



Welcome to  
Connecticut River Conservancy's

**LiveStream**

# Geological Time Travel Through the Connecticut River Basin

LiveStream Season 5, Episode 1



Connecticut River  
Conservancy

**Featured Presenter**

**Alfred (Fred) J. Venne**

**Museum Educator**

**Beneski Museum of Natural  
History at Amherst College**



**CRC Presenter**

**Kathy Urffer**

**Vermont River Steward  
Connecticut River Conservancy**



# Geologic Time Travel Through the Connecticut River Basin

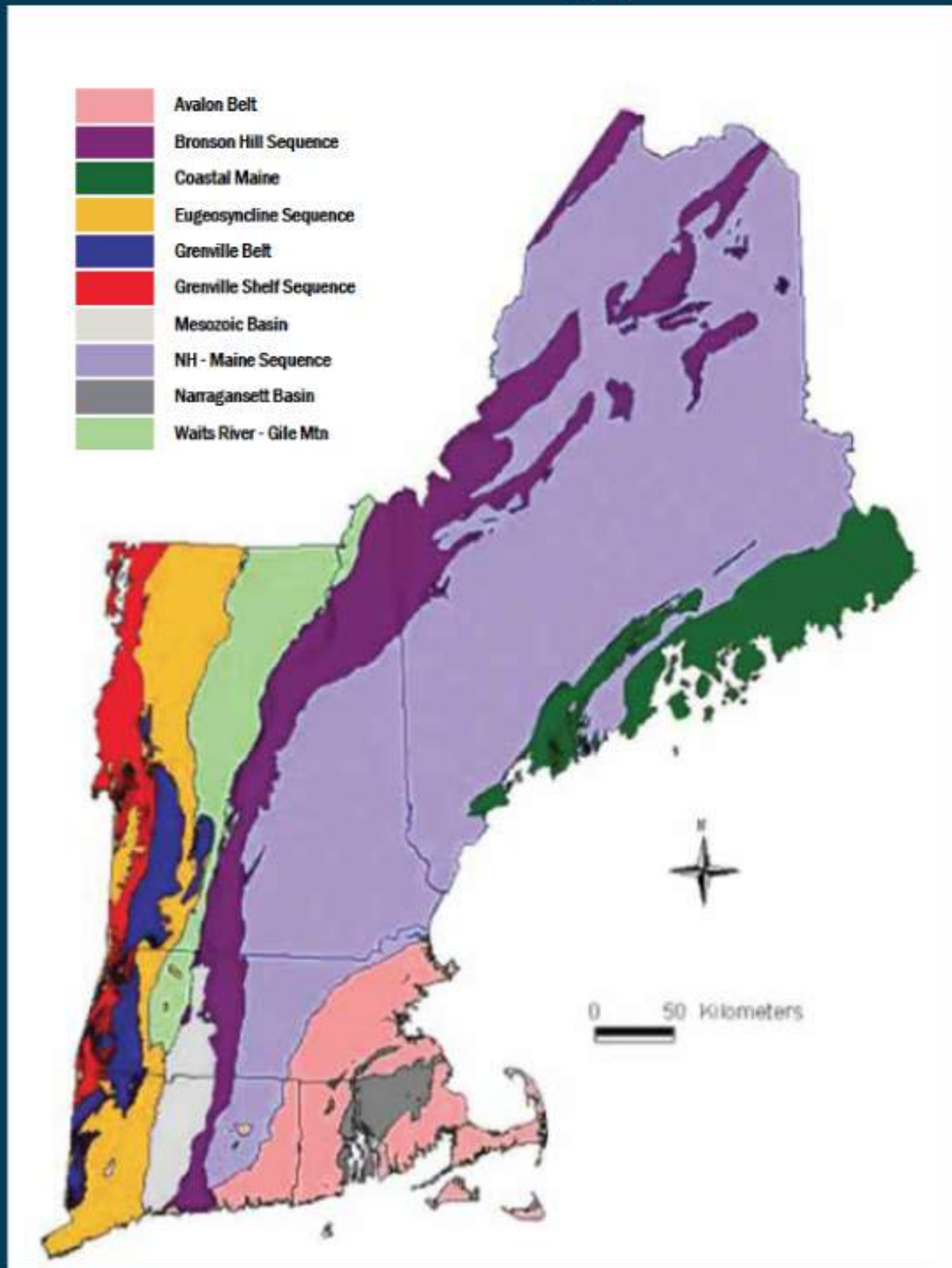
Overview of the geologic history of the east coast US and impact on CT River valley development

Evolution of the landscape

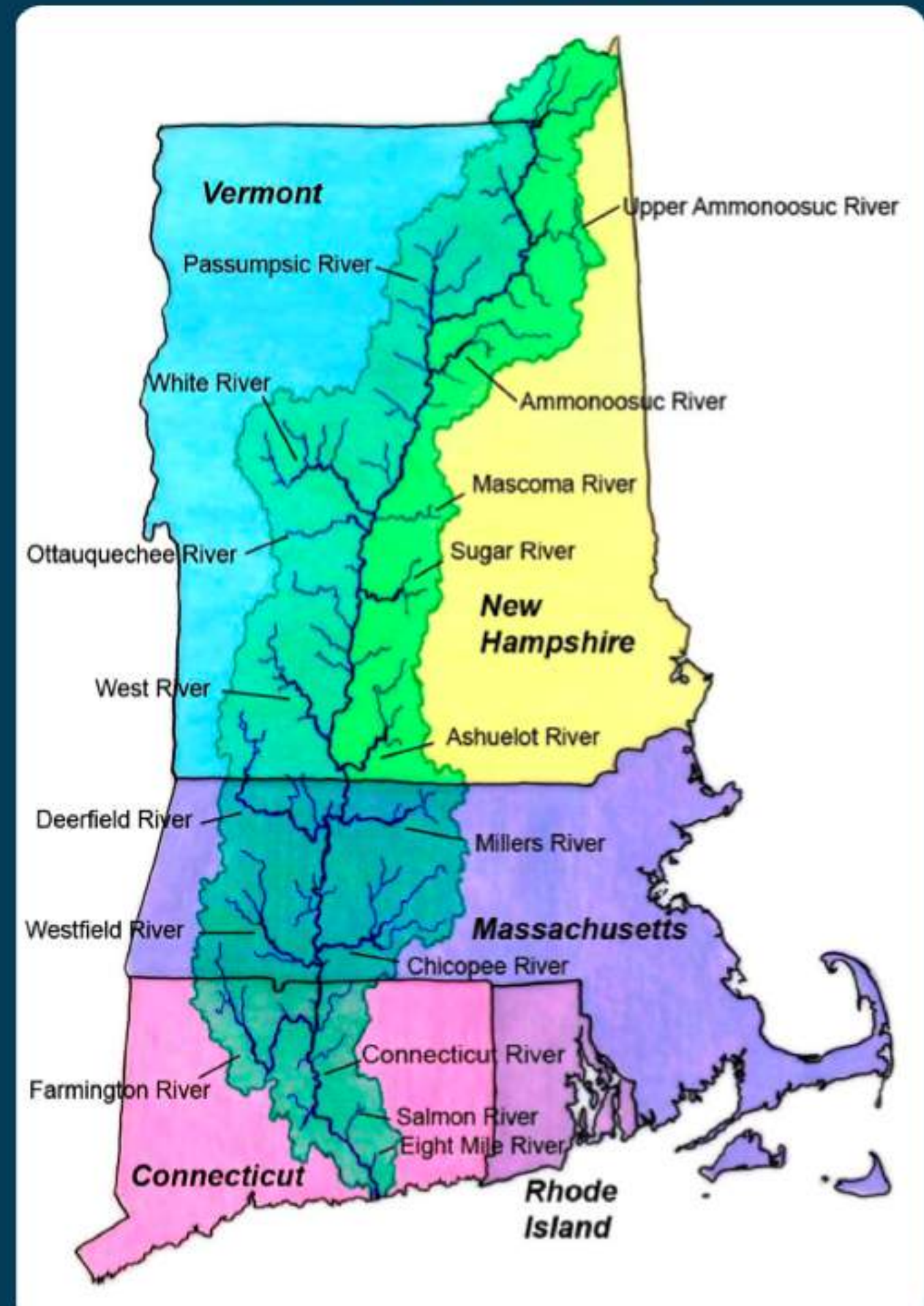
Alfred (Fred) J. Venne  
Amherst College  
Beneski Museum of Natural History



