

Introduction

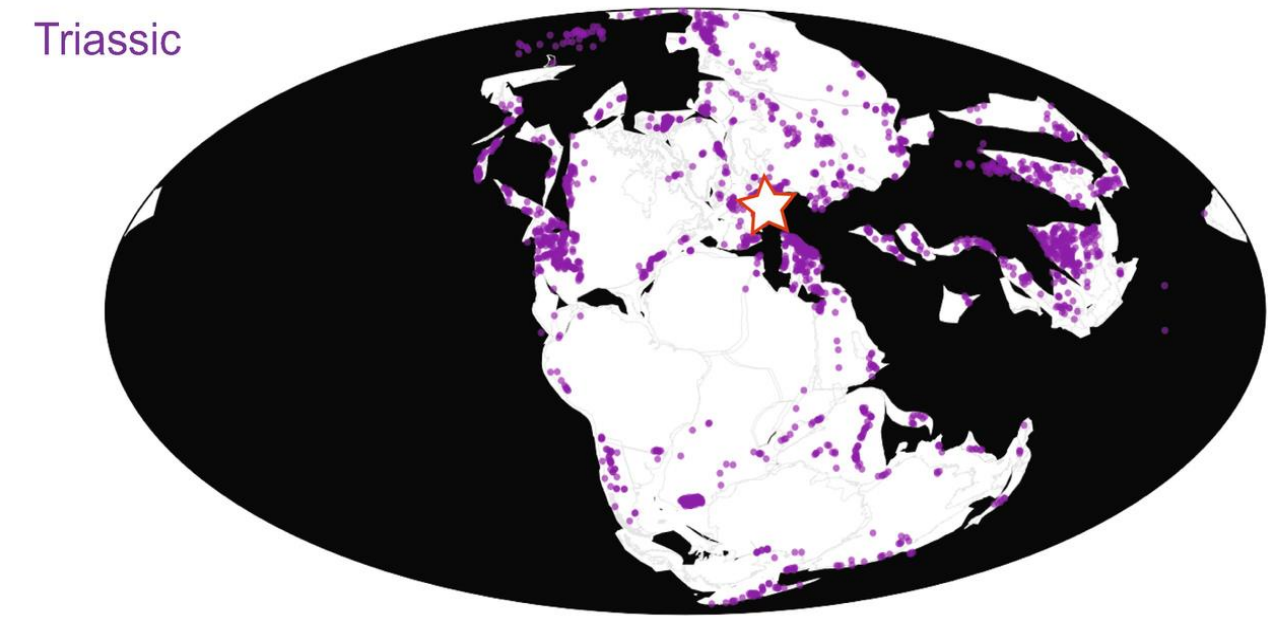
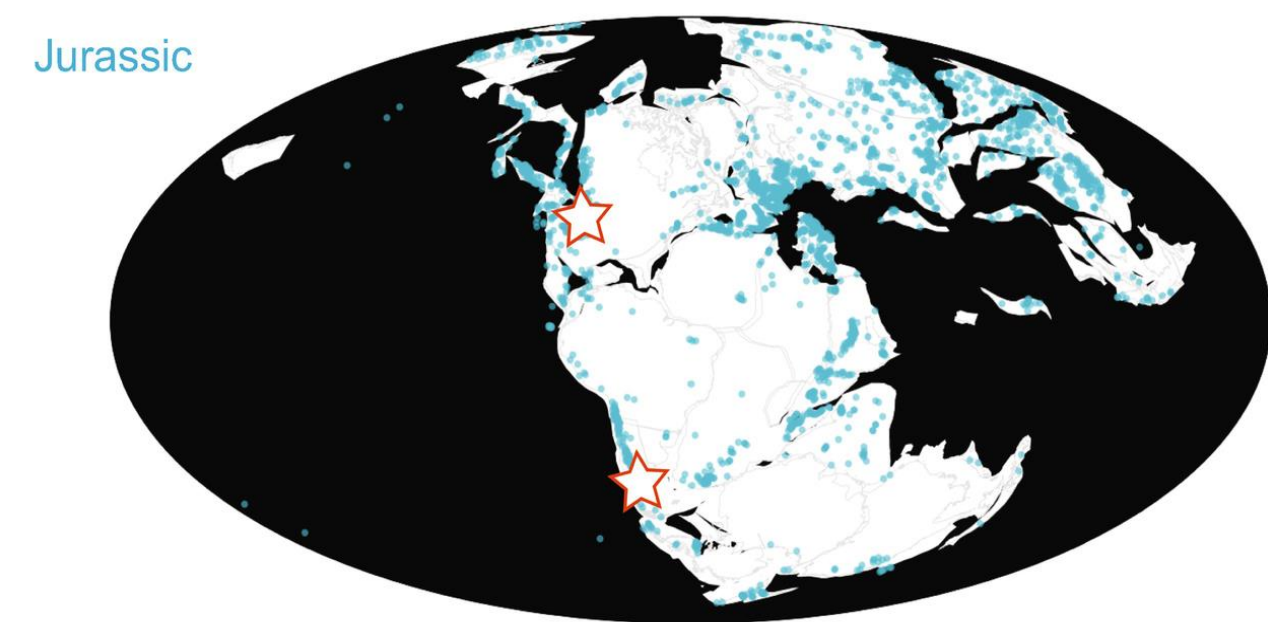
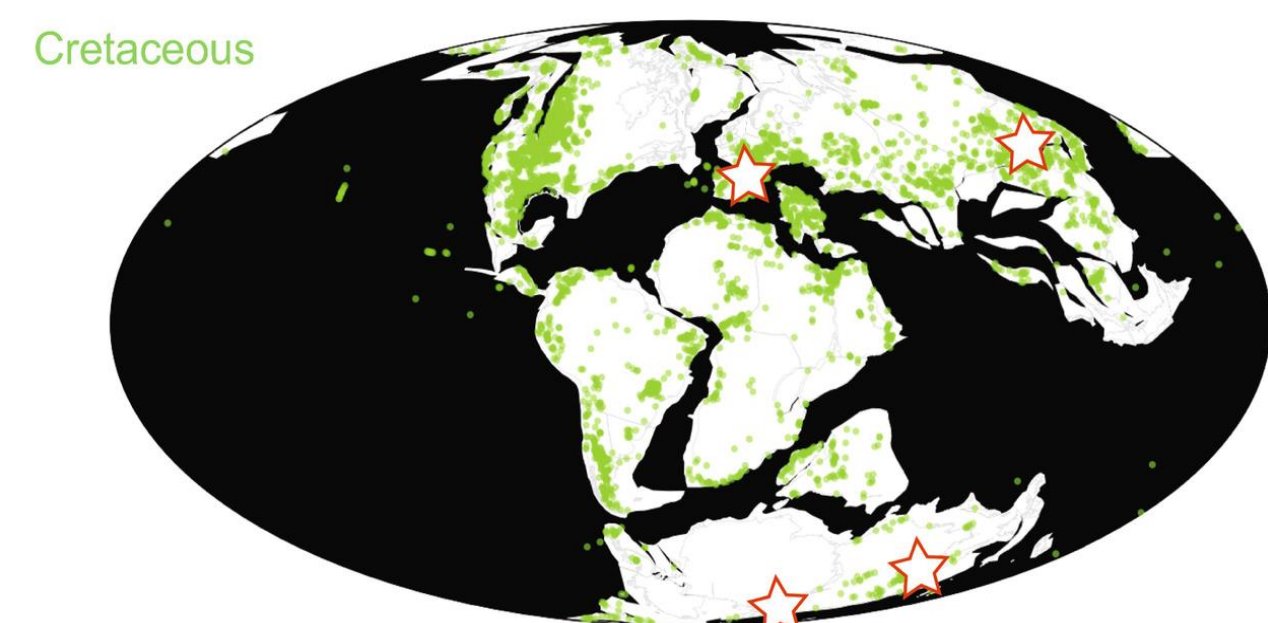
The Mesozoic Era is well-studied for dinosaurs fossilized remains to reconstruct the historical paleogeography of North America. Throughout this era, the eustatic sea level shifted, altering the landscape and impacting dinosaurs' ecosystems. We addressed the research question: can we outline the eustatic sea level change using dinosaur fossil deposits?

