

# Moraines, Glacial Lakes and Floods of the Ice Age

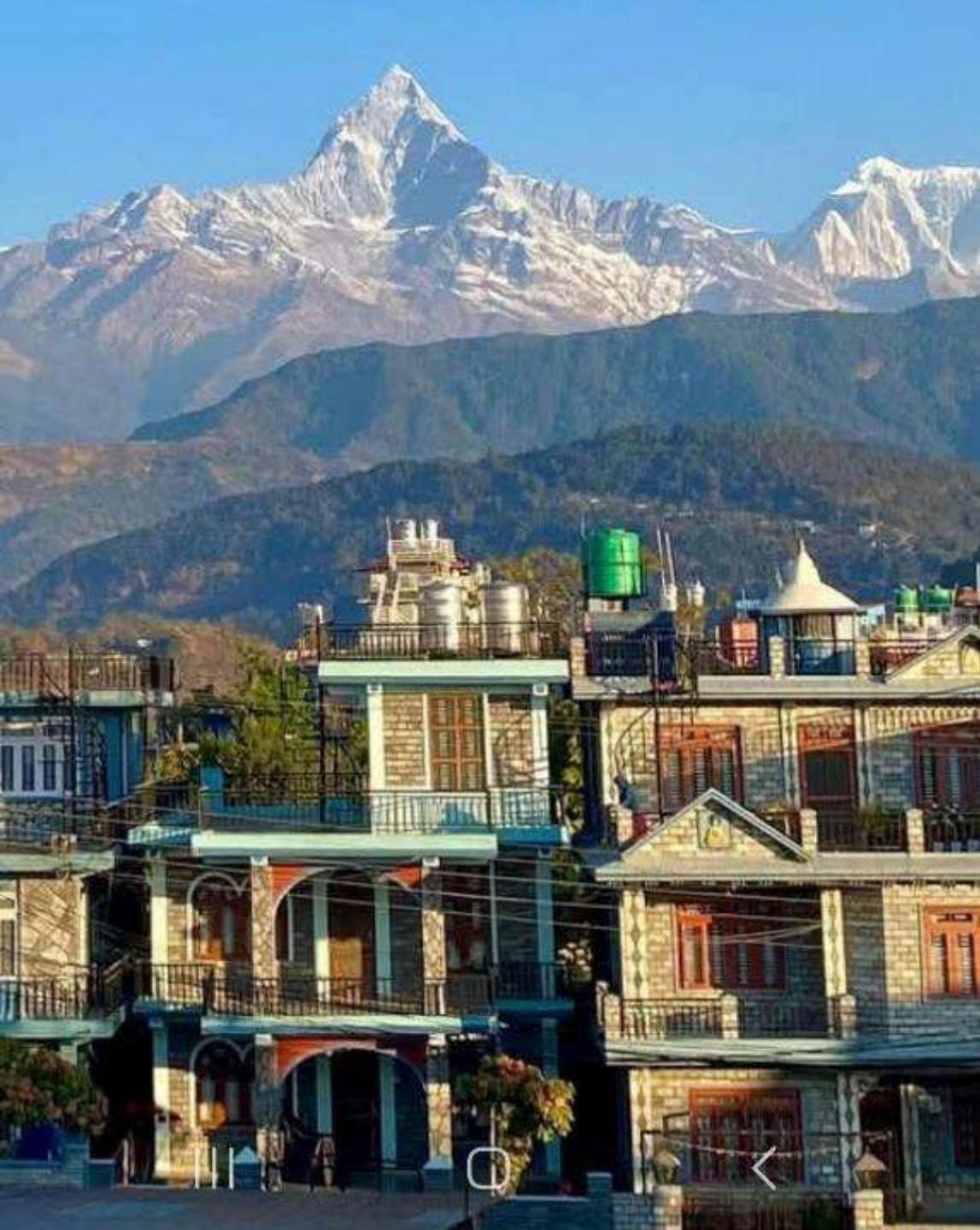


Lecture 5

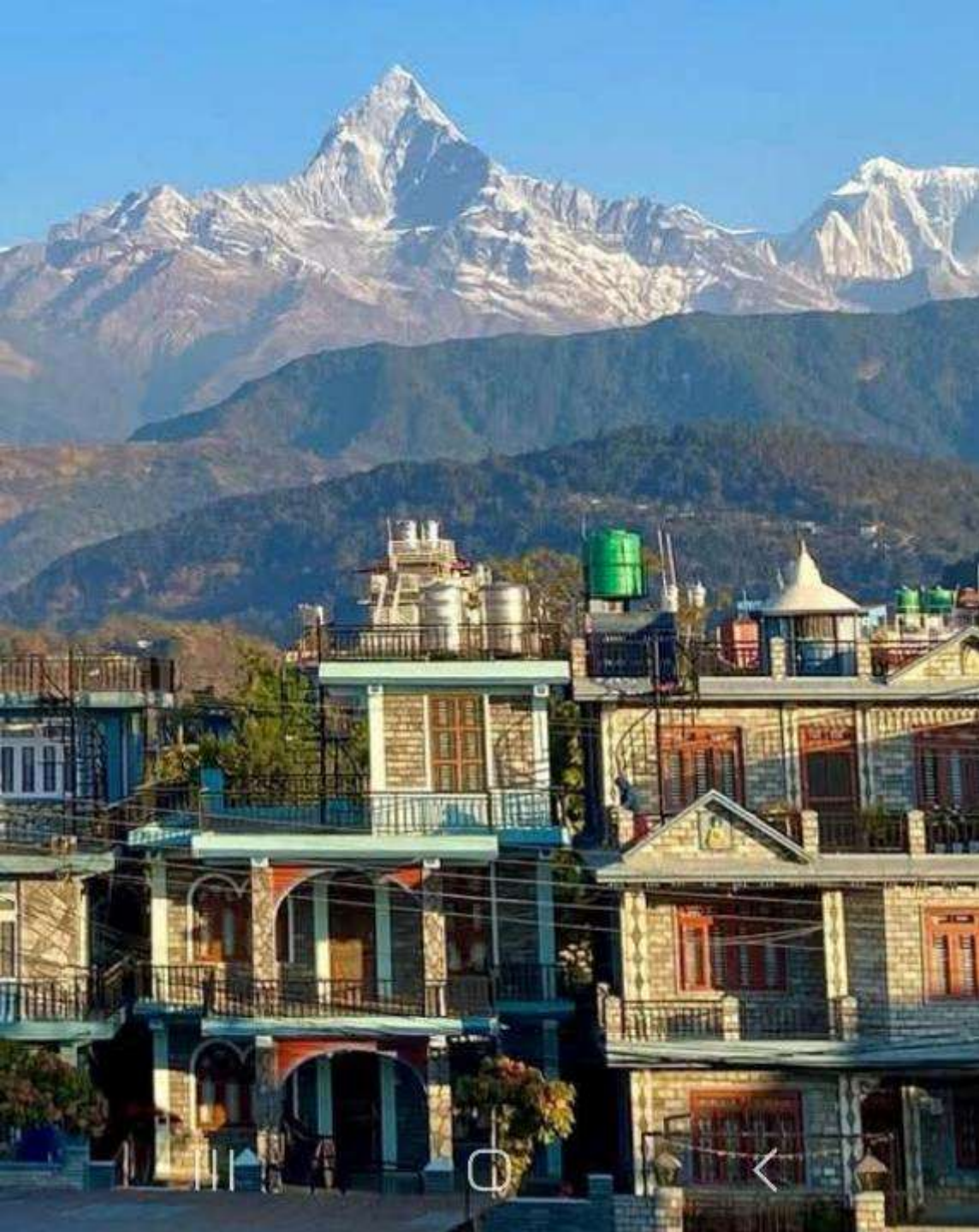
Skaftafelljökull (glacier)

Some Glacial Landform I came across  
on Social Media









Horn



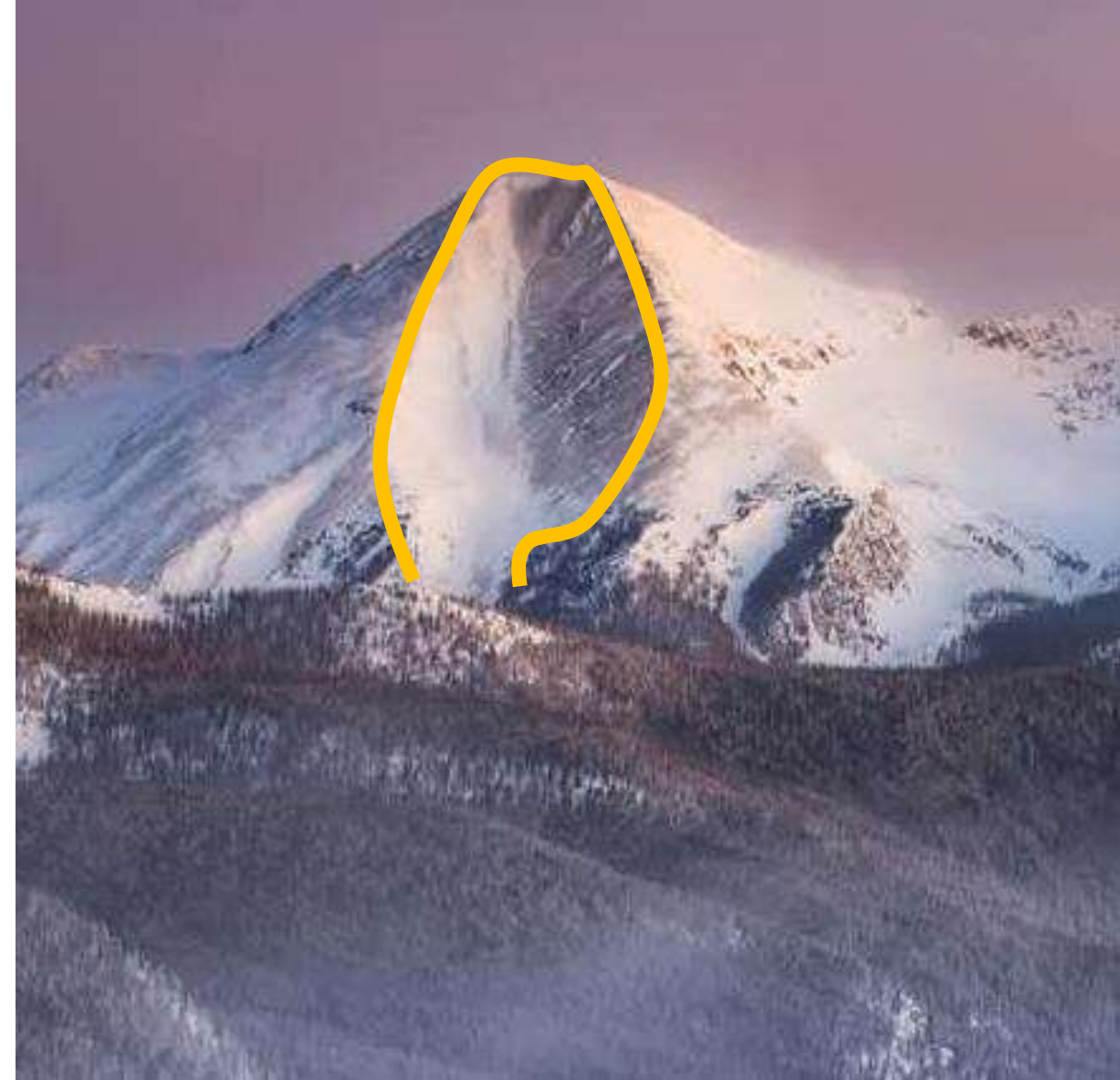


Glacially-  
smoothed  
surface  
with  
grooves









Cirque









Cirque and Cirque Lake



# Remnants of an Ice Age Subglacial River in Harriman State Park, New York

(along the Menomine Trail Below Stockbridge Mountain Shelter)