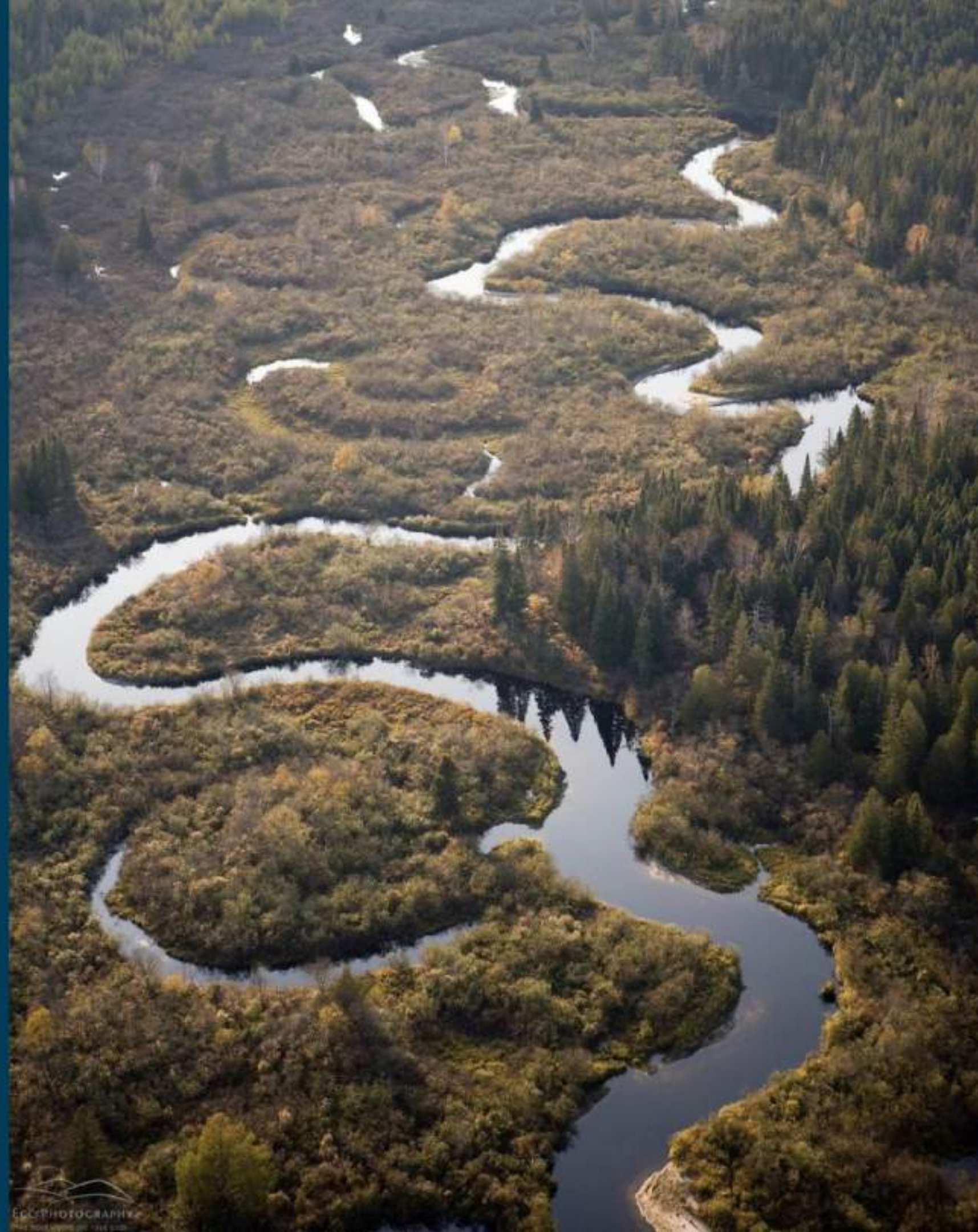
# Geology



# Watershed



**Aerial view of the  
Nulhegan River,  
Ferdinand, VT**



Jerry Monkman/EcoPhotography

THE MOUNT ORNE COVERED BRIDGE SPANS THE CONNECTICUT RIVER BETWEEN LUNENBURG, VERMONT AND LANCASTER, NEW HAMPSHIRE.





# THE CONNECTICUT RIVER FLOWS THROUGH FARMLAND IN NEWBURY, VERMONT AND HAVERHILL, NEW HAMPSHIRE.



Jerry Monkman/EcoPhotography

EcoPHOTOGRAPHY  
WE STAY ABOVE THE TREES

THE WHITE RIVER AT SUNSET IN HARTFORD, VERMONT.  
CONNECTICUT RIVER TRIBUTARY.



# THE CONNECTICUT RIVER IN HARTLAND, VERMONT.



THE WINDSOR-CORNISH COVERED BRIDGE SPANS THE CONNECTICUT RIVER BETWEEN WINDSOR, VERMONT AND CORNISH, NEW HAMPSHIRE.

