

Earth's dynamic surface

UNI – Earth and Environmental Sciences

Variable Energy



Processes



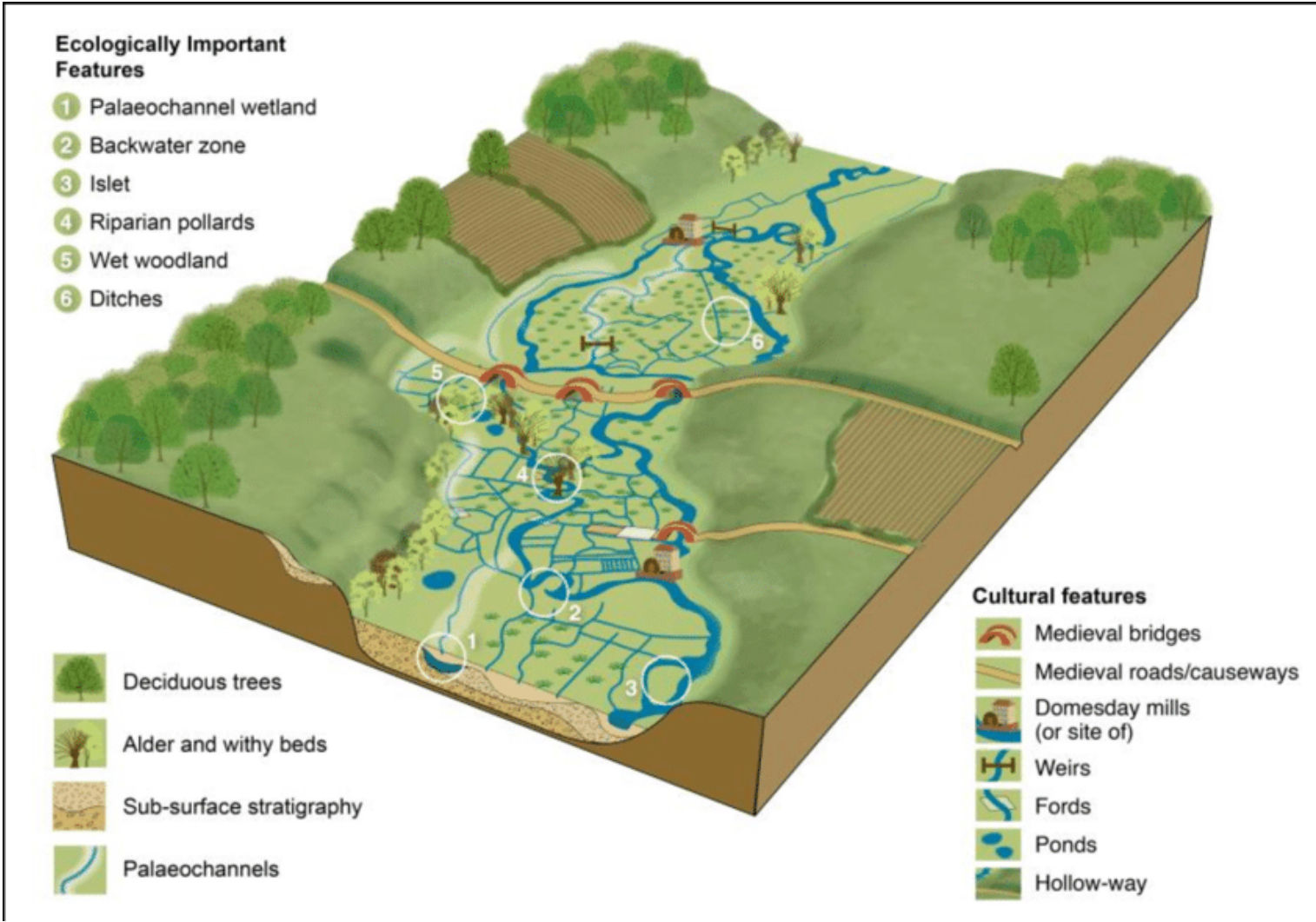
Change



Products/landforms

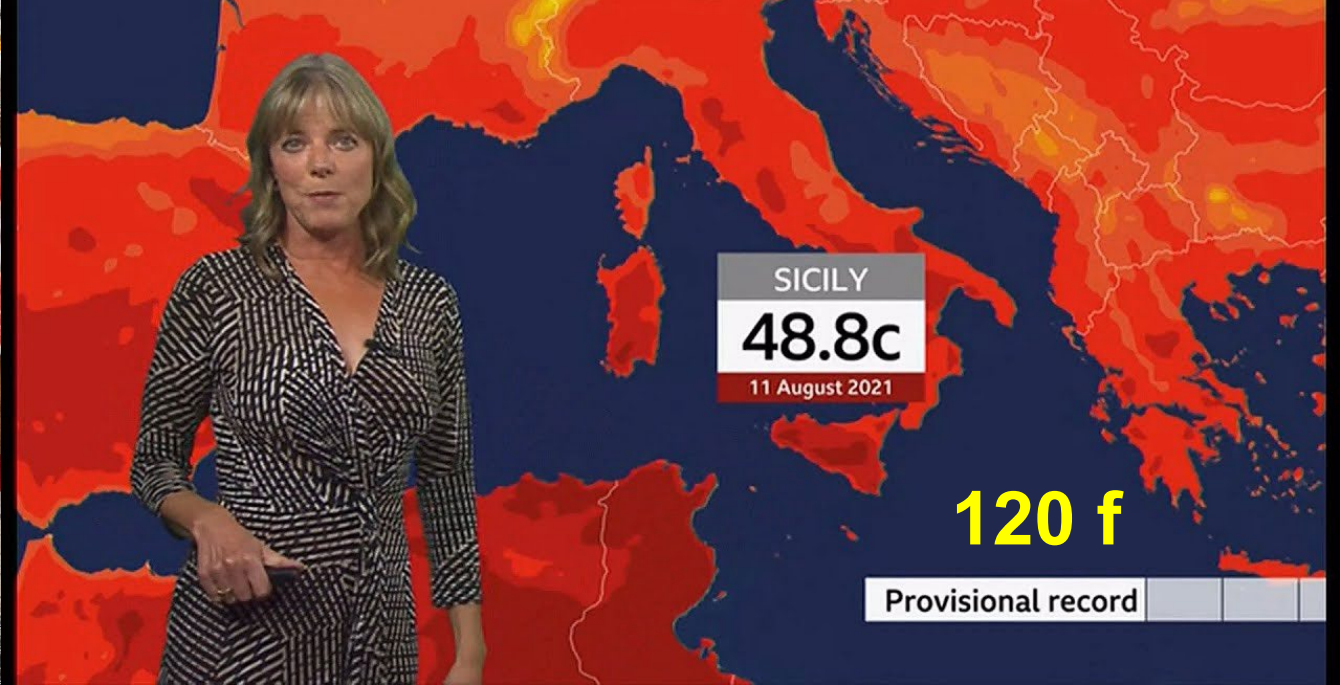
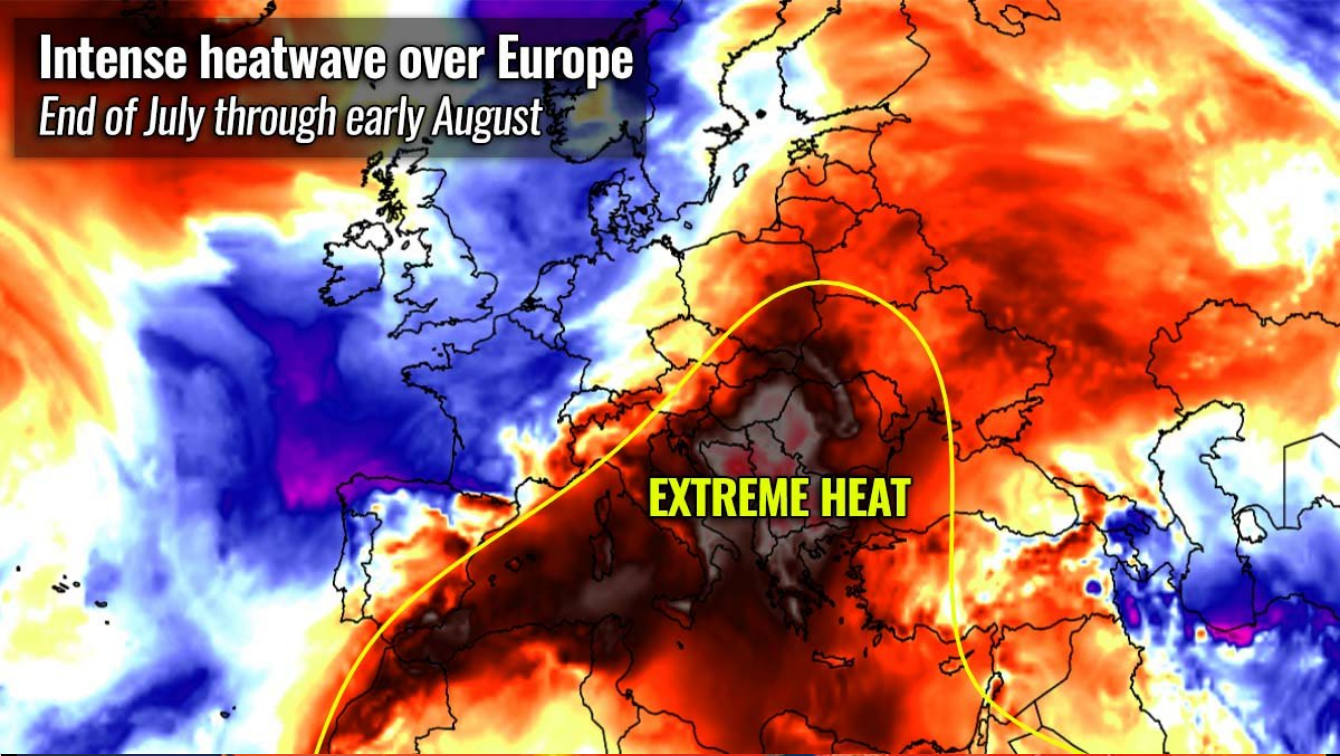


Geomorphology Types: Historical & Process

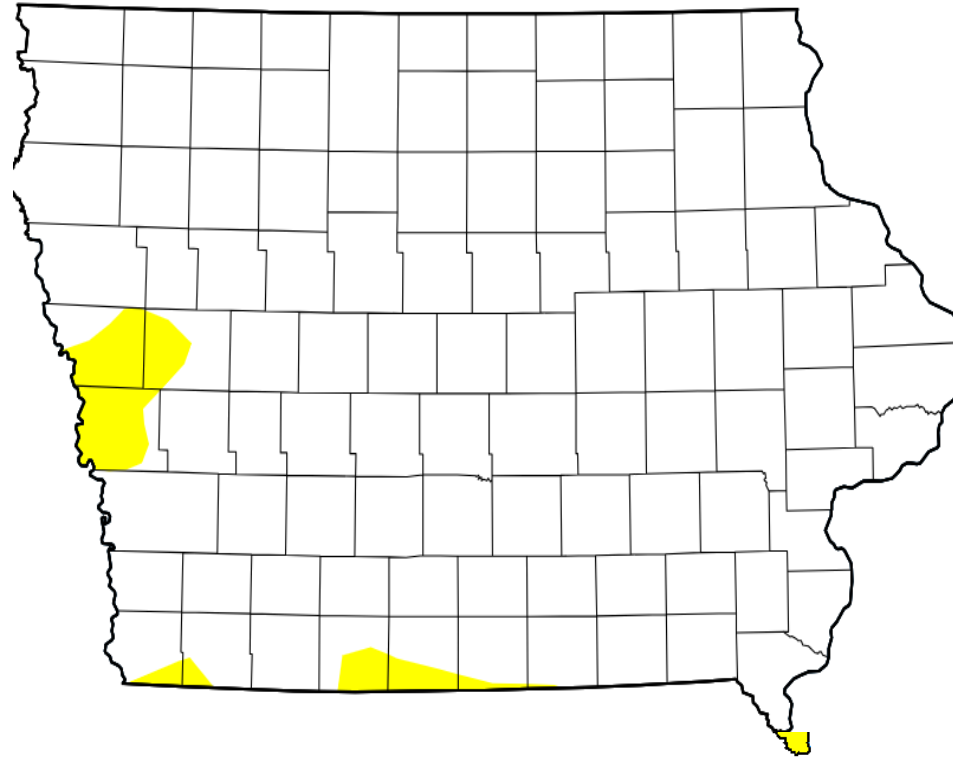




Increasing heat



Drought



Map released: Thurs. August 22, 2024

Data valid: August 20, 2024 at 8 a.m. EDT

Intensity

- None
- D0 (Abnormally Dry)
- D1 (Moderate Drought)
- D2 (Severe Drought)
- D3 (Extreme Drought)
- D4 (Exceptional Drought)
- No Data

Authors

United States and Puerto Rico Author(s):

[Richard Heim](#), NOAA/NCEI

Pacific Islands and Virgin Islands Author(s):