Harriman State Park



W

Harriman State Park

New York

Long Beach  
Google

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16 km





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Restaurants



Hotels



Things to do



Mus >



Forest Lake

Cranberry Mine



Lewis Mine



Silver Mine



Seven Lakes Dr

Seven Lakes Dr

Seven Lakes Dr

Palisades Interstate Pkwy

Anchor Loop T

Seven Lakes Dr

Seven Lakes Dr

William Brien

Terrain

View topography and elevation



Layers

Lake Tiorati Beach



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2000 ft



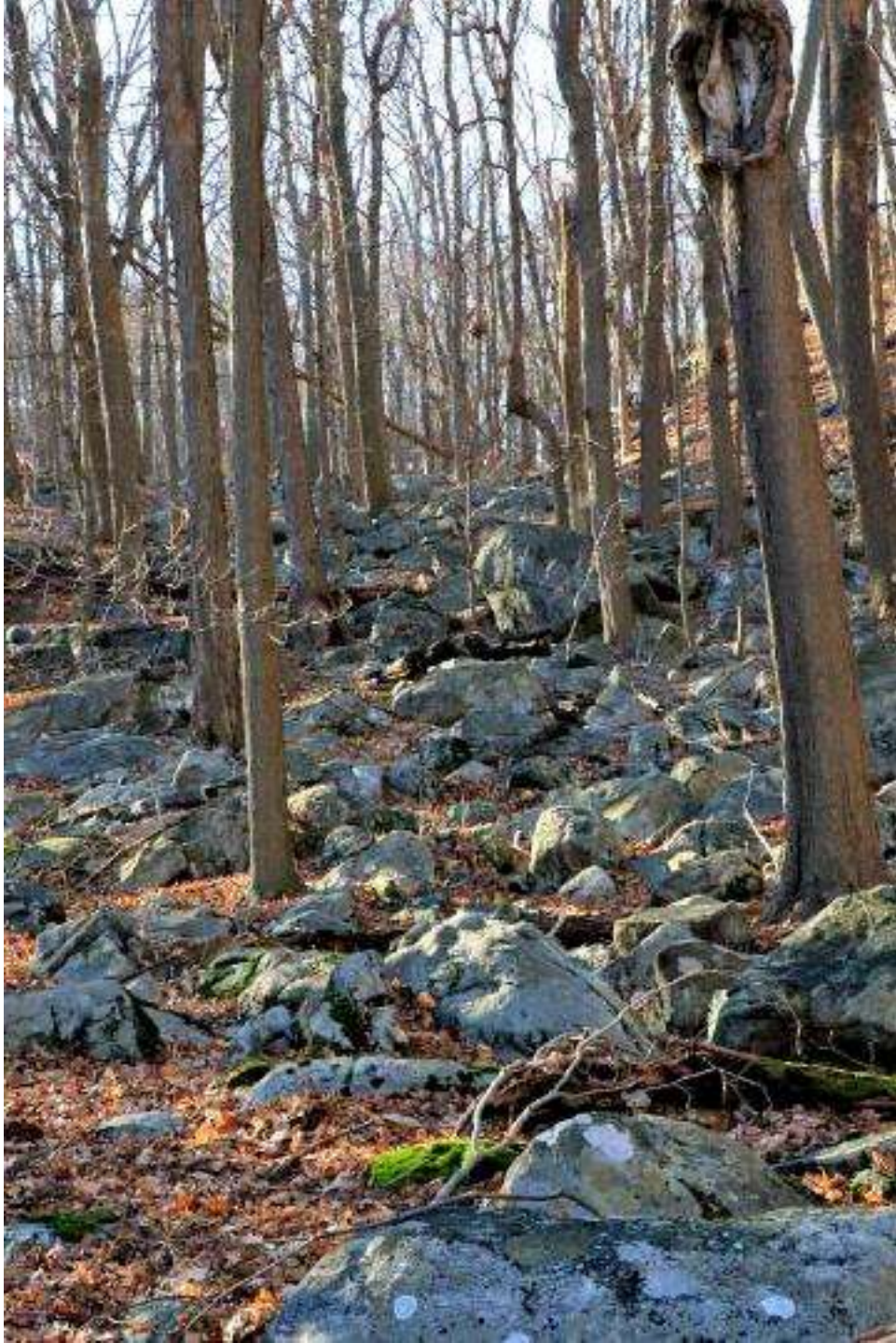




 Long Path

 Menomine Trail





Boulders  
North  
Of  
Trail



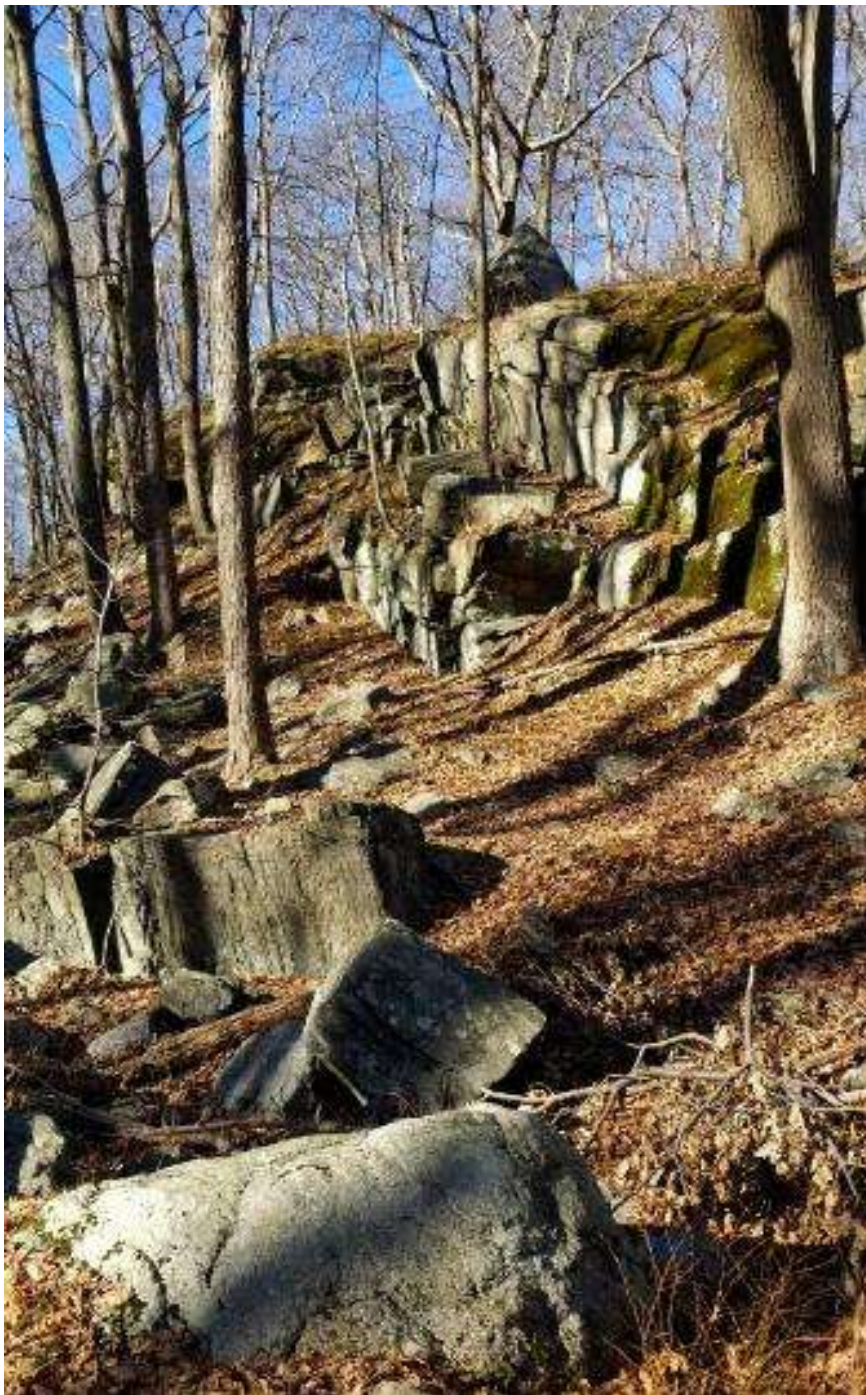
Some of the Boulders  
Very Large





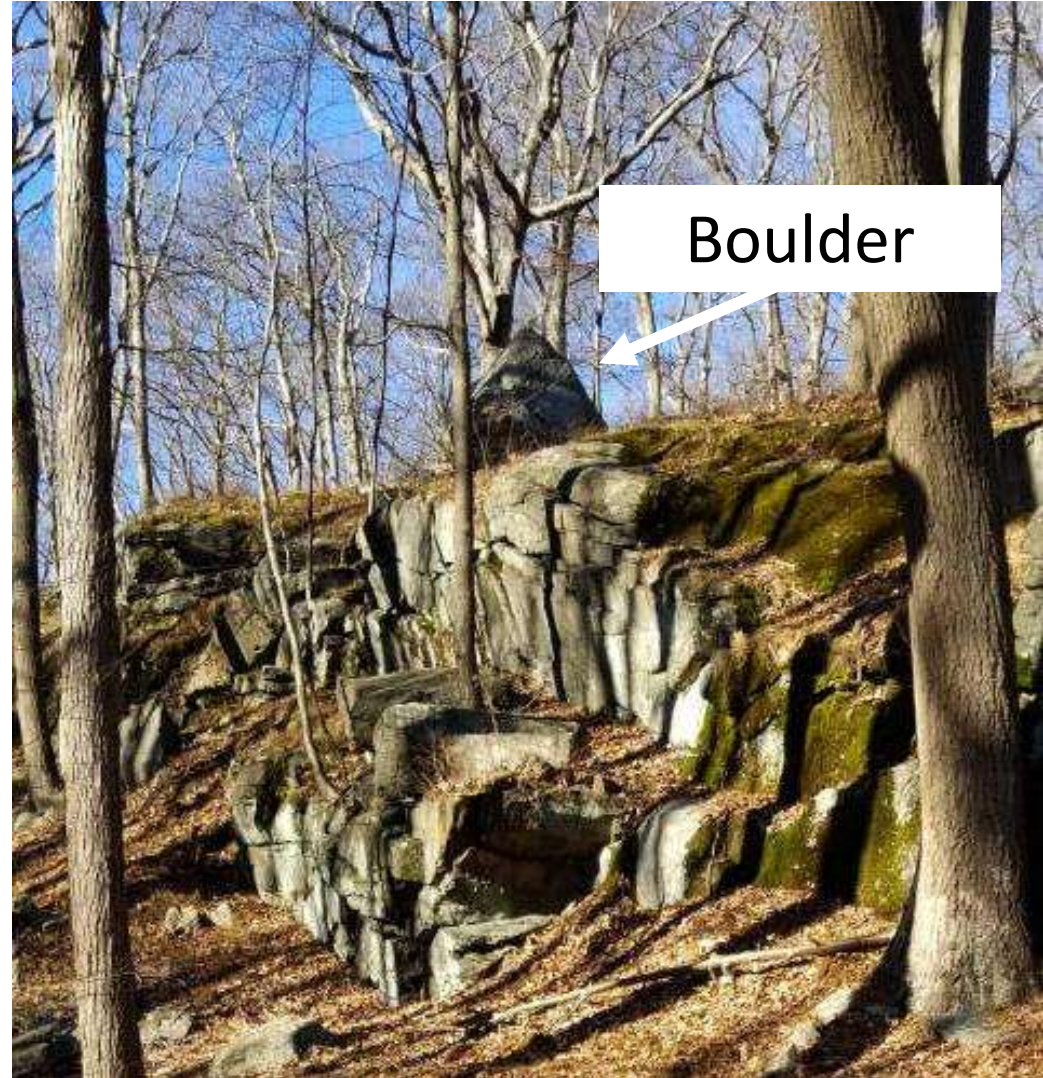
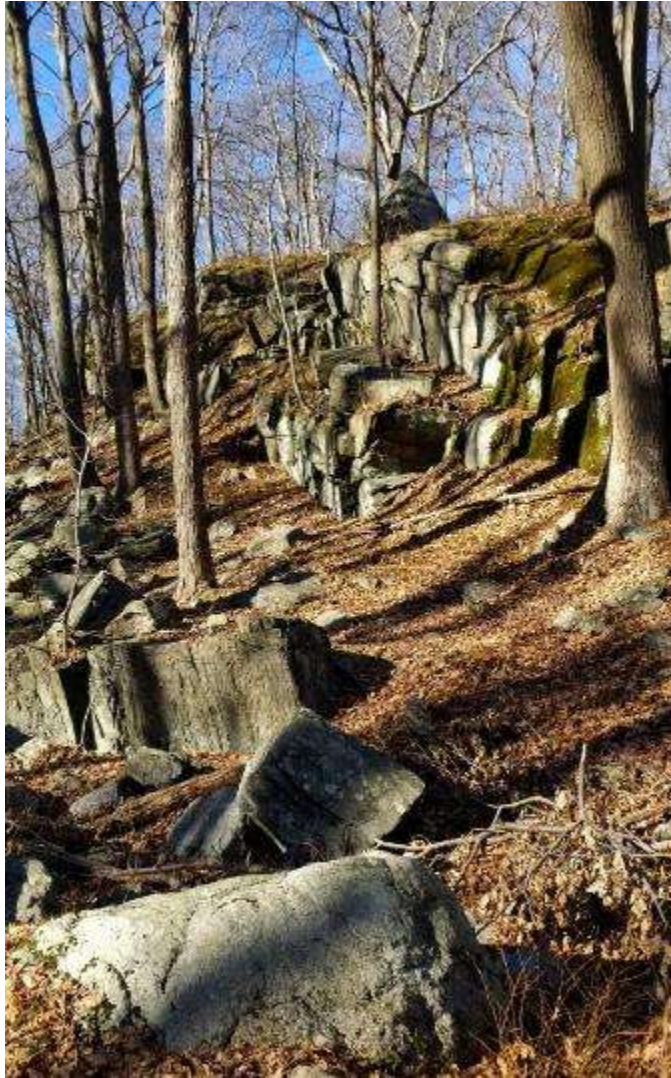
Cliff





Some rocks  
below cliff  
but probably not  
enough to  
account for the  
material that  
must have been  
removed to  
make the cliff





Glacial Boulder perched on the top of the cliff



Striae Parallel to Cliff



Glacial Scratches along trail



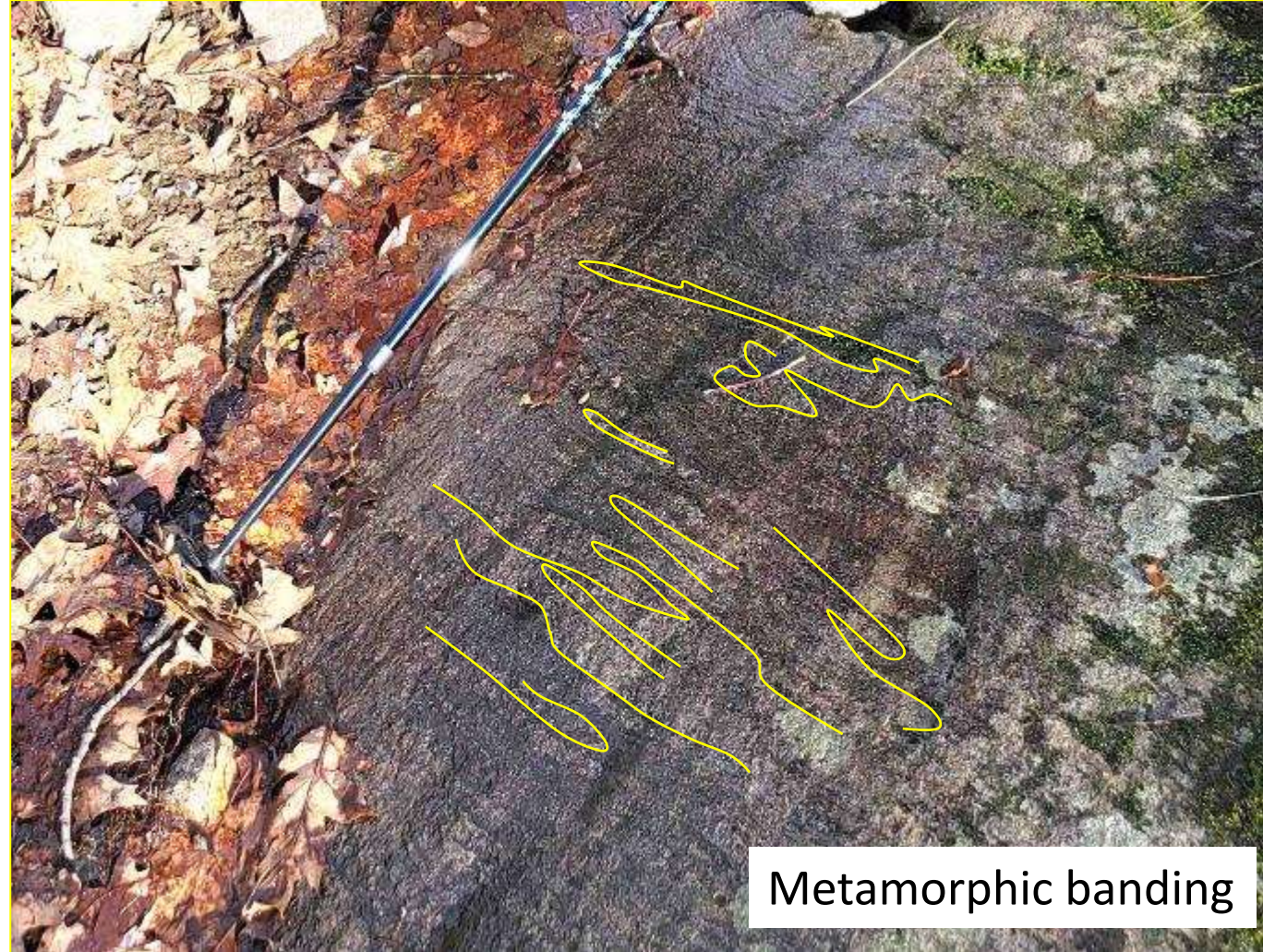
Striae Parallel to Cliff



Striae

# Glacial Scratches





Metamorphic banding

metamorphic banding of rock





sudden drop off





site of waterfall?





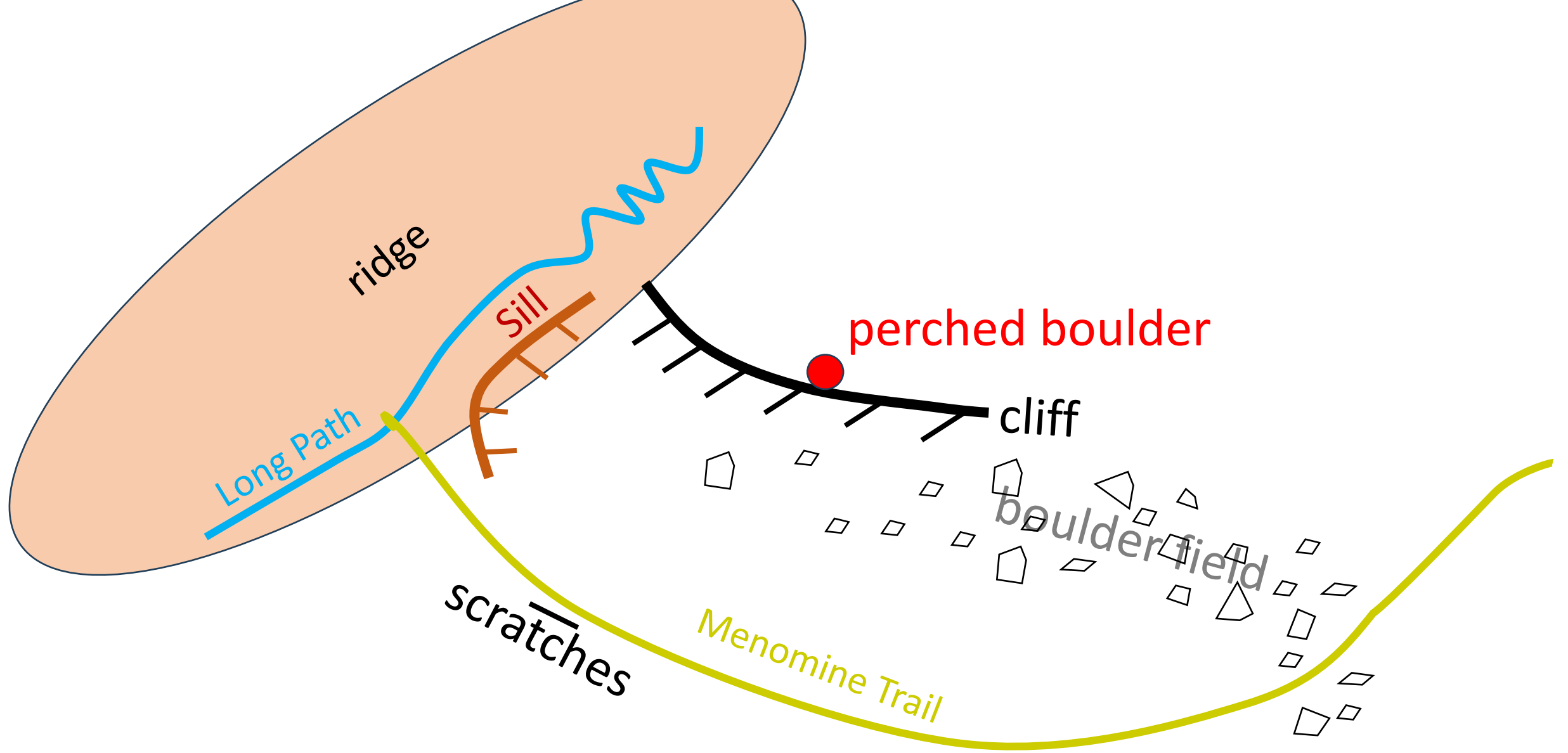
Stream  
Above  
Waterfall



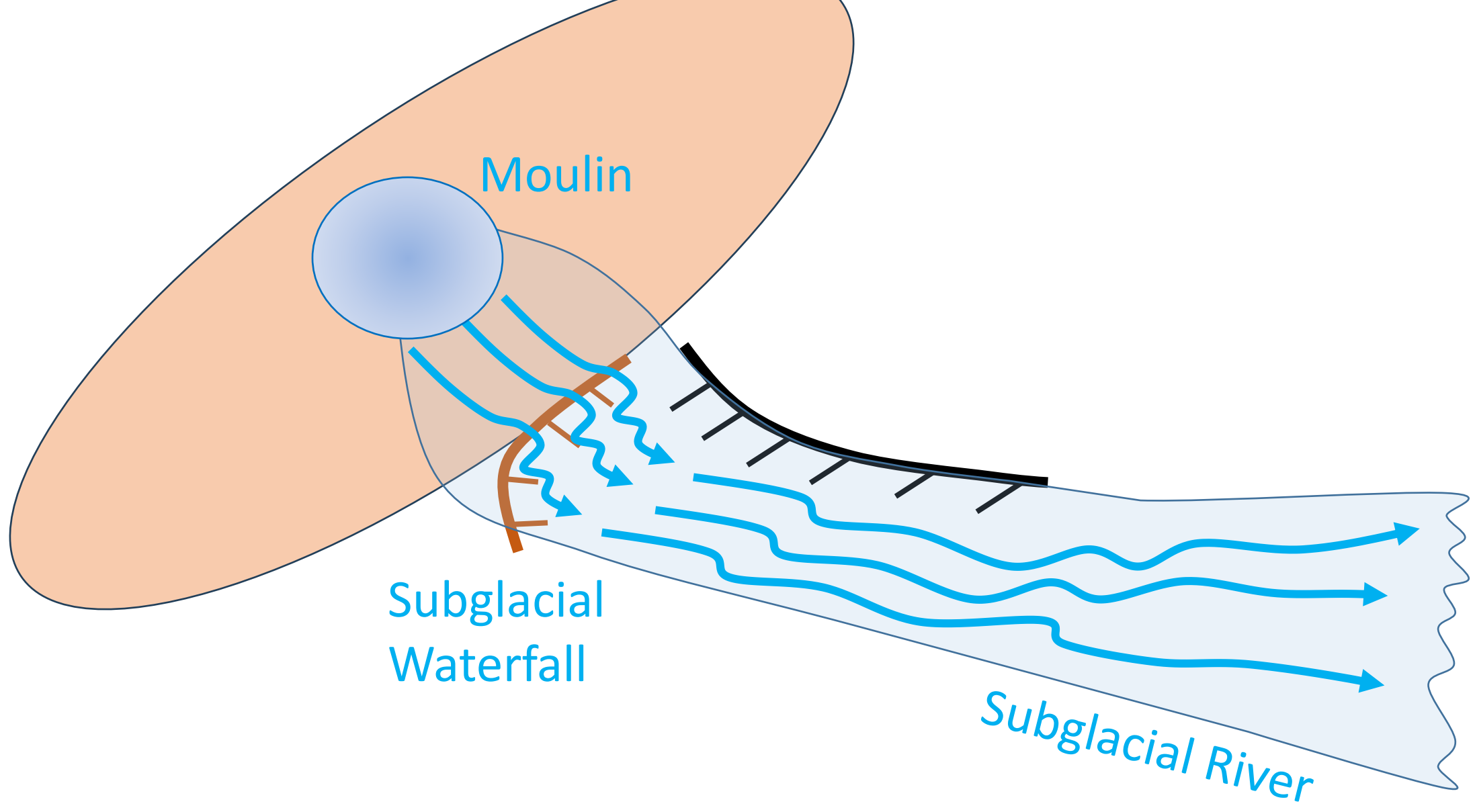


Tiny Watershed













Moulin in Greenland



# Granite Tors near Fairbanks Alaska

Tor - Dutch for tower



Me (Bill Menke) standing by one of the North Tors



Tors on a ridge line



# Erosional, not glacial in origin

How come Ice Age glaciers did not sweep them away?



