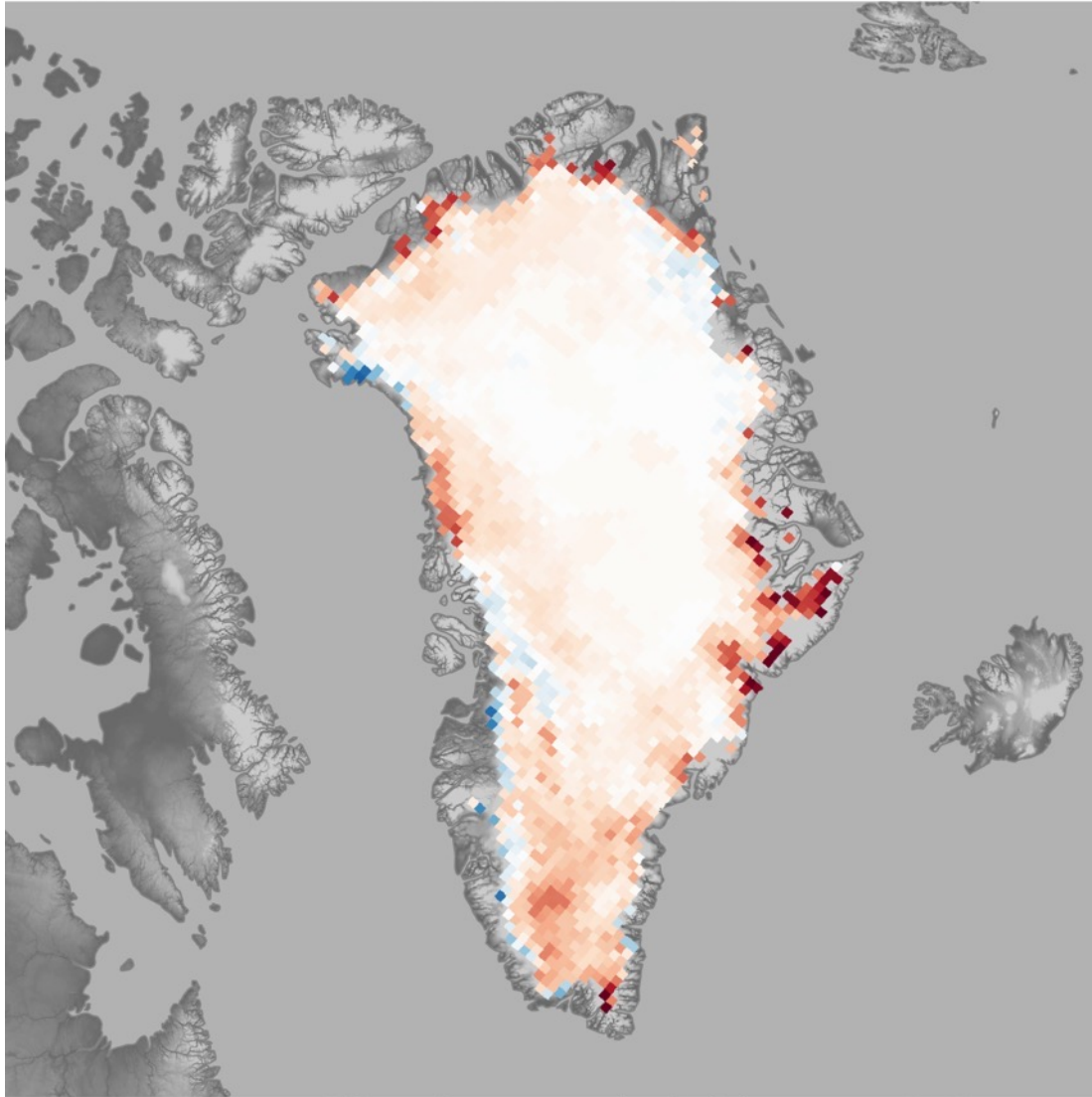
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LATE-SUMMER SPIKE EXTENDED 2021 SURFACE MELT SEASON