[Curtis Riganti](#), National Drought Mitigation Center

AUTHOR

Curtis Riganti

National Drought Mitigation Center



droughtmonitor.unl.edu

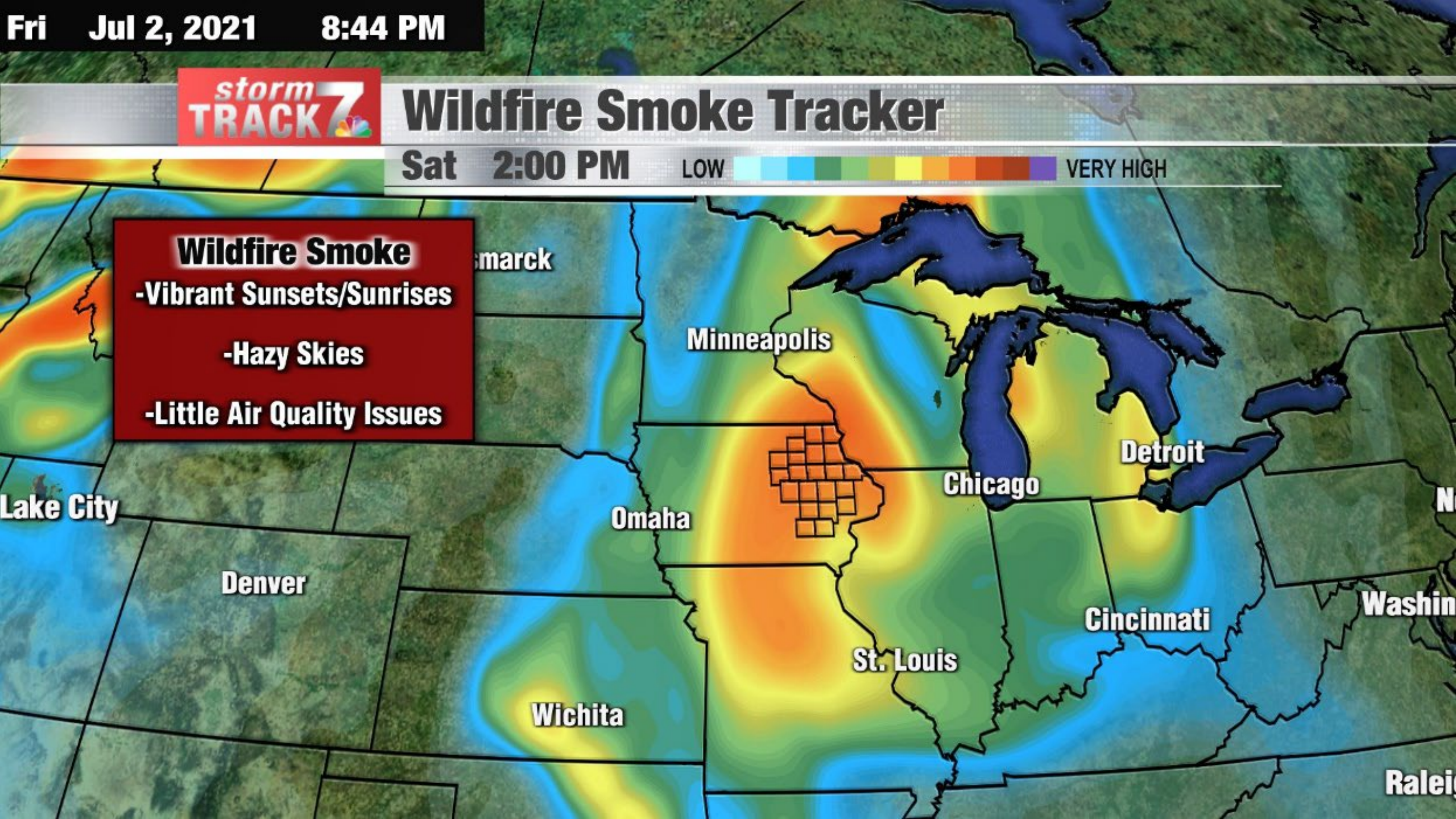


Wildfire Smoke Tracker

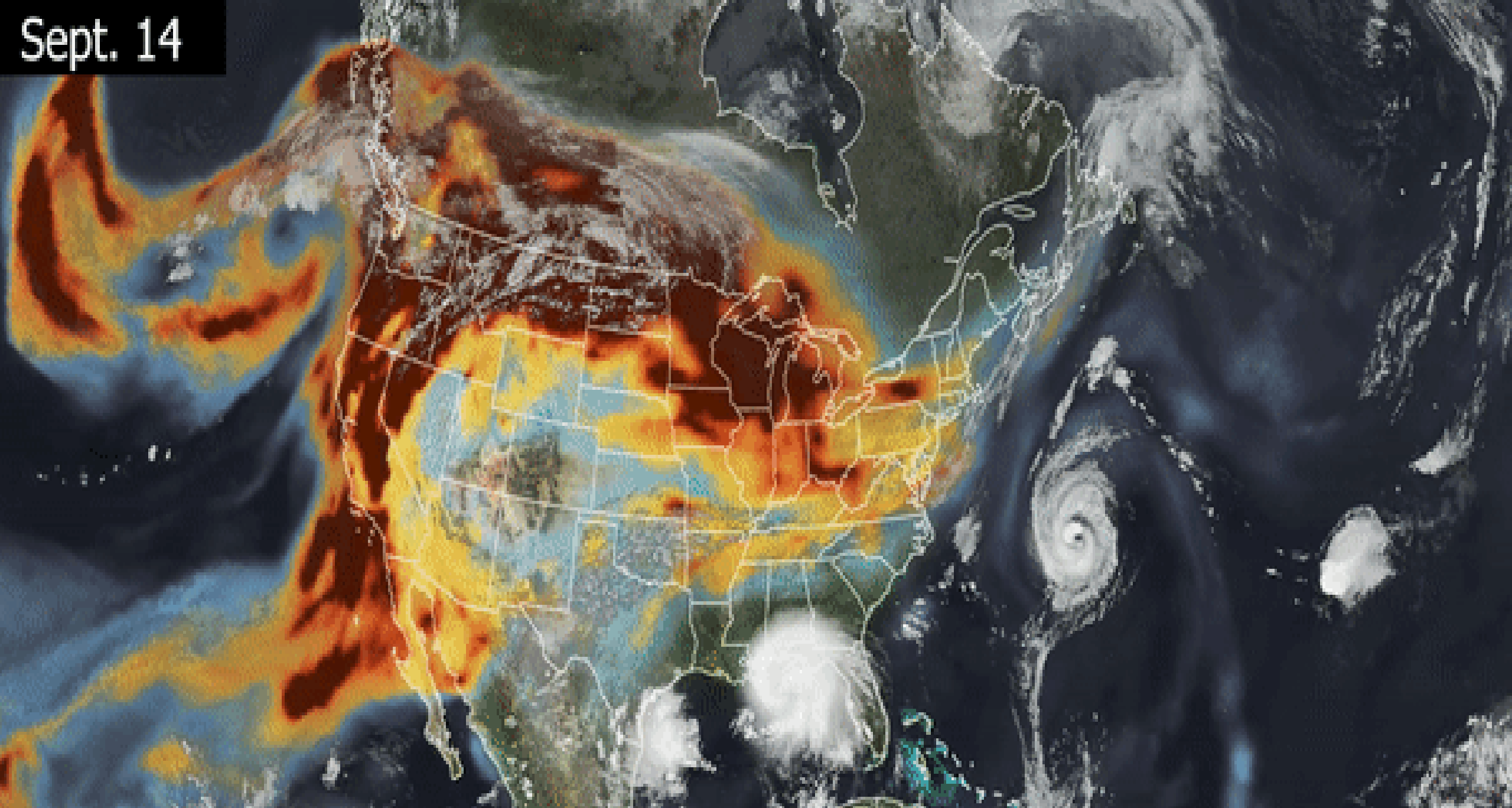
Sat 2:00 PM

LOW VERY HIGH

Wildfire Smoke
-Vibrant Sunsets/Sunrises
-Hazy Skies
-Little Air Quality Issues



Sept. 14

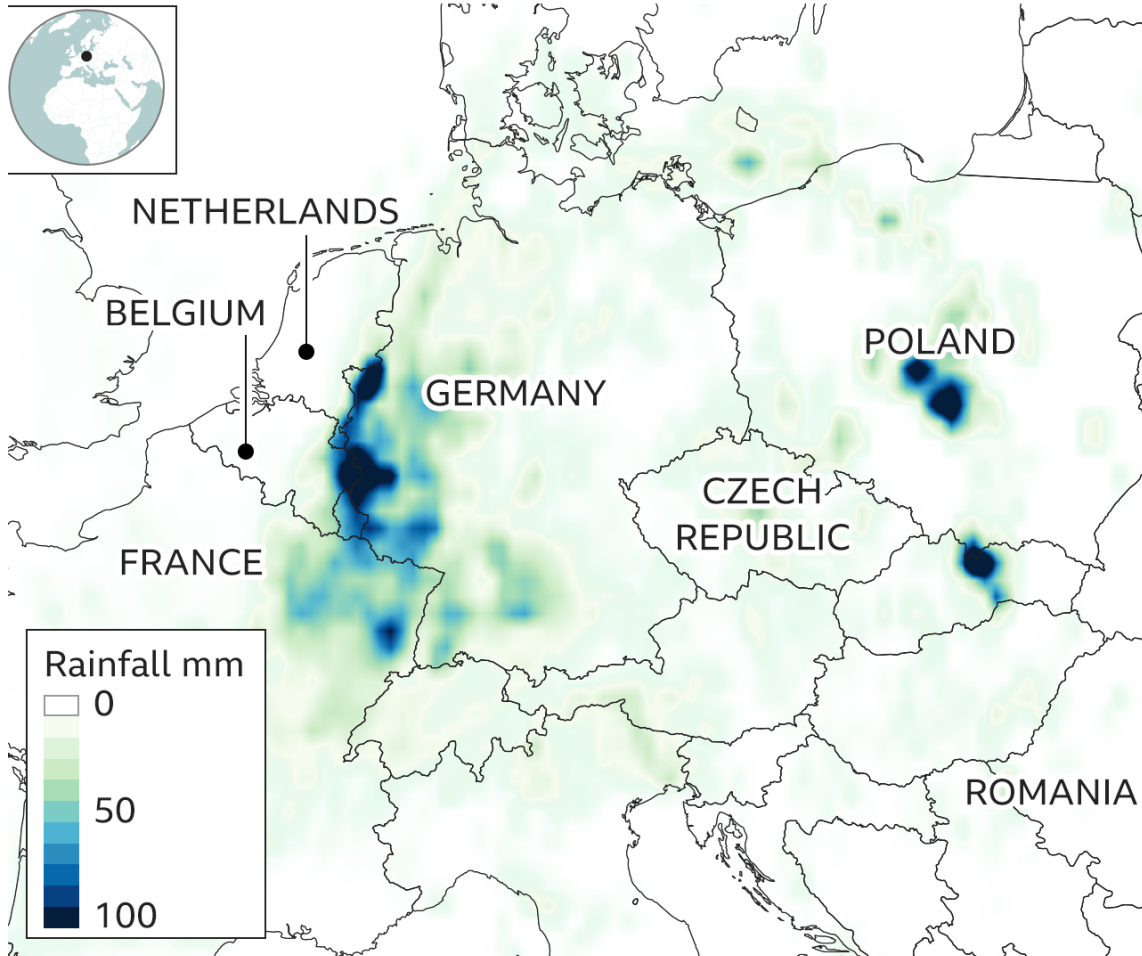


Kenora



Increased heat + Increased evaporation = increased air moisture content + rainfall potential

Rainfall over Europe on 14 July (24hrs)



Source: NOAA Global Forecast System (GFS), July 14 2021

BBC



Geosphere

Isostasy

Tectonics

Lithology & structures

Hydrosphere

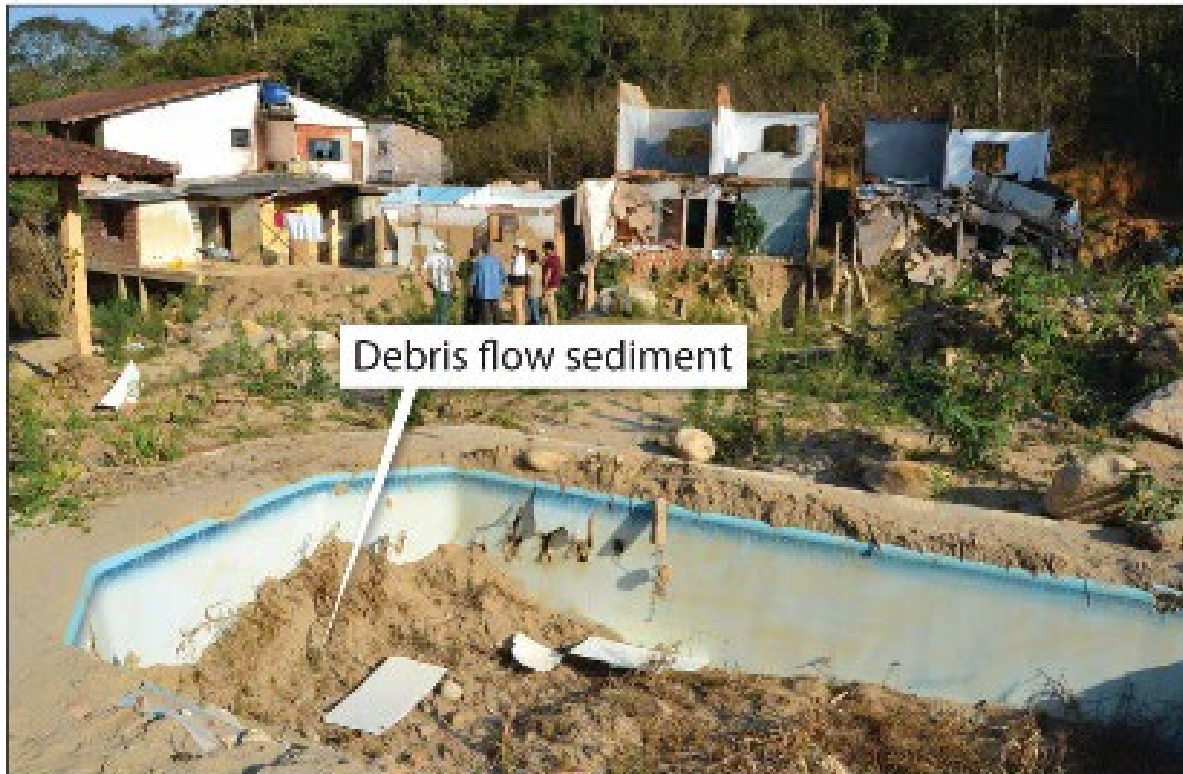
Ecosystems

Humans

Biosphere

Climate & Climate Zones

Hydrologic cycles



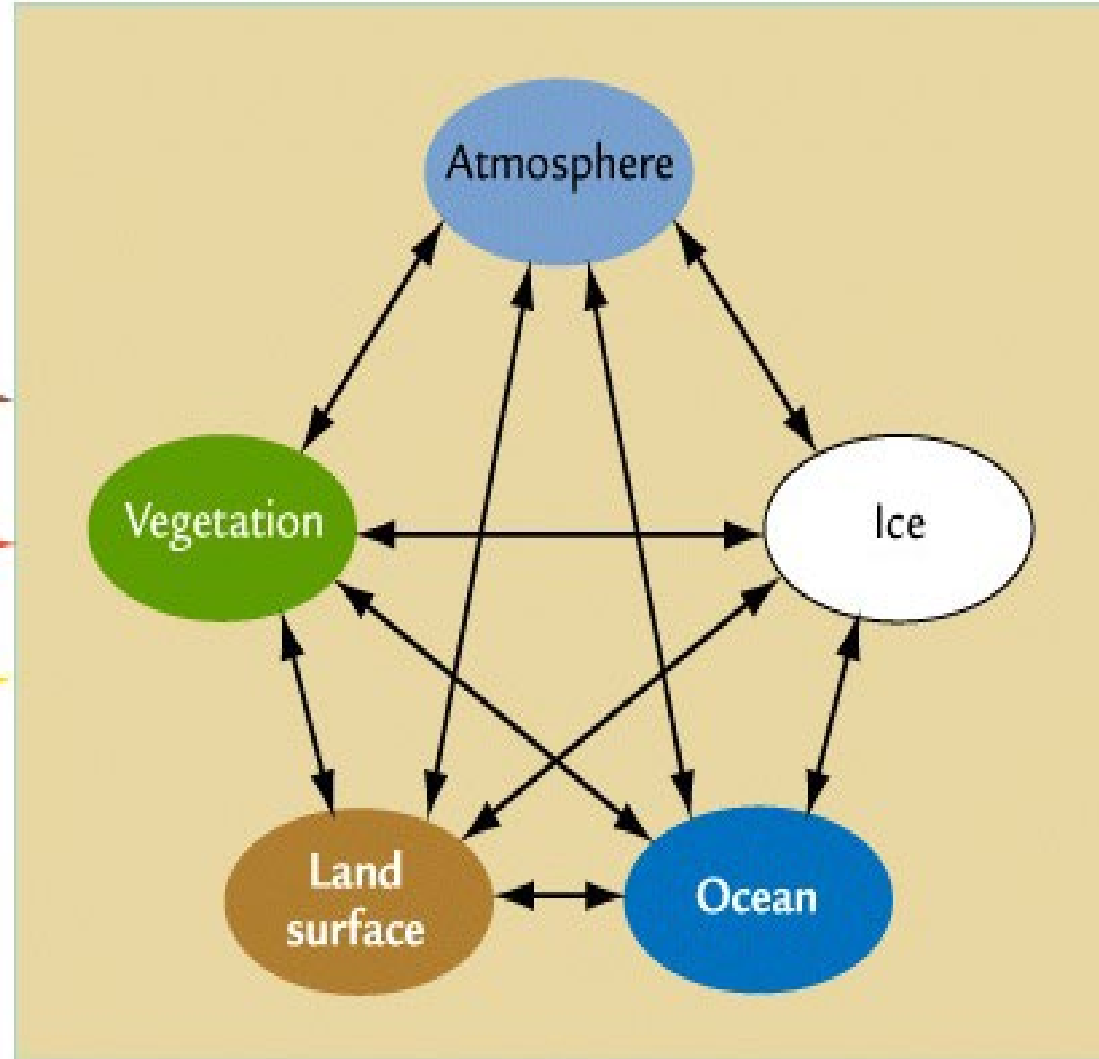
CAUSES
(external forcing)

Changes in
plate tectonics

Changes in
Earth's orbit

Changes in
Sun's strength

CLIMATE SYSTEM
(internal interactions)



CLIMATE VARIATIONS
(internal responses)

Changes in
Atmosphere

Changes in
Ice

Changes in
vegetation

Changes in
Ocean

Changes in
land surface



Rivers and Human History

“Iowa owes much to the streams that drain her fertile valleys. These waterways played a dramatic role as highways of exploration and communication as well as avenues of commerce”

- William Petersen, 1941



Primary questions

How do we view our streams and rivers, Today?