Me (Bill Menke) standing by one of the North Tors



Tors on a ridge line





Me (Bill Menke) standing by one of the North Tors

- (a) Younger than Ice Age
- (b) Erosional explanation wrong, actually glacial
- (c) Fairbanks not glaciated during Ice Age



Tors on a ridge line



# What's it take to make glaciers

Cold weather  
and  
\_\_\_\_\_?



Me (Bill Menke) standing by one of the North Tors



Tors on a ridge line



# What's it take to make glaciers

Cold weather  
and  
precipitation

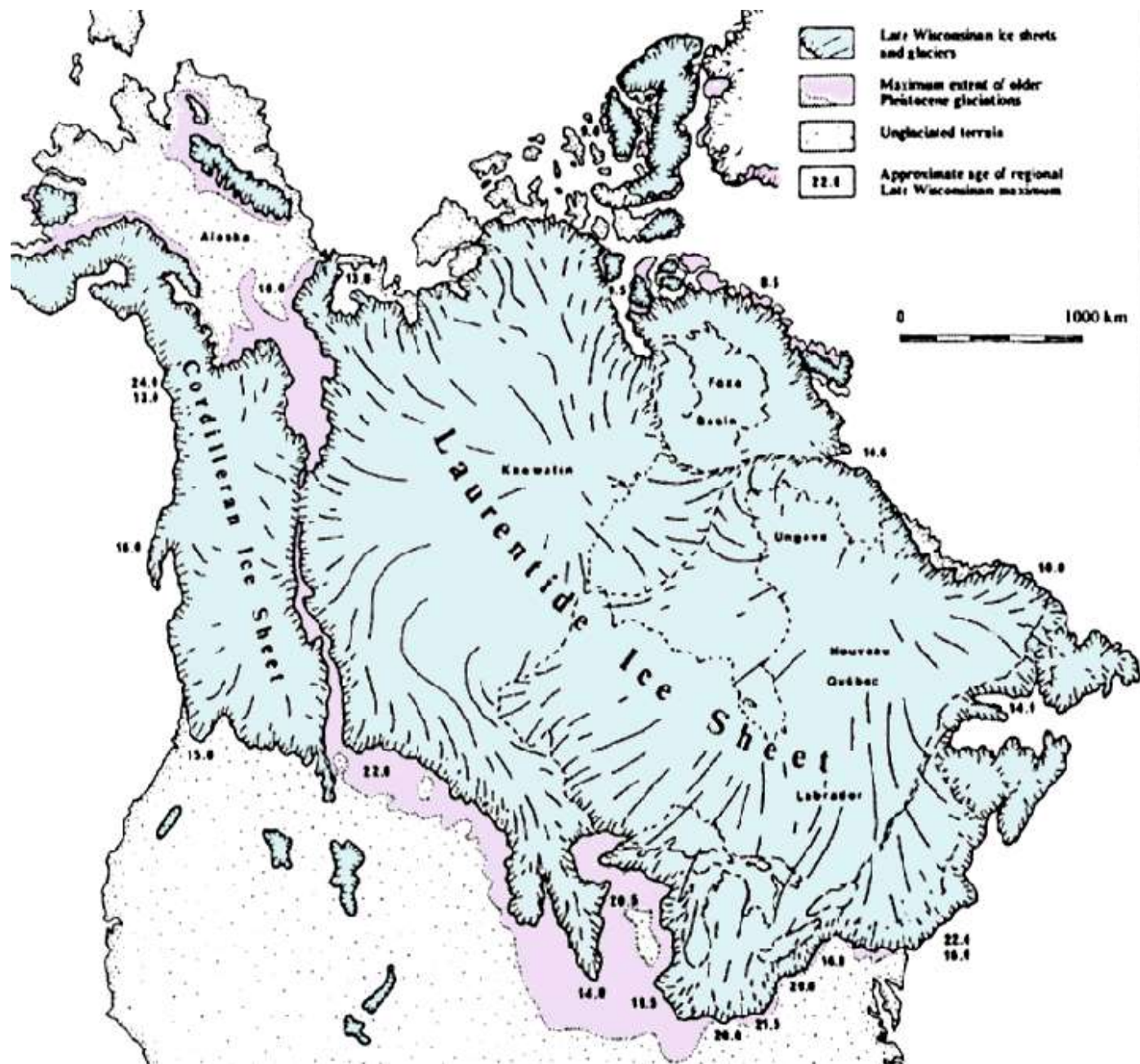


Me (Bill Menke) standing by one of the North Tors



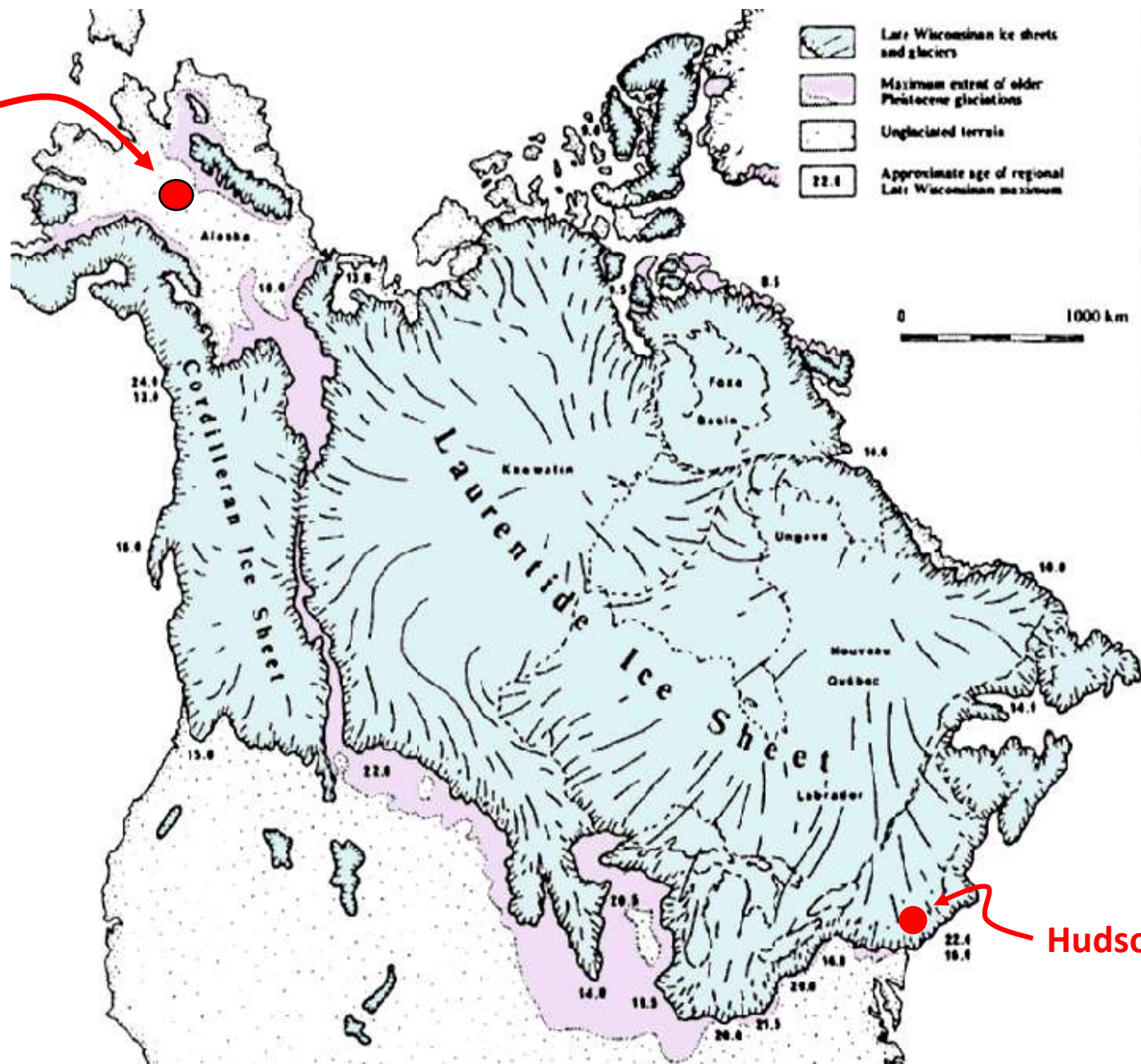
Tors on a ridge line





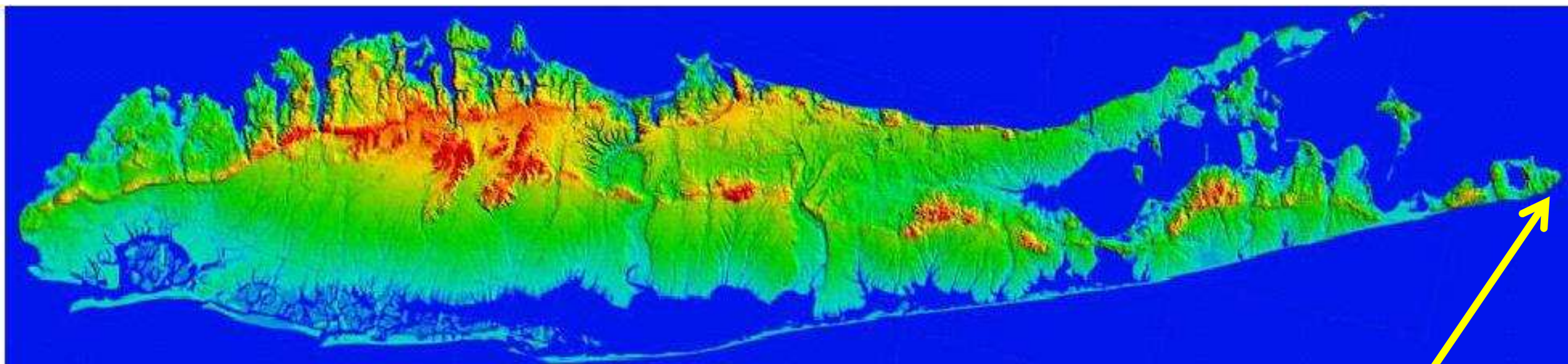


Fairbanks



Hudson Valley









Cliffs at  
Mountauk  
Point  
New York

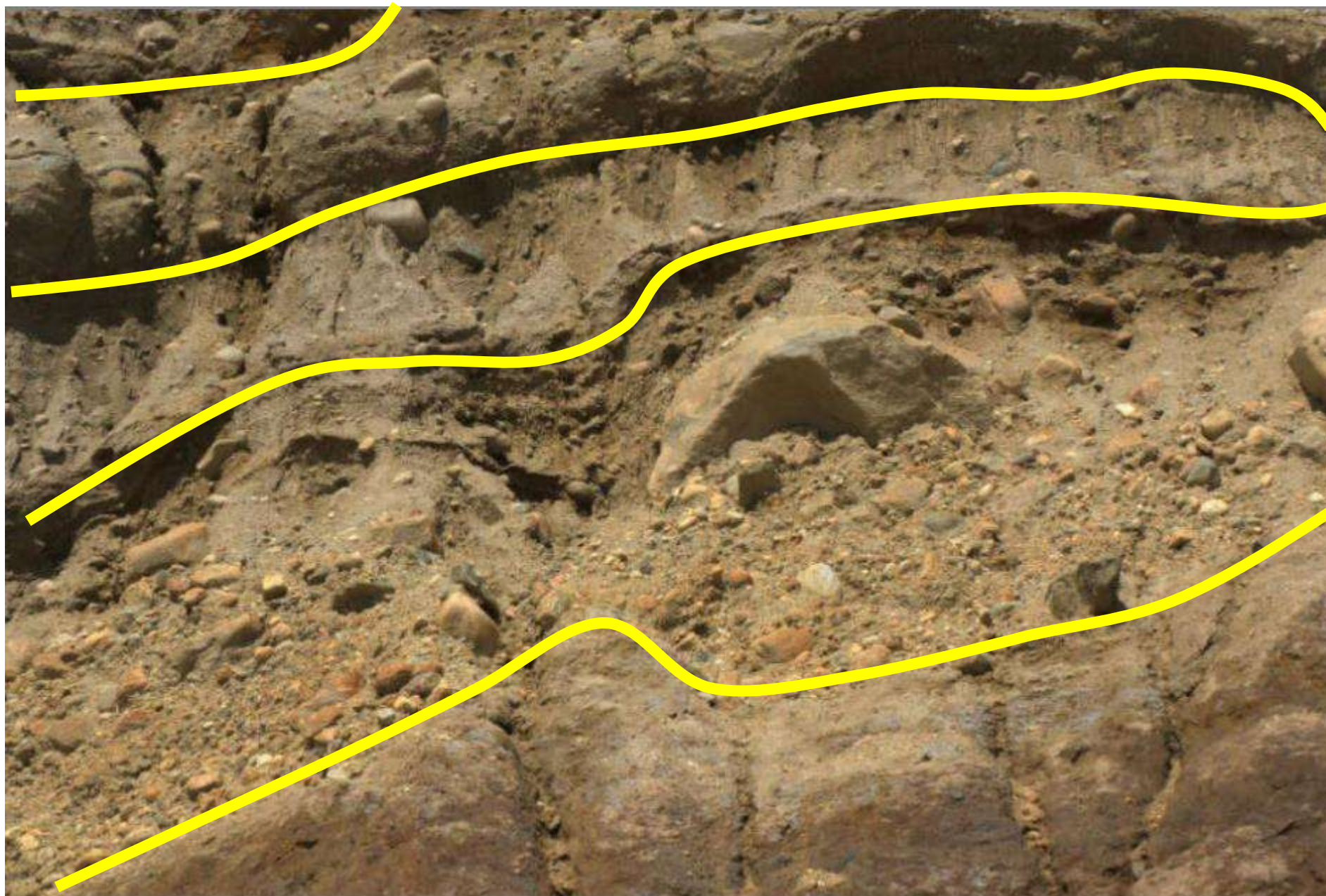




cliffs  
composed  
of  
unconsolidated  
sediment

Layer of pebbles

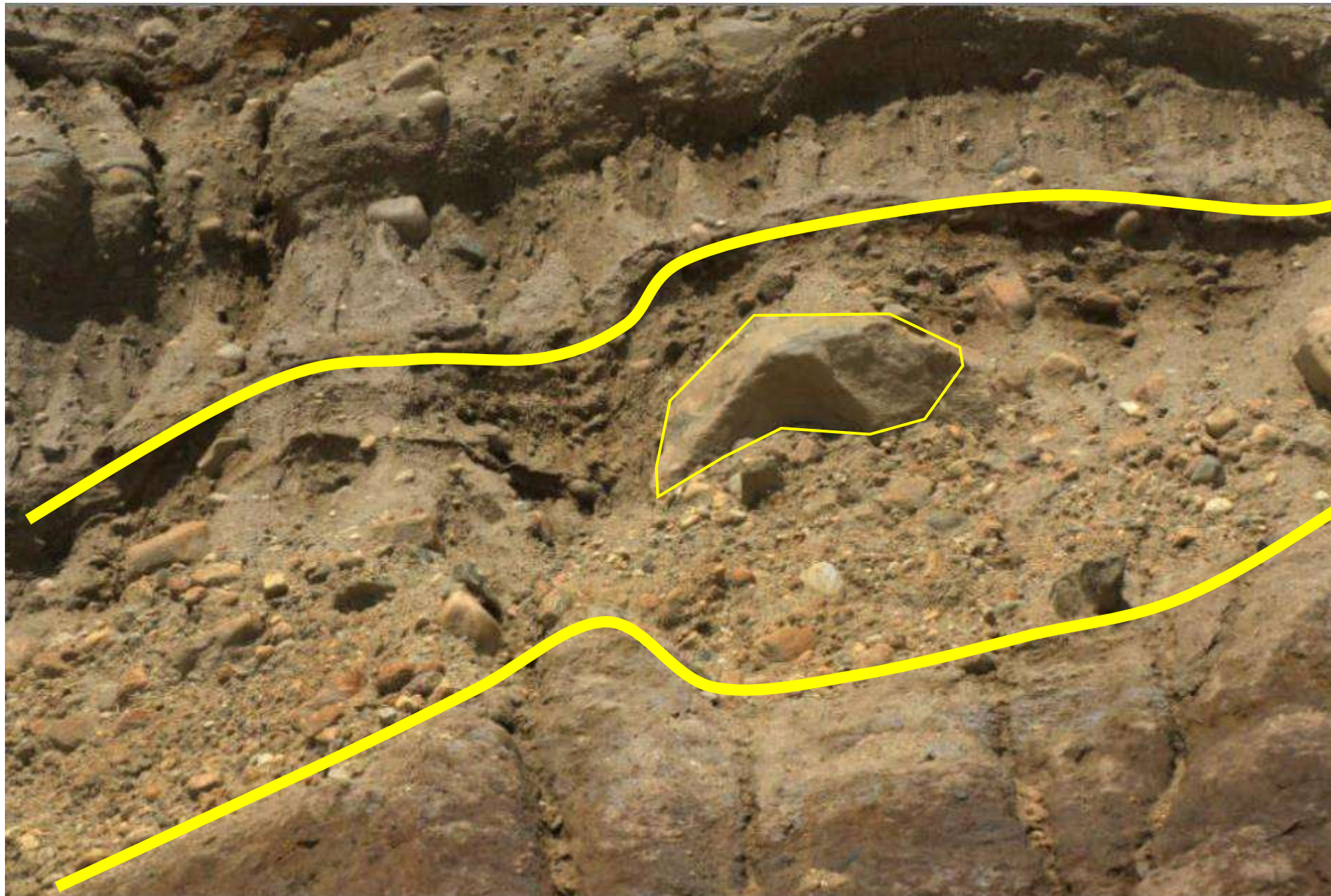




Stratified,  
so this is  
“outwash”  
and not  
“till”