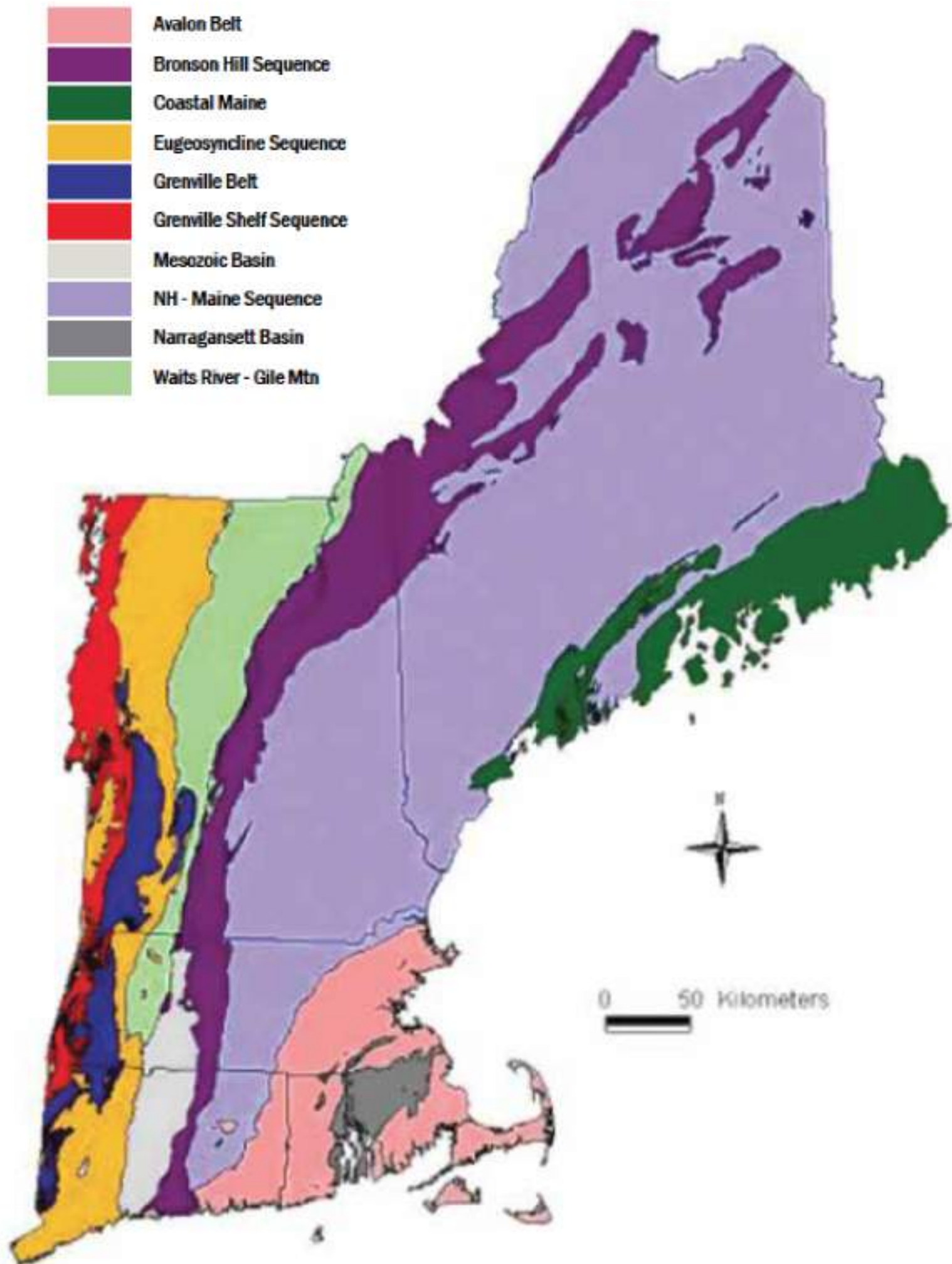


# Let's go back in time

**600 Million Years Ago**  
**Pre-Cambrian Era**

**And More.....**





# Geology

**One Billion Years Ago: Proto North America  
Grenville mountain building event**

**450 Million Years Ago: Iapetus (Japan Like – Bronson Hill)  
Taconic Mountain building Event**

**375 Million Years Ago: Avalonia  
Acadian mountain building event**

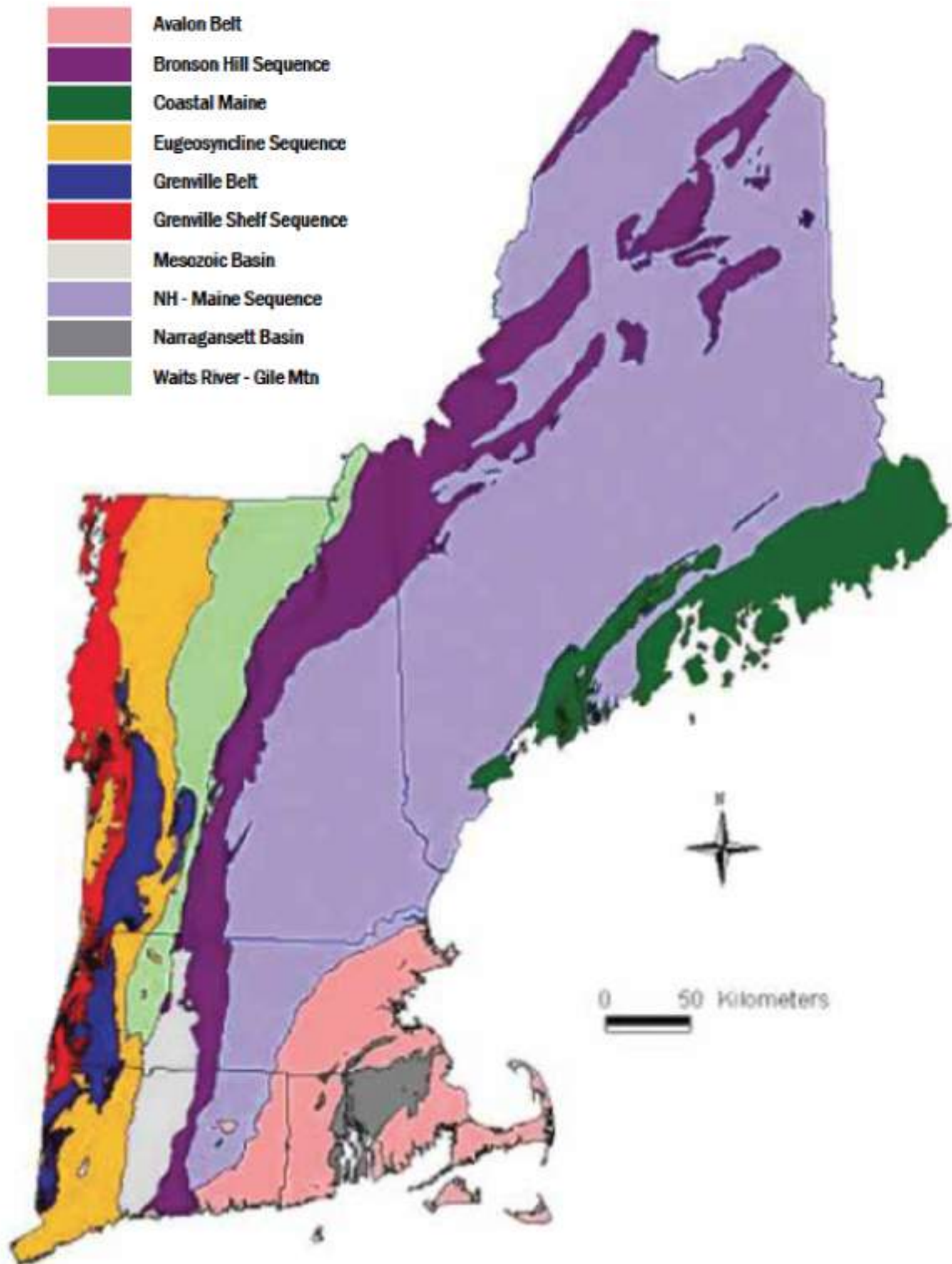
**300 Million Years Ago (South Appalachians)  
Alleghenian Mountain Building Event**

**250 Million Years Ago: Newark**

**Pangea “all Lands” hung  
together 50 Million Years**

# 5 Major events that shaped the valley & watershed

- 1 540 –400 MYA Shallow Inland Seas
- 2 450 –280 MYA Mountain Building
- 3 220 – 170 MYA Rifting
- 4 170 MYA – 21,000 YA Erosion
- 5 13,000 – Present – The Valley today



# Geology

**One Billion Years Ago: Proto North America**  
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# 540 -400 MYA Shallow Inland Seas



# Shallow sea life today and evidence from the fossil past



Sea Stars



Sponges



Shelled Creatures



# Close up of our Shallow Sea



Diorama showing how a Permian seafloor may have looked  
University of Michigan Exhibit Museum of Natural History



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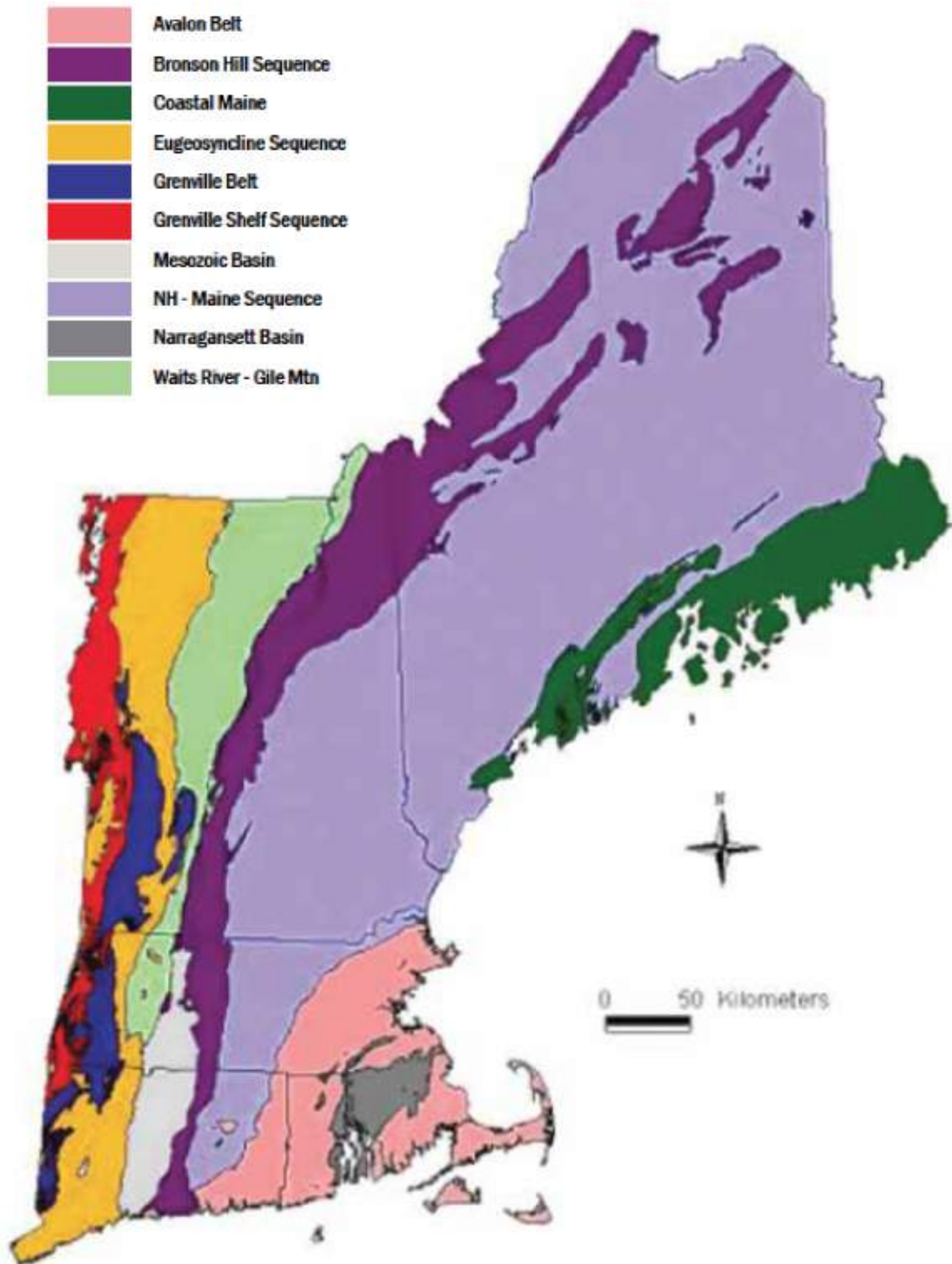
## Crinoids