- Source of transportation
- Means of disposal
- Recreation
- Source of distress – Contamination, Flooding
- Possibly not at all, no connection..?

Contributing to humanity's
Sense of Place & Perception of Time

“If you love a place you have a
duty to protect it & to love a
place you must know it first!”

Jeff Johnson – 180° South





Rivers Mystery to Mythology

Gros Ventres – Creation of the World, Creator's Tea



George Catlin

Music

- Spillville, Iowa
 - Billy Clocks Museum
- Turkey River
- #9 New World Symphony



Apollo 11 Mission
Neil Armstrong



Fascinated by Native American and African American melodies

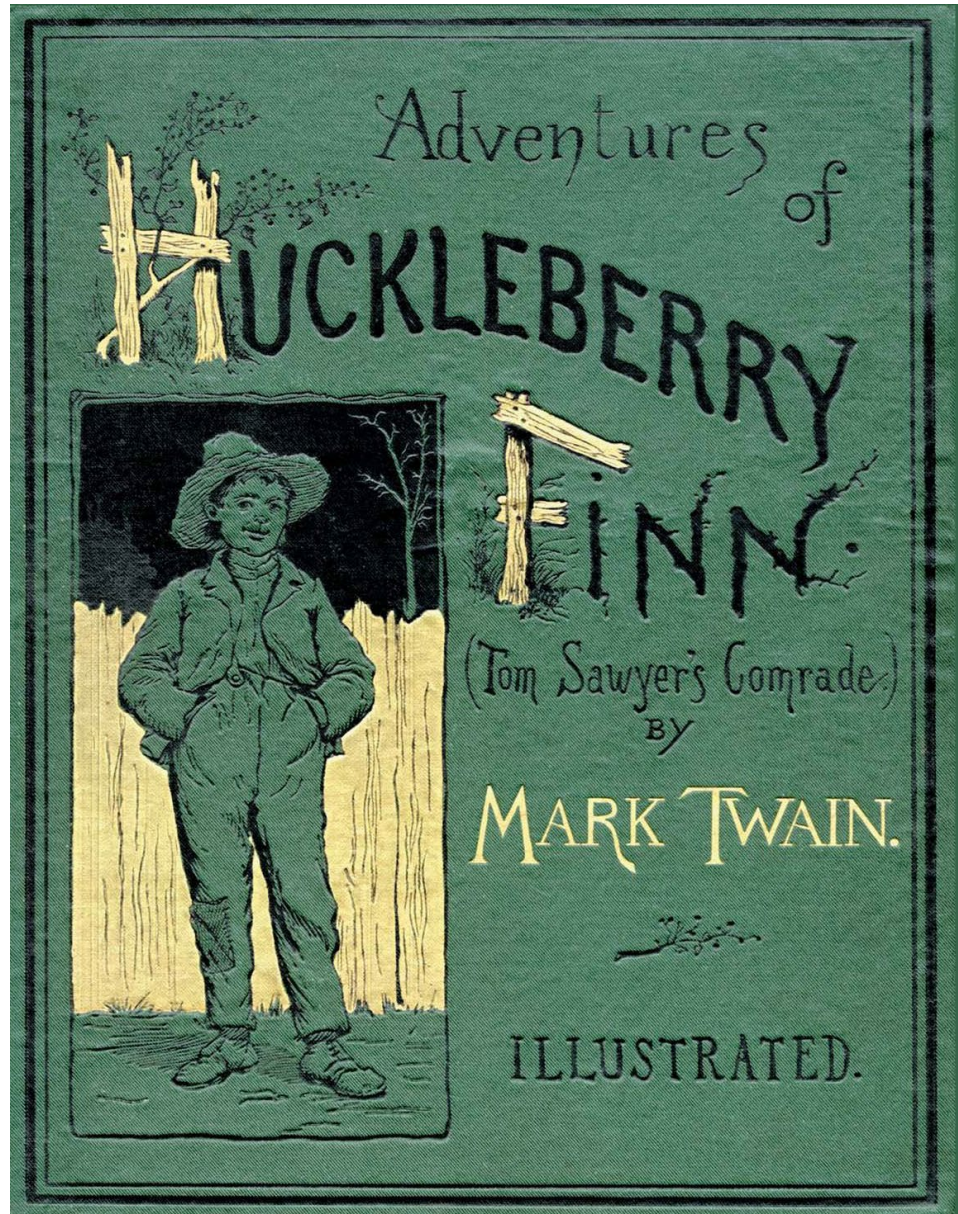


ONE ON ONE: LAUGHING RIVER



BISHOP BRIGGS
“River”

Literature, Novels and Poetry



Emily Dickinson

My River runs to thee –
Blue Sea – Wilt welcome me?

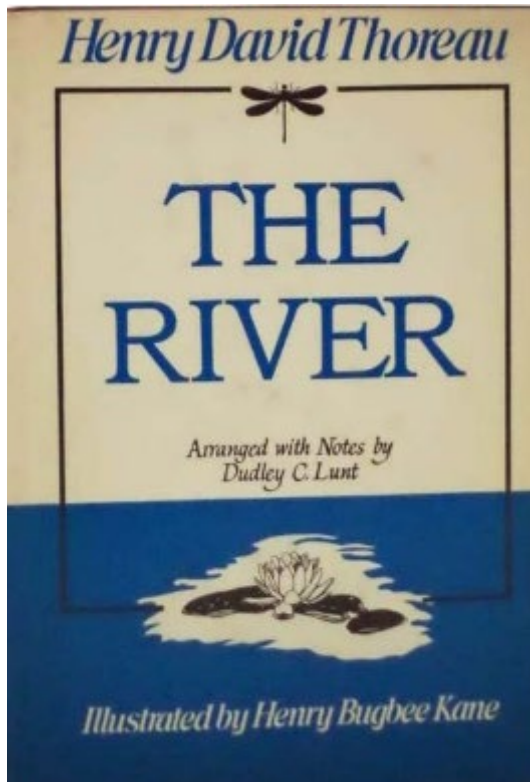
My River wait reply.
Oh Sea – look graciously!

I'll fetch thee Brooks
From spotted nooks –
Say Sea – take Me?

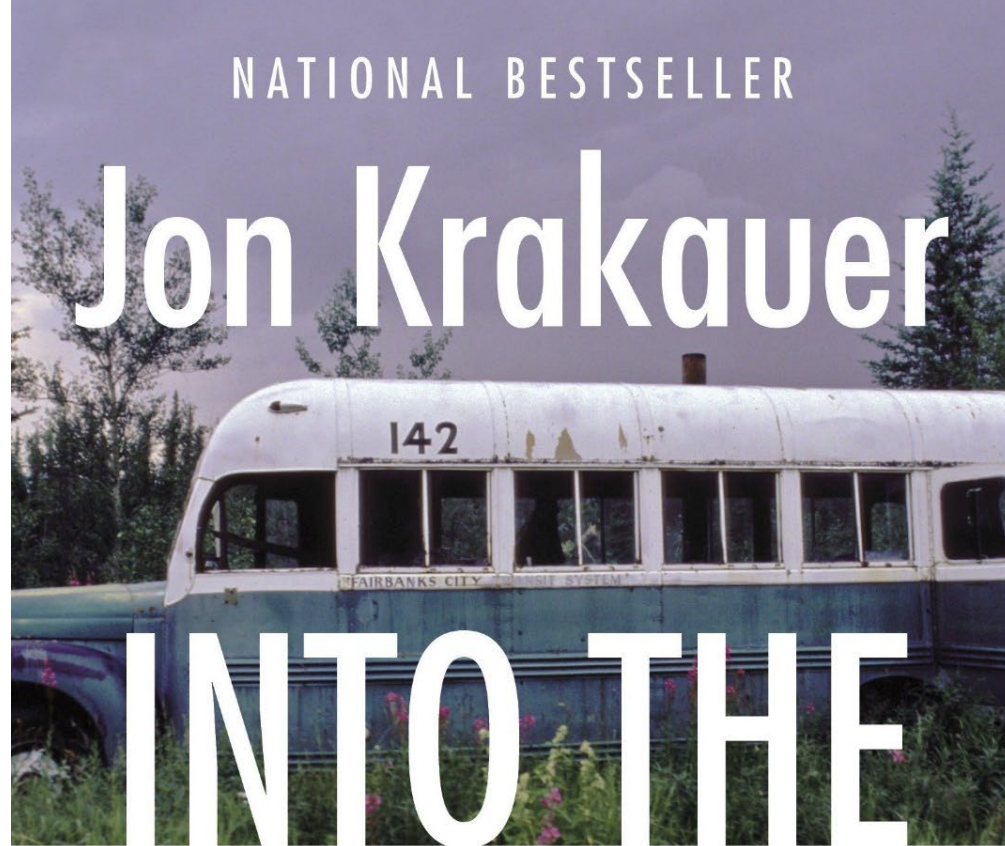
“The river is my own highway,
then only wild and unfenced
part of the world hereabouts.”

30 May 1852

Henry David Thoreau



Films

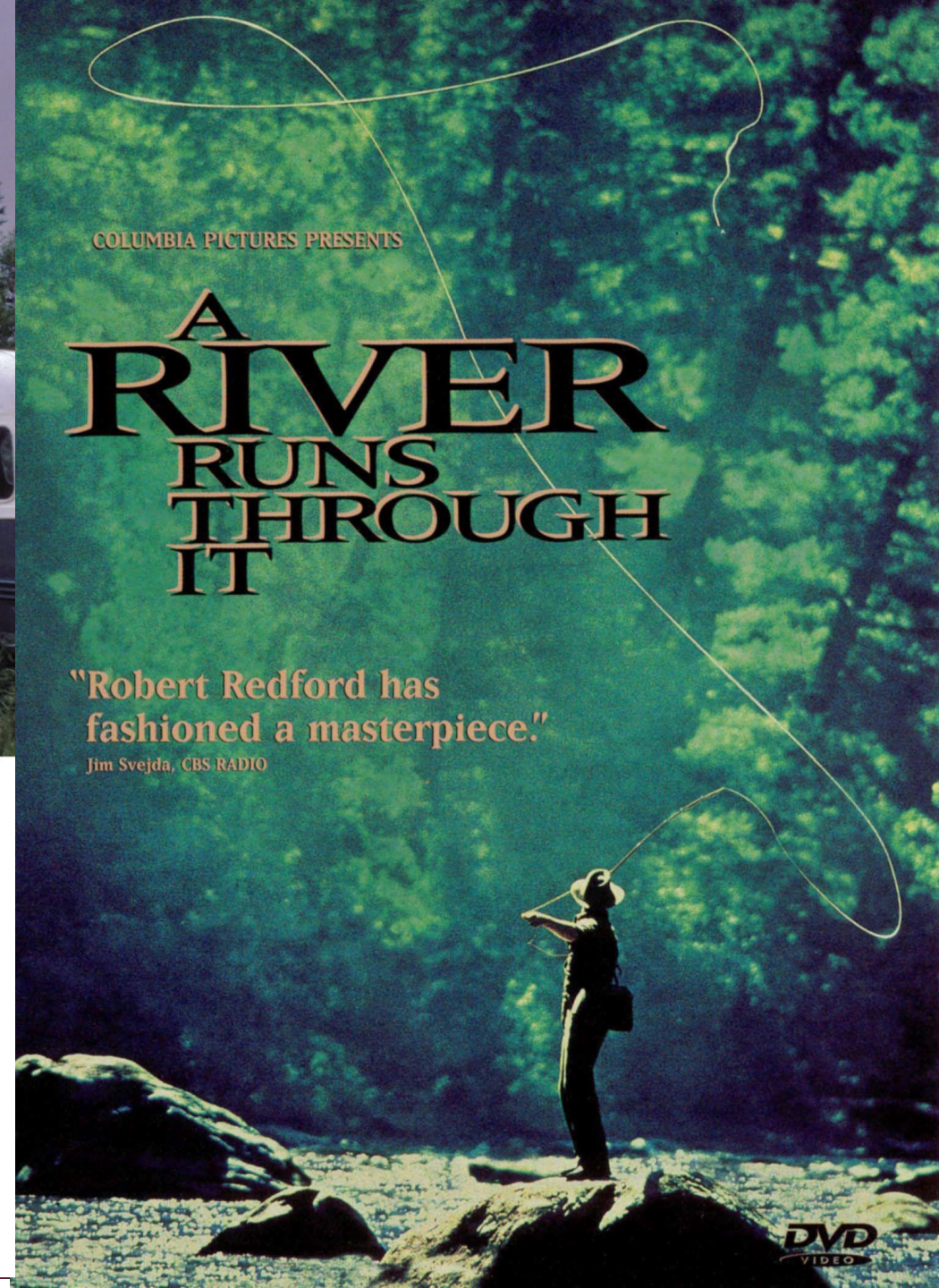


NATIONAL BESTSELLER

Jon Krakauer

INTO THE WILD

In April 1992 a young man from a well-to-do family hitchhiked to Alaska and walked alone into the wilderness north of Mt. McKinley. His name was Christopher Johnson McCandless. He had given \$25,000 in savings to charity, abandoned his car and most of his possessions, burned all the cash in his wallet, and invented a new life for himself. Four months later, his decomposed body was found by a moose hunter. . . .