Layer of pebbles





some layers  
poorly  
sorted  
and with  
big  
boulders

Layer of pebbles









overturned  
fold

bulldozing  
by glacier





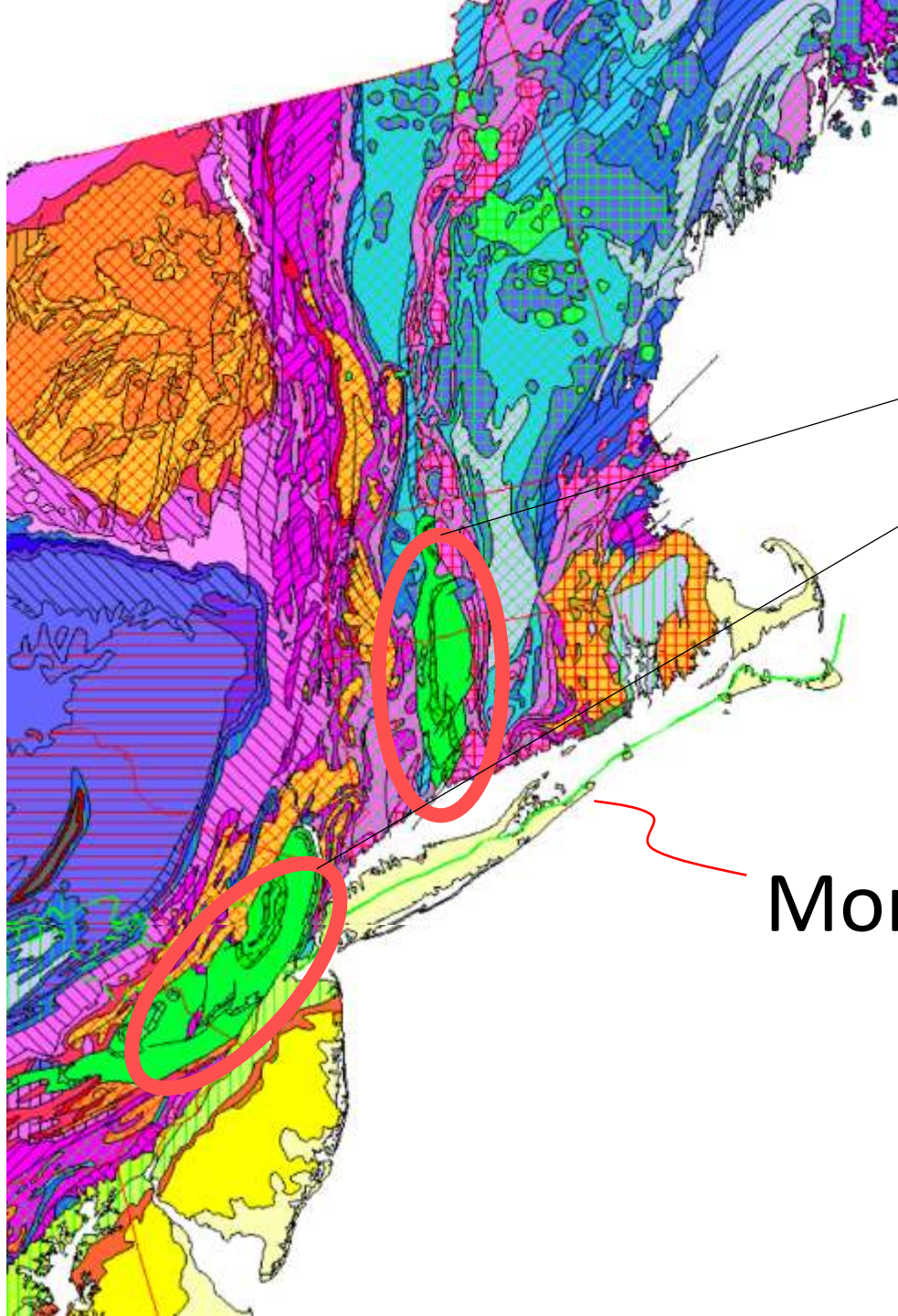
Many Glacial Boulders that have washed out of the cliff





Glacial boulder of red sandstone

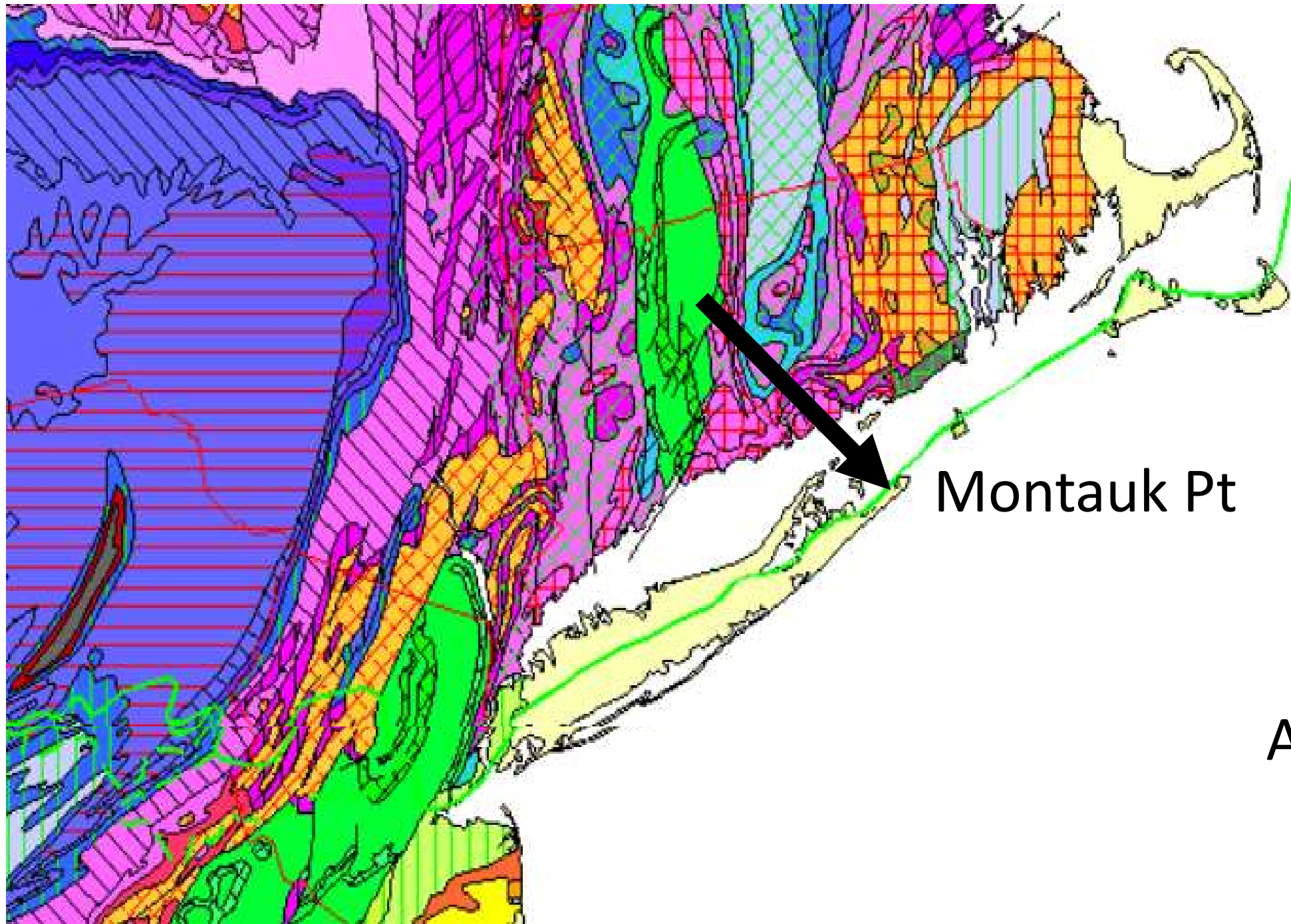




Red Sandstone

Montauk Pt

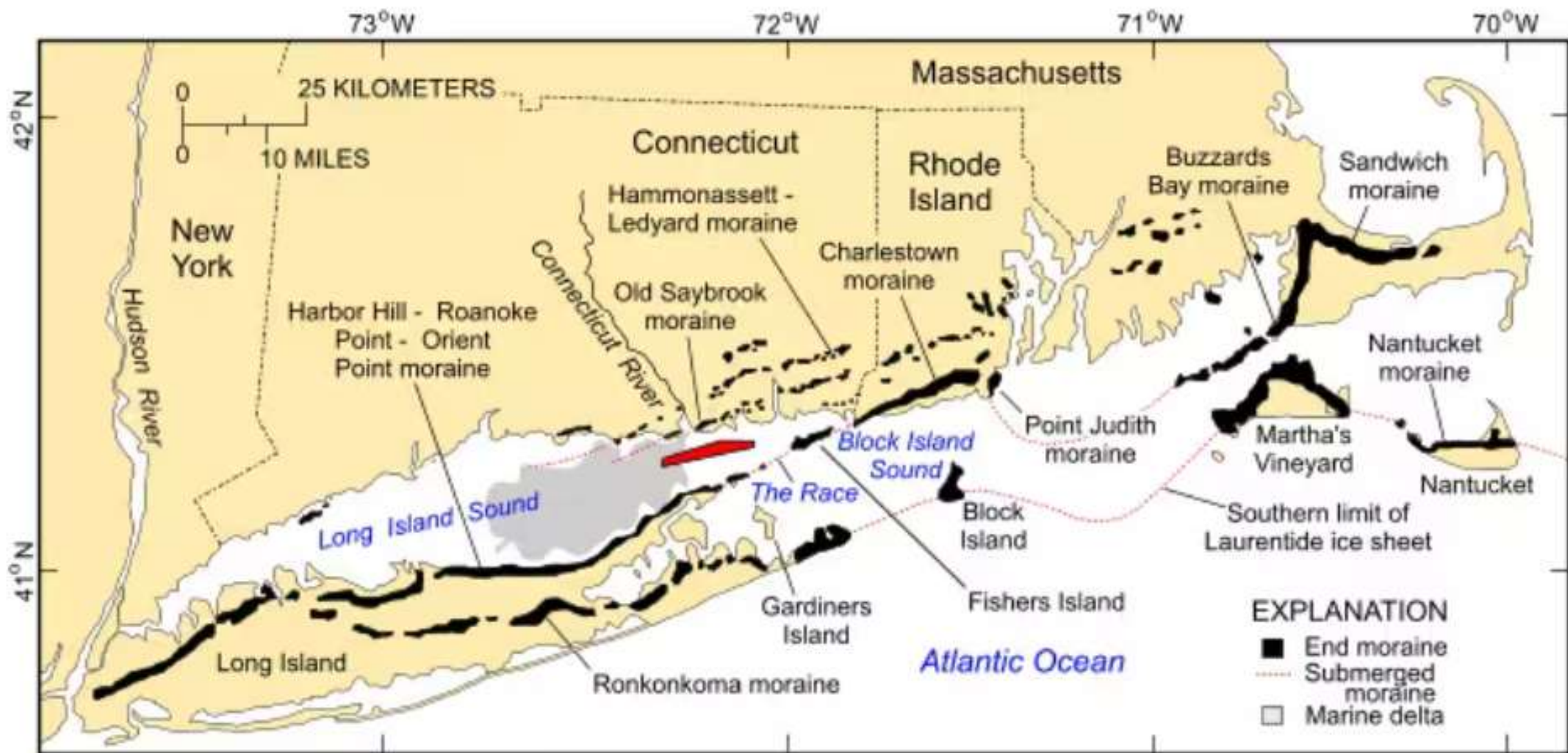




Montauk Pt

About 50 km







Manitou Lake Moraine  
[Elev: 25.7 ± 2.0]  
[PAH: 21.8 ± 2.3]  
[Corbett et al., 2017]

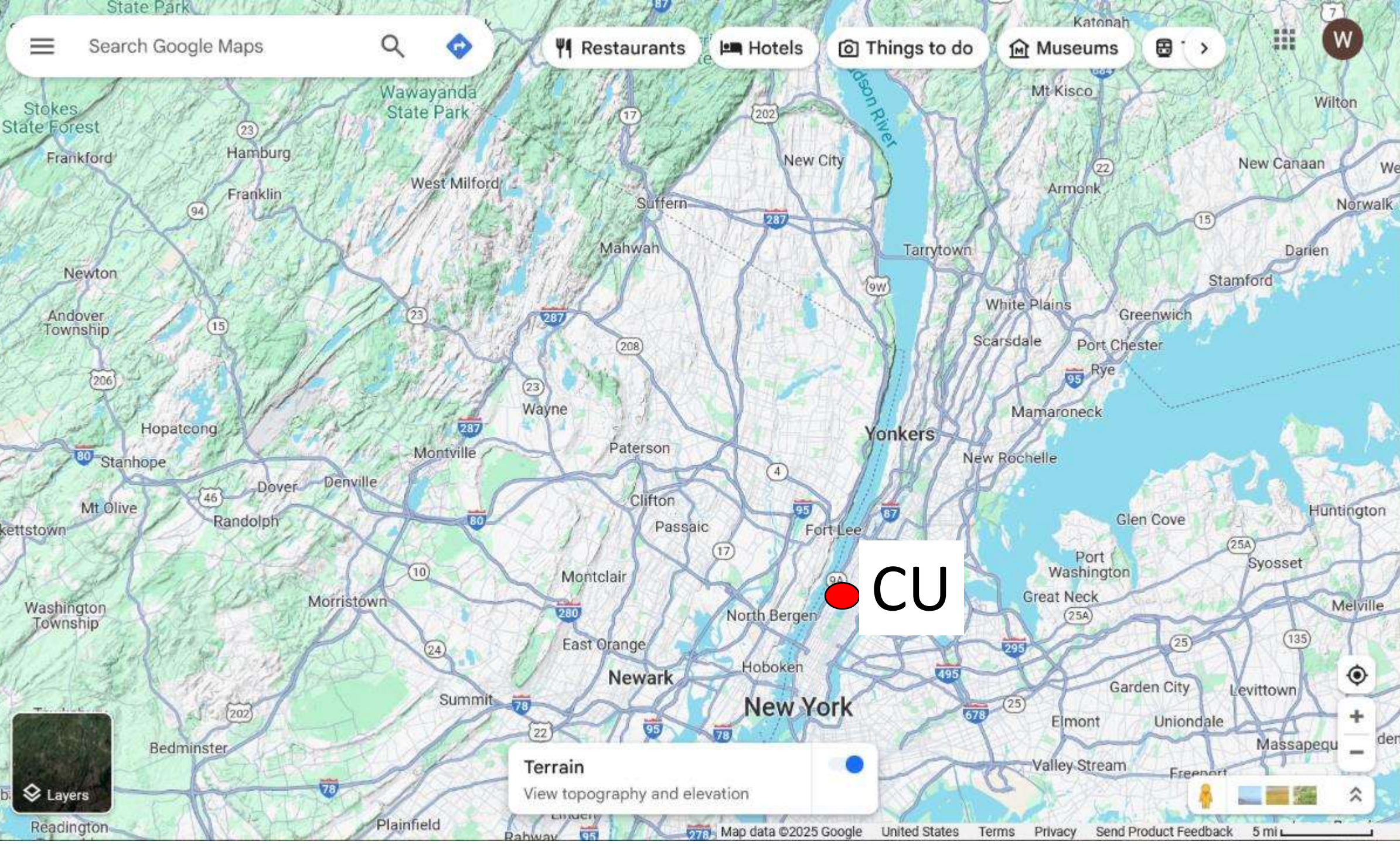
NEW JERSEY

Central Pk  
[30.0 - 35.7]

LOED  
[29.0 ± 1.8]

Strawn Island  
[18.9 - 21.6]