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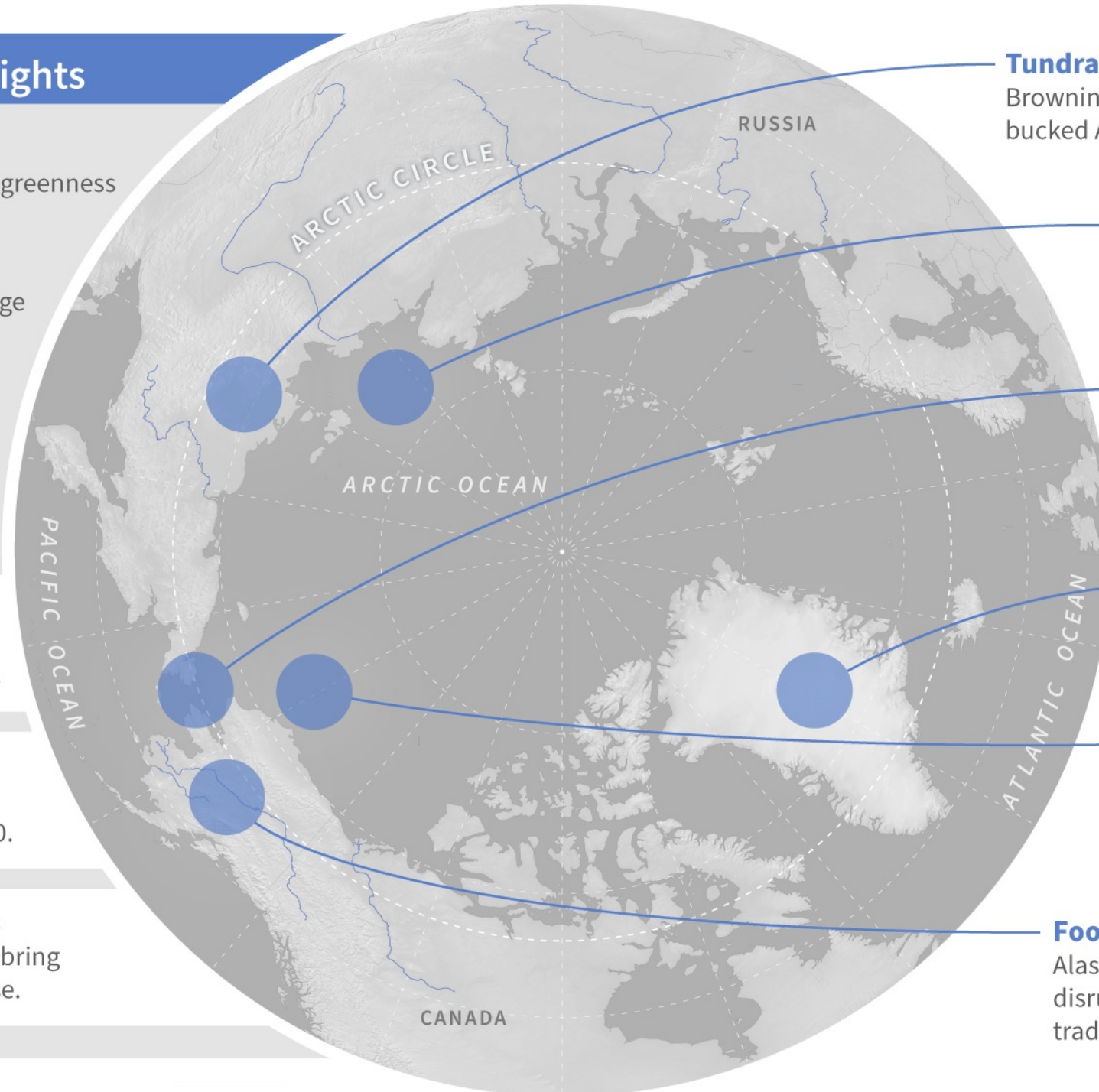
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