COLUMBIA PICTURES PRESENTS

A RIVER RUNS THROUGH IT

"Robert Redford has
fashioned a masterpiece."

Jim Svejda, CBS RADIO

DVD
VIDEO

“Loch water rushing over rocky falls, barley malted over moorland peat slow distillation and long maturation in oak casks; all help us to shape Lagavulin’s robust and smoky character. “Time”, say the islanders TAKES OUT THE FIRE but LEAVES IN THE WARMTH.”

The Strange Horse of Suinabhal by William Black

I hef been in Isa more as three or tow times myself, and I hef been close to the Lagavulin Distillery and I know that it is the clear water of the spring that will make the Lagavulin Whisky just as fine as new milk’



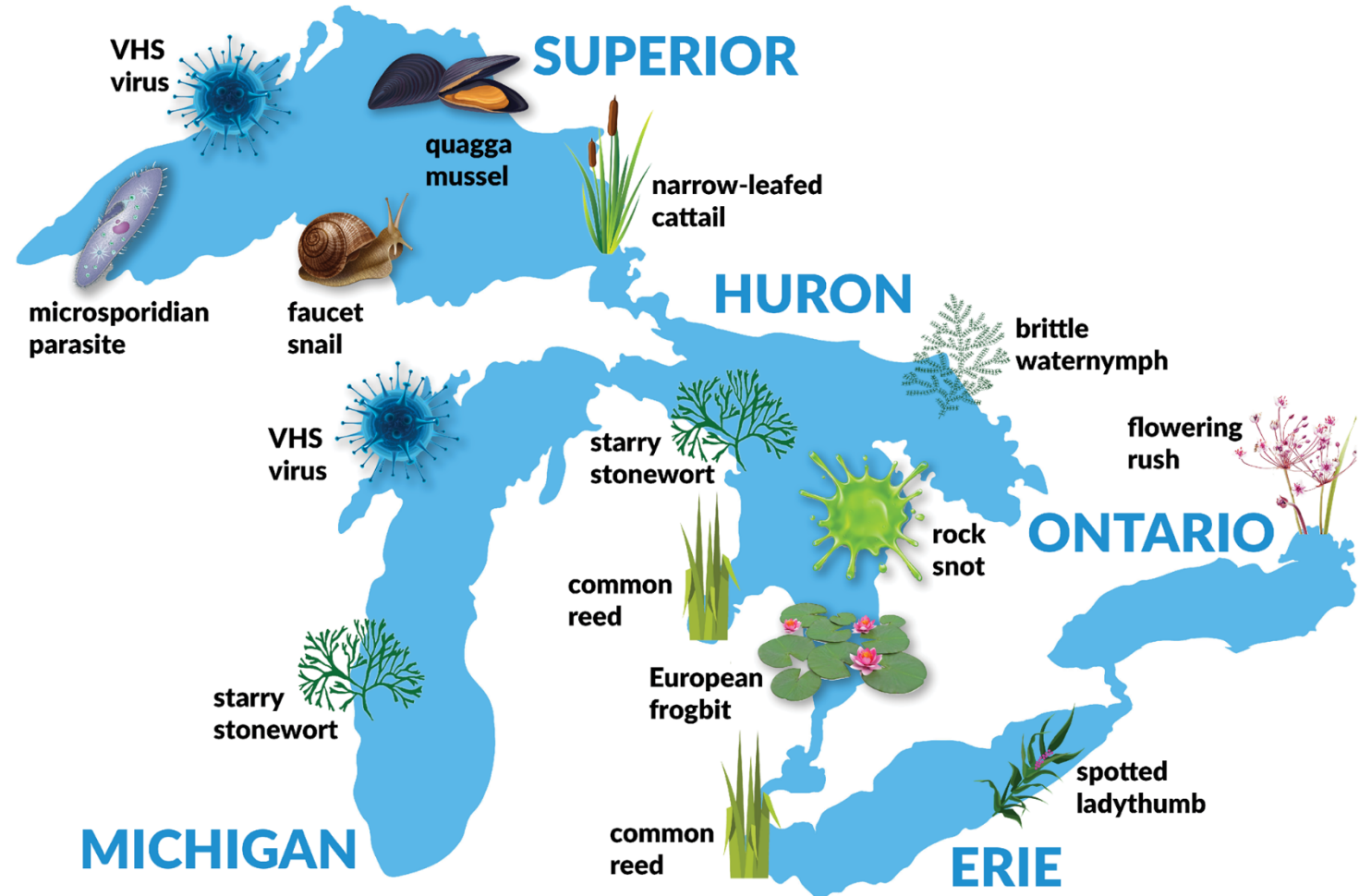


Invasive species



Invaders keep spreading

Just three new nonnative species have been detected in the Great Lakes in recent years. Their introduction has been slowed by ballast water regulations for ocean-faring ships. But scientists and regulators struggle to keep unwanted creatures from traveling between lakes. Here's a look at species that have spread to each lake over the past decade.



Source: U.S.-Canadian State of the Great Lakes 2019 report

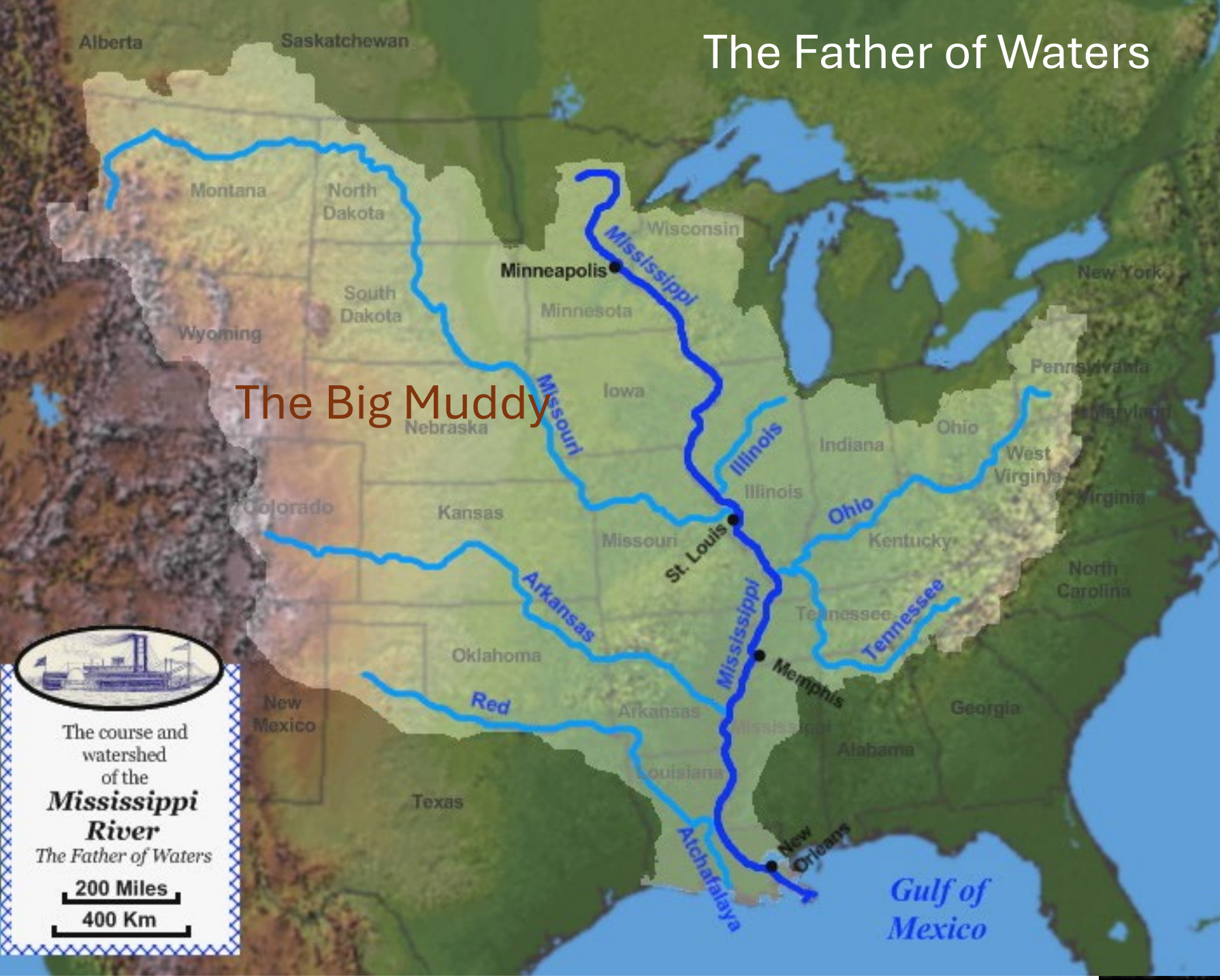
The Father of Waters

The Big Muddy

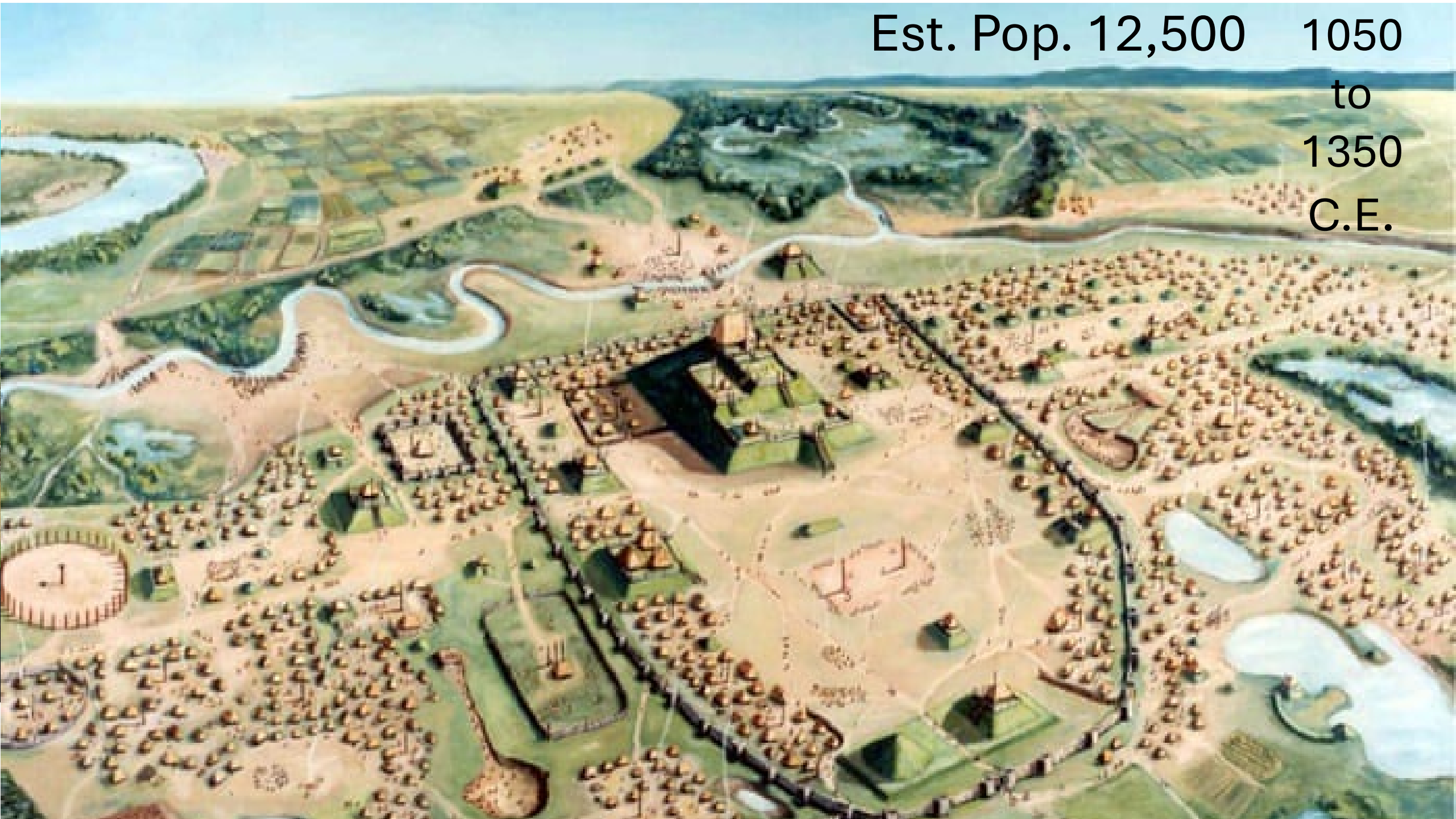


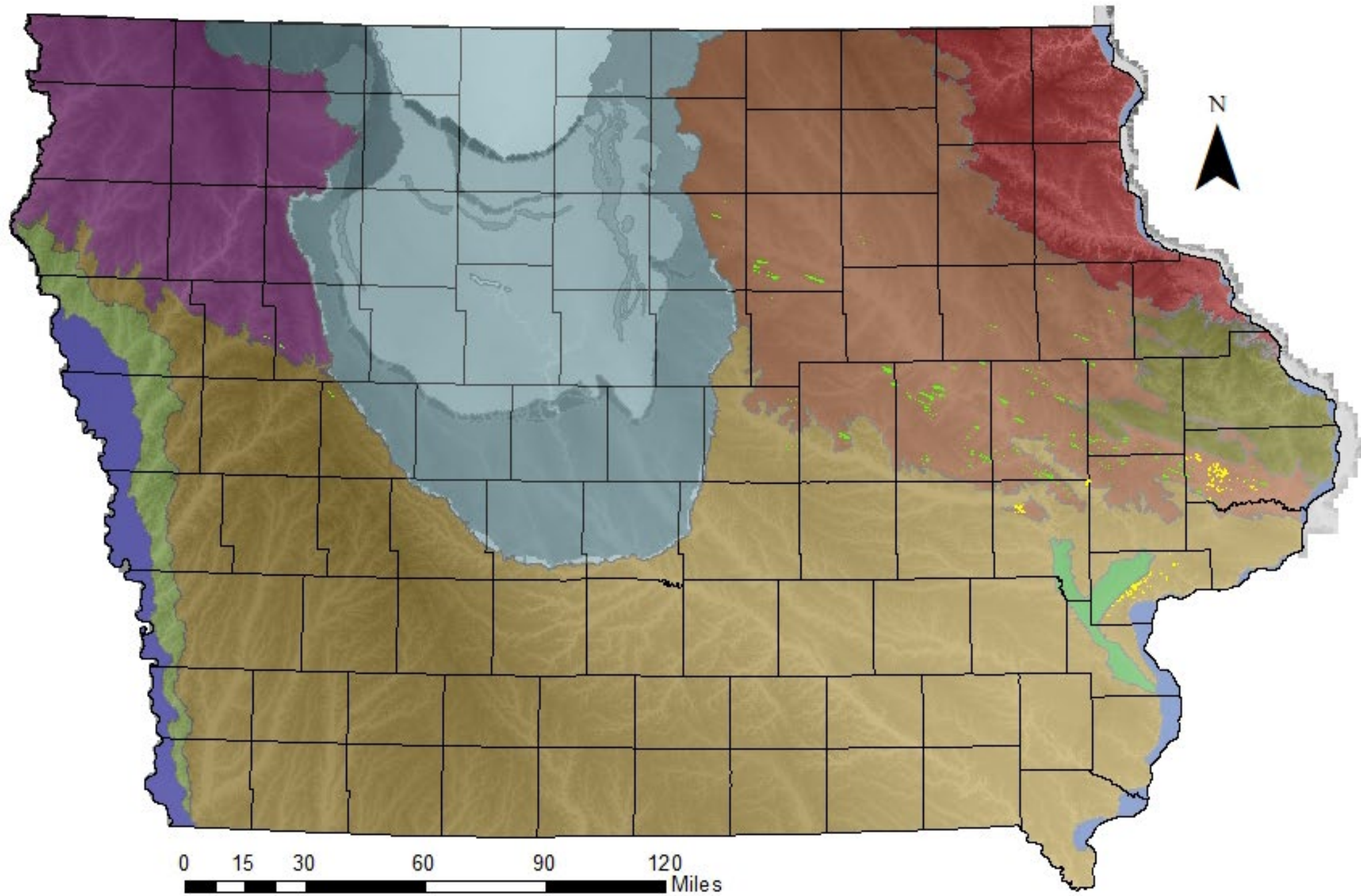
The course and watershed of the **Mississippi River**
The Father of Waters