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Things to do



Museums



Terrain

View topography and elevation



CU



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United States

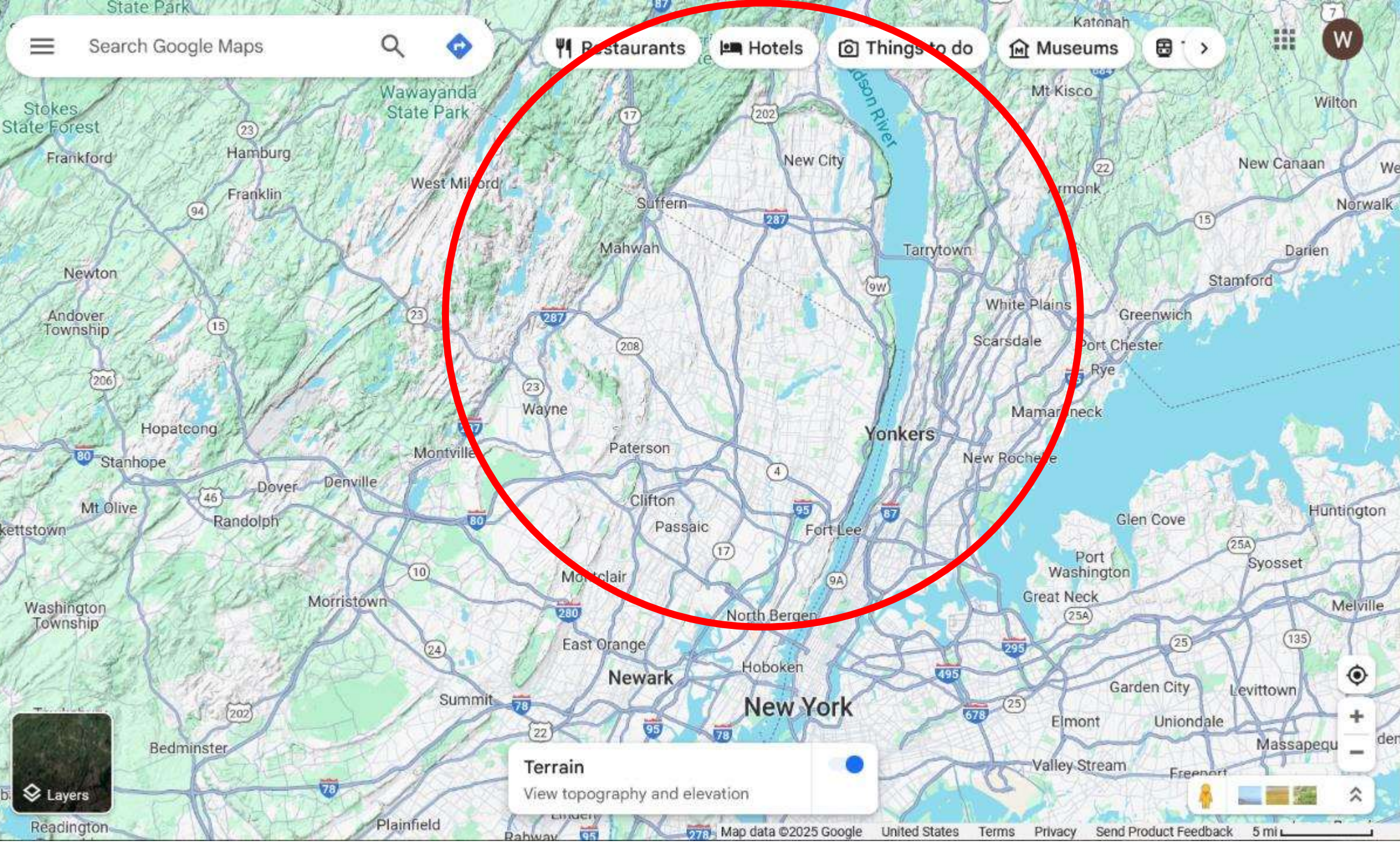
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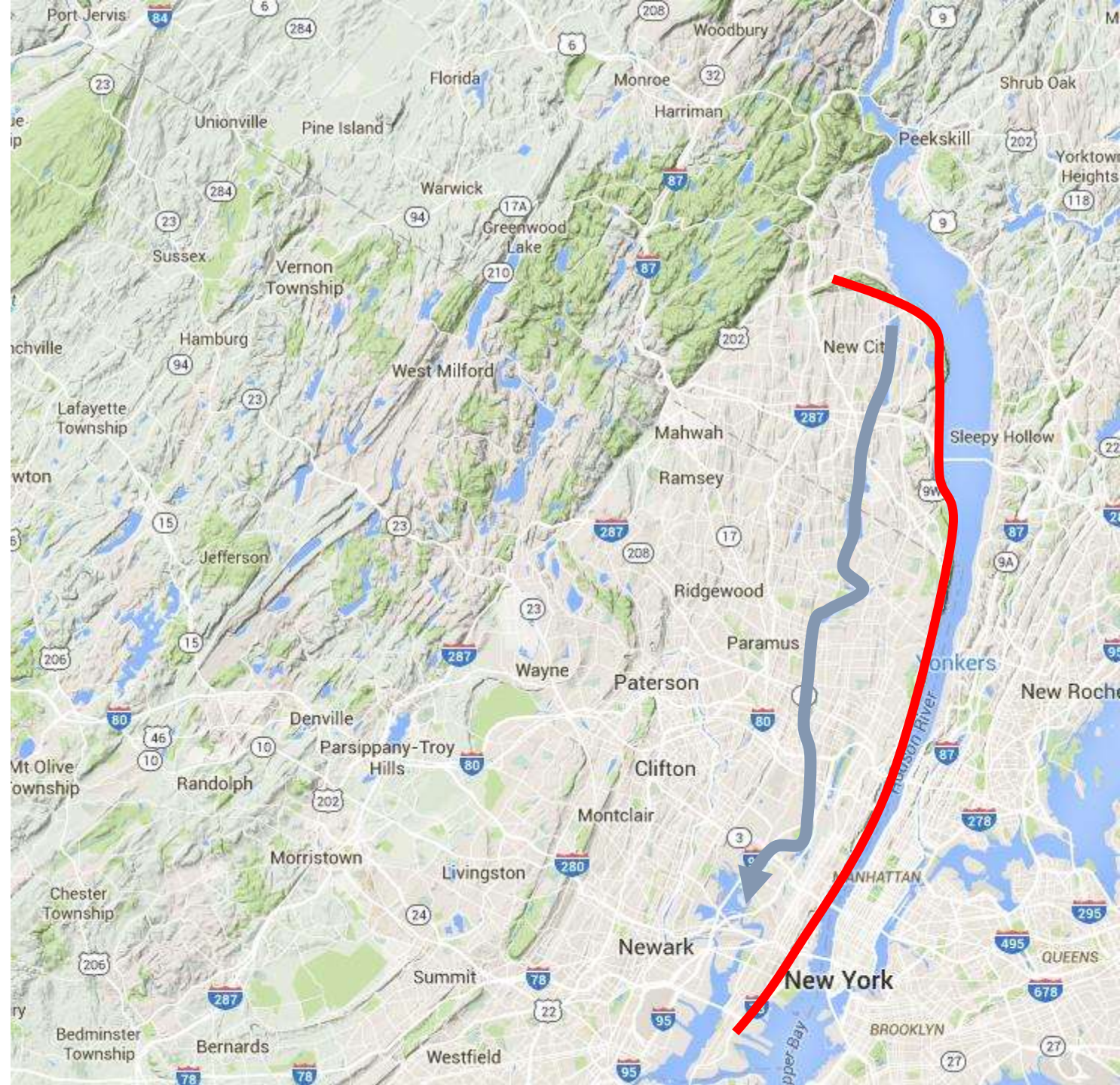