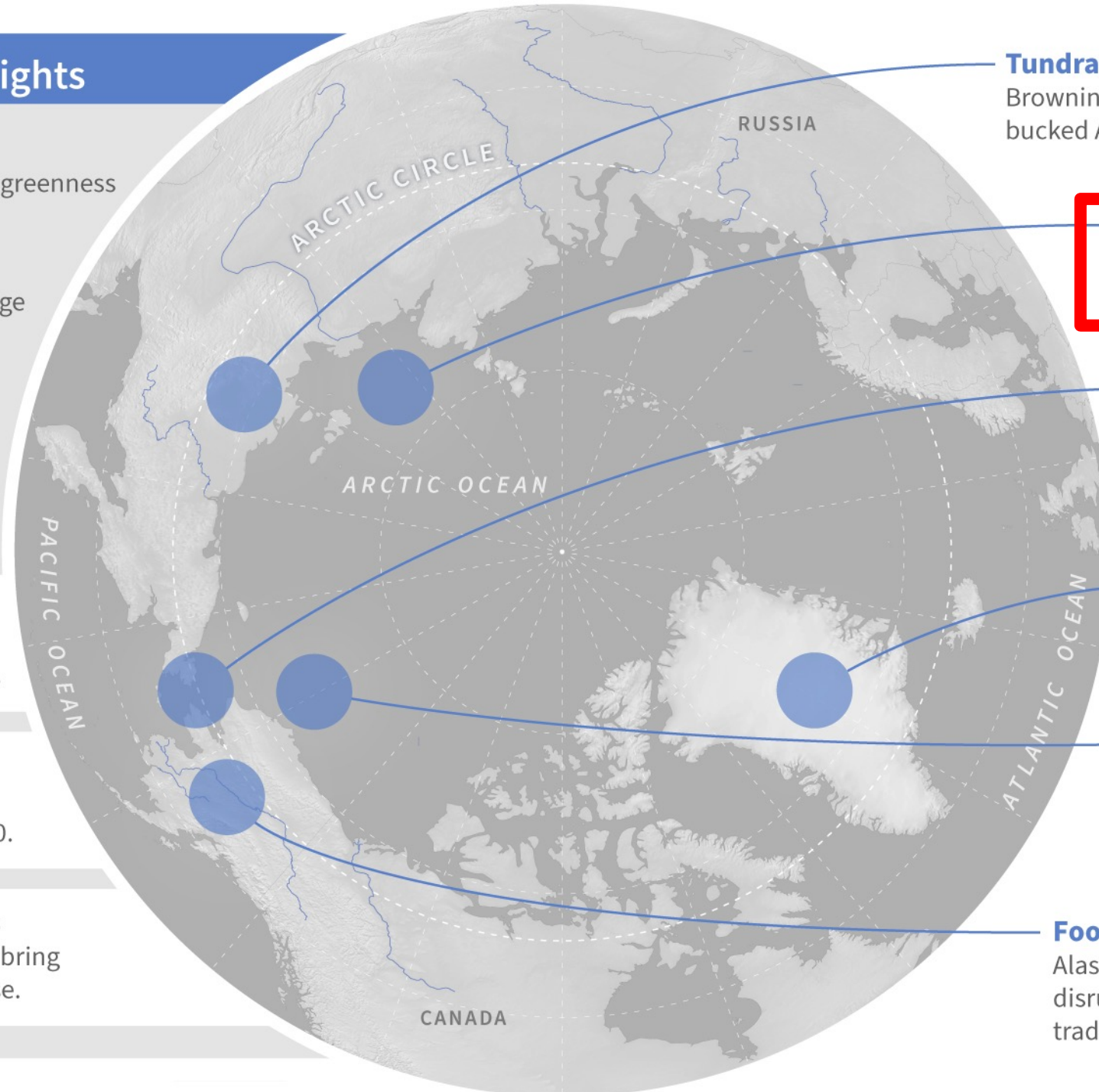
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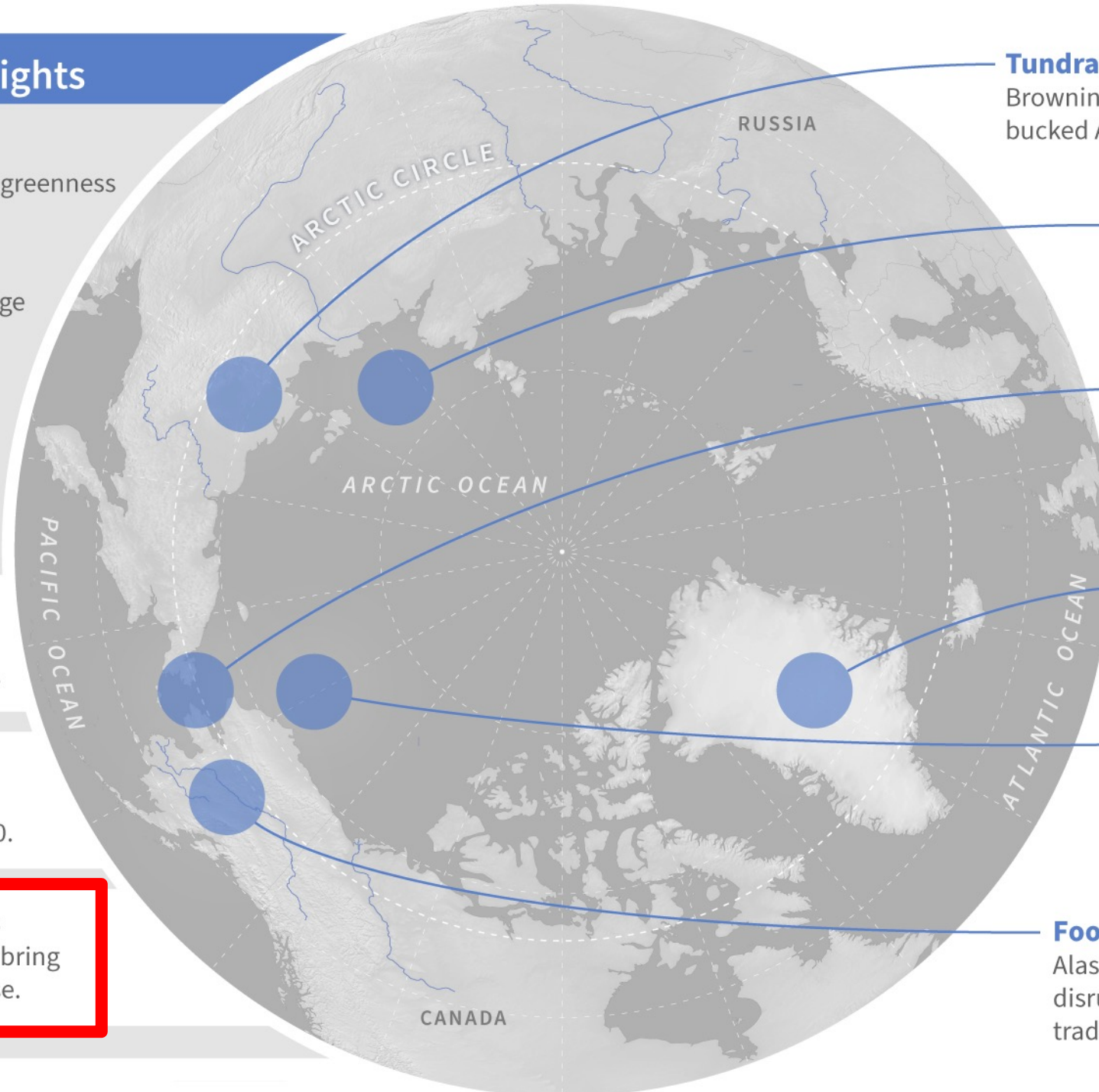