To accomplish this goal, we utilized geologic knowledge and GIS techniques to theoretically map an outline of North America's eustatic sea level history.

Methods

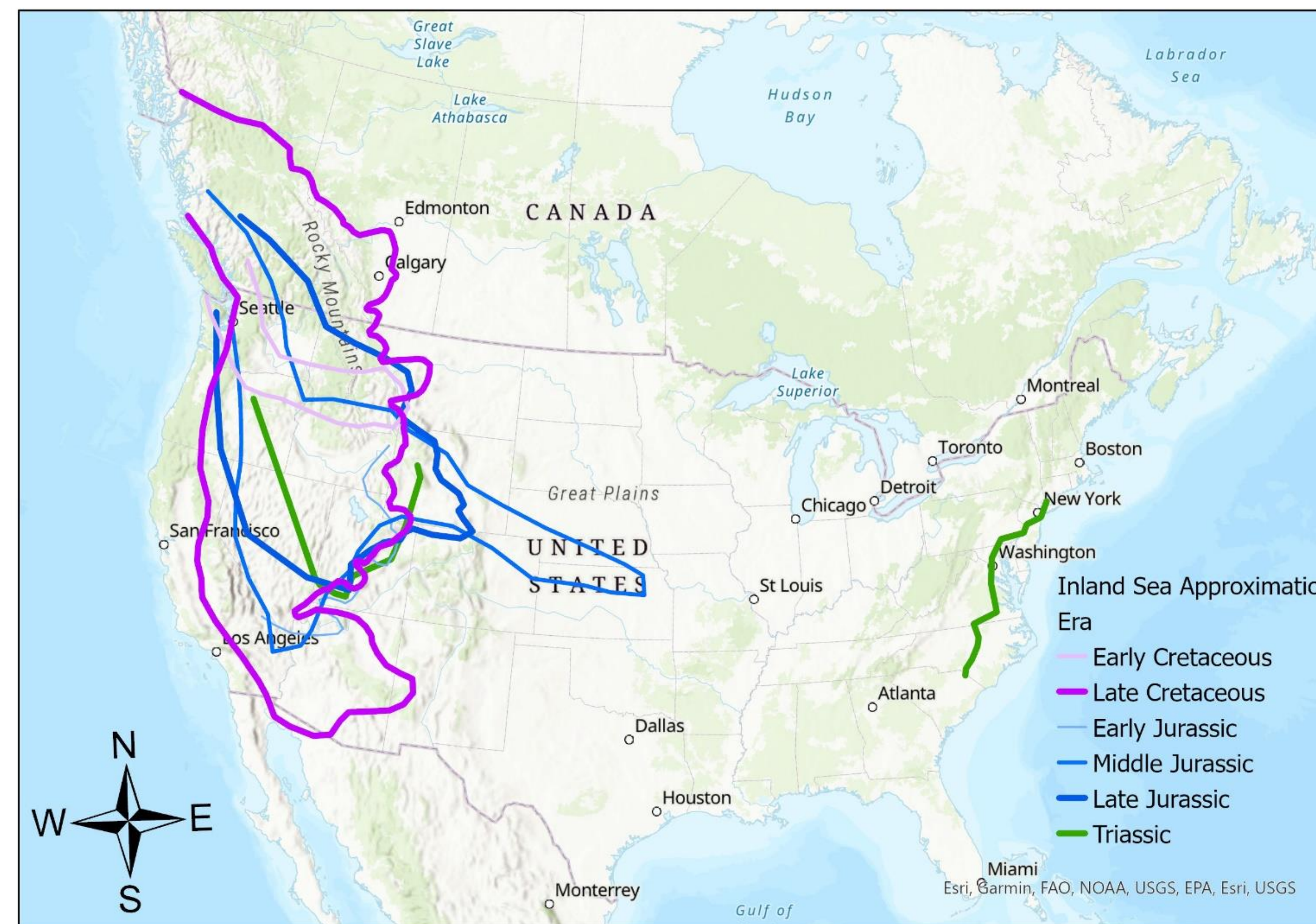
- 1.) Searched for research articles on Morrison and Kootenai Formation discussing fossil deposits and existing maps of Pangea.
- 2.) Downloaded data from ArcGIS online and Paleobiology Database to create a time lapse of continental movement.
- 3.) Organized data into individual layers and classified dinosaurs into specific categories based on time period, predator or prey.
- 4.) Created a hypothetical outline of sea level for each time period using the locations of fossil deposition.