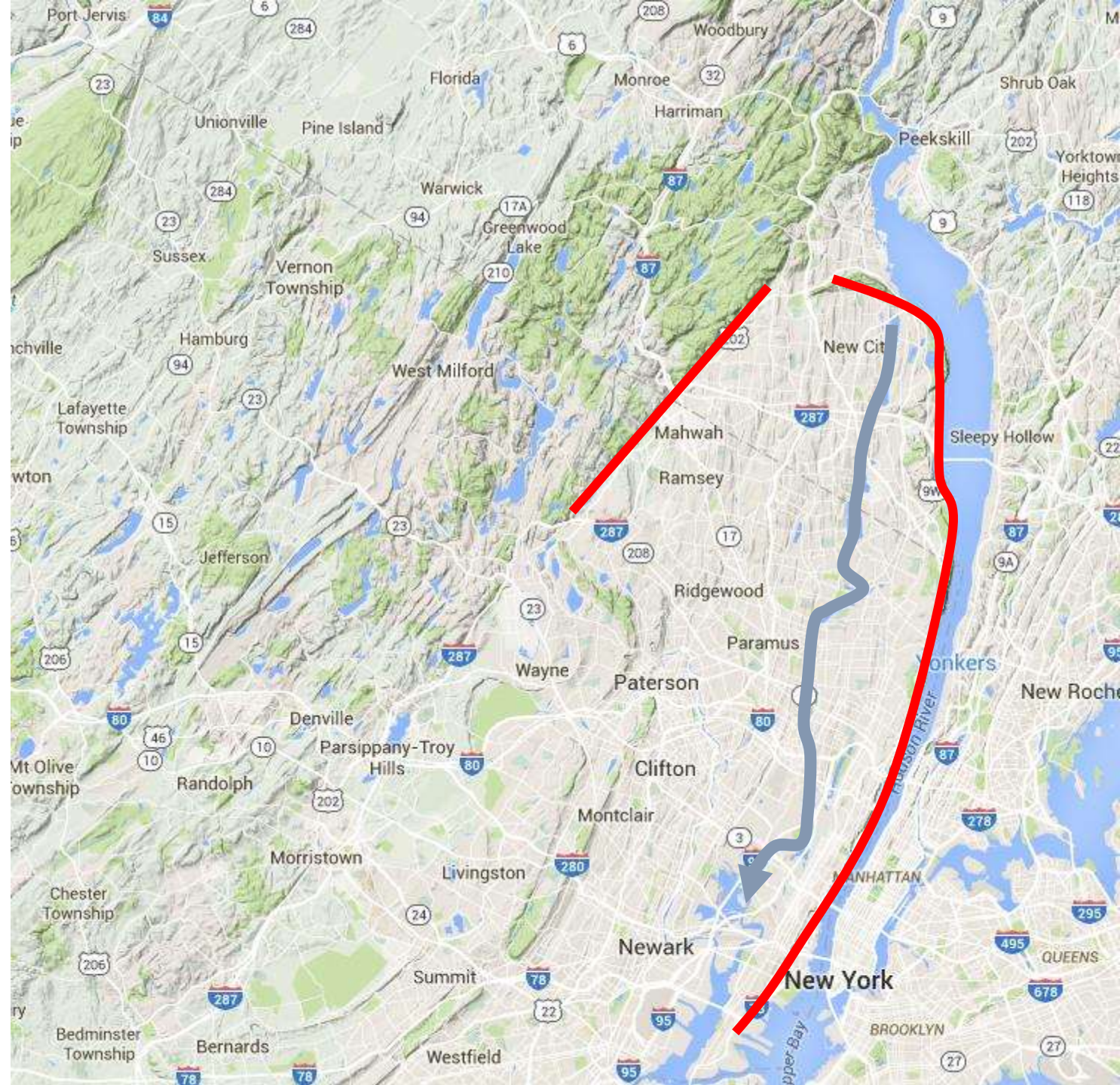


Lake Deforest

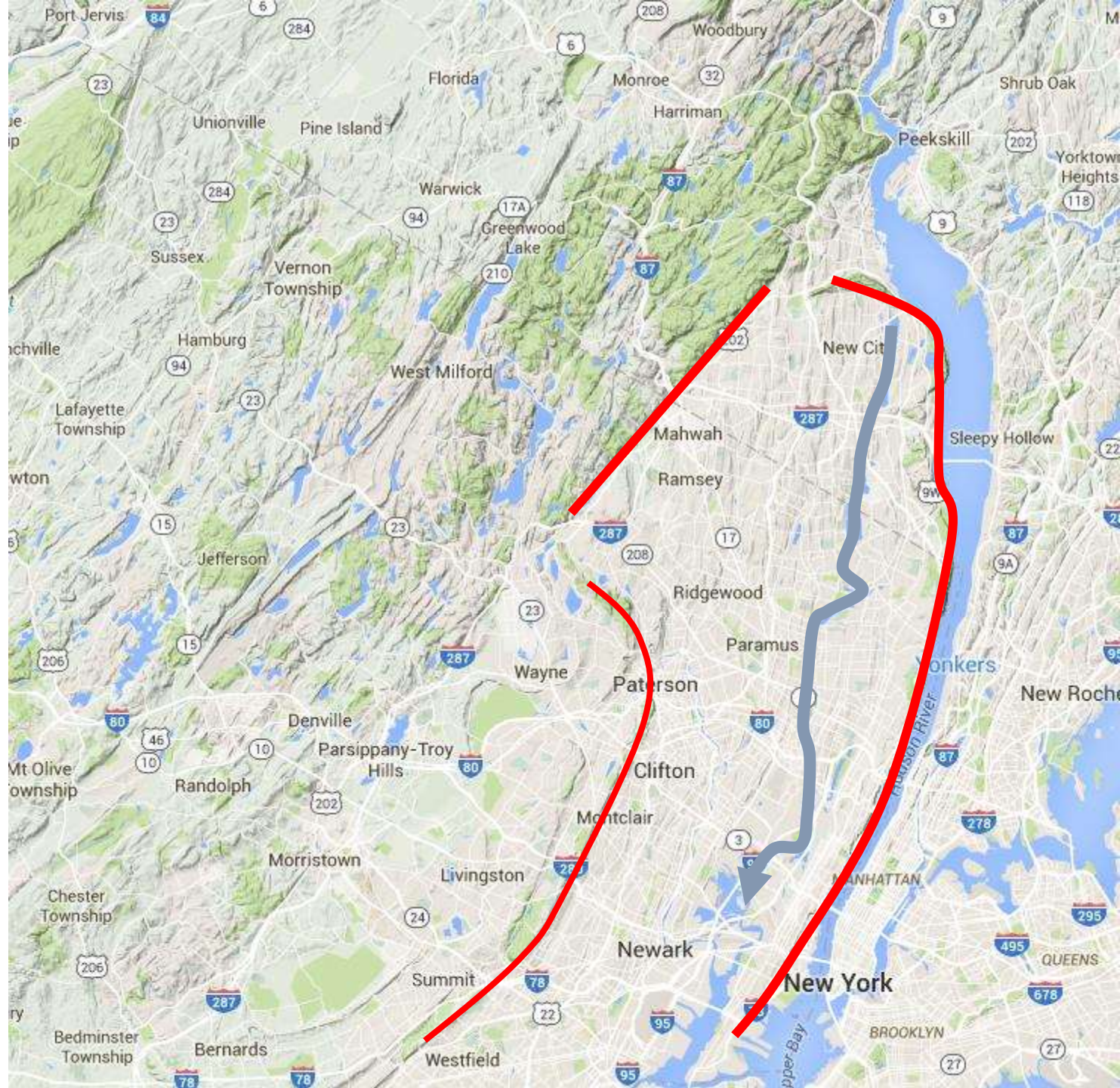




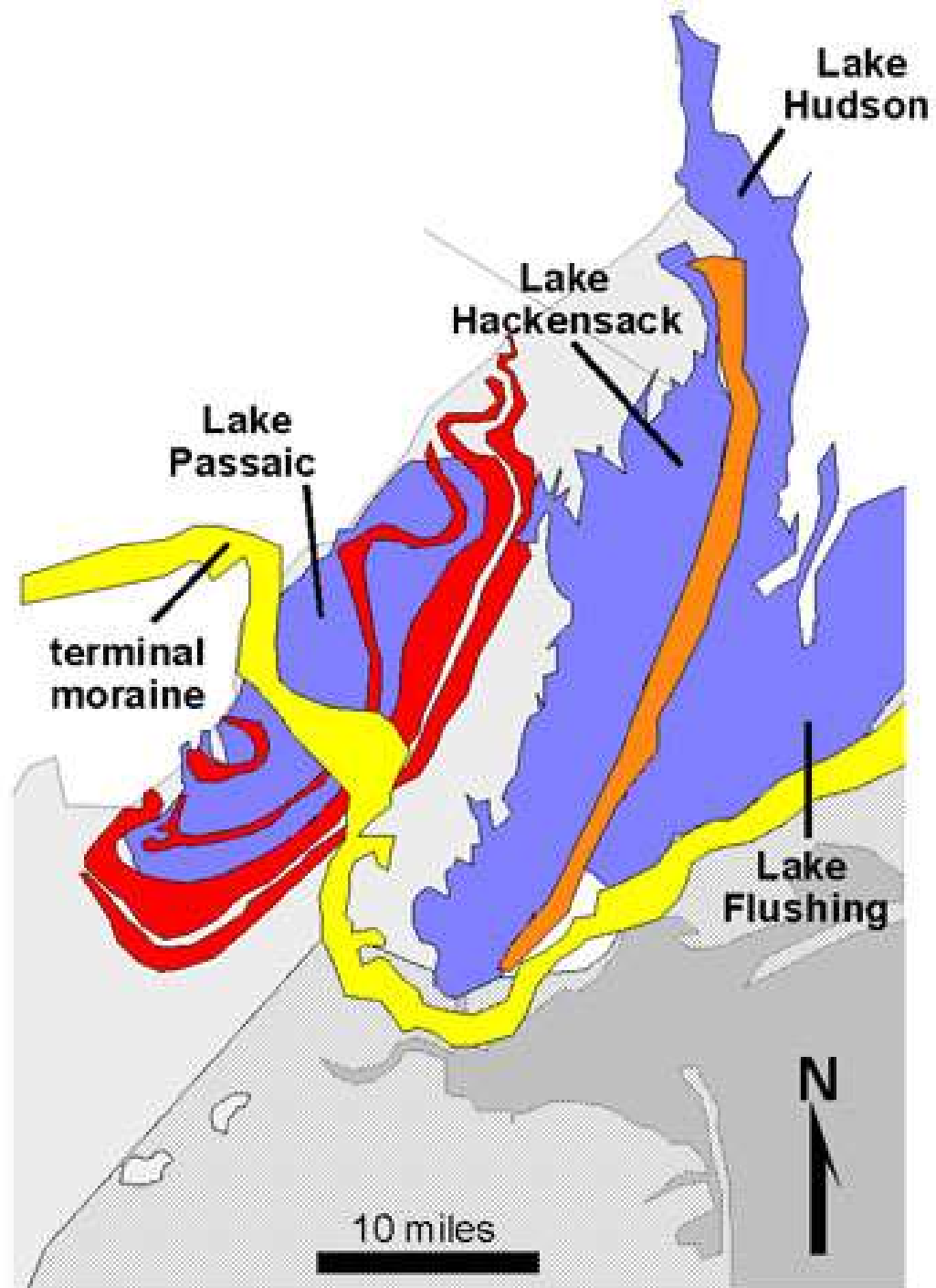




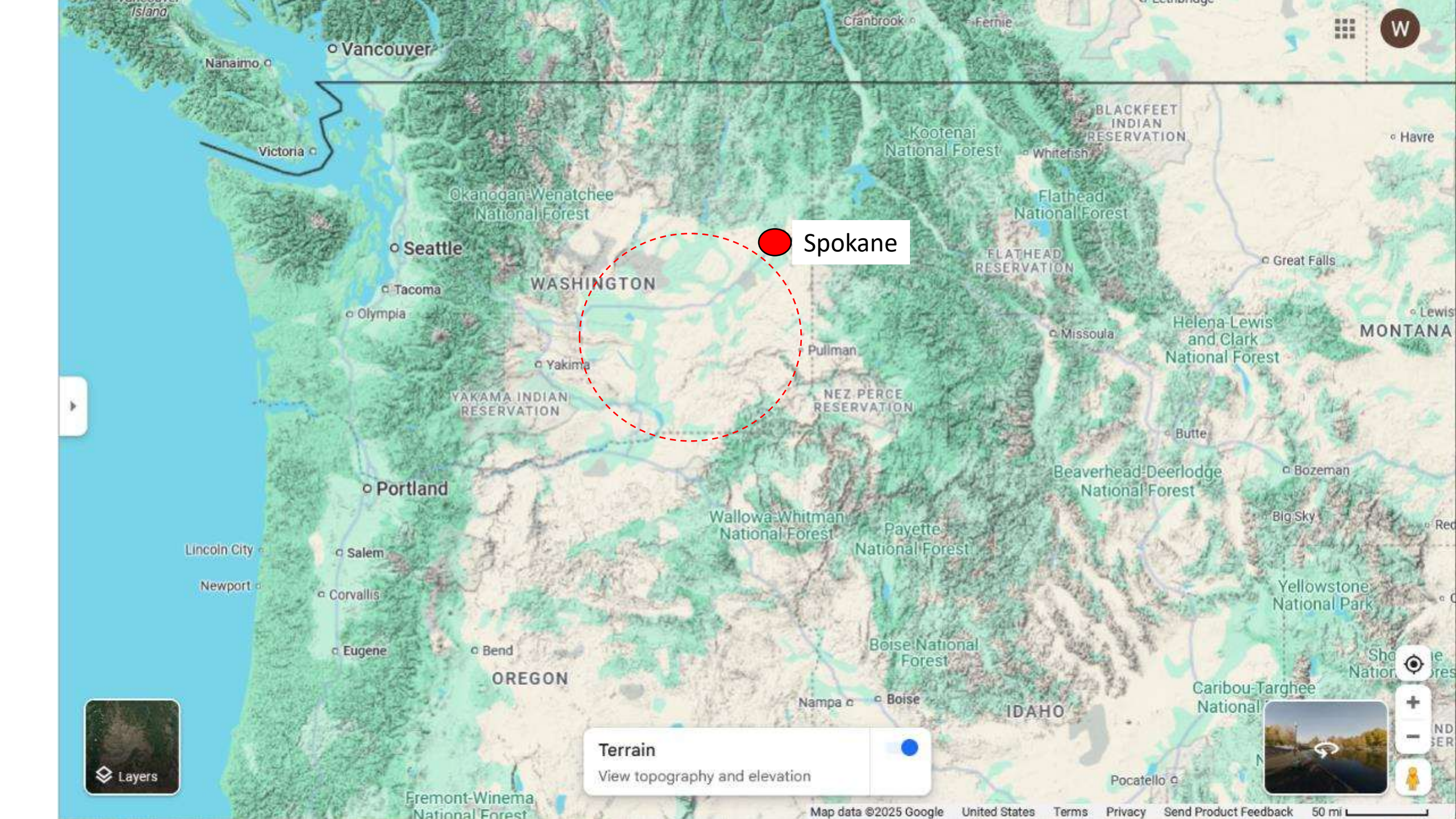




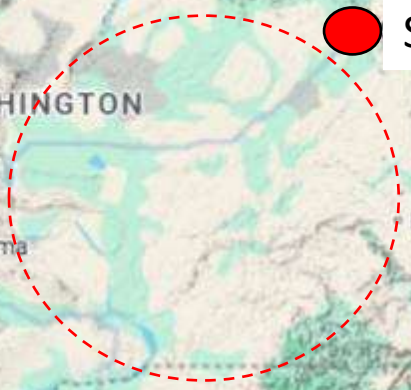








Spokane



**Terrain**  
View topography and elevation







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Restaurants



Hotels



Things to do



Museums



Tr >



W

Coulee Blvd

Jones Bay Campground



Ruby Rock



155

Northrup Point Trailhead



Coulee Blvd

Northrup Canyon



Northrup Canyon Trailhead



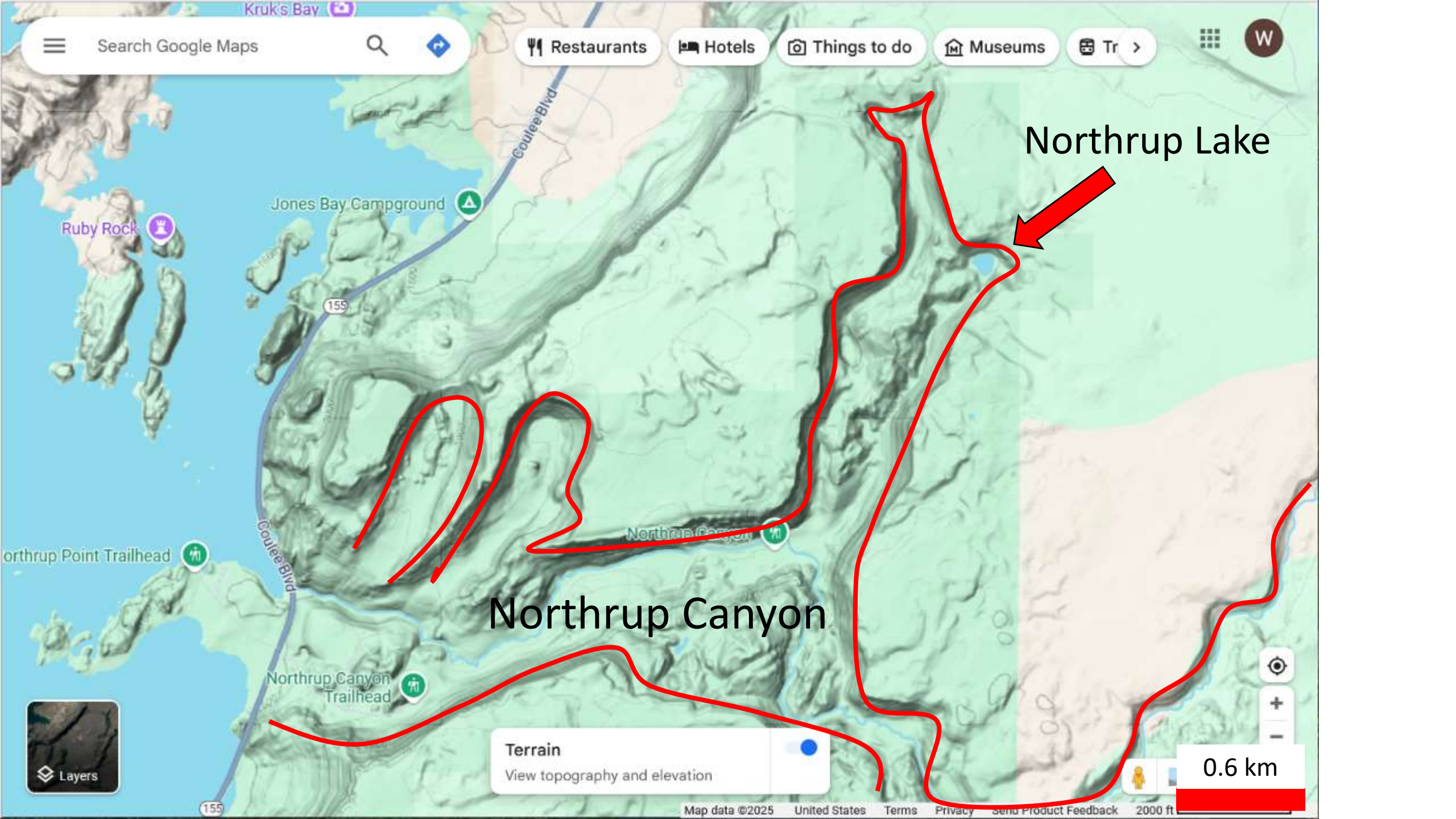
Terrain

View topography and elevation



0.6 km





Northrup Lake

Northrup Canyon

0.6 km



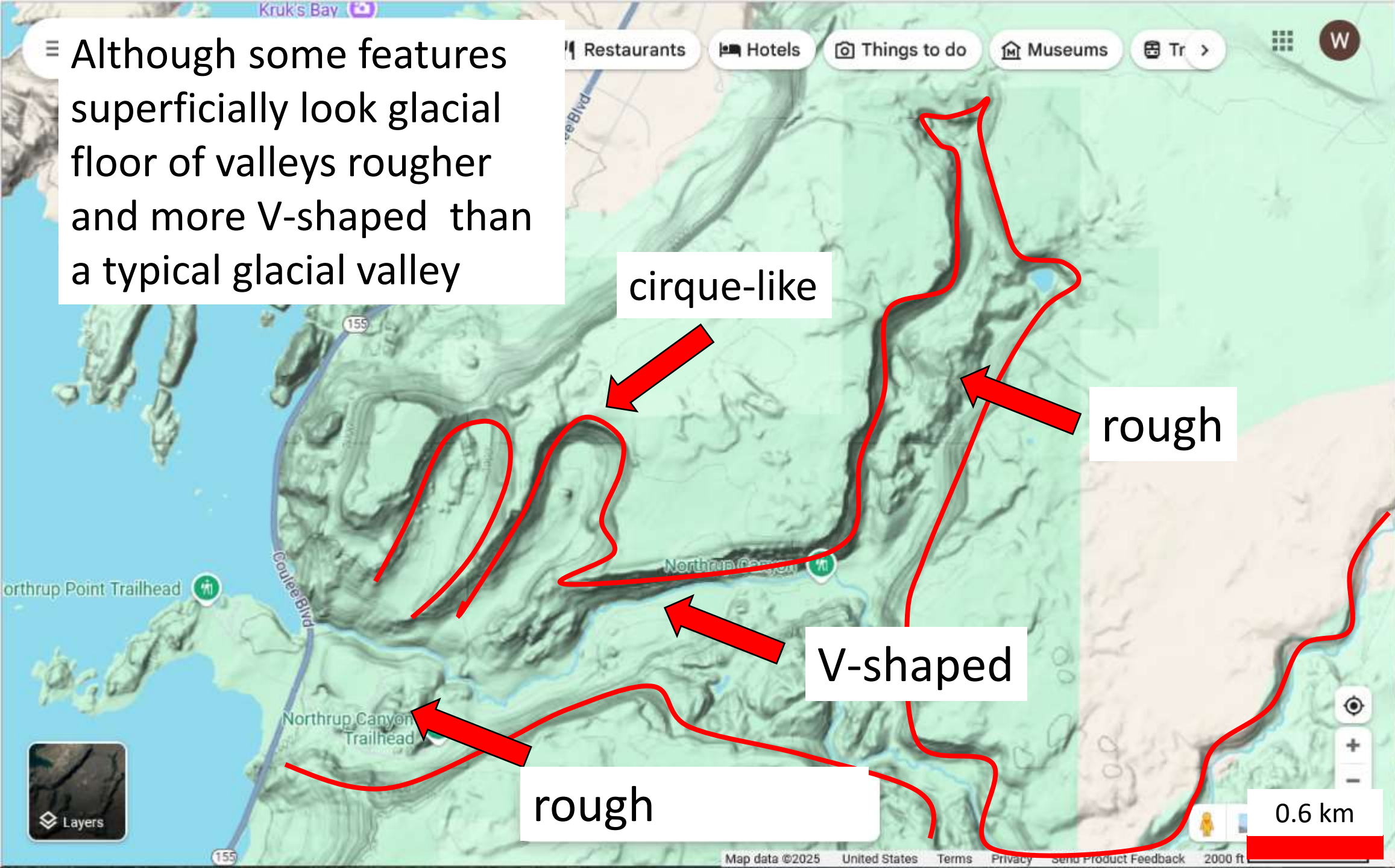








Although some features superficially look glacial floor of valleys rougher and more V-shaped than a typical glacial valley