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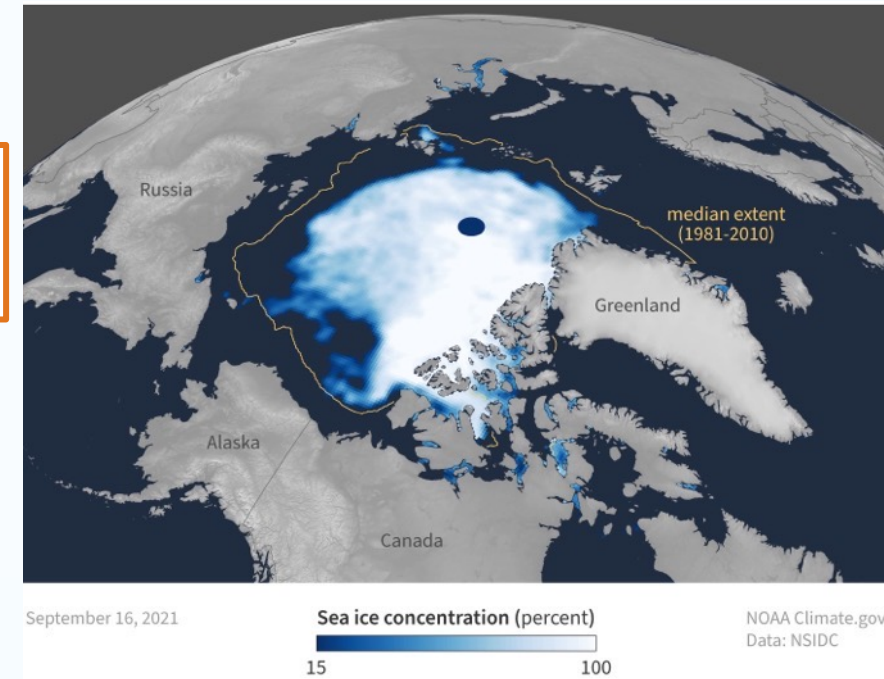
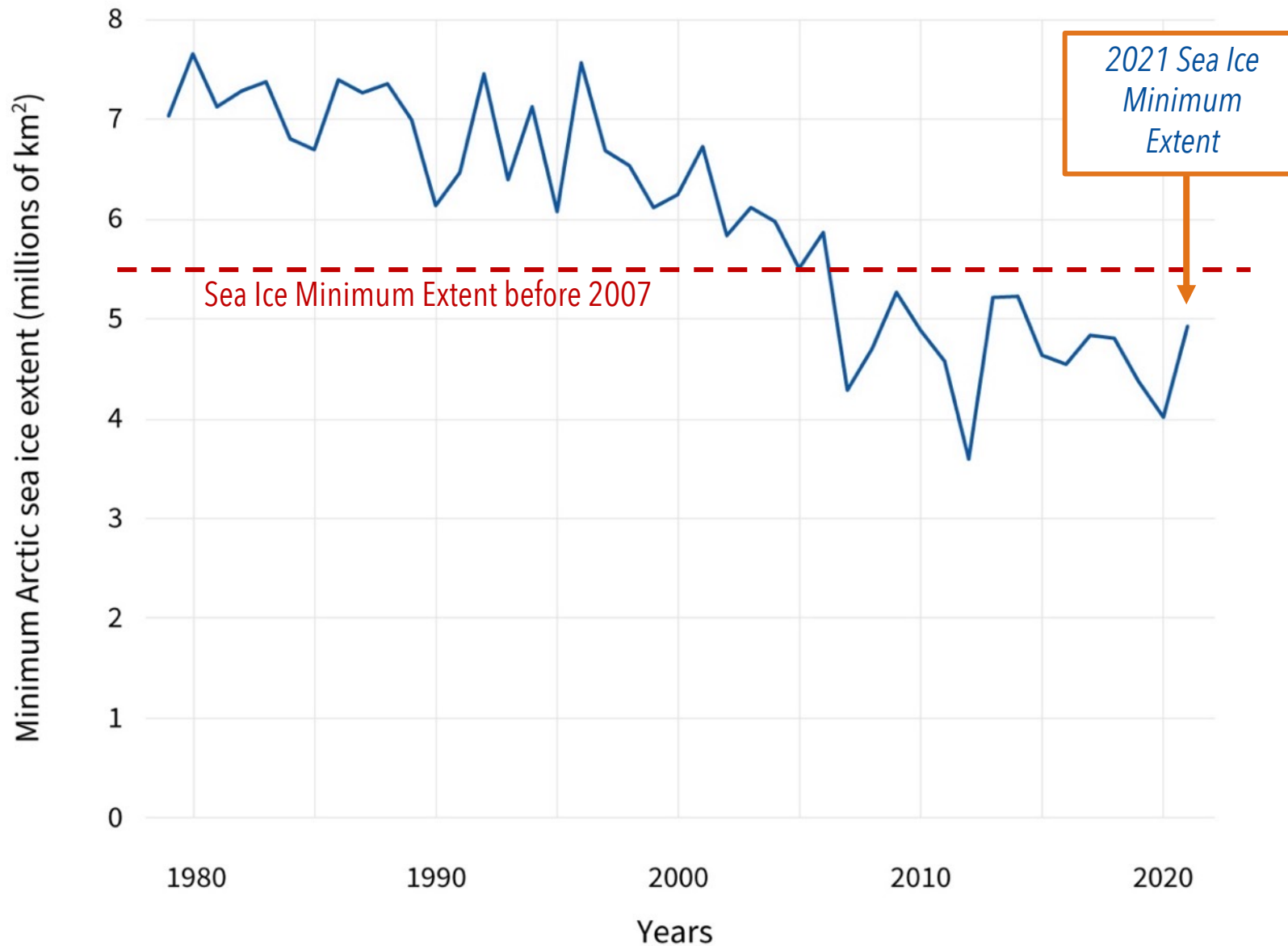