## Coral



540 -400 MYA Picture from the past



# Geology

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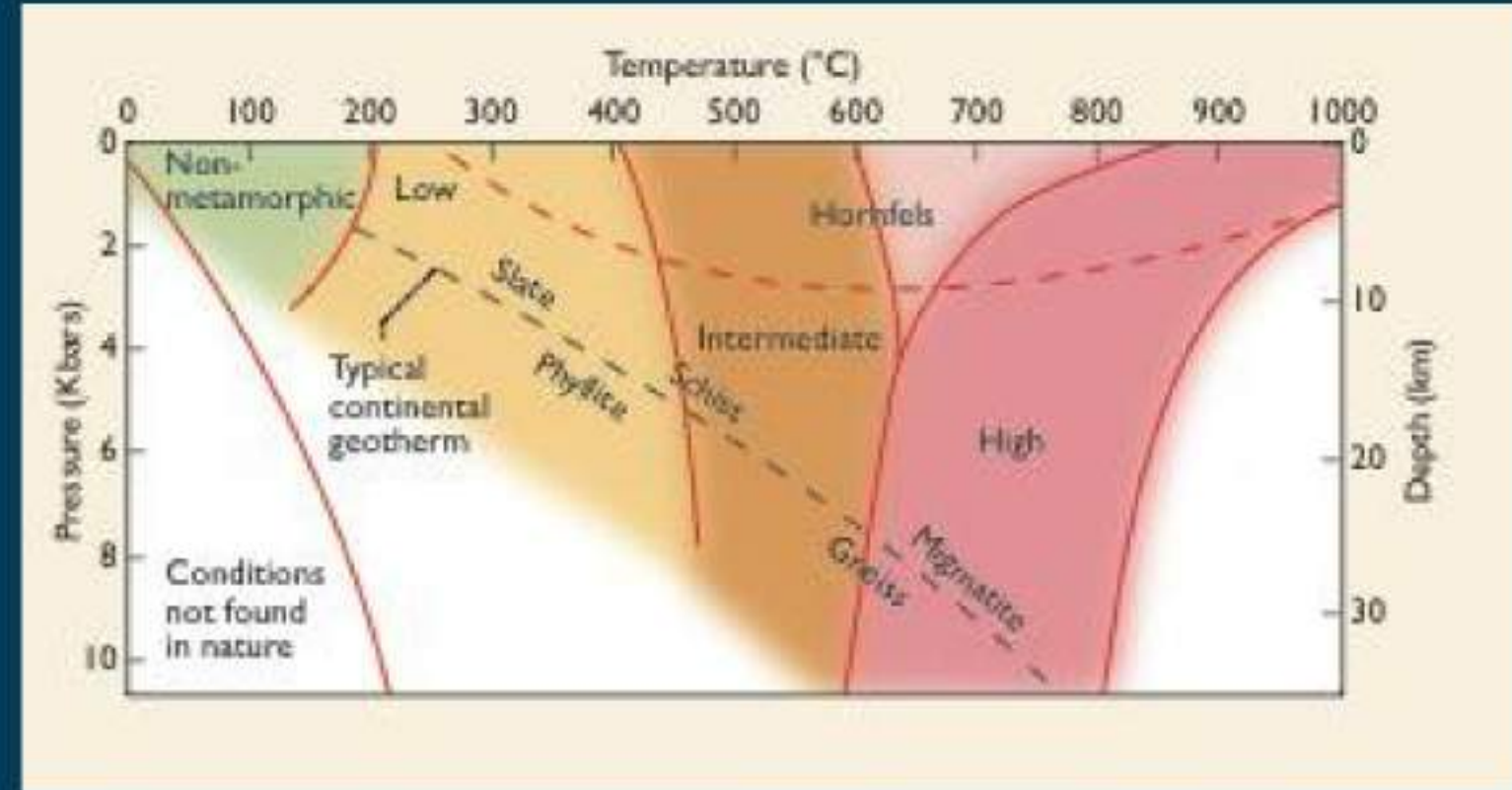
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Pangea “all Lands” hung  
together 50 Million Years

# 450 – 280 MYA Mountain Building



Before metamorphism



After metamorphism



# Formation of Pangea (Pangaea)

Middle Devonian  
Eifelian  
390 Ma

• We are here --

A paleogeographic map of Earth 390 million years ago, during the Middle Devonian Eifelian stage. The map shows the supercontinent Pangea (Pangaea) in the process of forming, with a large superocean to the north and a large superocean to the south. The landmasses are colored in shades of green and yellow, indicating different elevations or geological features. A yellow dot with the text "We are here --" is located on the western coast of North America, marking the location of the present-day United States.

The effect of Mountain Building on the rocks



© 2012 Encyclopædia Britannica



- Appalachians including
- Green Mountains
  - Catskills
  - White Mountains
  - Berkshires
  - Poconos
  - Mahoocucs
  - Taconics
  - Hudson Highlands

# Geology

One Billion Years Ago: Proto North America  
Grenville mountain building event

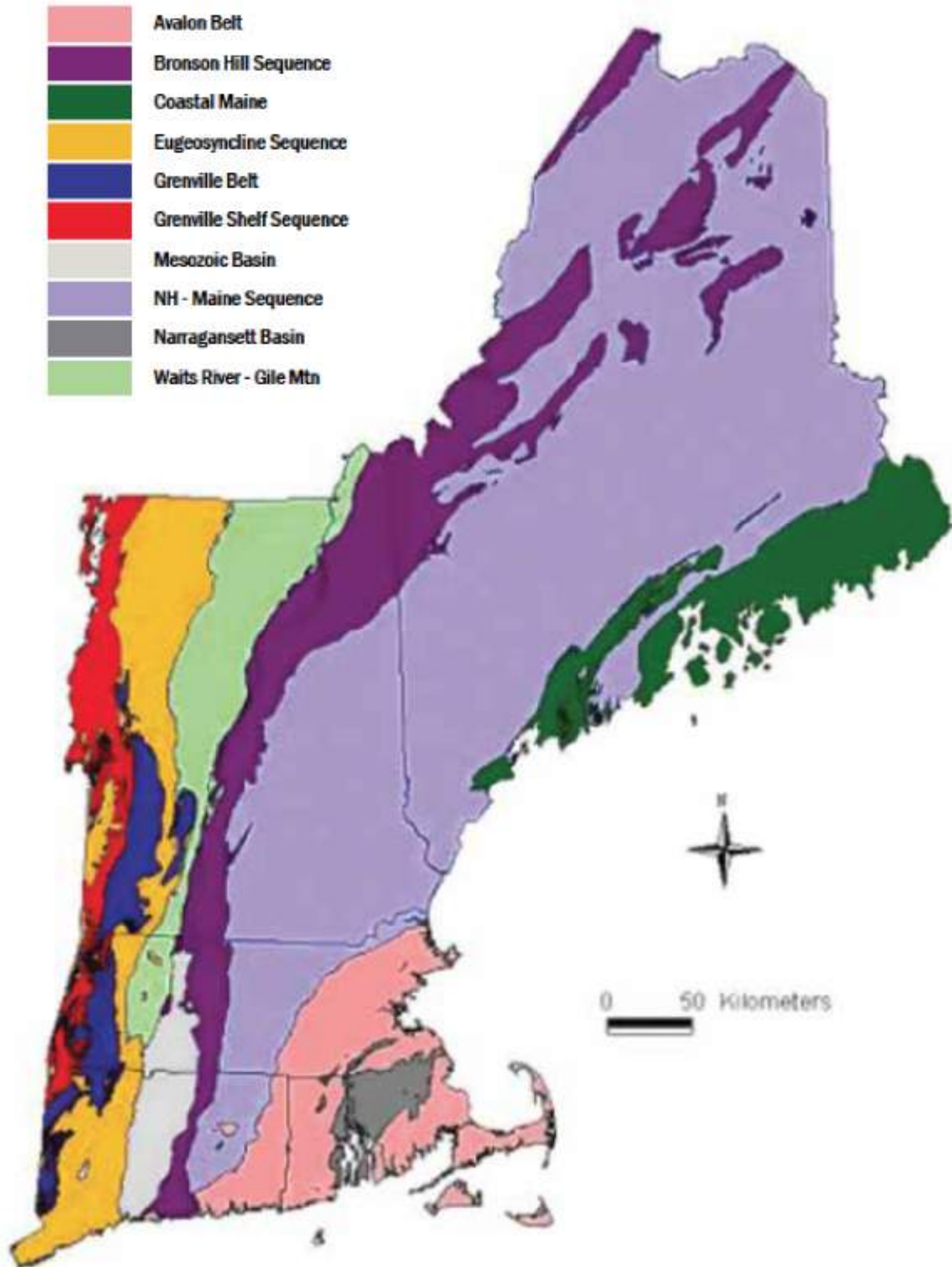
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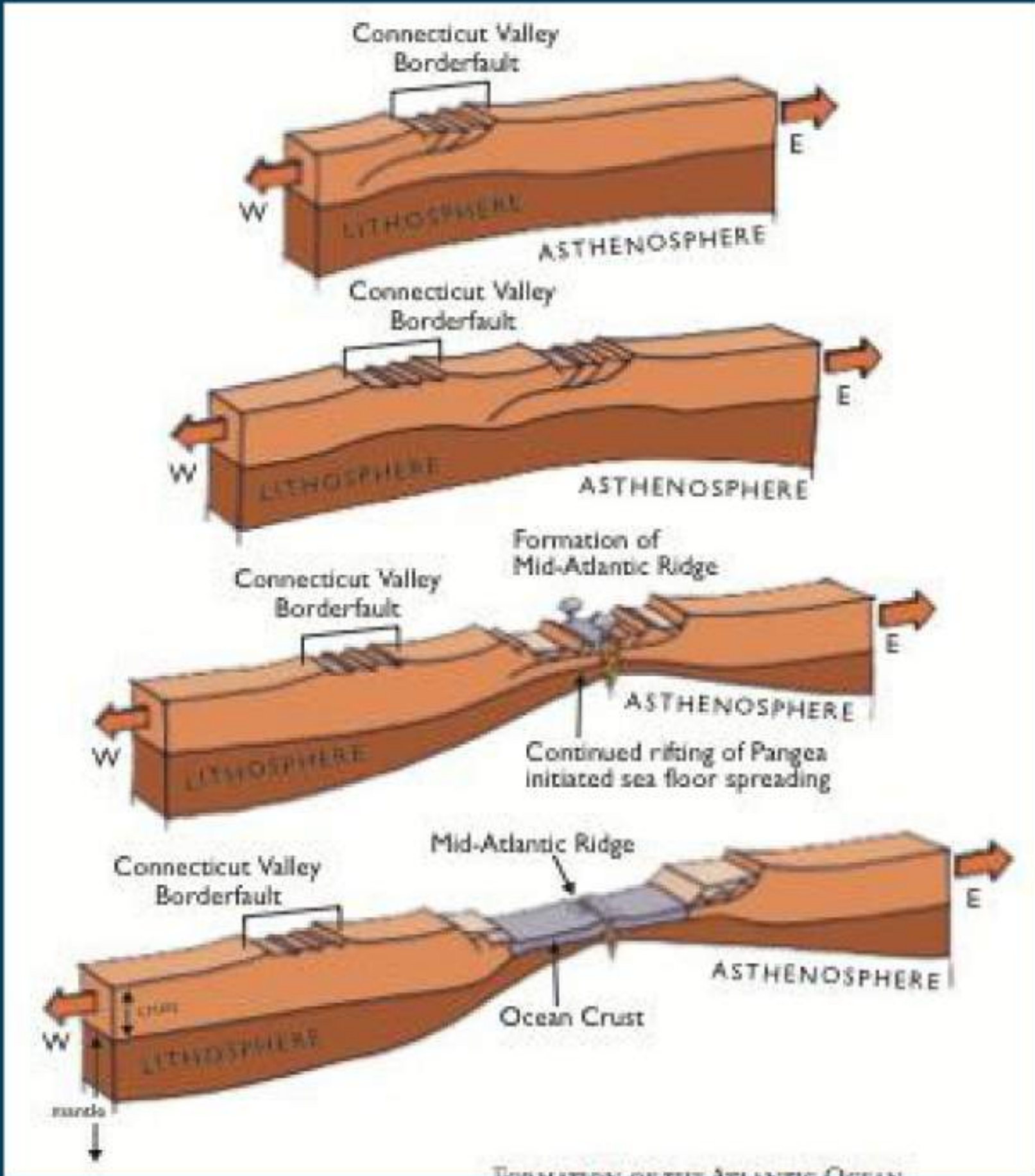