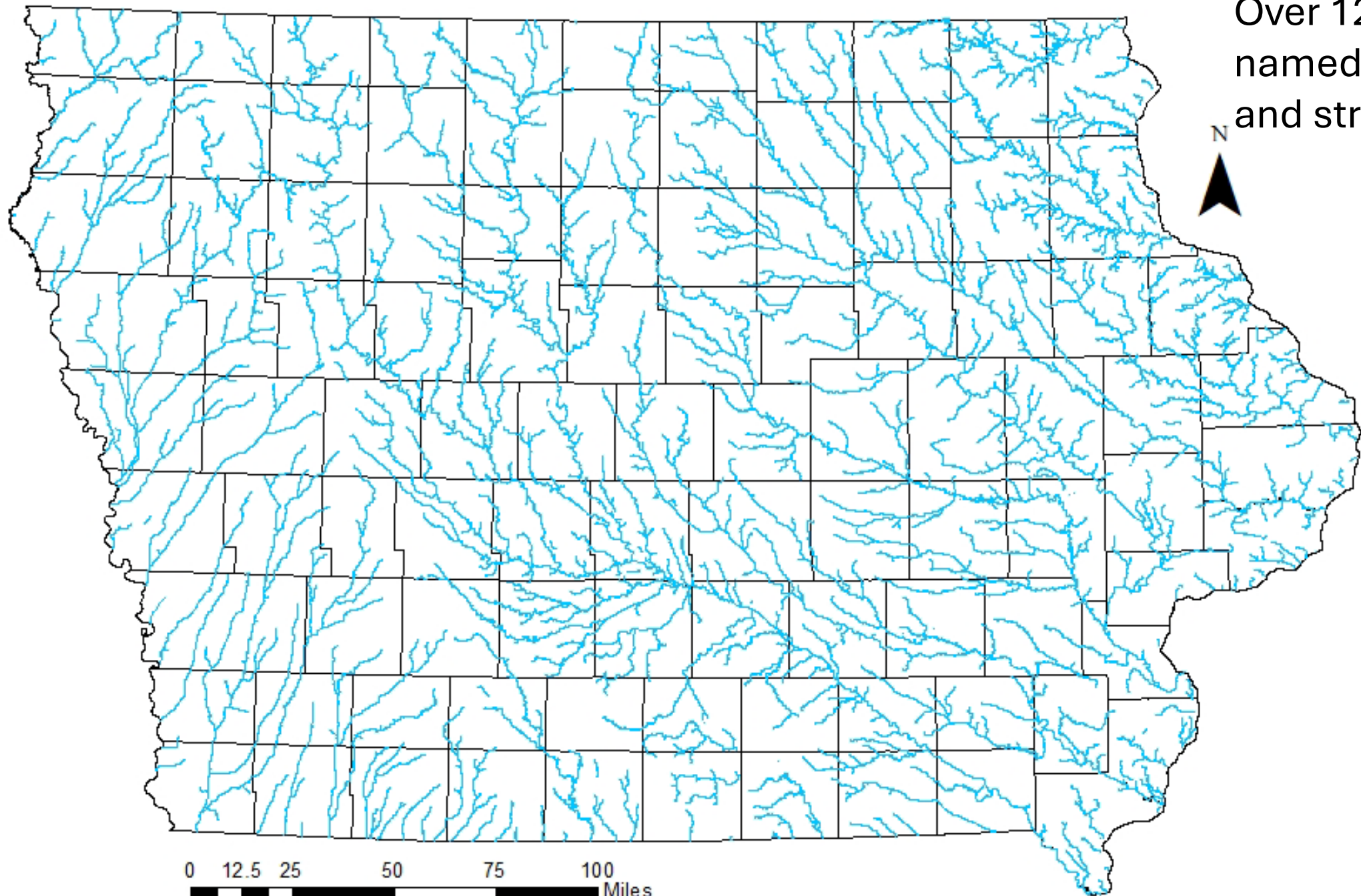
200 Miles
400 Km



Est. Pop. 12,500 1050
to
1350
C.E.



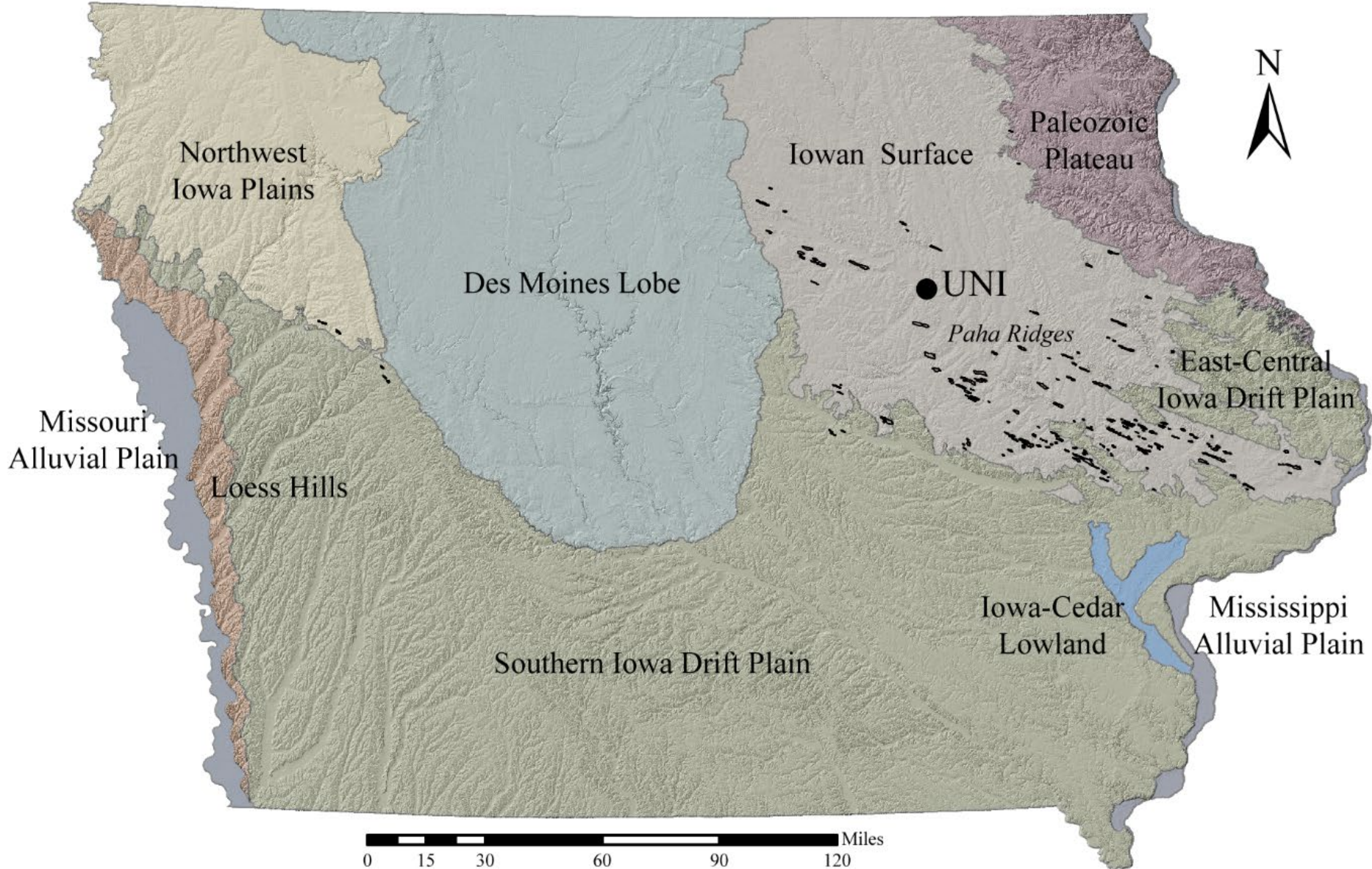




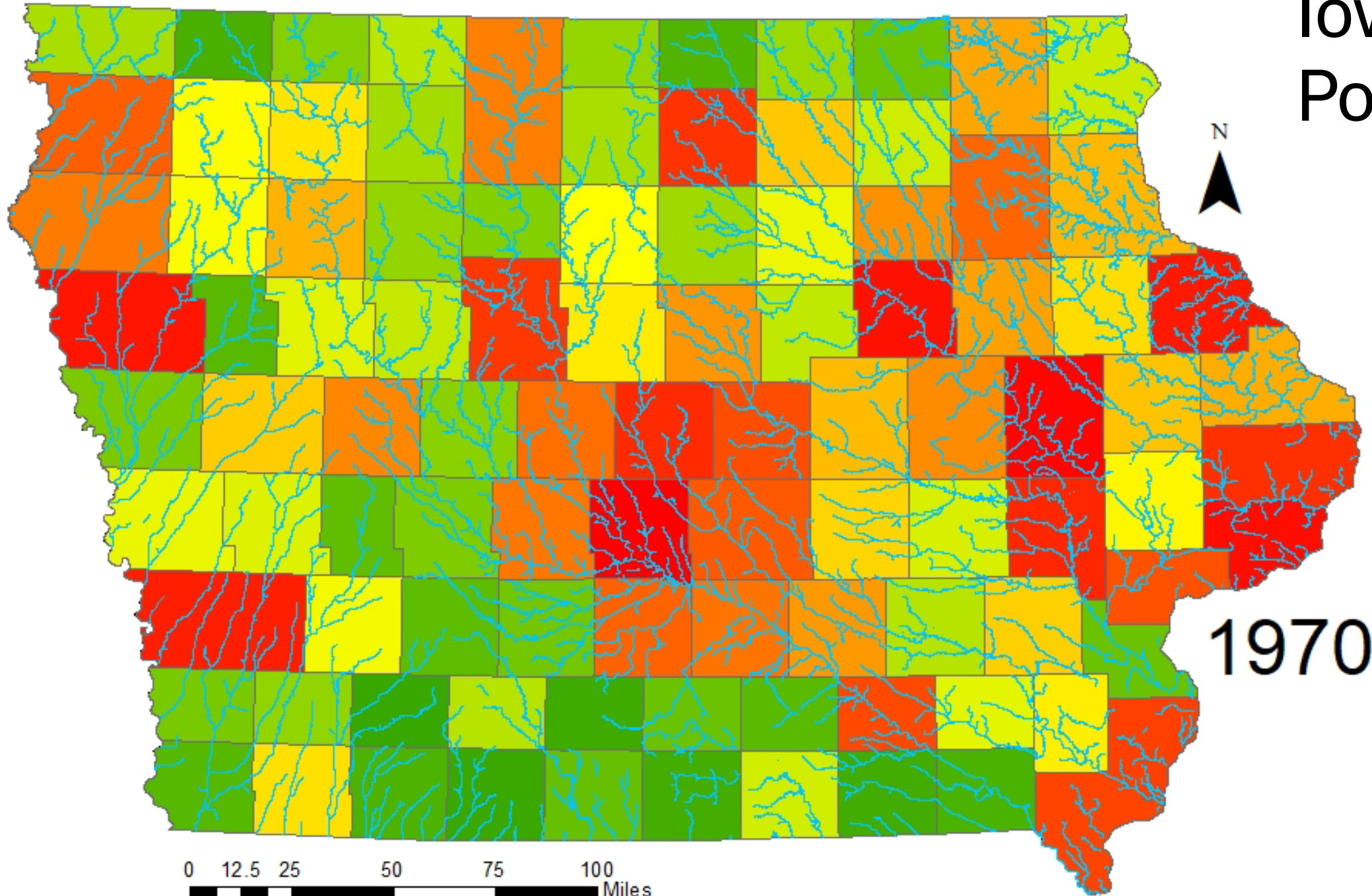
Over 1200
named Rivers
and streams



0 12.5 25 50 75 100 Miles



Iowa's Population



1970

Explorers, Pioneers and Steamboats

Rivers facilitated

Migration

Trade

Pelts

Grain

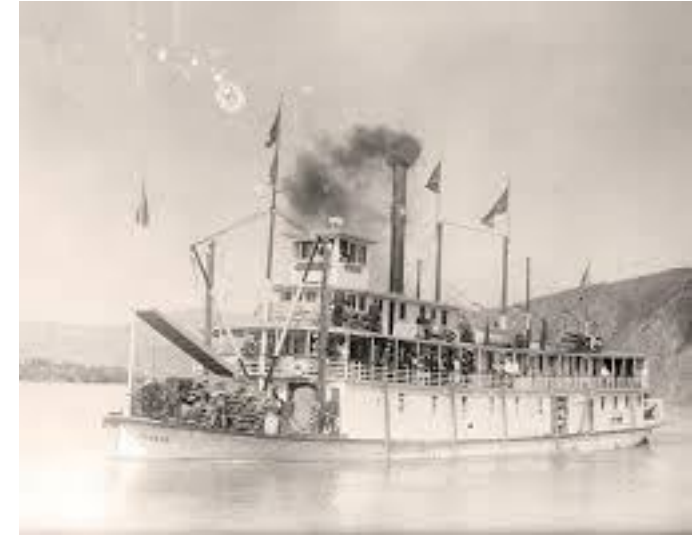
Wood

Ore

Gambling

Military

1823



Virginia

1860



Chippewa

[Missouri pdf](#)

1819

Old Times on the
Upper Mississippi

The Recollections of a Steamboat Pilot 1908 from 1854 to 1863

George Byron Merrick (1908)