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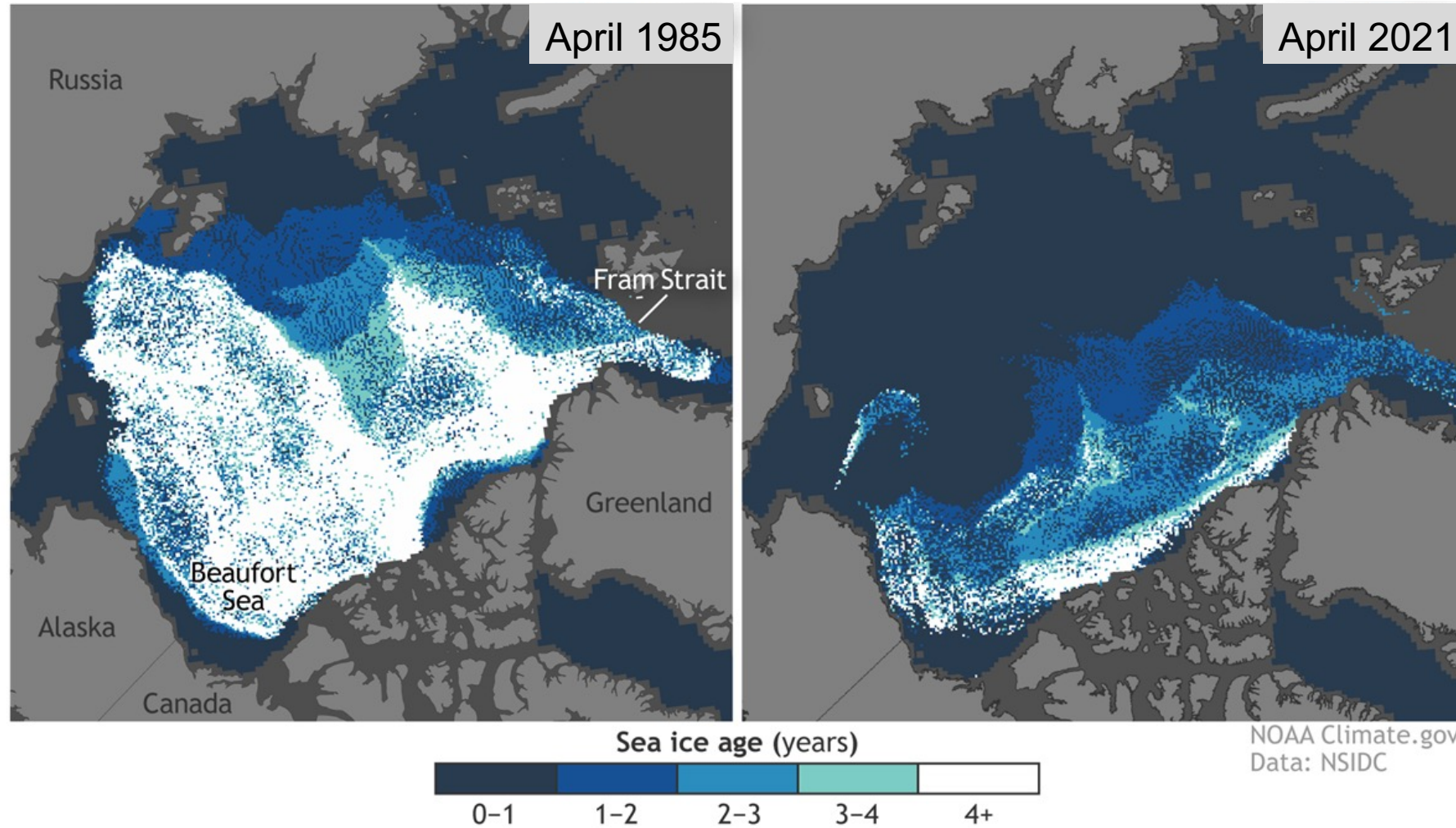
Subsistence Infrastructure, 2015
Photo by Jeff Erickson