220 – 170 MYA  
Rifting

# Rifting: Creation of the Connecticut River Valley



**Above – the valley during a volcanic fissure event.  
Below – the valley as things settle down a bit & life takes hold**



# Evidence – Ancient Life in the Valley



# Evidence – Life in the Valley



# 170MYA – 21,000 YA Erosion



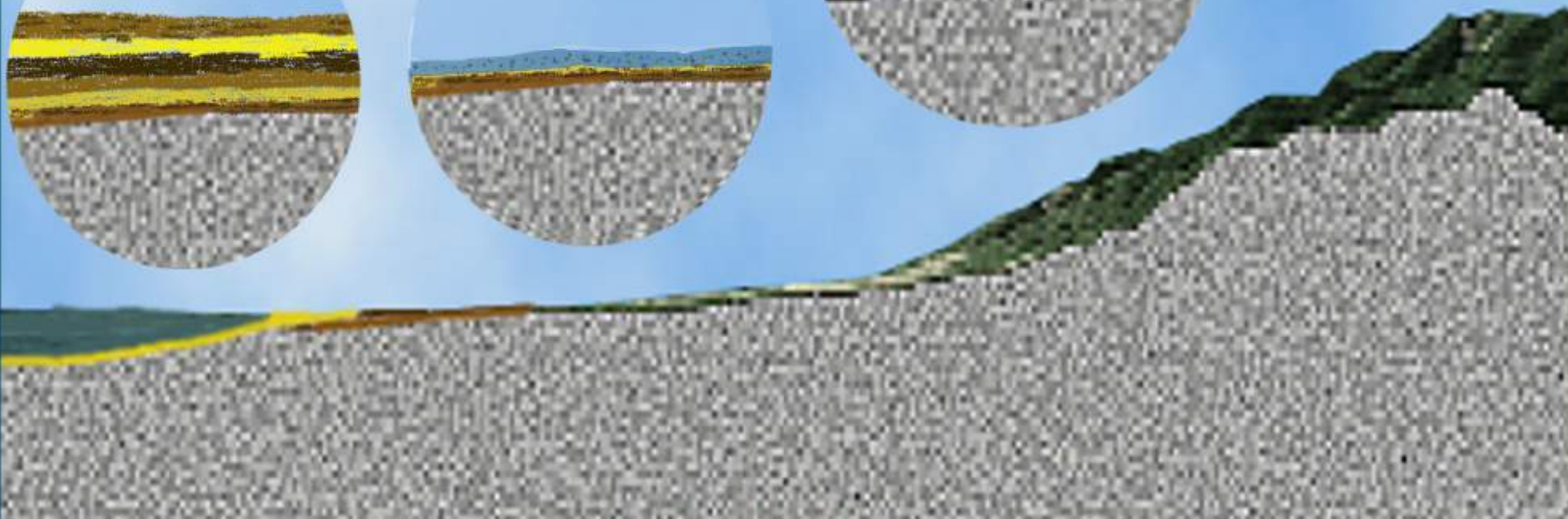
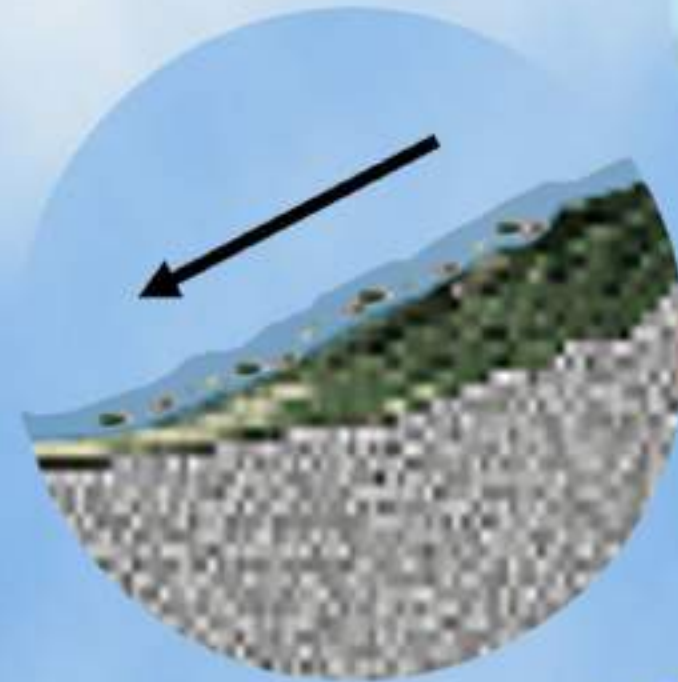
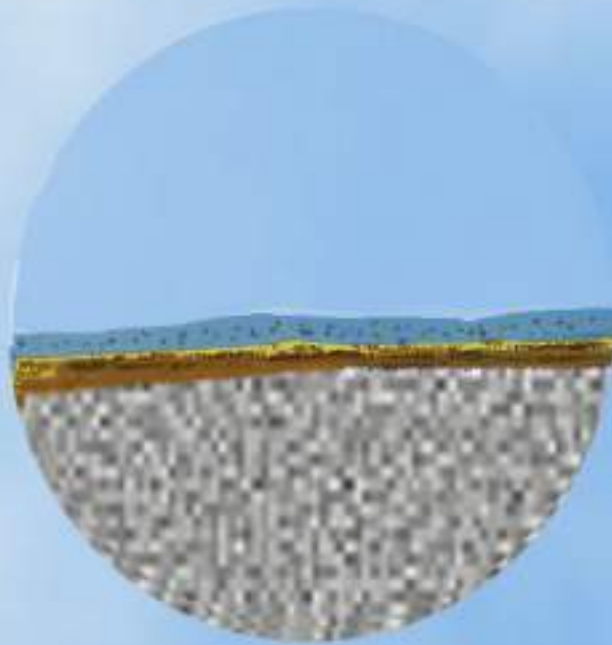
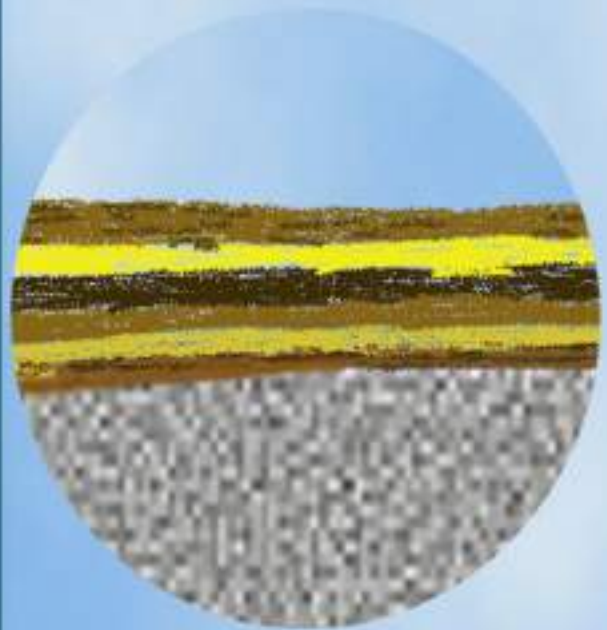
# Process of Weathering and Erosion