Period	Sub-period	Approx. Age (Ma)	
Cretaceous	Maastrichtian	66.0	
	Upper	Campanian	72.1 ± 0.2
		Santonian	83.6 ± 0.2
		Coniacian	86.3 ± 0.5
		Turonian	89.8 ± 0.3
		Cenomanian	93.9
	Lower	Albian	~113.0
		Aptian	~125.0
		Barremian	~129.4
		Hauterivian	~132.9
Valanginian		~139.8	
Jurassic	Berriasian	~145.0	
	Tithonian	152.1 ± 0.9	
	Upper	Kimmeridgian	157.3 ± 1.0
		Oxfordian	163.5 ± 1.0
	Middle	Callowian	166.1 ± 1.2
		Bathonian	168.3 ± 1.3
		Spicocan	170.3 ± 1.4
		Aalenian	174.1 ± 1.0
	Lower	Toarcian	182.7 ± 0.7
		Pliensbachian	190.8 ± 1.0
Sinemurian		199.3 ± 0.3	
Hettangian		201.3 ± 0.2	
Triassic	Rhaetian	~208.5	
	Upper	Norian	~227
		Carnian	~237
		Ladinian	~242
	Middle	Anisian	247.2
		Olenekian	251.2
	Lower	Induan	251.902 ± 0.024