2021 Arctic sea ice yearly minimum



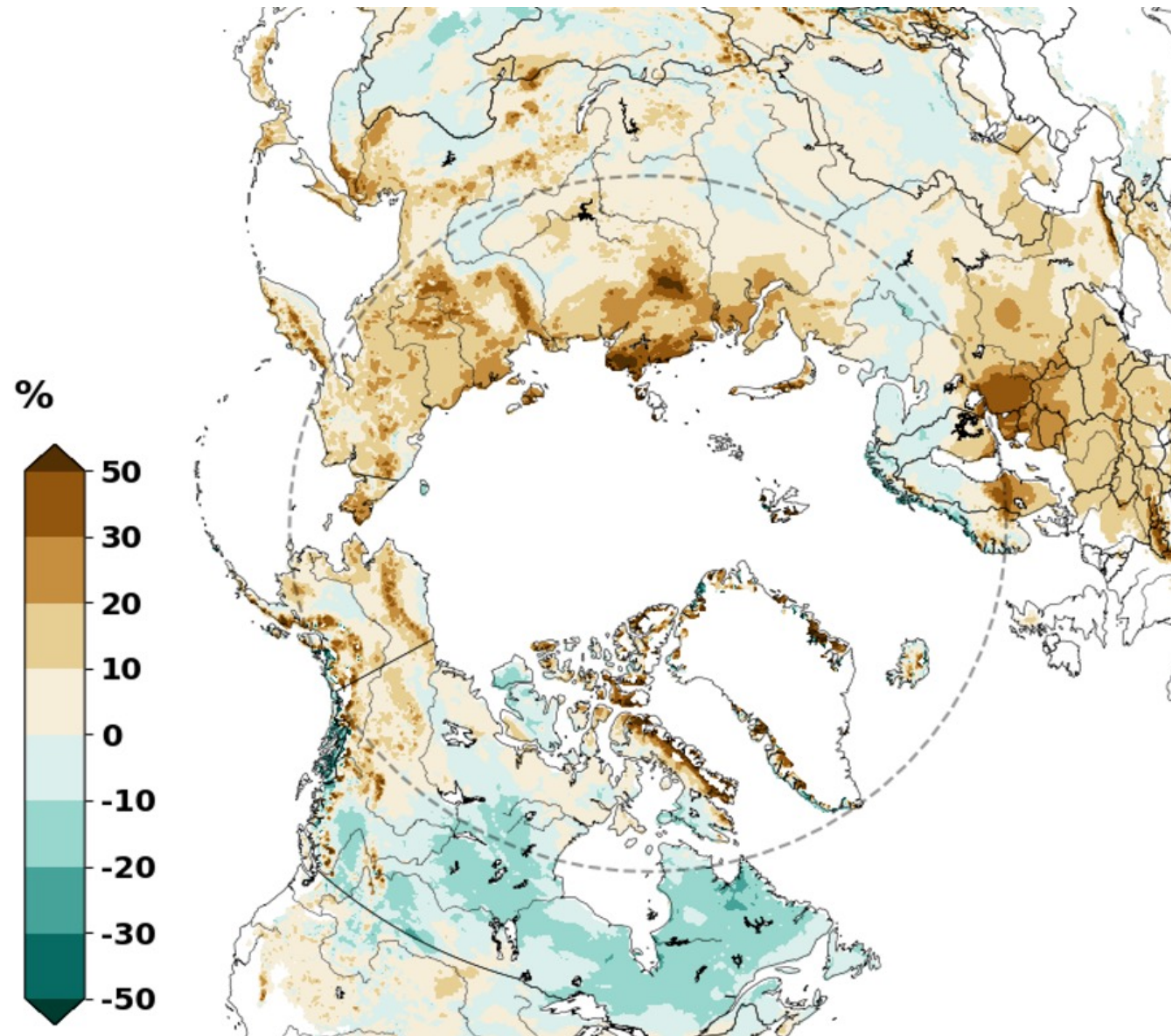
The **15** lowest minimum extents have all occurred in the last **15** years