**Weathering  
and Erosion**

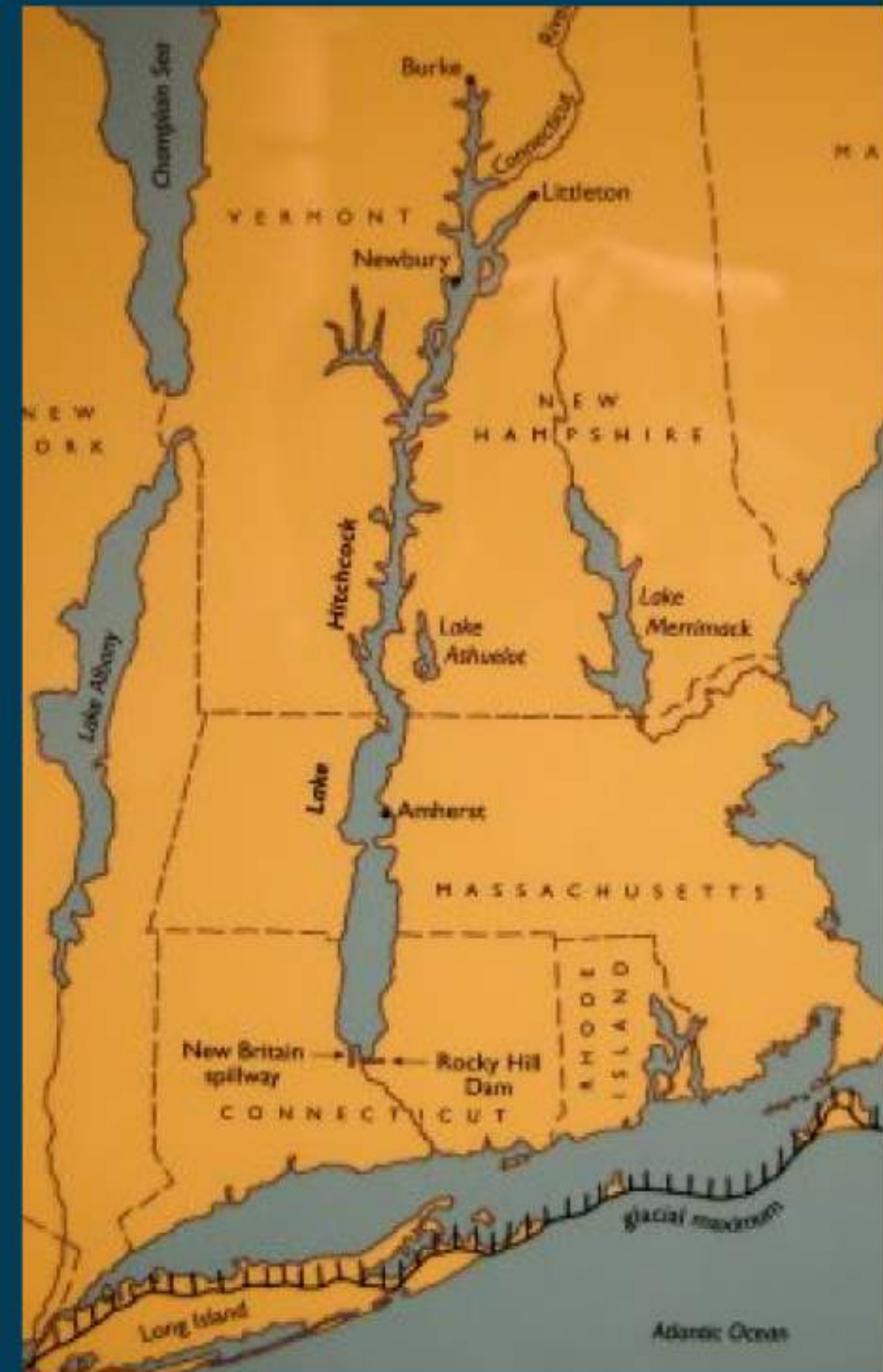
**Transport**

**Deposition**

**Burial,  
Compaction, and  
Lithification**



# Glacial Lake Hitchcock ~15,000 years ago

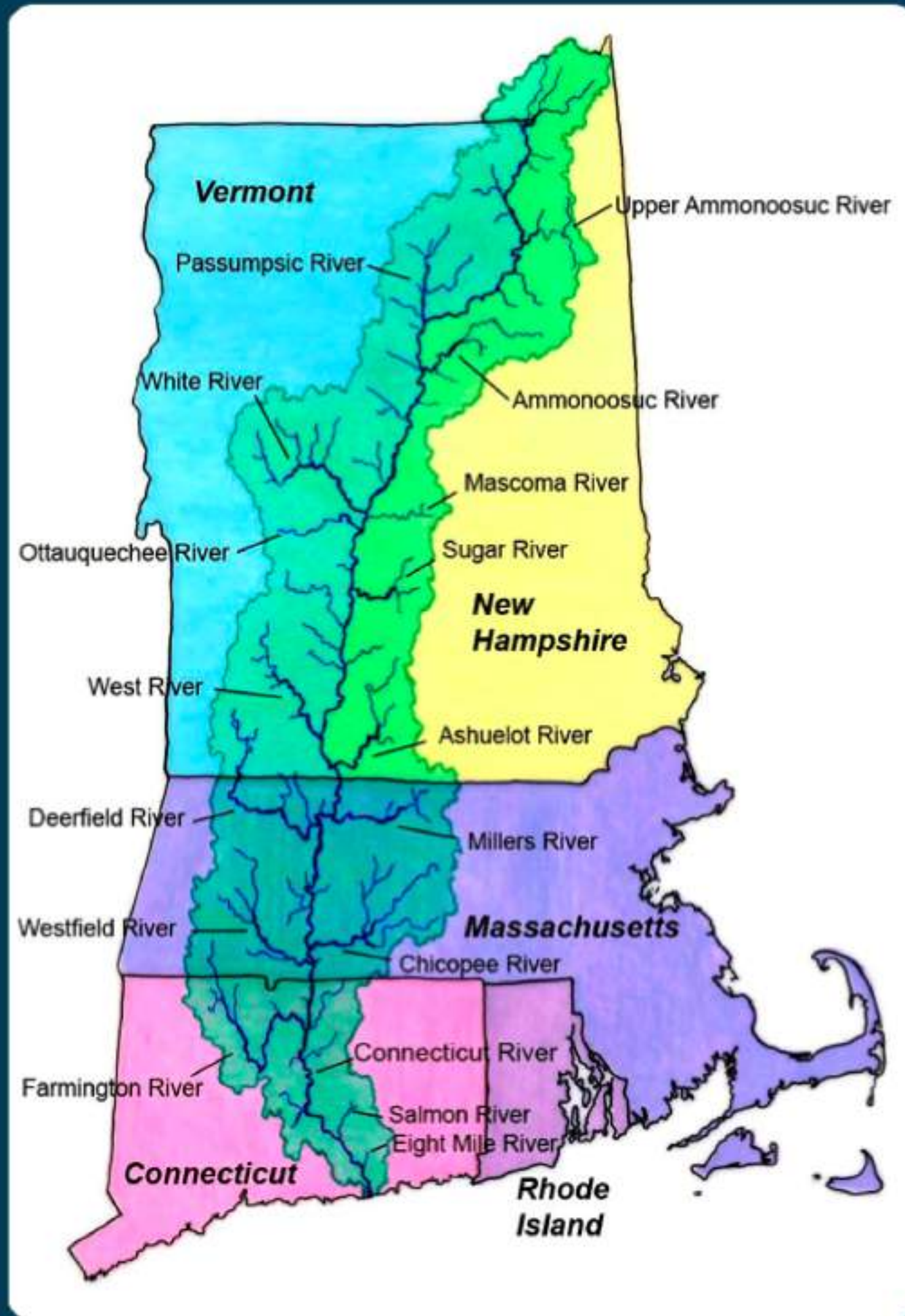


# The Oxbow of the Connecticut River





# Connecticut River Valley Watershed TODAY





Connecticut River near Stewartstown



AERIAL VIEW OF THE  
NULHEGAN RIVER IN  
FERDINAND, VERMONT.  
Tributary to the CT River  
about 20 miles south of  
Stewardstown

THE MOUNT ORNE COVERED BRIDGE SPANS THE CONNECTICUT RIVER BETWEEN LUNENBURG, VERMONT AND LANCASTER, NEW HAMPSHIRE.