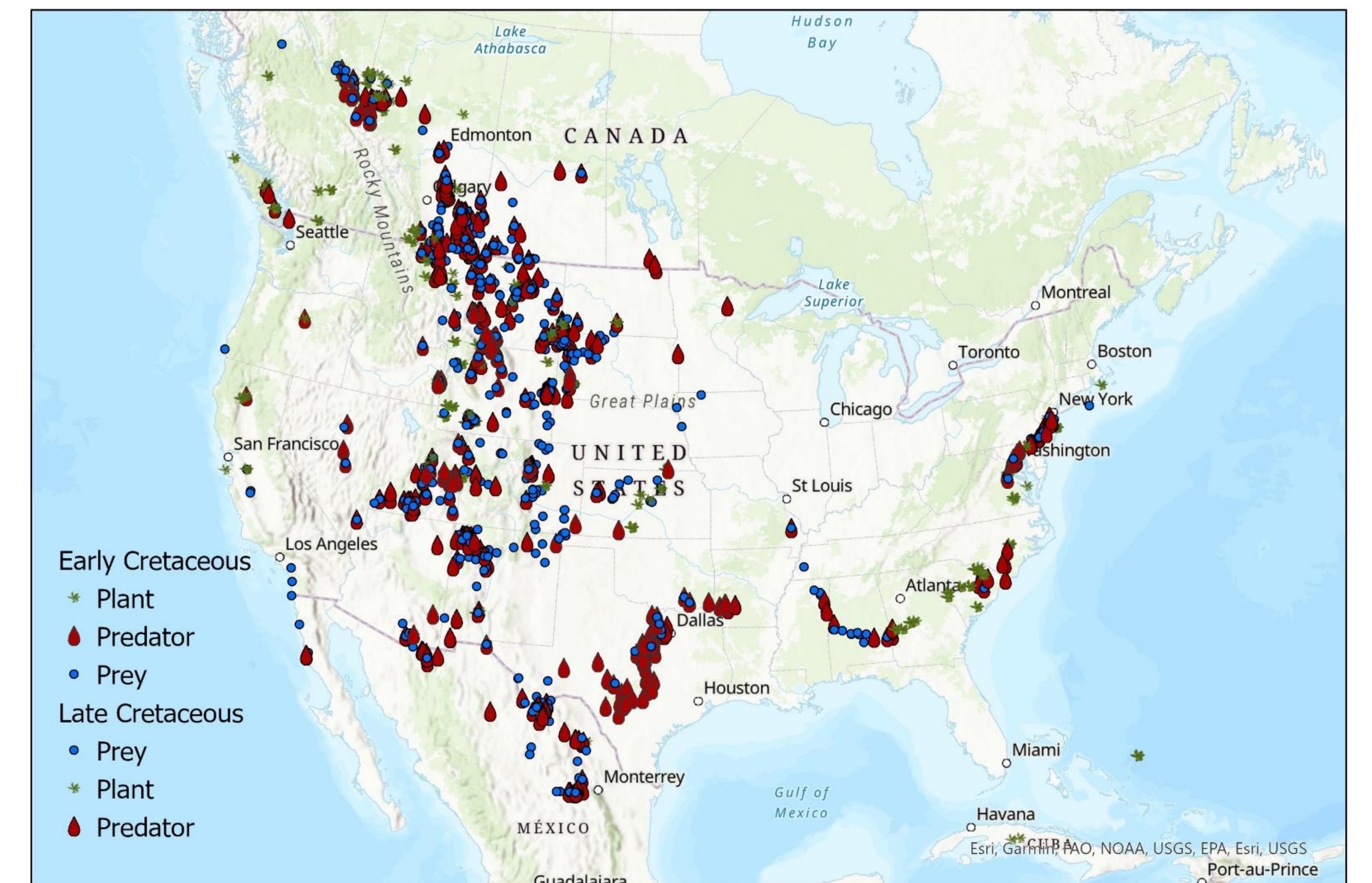


Tschopp, Emanuel, et al. "How to live with dinosaurs: Ecosystems across the Mesozoic." Nature through Time: Virtual field trips through the Nature of the past. Cham: Springer International Publishing, 2020. 209-229.

Mesozoic Fossils Predict Inland Seas



Inland Sea Approximation



Prey vs Predator Cretaceous Period (145-66Ma)



Prey vs Predator Triassic Period (251-201Ma)



Prey vs Predator Jurassic Period (201-145Ma)

Discussion

During the Jurassic period the map displays the eustatic sea level increasing the furthest. The western coast is completely separated from North America. Geologically this separation results from the development of the Sundance sea occurrence primarily in the Jurassic period. Throughout the establishment of the outline, it displayed extreme fluctuations in sea level. These environmental events reduced or expanded the available area dinosaurs could inhabit. The fossil record reflected these sea level rise and fall events by influencing the distance of depositing further inland. Spatially, this demonstrates the trend relationship between fluctuating sea level and fossil deposition locations.

Conclusion

In conclusion, the maps effectively displayed as the eustatic sea level expanded and reduced it directly impacted the locations of where fossils were being deposited. Research similar to this is important because it allows scientists to study how the change in geography can affect living organisms. Abrupt changes in the environment can have devastating effects on the surrounding ecosystem. Animals and plants aren't always well adapted enough to withstand sudden widespread ecological changes. This could impact how far they must travel for food and affect the range that their capable of inhabiting. If I could continue my research, I would expand to studying all animals and plants so that I can have a higher detailed outline using more specimens. I could construct a more detailed outline of eustatic sea level.



Bibliography

<https://paleobiodb.org/navigator/>
<https://deeptimemaps.com/north-america/>
 Tschopp, Emanuel, et al. "How to live with dinosaurs: Ecosystems across the Mesozoic." Nature through Time: Virtual field trips through the Nature of the past. Cham: Springer International Publishing, 2020. 209-229.