<https://www.gutenberg.org/files/47262/47262-h/47262-h.htm>

Continued Immigration into and through 1900

- Steamboat 'Bills of Lading' Post 1850 show increased arrivals of..
 - Rakes, hoes, spades, grindstones
 - Farm machinery
- Major populations of
 - Dutch to Pella
 - Tappist monks to New Melleray/Ireland
 - Luxemburgers to St. Donatus
 - Swiss to New Glarus
 - Germans to Davenport, Guttenburg, Reinbeck and New Berlin/Lincoln...
 - Mecklenburgers, set up a socialist community in Elkader
 - Czech and Slovak to Cedar Rapids



Iowa's Interior – Resources, Power, Goods

- Black Hawk Purchase, 1833

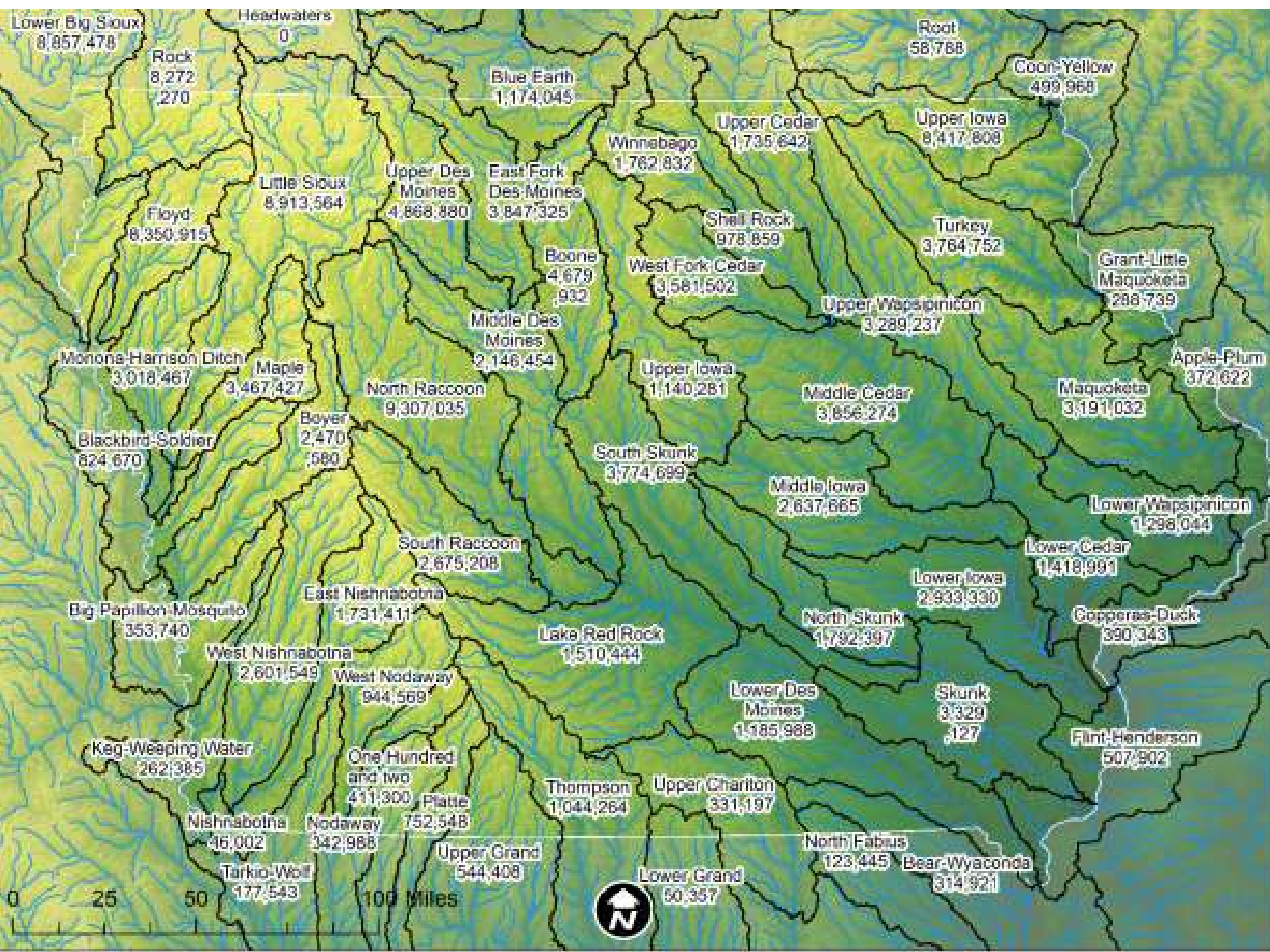
- 1830s 1st Mills

- Grist
 - Saw

- 1870

- 502 Gristmills
 - 545 Sawmills





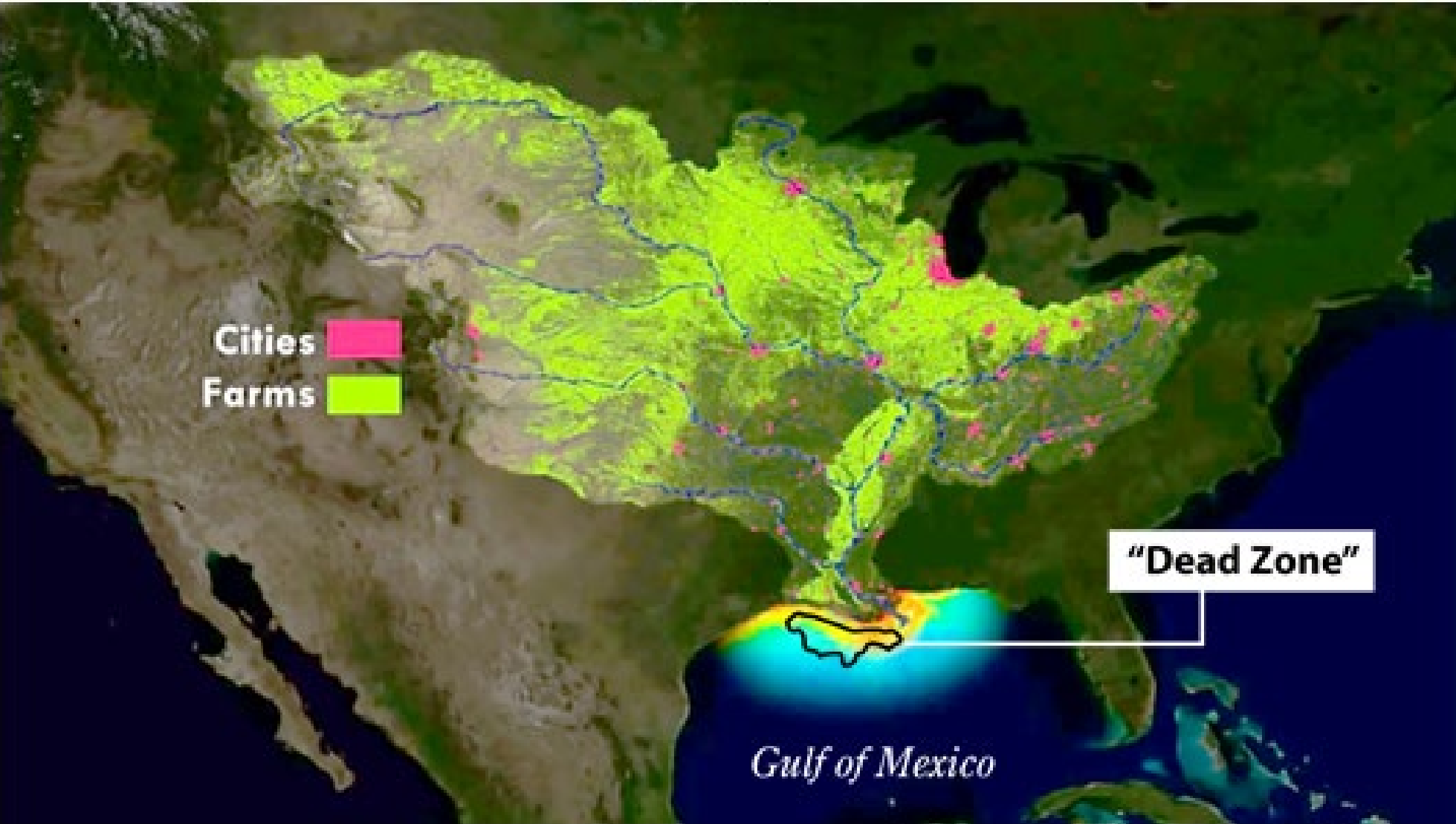
Population, from
294,122
to with animals
3,289,237

Statewide
24 million pigs
3 million people
8:1

Chris
Jones
U Of Iowa
IIHR

Gulf 'Dead Zone' Chokes Marine Life

The Gulf of Mexico at the Mississippi River Delta experiences a seasonal *hypoxia*, or "dead zone," where there is not enough oxygen in the water to sustain marine life.



Nitrate equivalents

2019 – may
surpass previous
record due to
record flooding

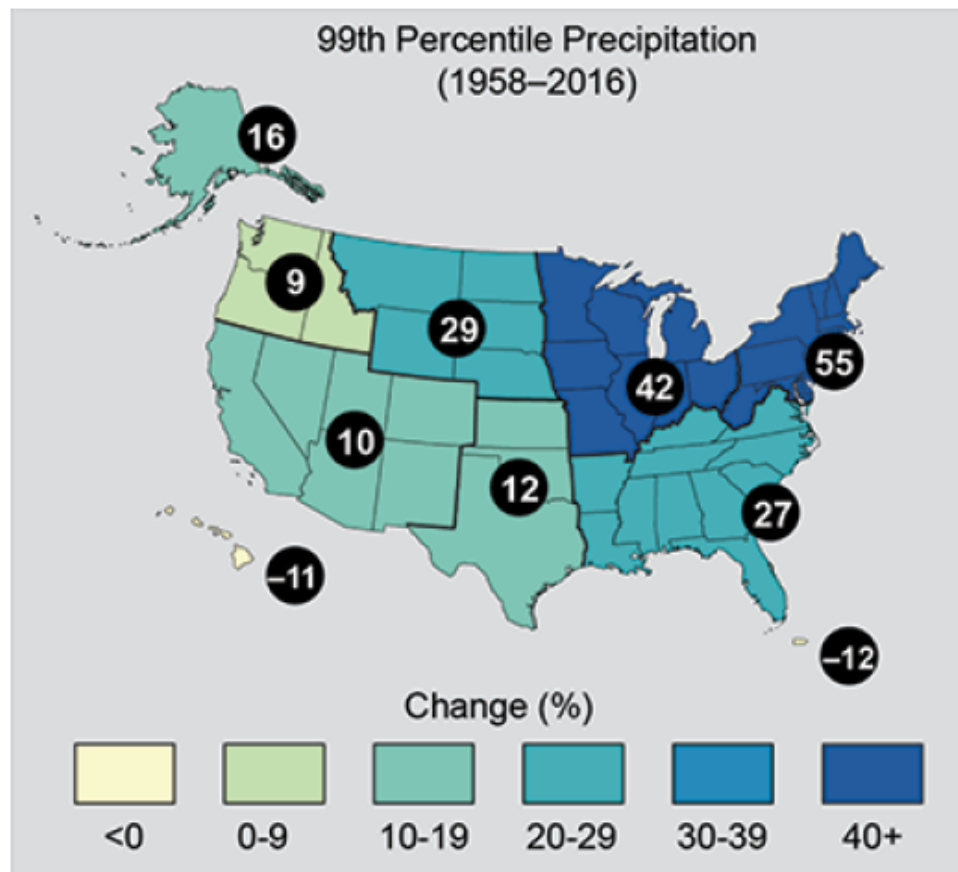
Chris
Jones

U Of Iowa
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The Iowa Watershed Approach

Antonio
Arenas

U OF I
ihr



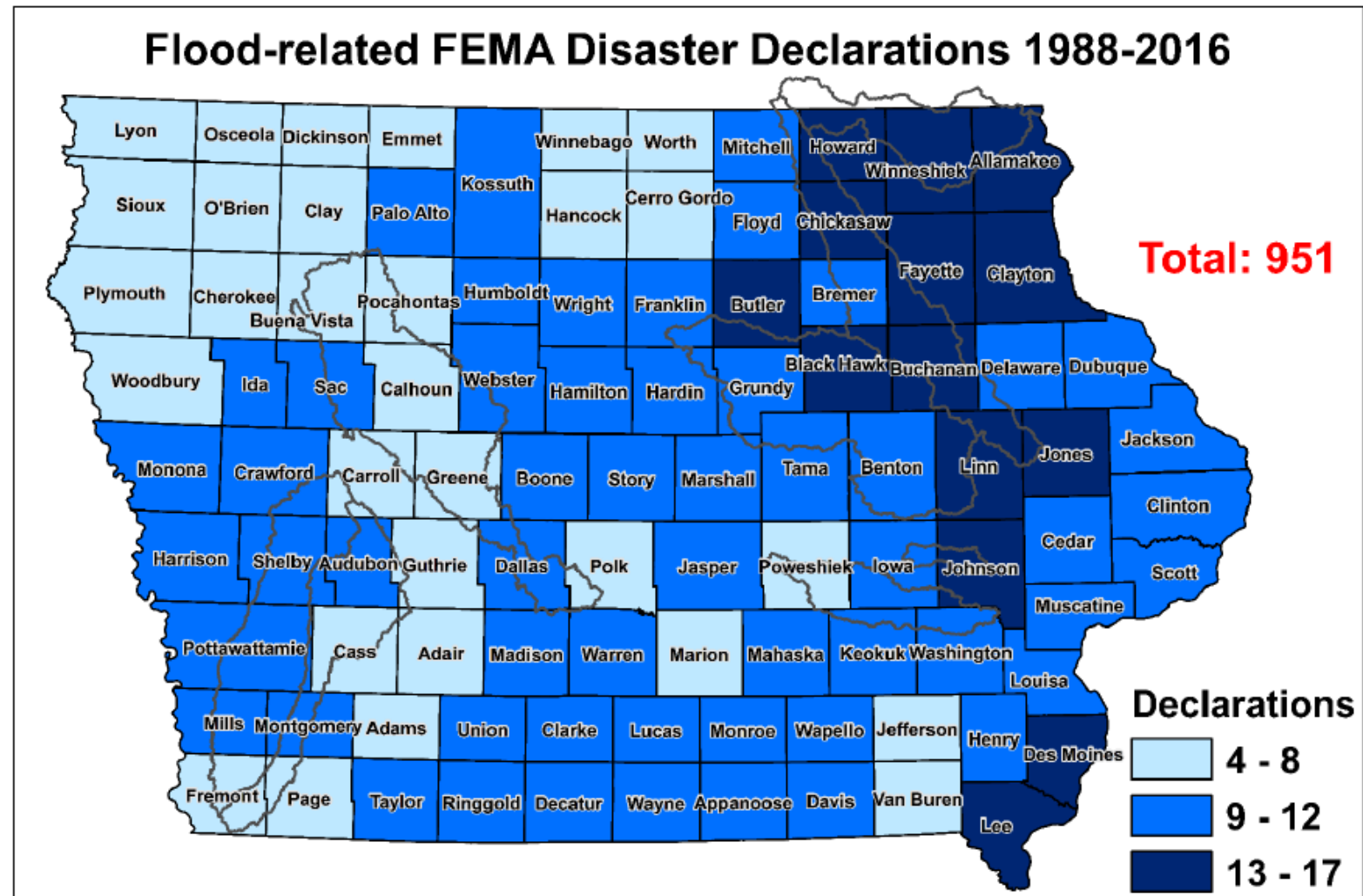
Observed change in heavy precipitation (the heaviest 1%) between 1958 and 2016. Figure taken from The Climate Science Special Report (Easterling et al. 2017) (<https://science2017.globalchange.gov/>).