Young, thin ice dominates today's ice pack



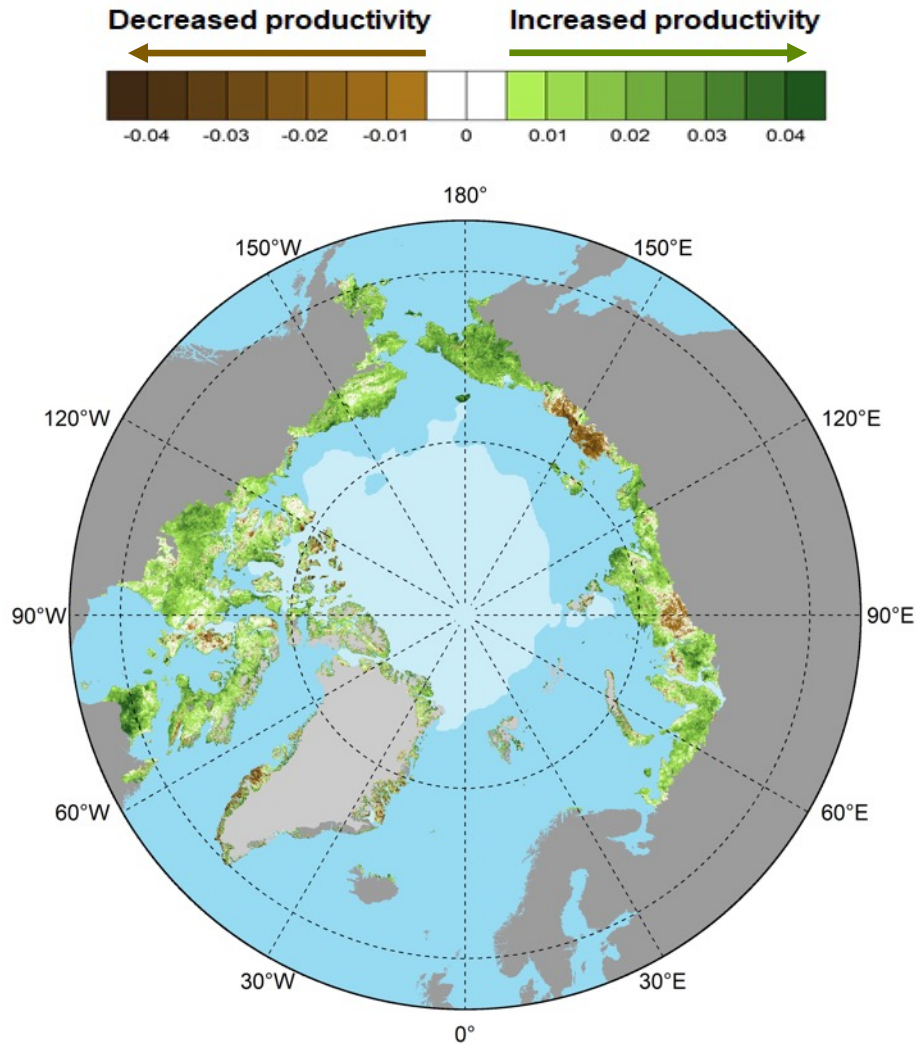
Combined loss of ice extent and thickness resulted in the lowest seasonal ice maximum in 2021