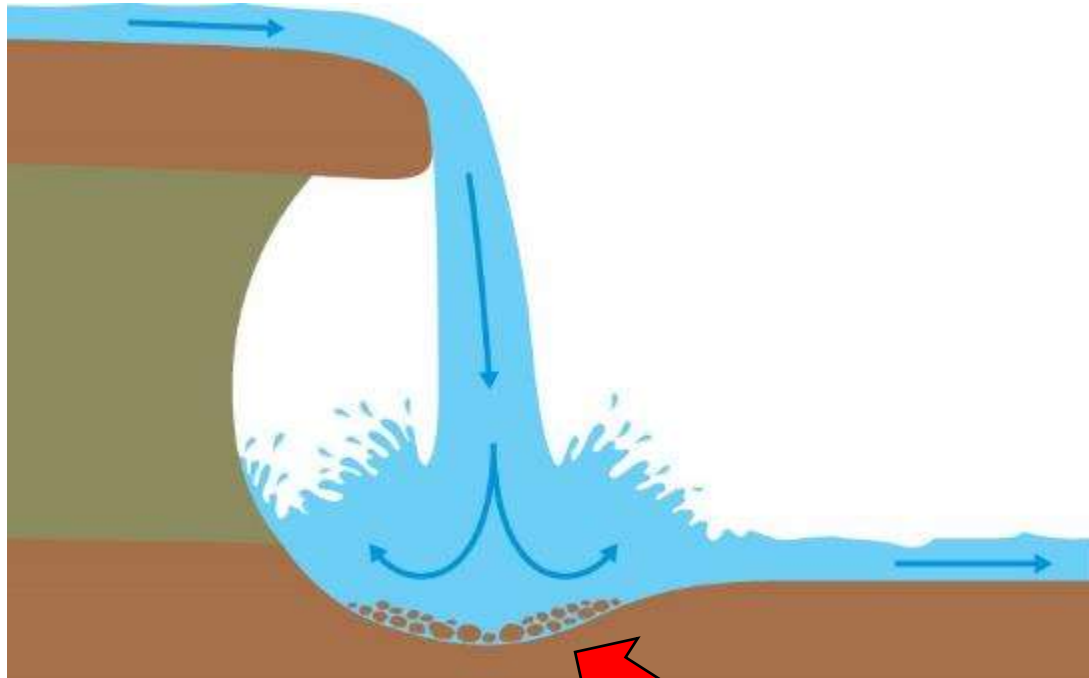




another way  
to make a  
cirque-like  
valley

Niagara Falls,  
New York



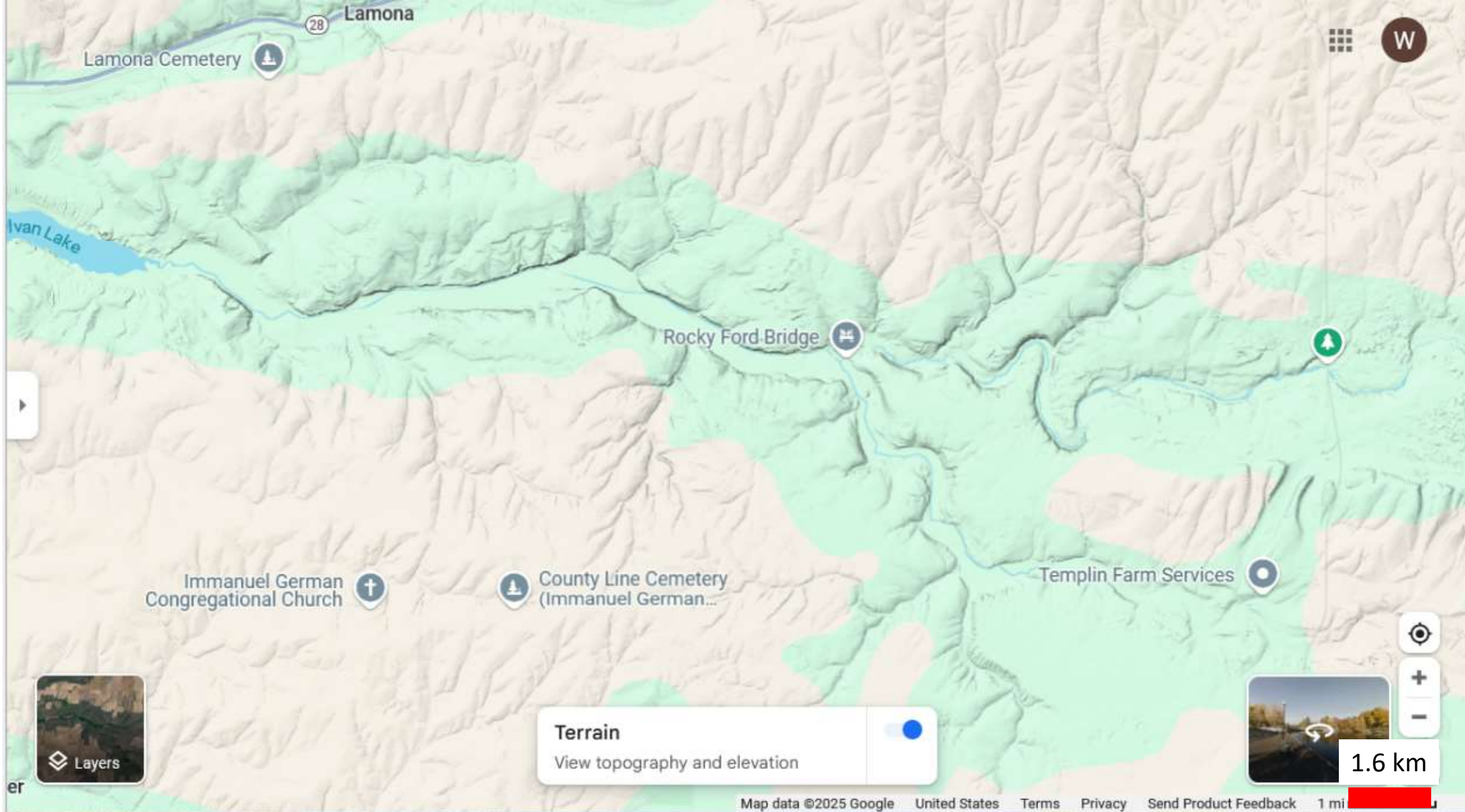


Plunge Pool



Northrup Lake



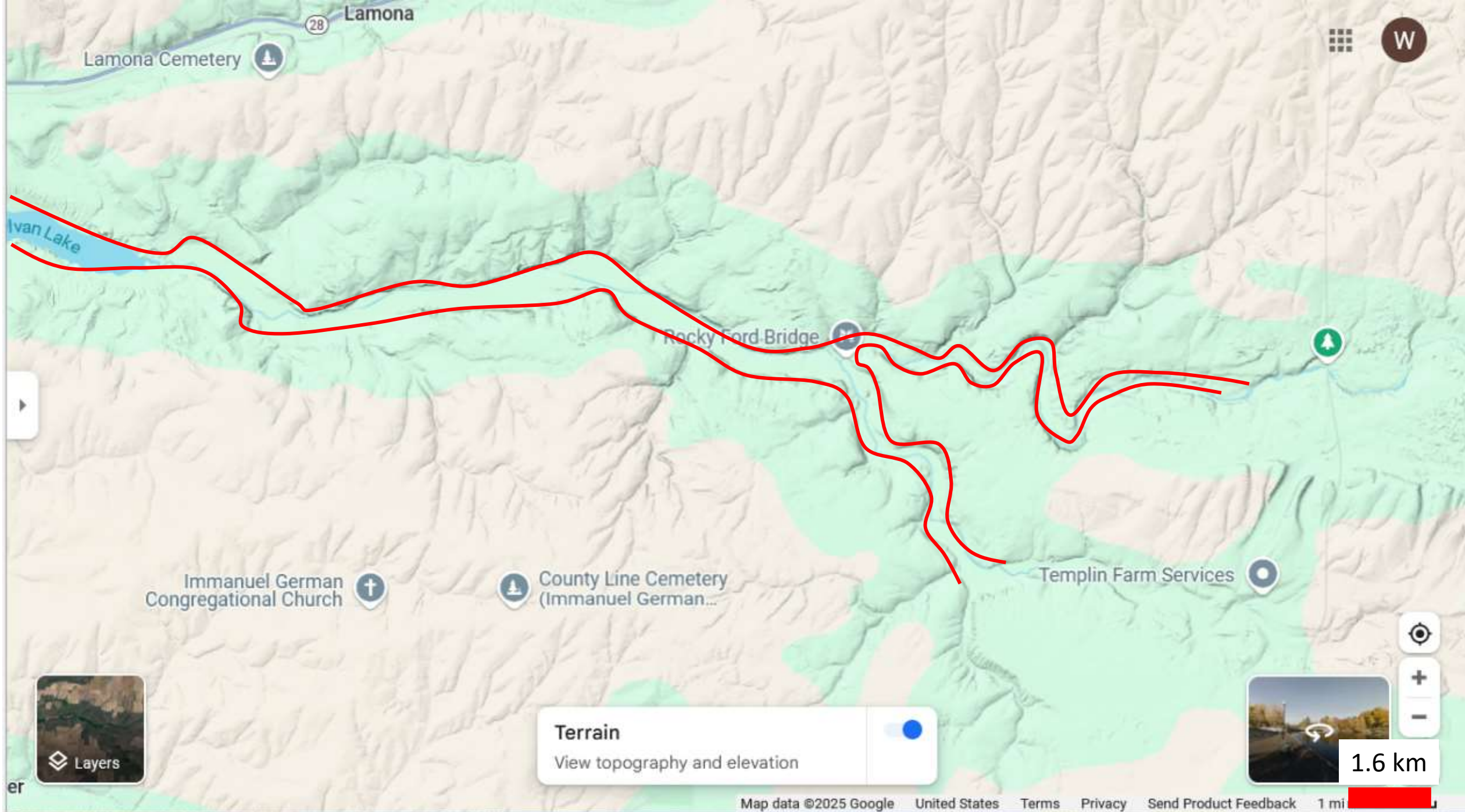


**Terrain**

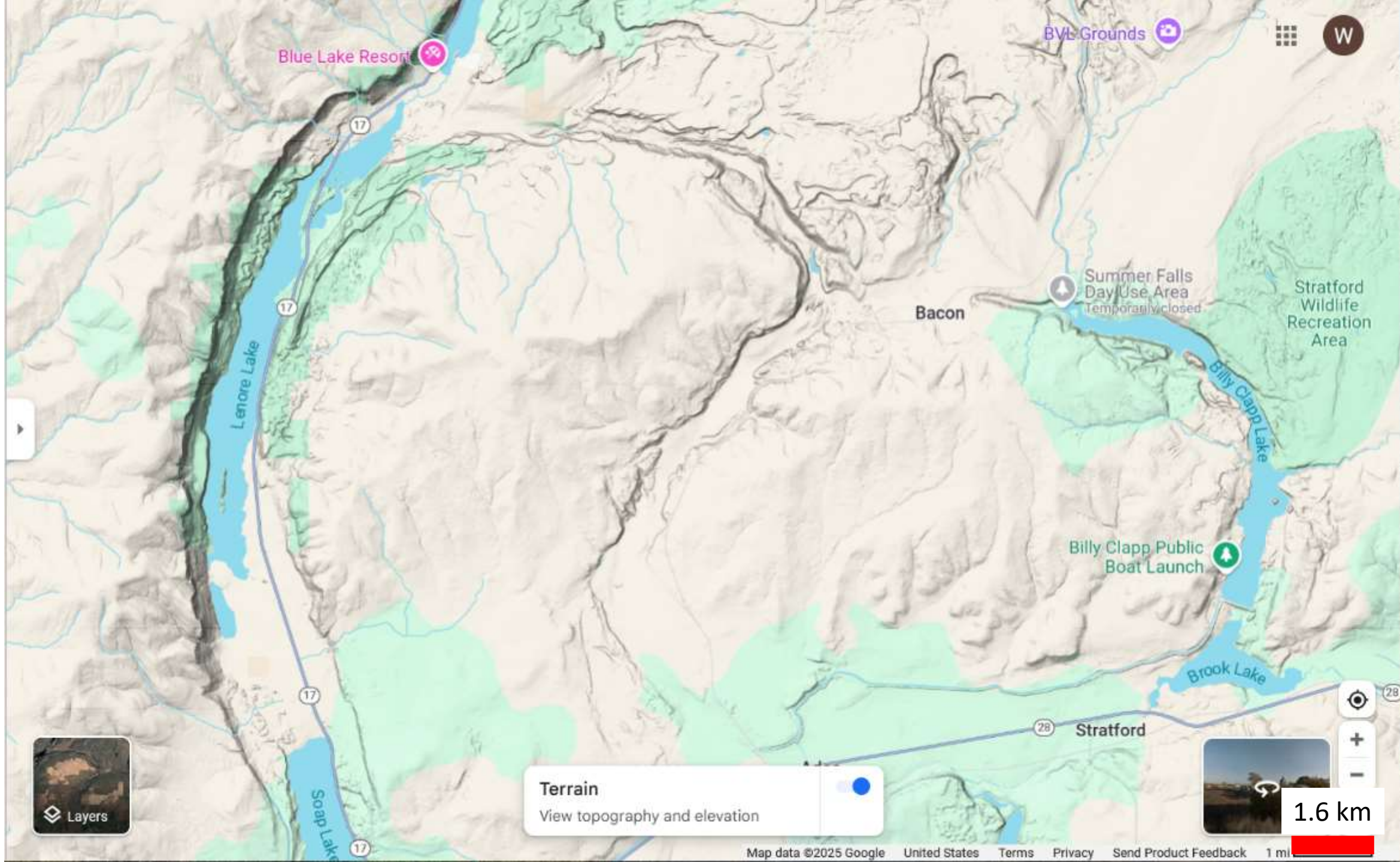
View topography and elevation

☒









Blue Lake Resort

BVL Grounds

Bacon

Summer Falls  
Day Use Area  
Temporarily closed

Stratford  
Wildlife  
Recreation  
Area

Lenore Lake

Billy Clapp Lake

Billy Clapp Public  
Boat Launch

Brook Lake

Stratford

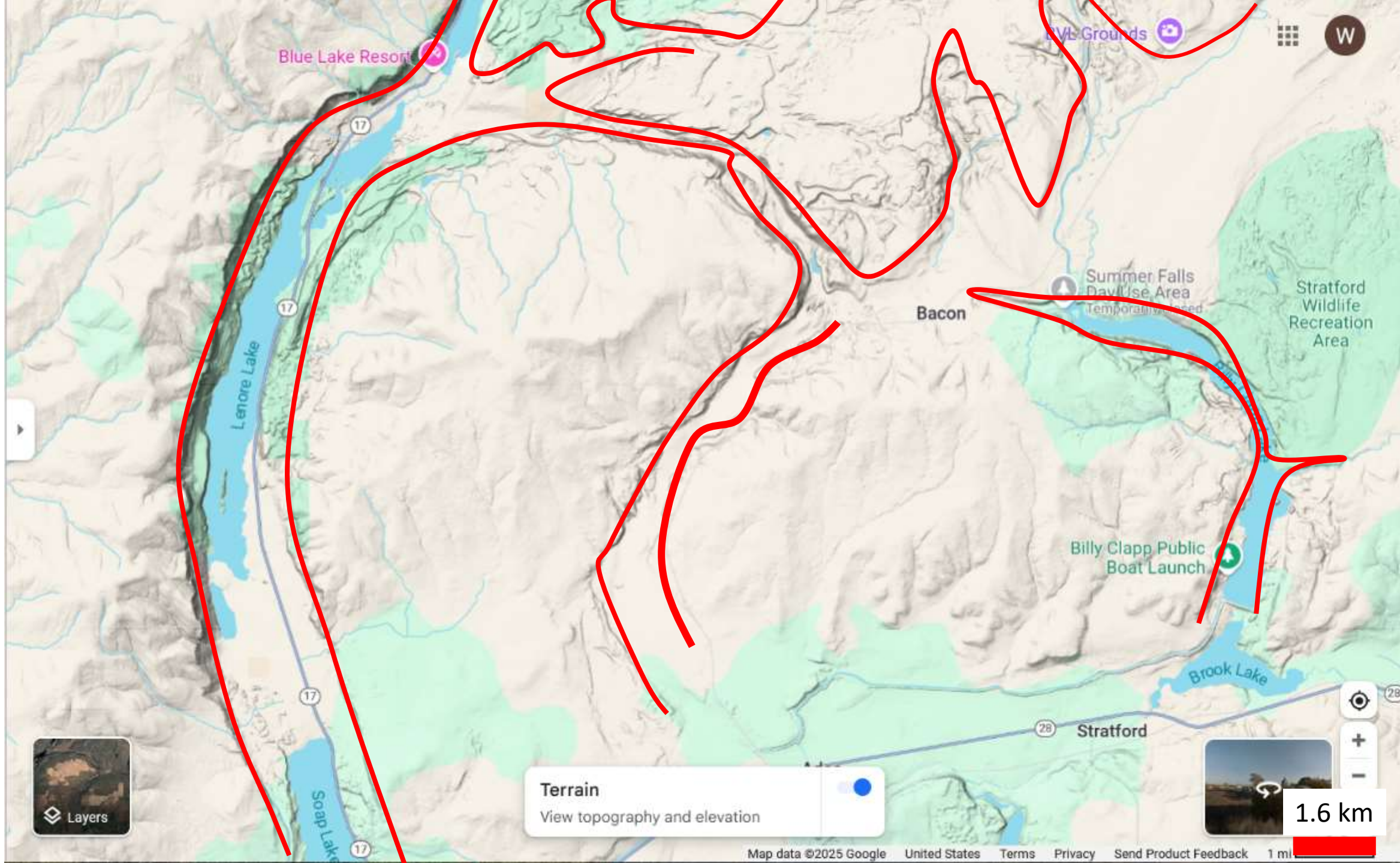
Terrain

View topography and elevation

Layers

1.6 km





Blue Lake Resort

RVs Grounds

Summer Falls  
Day Use Area  
Temporary closed

Stratford  
Wildlife  
Recreation  
Area

Bacon

Billy Clapp Public  
Boat Launch

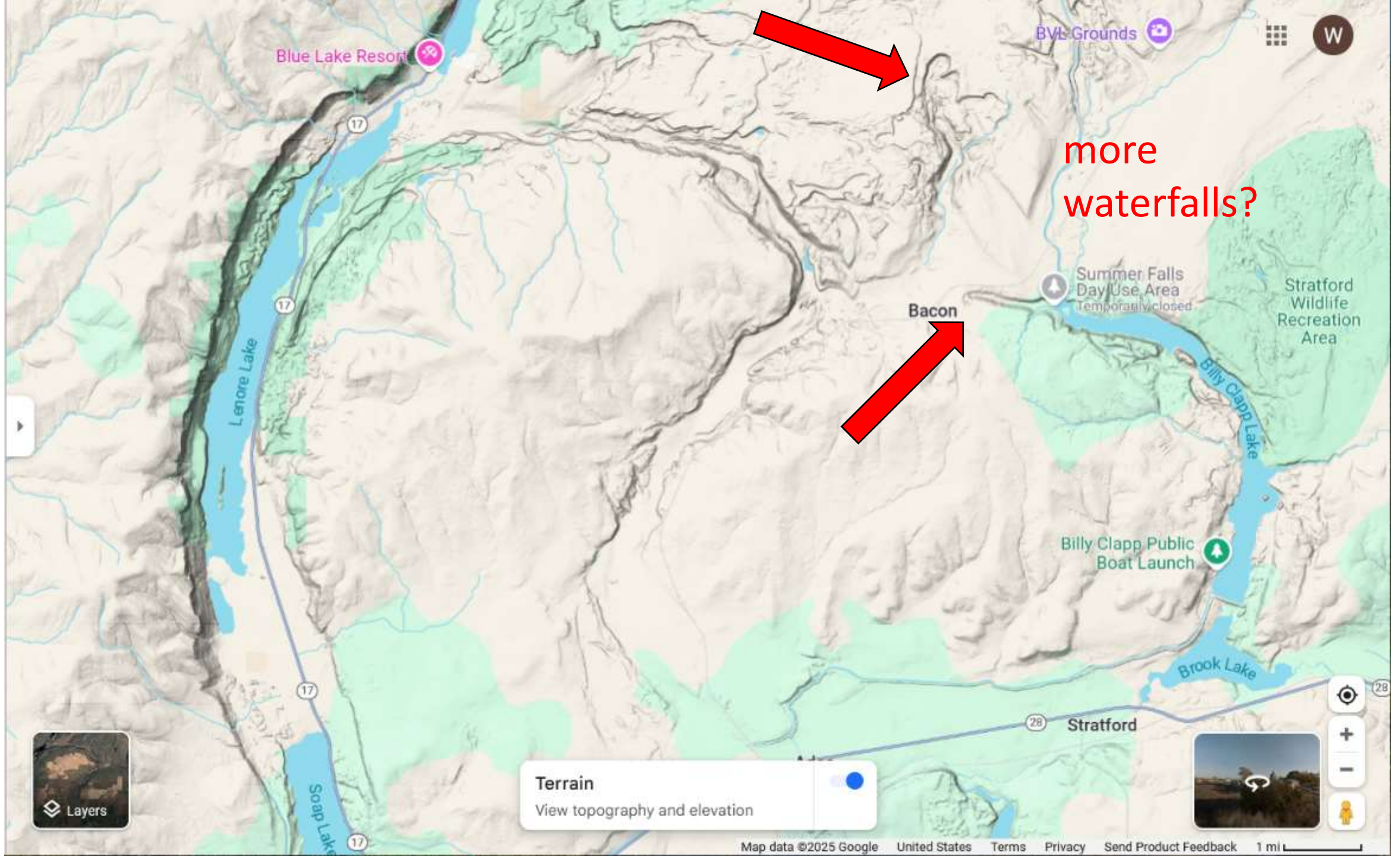
Brook Lake

Stratford

**Terrain**  
View topography and elevation

1.6 km





Blue Lake Resort

BVL Grounds

more  
waterfalls?