Date	Grundy Center ppt (inches)	Date	Vinton ppt (inches)
7/10/2000	5.91	8/12/2016	6.04
4/25/2008	4.35	5/30/2008	4.15
8/29/2015	4.11	6/15/1982	3.98
9/4/2018	3.98	6/12/2015	3.8
8/6/2018	3.76	11/4/2003	3.49
5/30/2013	3.56	7/1/2014	3.33
9/11/2006	3.36	7/9/1993	3.29
7/27/1990	3.22	6/17/1990	3.25
7/1/2018	3.17	8/8/1991	3.18
9/13/1991	3.16	4/18/2013	2.93

Date	Cedar Rapids ppt (inches)
6/17/1990	4.42
8/12/2016	4.14
7/17/2007	3.85
6/12/2015	3.75
4/18/2013	3.66
6/10/2018	3.36
8/26/1987	3.28
4/14/2014	3.16
6/15/1982	3.11

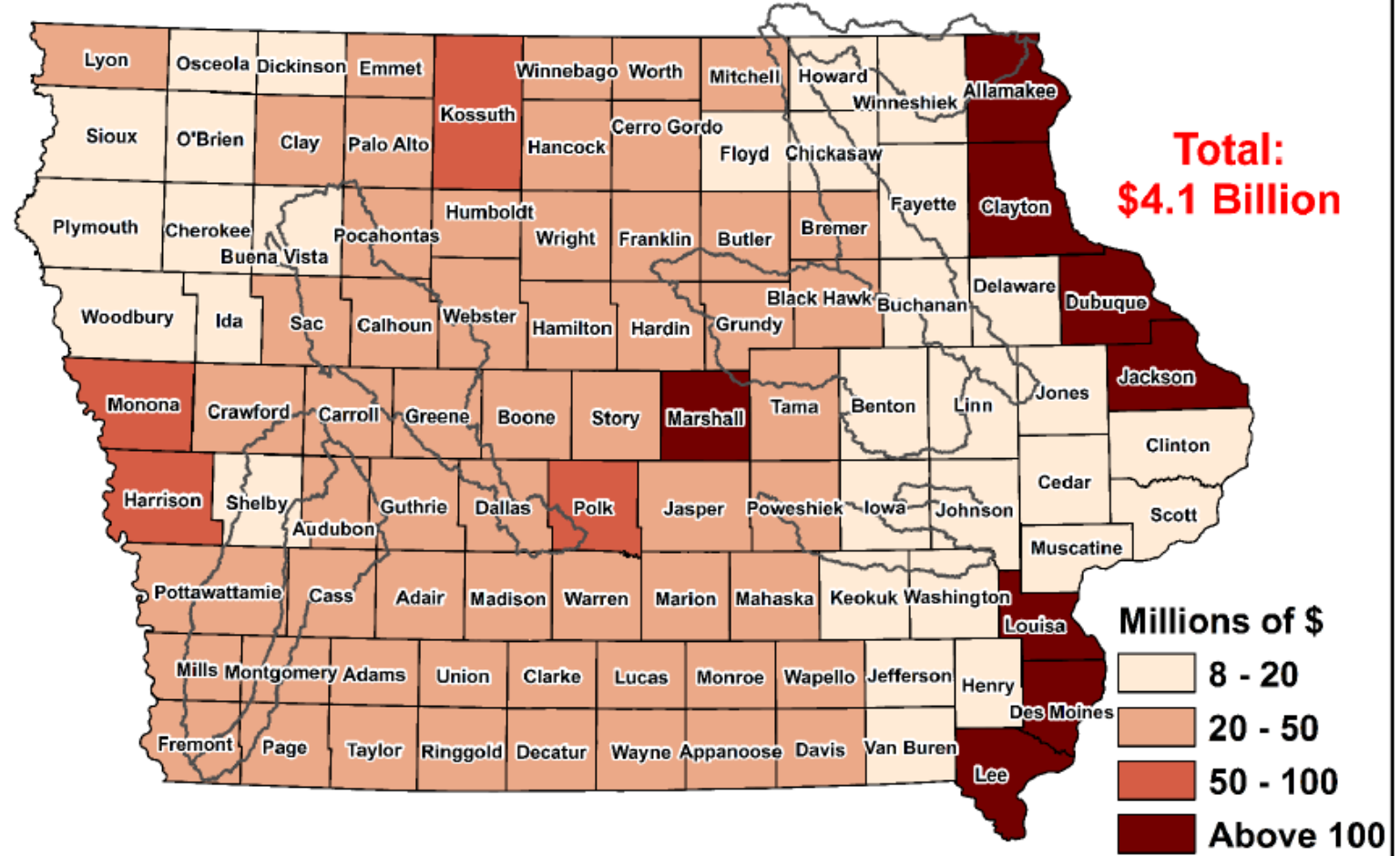
(Data source: <http://www.prism.>

The Iowa Watershed Approach

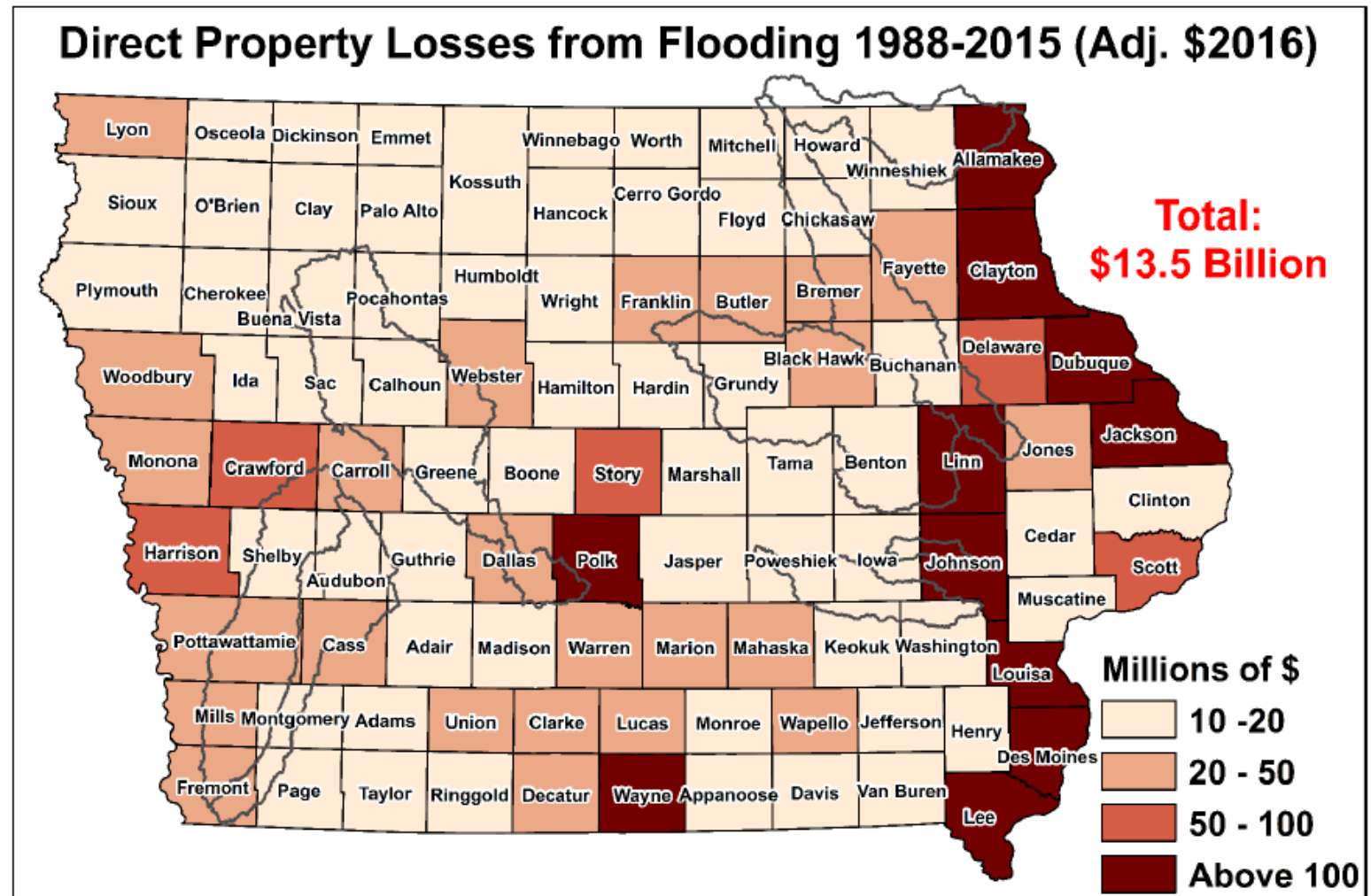


The Iowa Watershed Approach

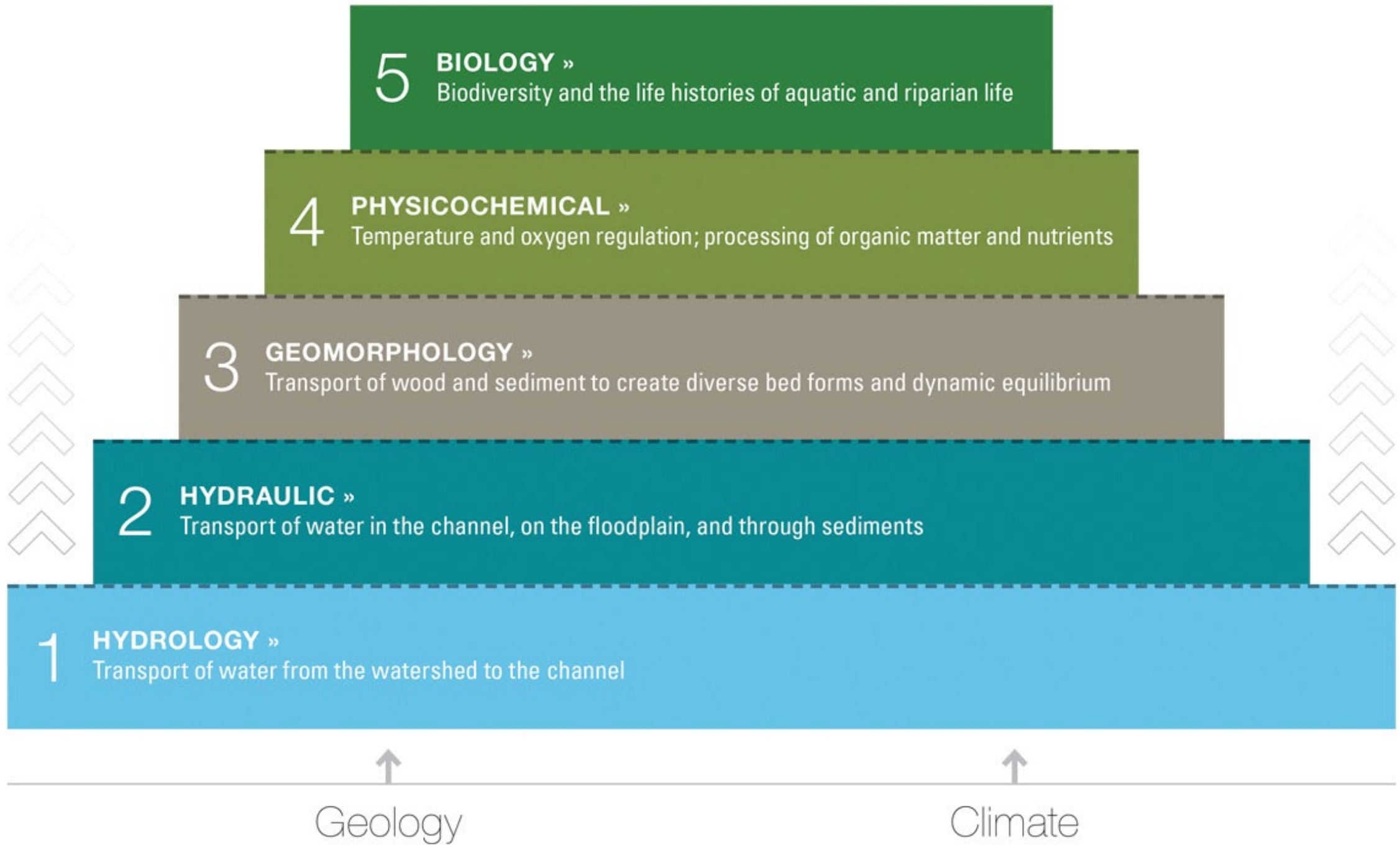
Direct Crop Losses from Flooding 1988-2015 (Adj. \$2016)



The Iowa Watershed Approach



Stream Function Pyramid

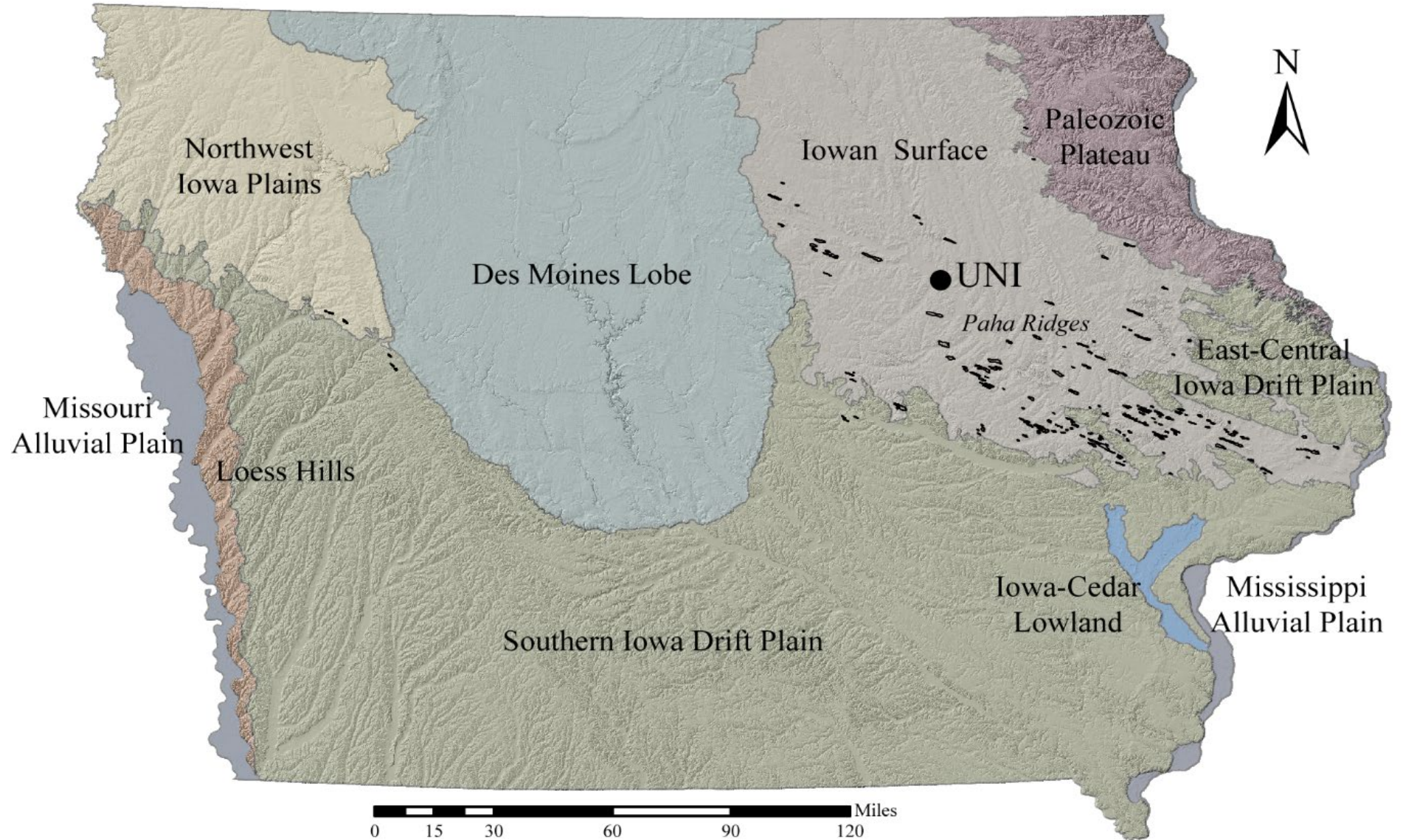


Glaciers

Why study glaciers?