THE CONNECTICUT RIVER FLOWS THROUGH FARMLAND IN  
NEWBURY, VERMONT AND HAVERHILL, NEW HAMPSHIRE.



THE WHITE RIVER AT SUNSET IN HARTFORD,  
VERMONT. CONNECTICUT RIVER TRIBUTARY.



Jerry Monkman/EcoPhotography

EcoPHOTOGRAPHY  
we start where the road ends

# CONNECTICUT RIVER AT WEST LEBANON , NH



# THE CONNECTICUT RIVER IN HARTLAND, VERMONT



Jerry Monkman/EcoPhotography

EcoPHOTOGRAPHY



THE WINDSOR-CORNISH COVERED BRIDGE SPANS THE CONNECTICUT RIVER BETWEEN WINDSOR, VERMONT AND CORNISH, NEW HAMPSHIRE.



At 460 feet is the longest remaining historic covered bridge in the United States.

# View from Bellows Falls kayak, canoe, and fish access on Connecticut River



Large archeological sites occur throughout the valley on upper and lower terraces as well as near tributaries' confluences with the Connecticut. One site of particular interest which is listed on the National Register of Historic Places, are rock engravings of numerous faces at Bellows Falls, VT, settled by Native Americans around 800 A.D.



CONNECTICUT RIVER AT NORTHFIELD, MA



CONNECTICUT RIVER AT SPRINGFIELD, MA



CONNECTICUT RIVER AT CROMWELL CT



LOWER CONNECTICUT RIVER ESTUARY

# Present day fluvial and riparian environments

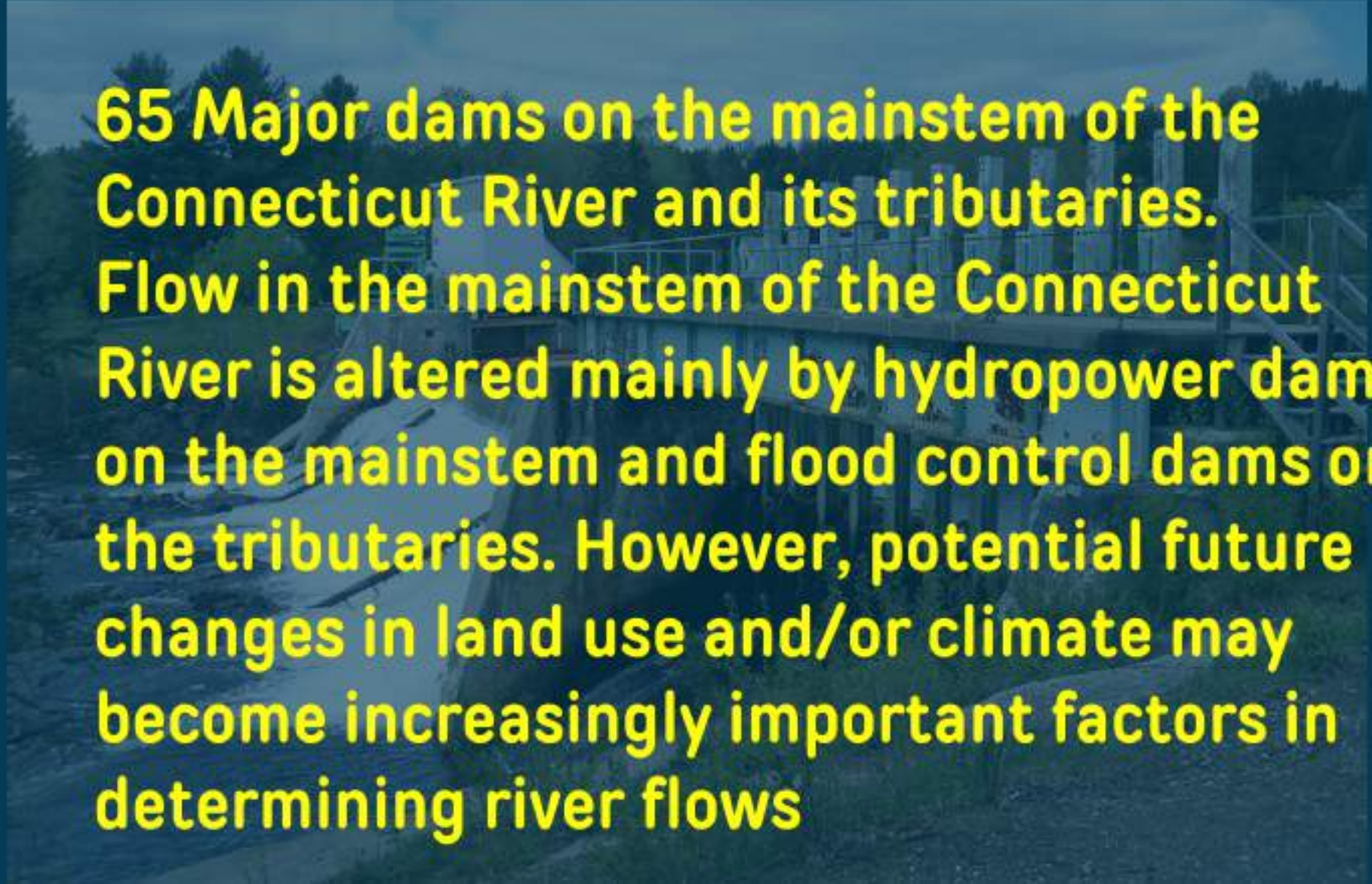
Stream channels and fluvial landforms are influenced by the complex interplay among regional geology, climate, topographic gradient, river history, drainage basin hydrology, and sediment load.



**Like much of New England, the watershed has more forested land today than it did 150 years ago.**

- 77 percent forested
- 9 percent agricultural
- 7 percent wetlands
- 7 percent developed.

Connecticut River near Canaan, Vt. and Stewartson, N.H. *Alexius Horatius*



**65 Major dams on the mainstem of the Connecticut River and its tributaries. Flow in the mainstem of the Connecticut River is altered mainly by hydropower dams on the mainstem and flood control dams on the tributaries. However, potential future changes in land use and/or climate may become increasingly important factors in determining river flows**

Mean Temp °F	Vermont/New Hampshire and Berkshire Hills Area of Massachusetts	State of Connecticut and Connecticut Valley area of Massachusetts	Difference
Winter	19	28	9
Spring	41	44	3
Summer	65	68	3
Fall	47	52	5
Annual	43	48	5

Mean Precipitation Inches	Vermont/New Hampshire and Berkshire Hills Area of Massachusetts	State of Connecticut and Connecticut Valley area of Massachusetts	Difference
Winter	8.9	11	2.1
Spring	9.5	11.1	1.6
Summer	10.9	11.1	0.2
Fall	10.4	11.0	0.6
Annual	39.7	44.2	4.5

Climate variation based upon location and elevation  
 Meteorological and oceanographic effects



Other	Vermont/New Hampshire and Berkshire Hills Area of Massachusetts	State of Connecticut and Connecticut Valley area of Massachusetts	Difference
Mean Annual snowfall Inches	80	45	35
Aver. Length of Spring Season Weeks	5	9	4
Aver. Length of Fall Season Weeks	6	9	3
Days per year with temps of 32° or below.	180	26	154
Days per year with temps of 0° or below	12	3	9
Average length of frost-free season days	120	185	65

# Take Aways.....

Today (Deforestation 1636–1900) we have more forested land than we did 150 years ago.

**How do we continue that trend?**

Today we have 65 major dams along the Connecticut River.