Summer Falls  
Day Use Area  
Temporarily closed

Stratford  
Wildlife  
Recreation  
Area

Bacon

Billy Clapp Lake

Billy Clapp Public  
Boat Launch

Brook Lake

Stratford

**Terrain**  
View topography and elevation

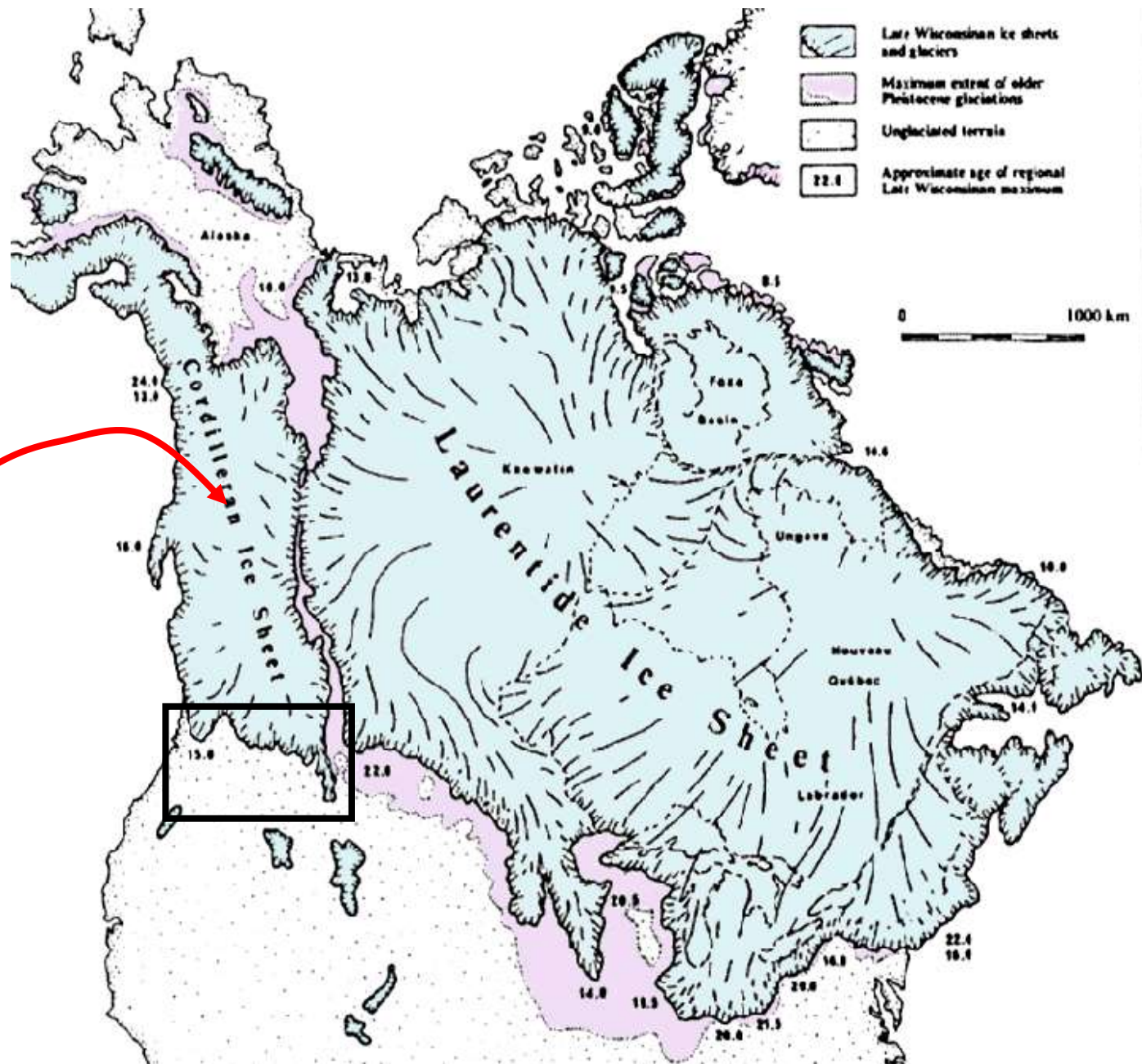




superficially cirque-like but much rougher than typical cirque



# Cordilleran Ice Sheet







Ice Dam

Glacial Lake





Ice Dam

Lake

Spokane

Missoula





Clark Ford Idaho, site of Ice Dam



**Channeled  
Scablands**

Okanogan  
Lobe

Spokane

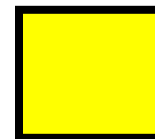
WA

**Wallula Gap**

West  
Bar



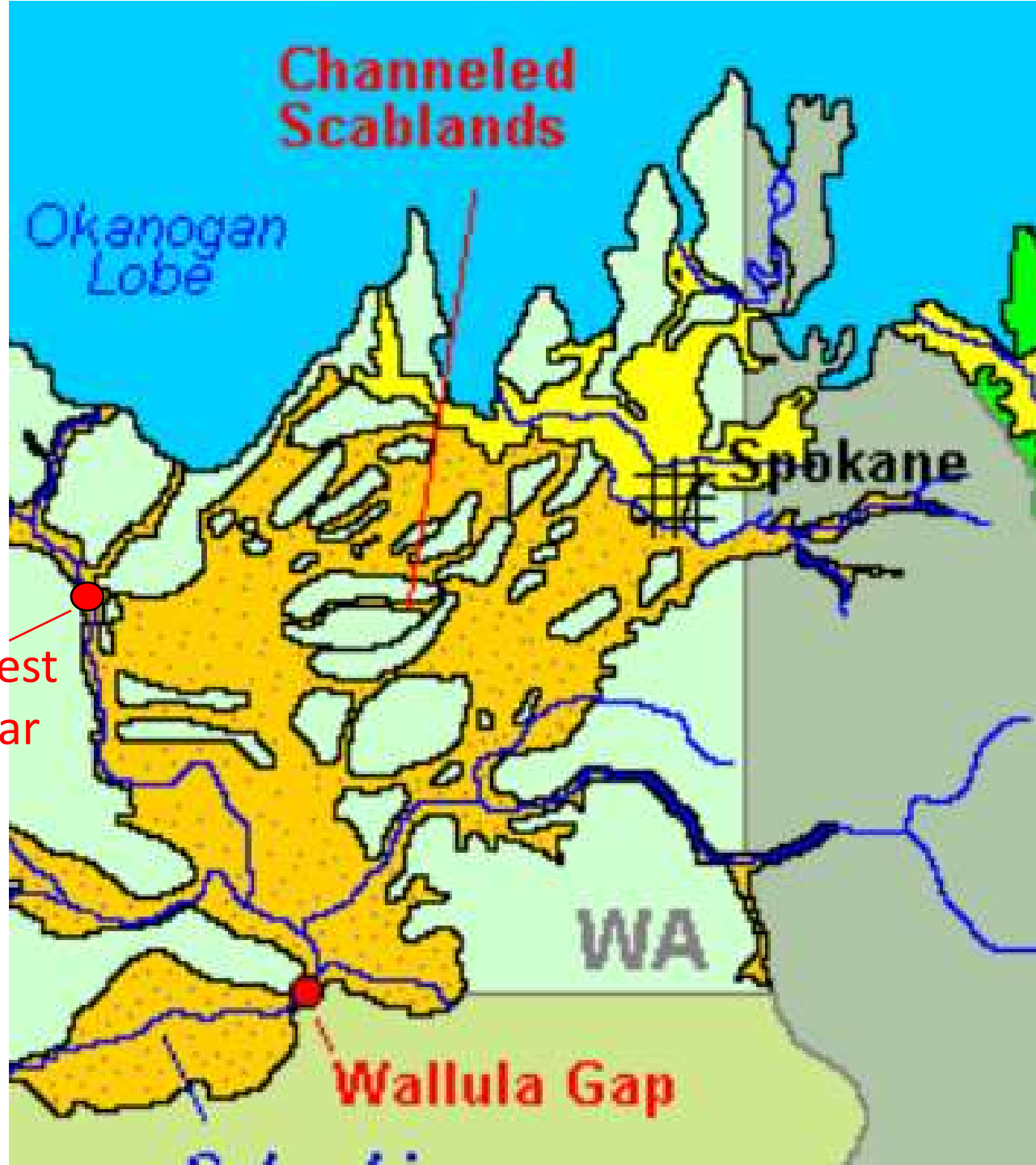
Glaciers



Lake



Flood







West Bar

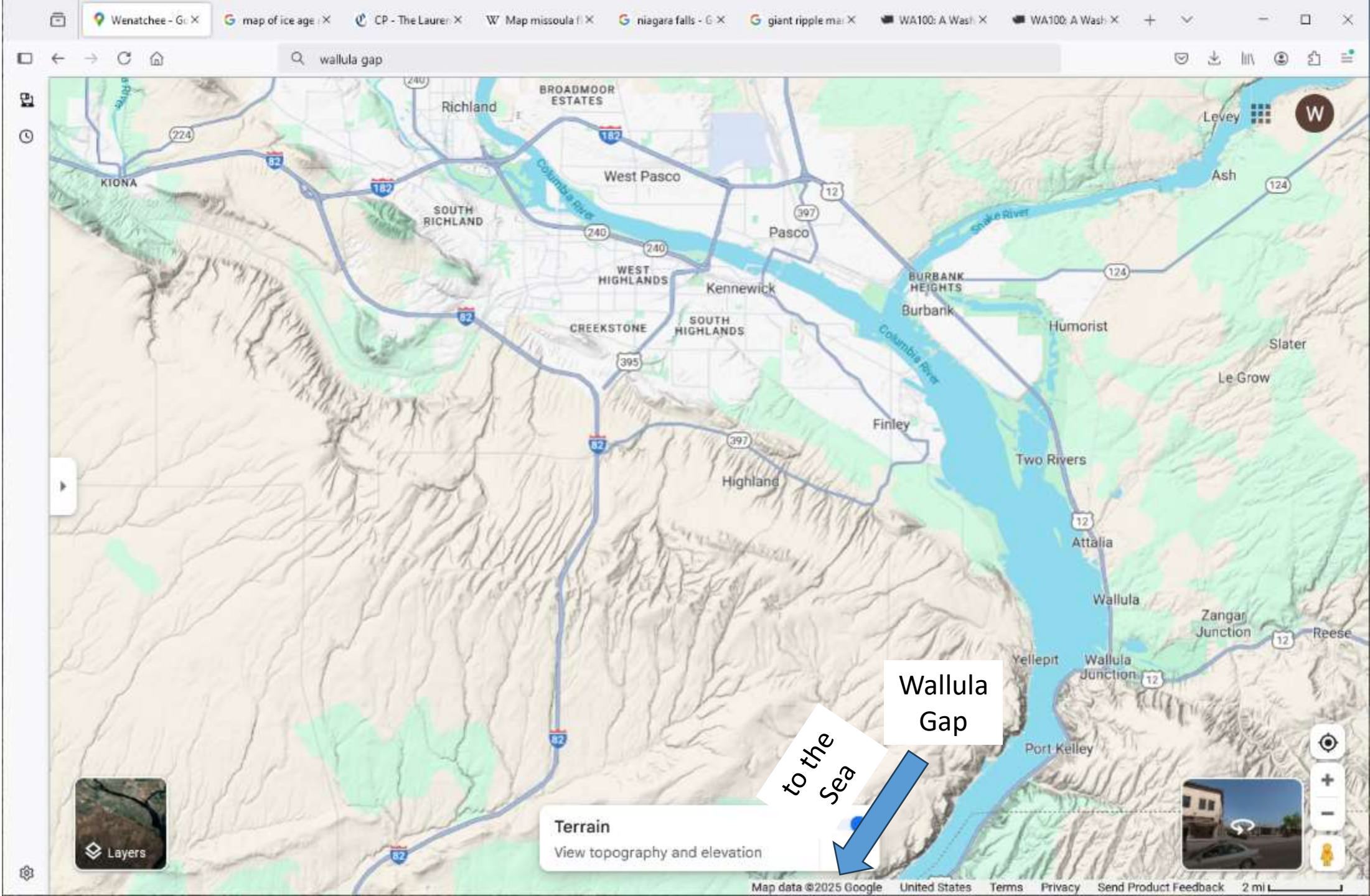
Columbia River

to the Sea

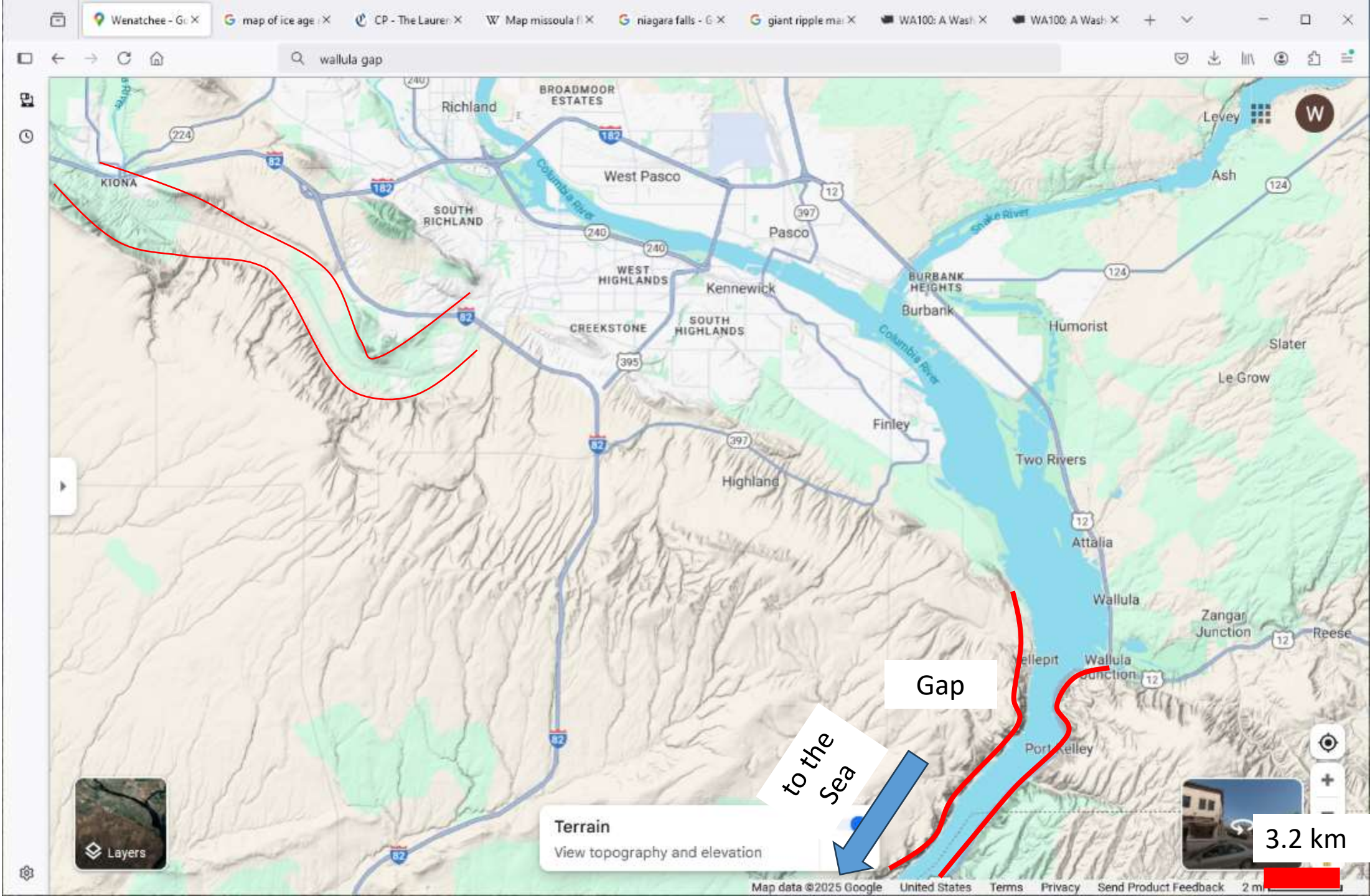
Wallula Gap

16 km







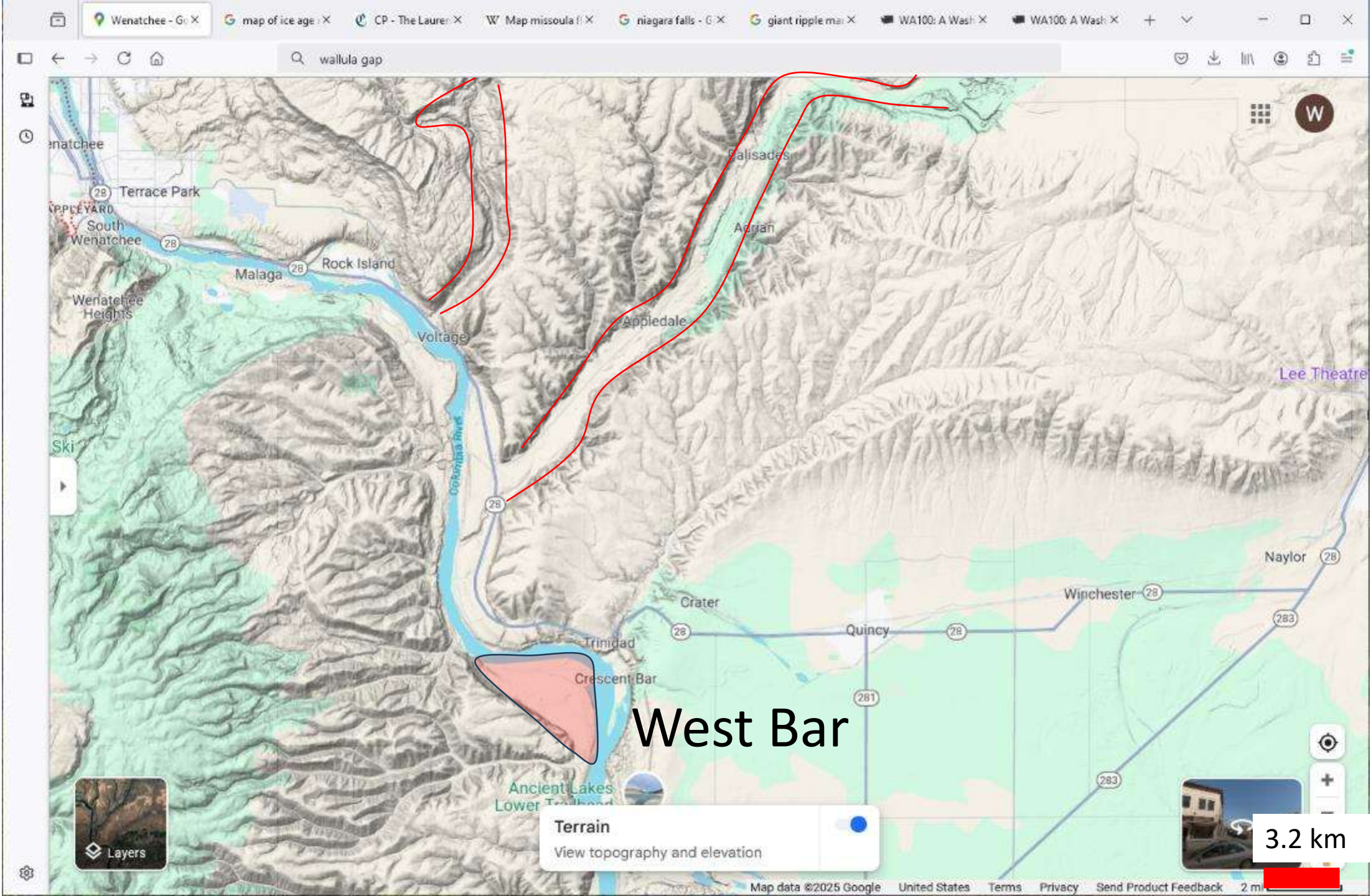






Wallula Gap





West Bar

3.2 km

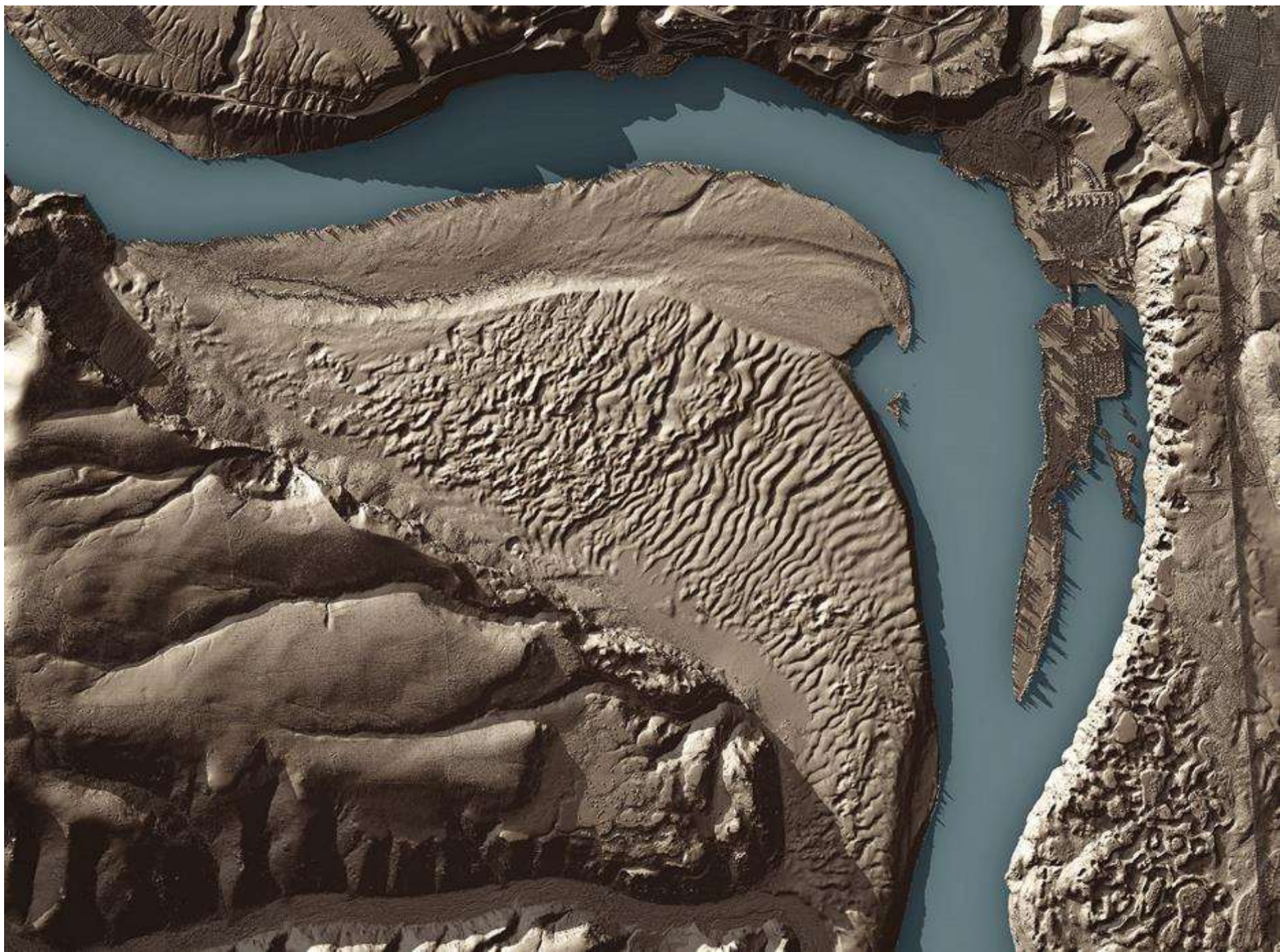




West Bar

Giant  
Ripple  
Marks









Ice Dam

Glacial Lake