- Climate change indicators
- Major part of Iowa's history
- Glacial products affect everything we do

Iowa's Landform Regions



Ice Production



Glaciers

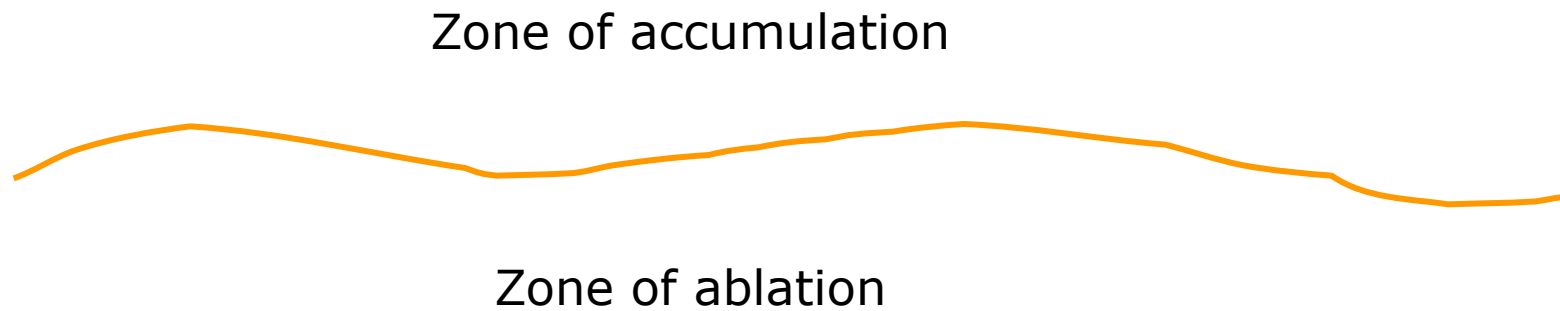
- A body of ice, firn, and snow that is,
 - On land and
 - On the move!



C.E. Heinzl

Equilibrium line

- A irregular line separating the two primary glacial zones





The Dinwoody Glacier , late summer, (Wind River Range, WY)

Glacial movement

- Accumulation $>$ Ablation
- Accumulation $<$ Ablation
- Accumulation = Ablation

Glaciers are dynamic

- Fact: Glacial movement and gravity
- Concept: Glacial margins and retreat
- Ablation $>$ Accumulation.
 - Glaciers always flow **forward** or down gradient!

Basic types of Glaciers

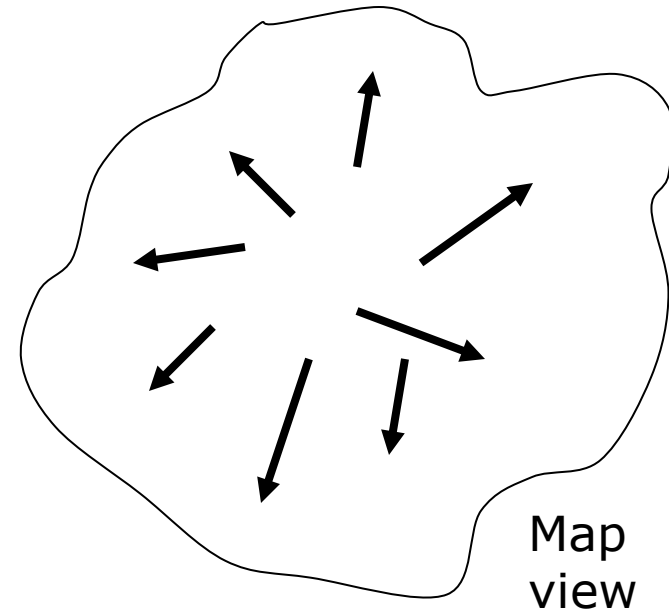
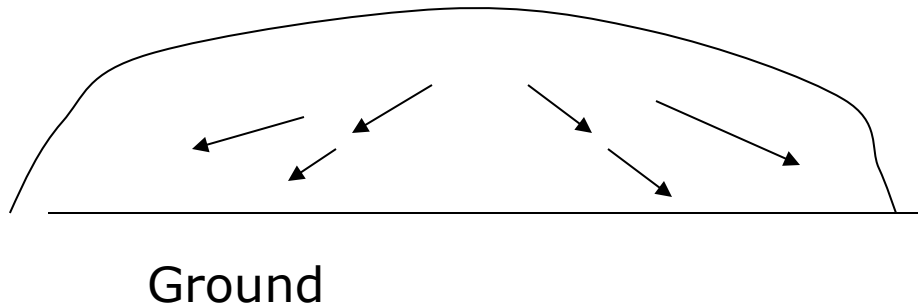
- Continental
- Alpine
- Piedmont

Ice sheets and caps

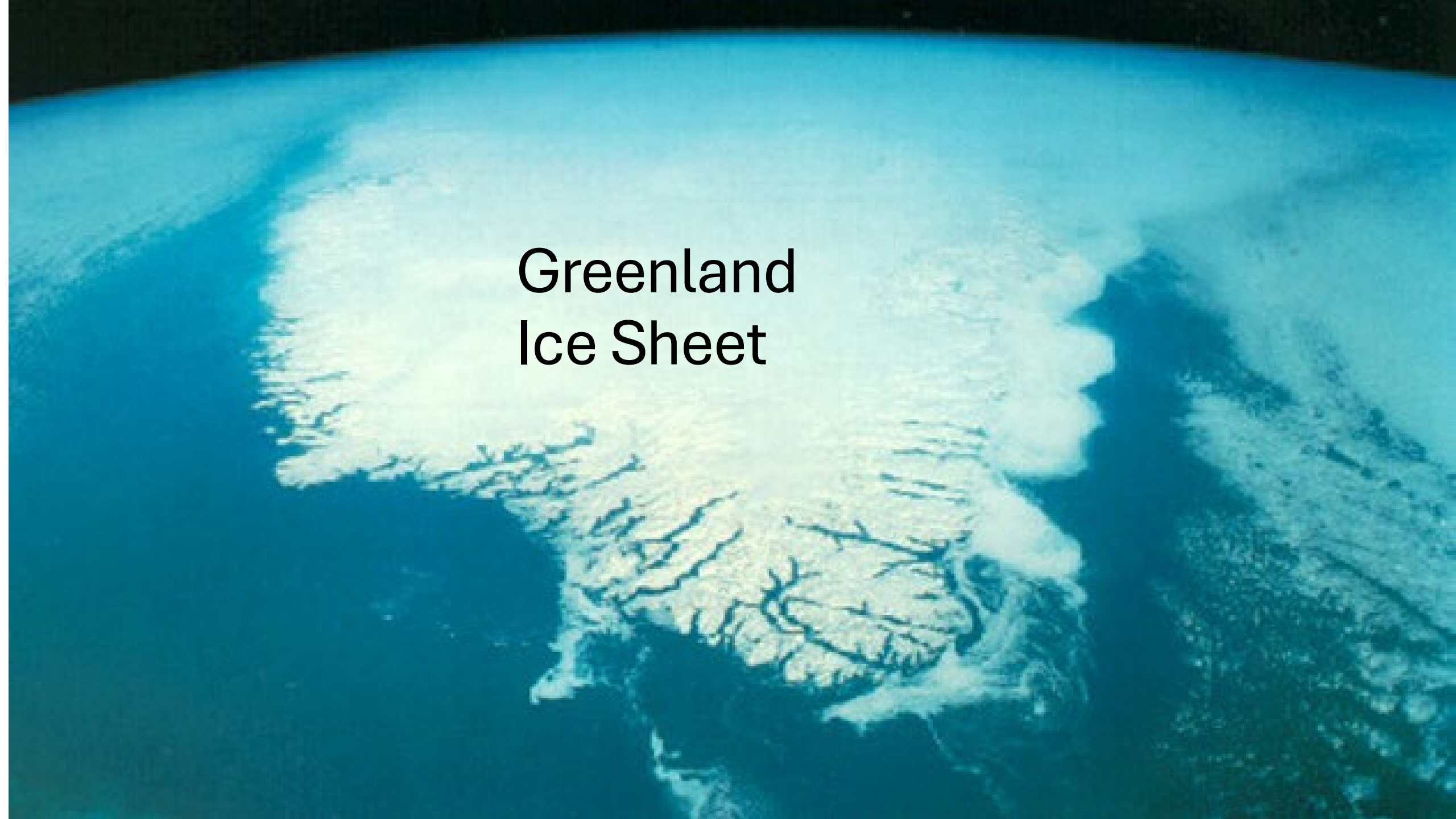
- Massive, unconfined, bodies of snow, firn, and ice
 - Ice sheets are larger than ice caps
- Extremely sensitive to climatic change

Morphology

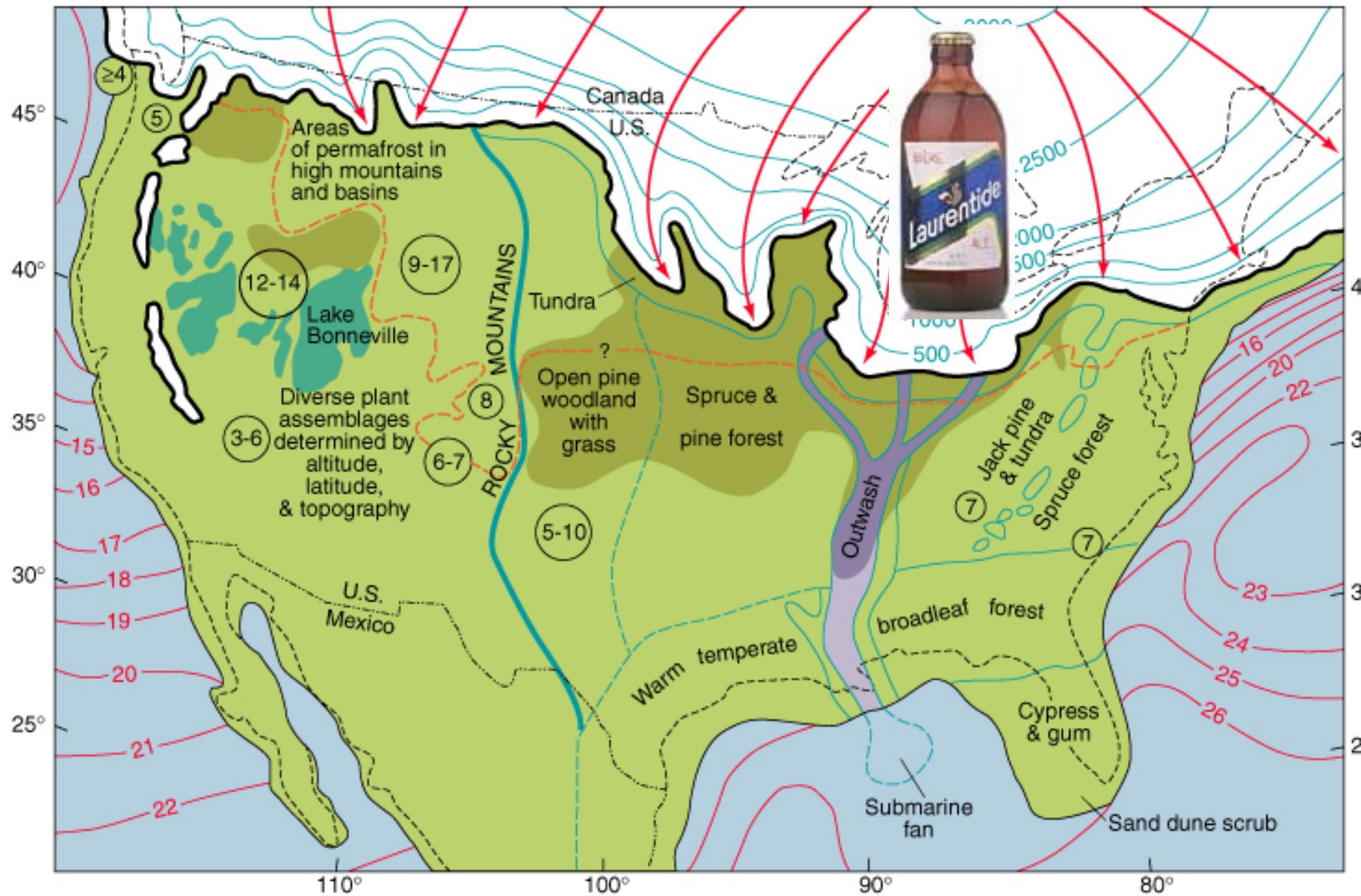
1. Continuous sheets; Ice sheets (i.e. continental glaciers)



Ice caps are much smaller!!

A satellite photograph of the Greenland Ice Sheet, showing the vast expanse of white ice covering the island. The ice sheet is surrounded by dark blue ocean water. The text "Greenland Ice Sheet" is overlaid in the center of the image.

Greenland Ice Sheet



- Present coastline
- Glacier limit
- 17- August sea-surface temperatures (°C)
- 1500- Glacier surface contours (m)
- - - - - Approximate southern limit of permafrost
- █ Principal areas of dune sand and loess

Laurentide Ice Sheet

Iowa's Landform Regions