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

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

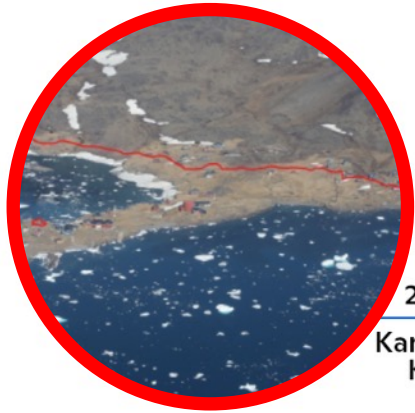
Permafrost Hazards

Glacier Hazards

Permafrost



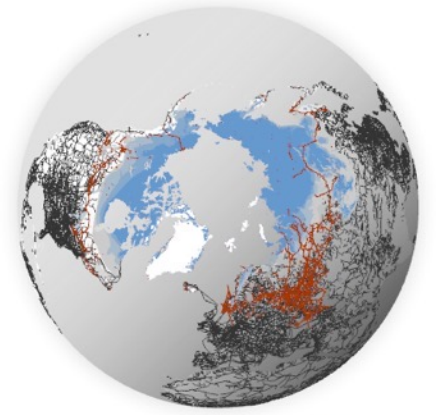
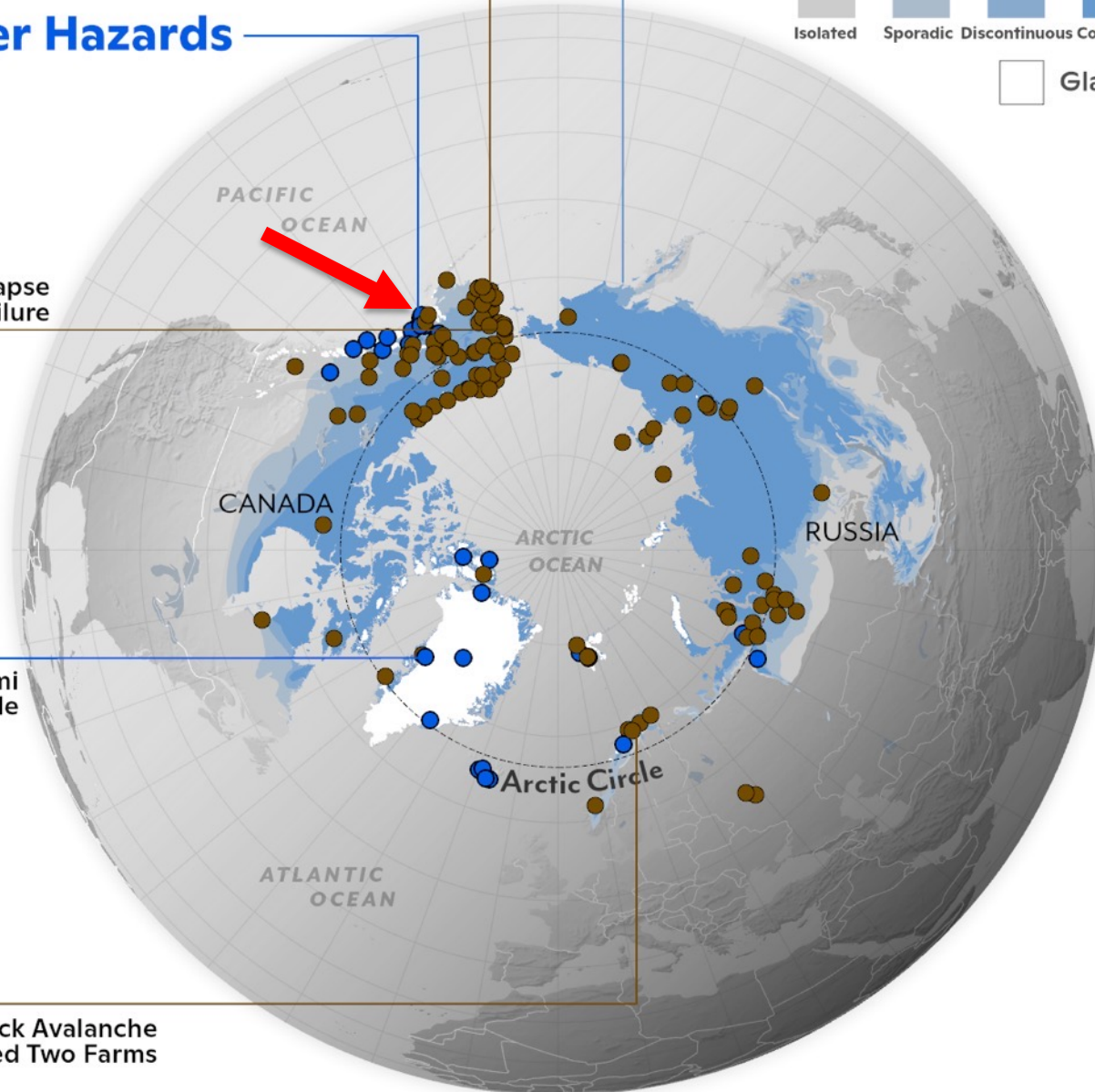
2021 Point Lay Permafrost Collapse Complete Water System Failure



2017 Karrat Fjord Tsunami Killed Four People



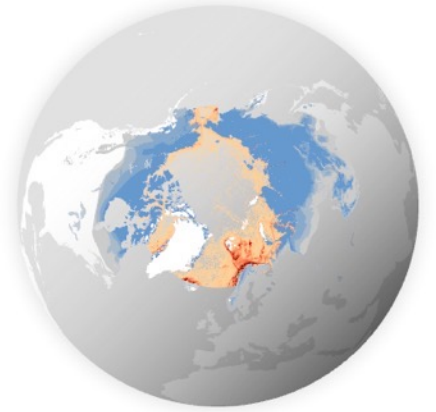
2008 Signaldalen Rock Avalanche Endangered Two Farms



Roads and Pipelines



Populated Places



Arctic Shipping

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.

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



Barry Arm Landslide, Alaska, July 2021

Photo by AK DGGS

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



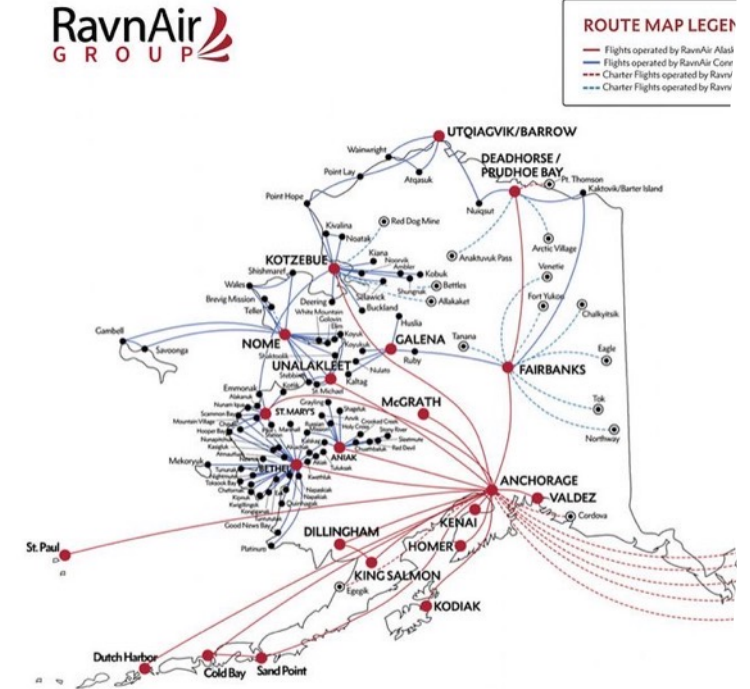
Overarching project question: ***How has the 2020 COVID-19 pandemic impacted food access for Indigenous individuals in the Arctic and the US Southwest?***



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)