**How do we balance safety, sustainability and the ecosystem?**

200 Million year ago the climate here was quite different as were the trigger events.

**How do we respond to present day processes?**



**Beneski Museum of Natural History  
at Amherst College**



# Human Impacts

“Vernon was an ambitious facility that required raising the river 30 feet, flooding all or parts of 150 farms.”



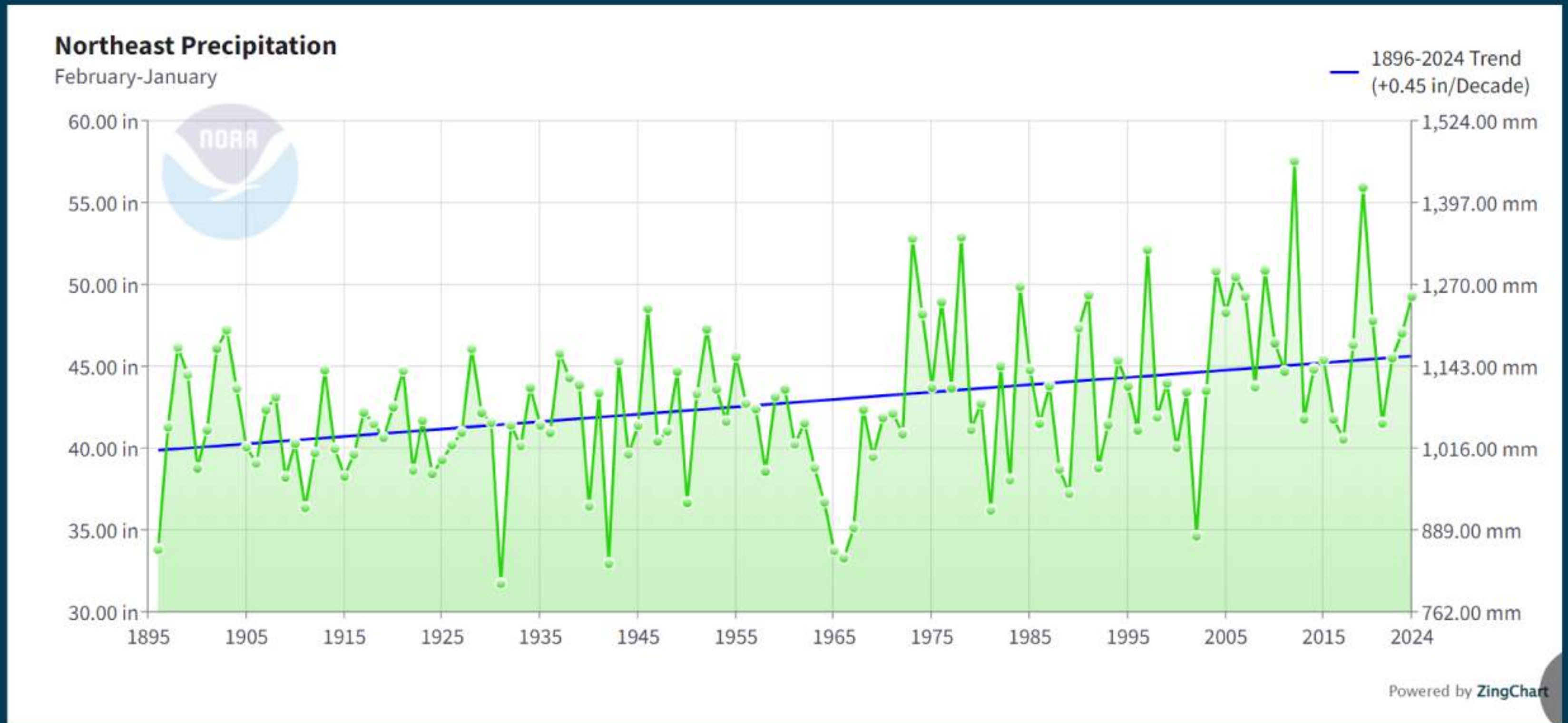


**Sediment deposited at mouth of West River**



**Erosion in Claremont**

# Precipitation is Increasing




<https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/regional/time-series/>

# Mass Failures & Landslides

anrgeodata.vermont.gov/datasets/landslides/explore?location=43.796258%2C-72.144270%2C7.80

Vermont Agency of Natural Resources GIS - Open Data

## Landslides

 **ANR GIS**  
Vermont Agency of Natural Resources


### Summary


A compilation of landslide locations from the Vermont Geological Survey's preliminary landslide inventory, verified landslides from the public Geoform and other technical reports.

[View Full Details](#)

[Download](#)

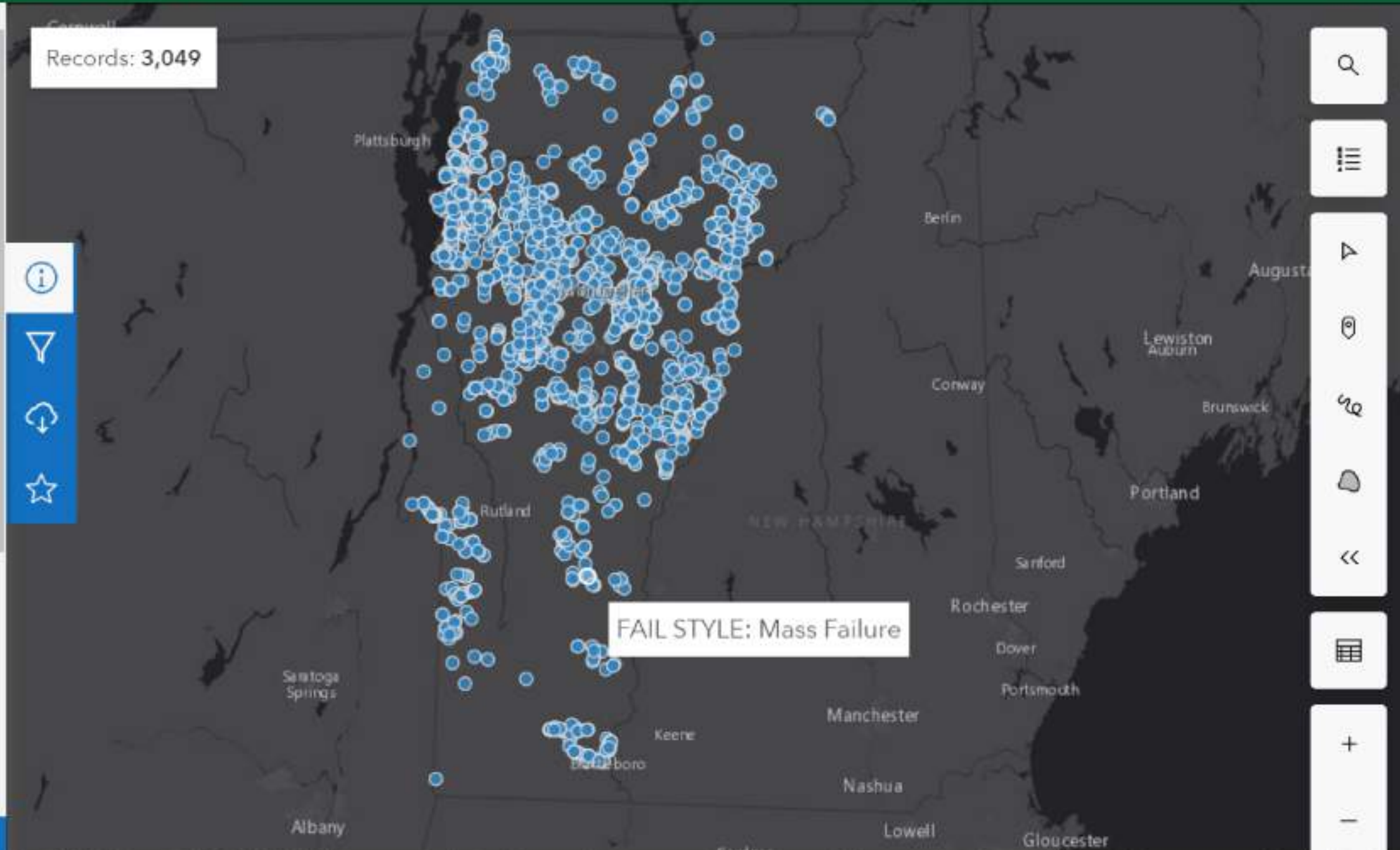
### Details

 **Dataset**  
Feature Layer

 **September 14, 2018**

[I want to use this](#)

Records: 3,049



FAIL STYLE: Mass Failure

Esri, HERE, Garmin, USGS, EPA, NPS | Vermont Geological Survey, Department of Environmental Conservation, Agency of Natural Resources ... Powered by Esri





**Mass Failures & Landslides**



# Natural Resource Projects



**Before**



**After**

# Presenter Contacts



Connecticut River  
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Connecticut River  
Conservancy

Q & A