

Modern Field Work in the Uinta Basin, UT

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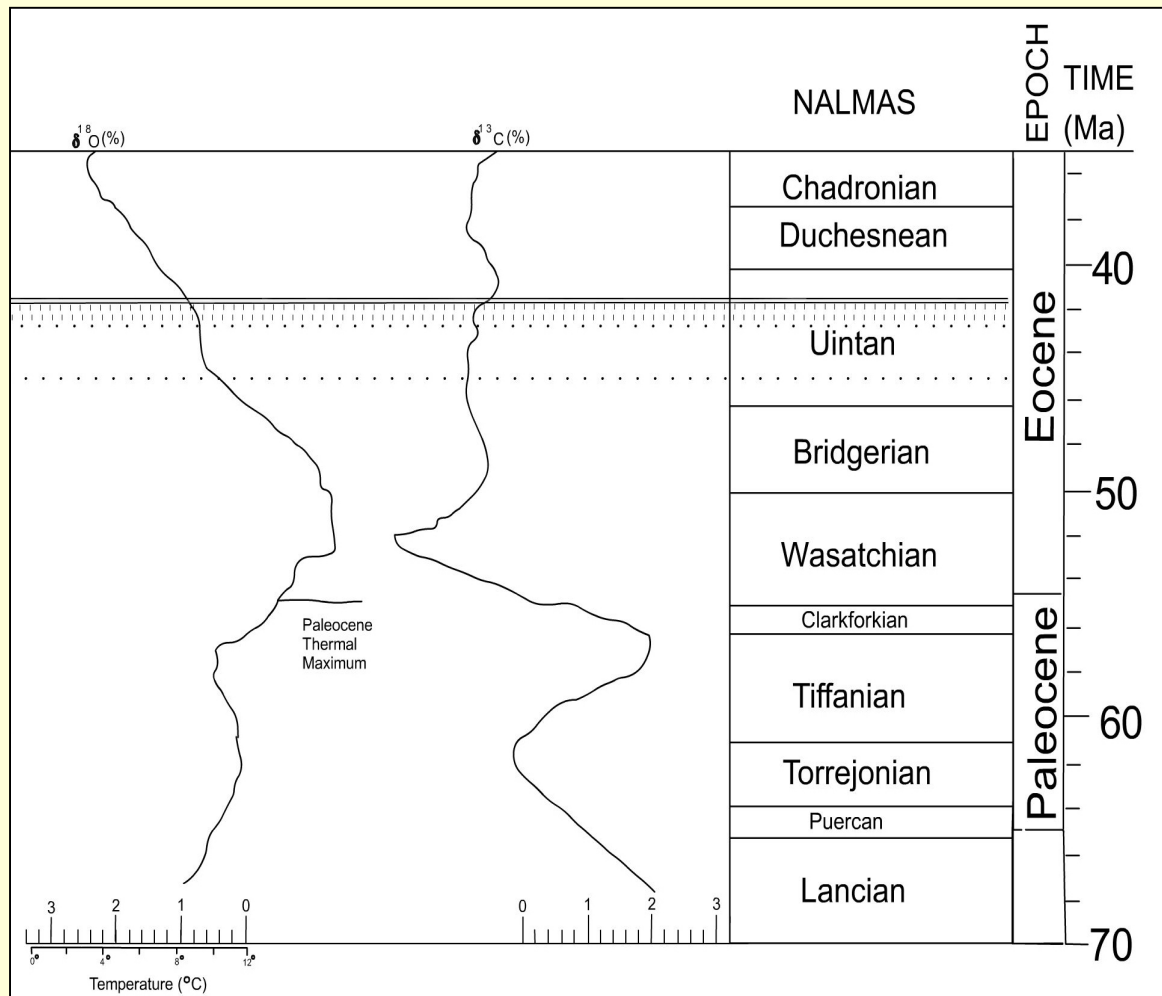
Paul C. Murphey - San Diego Museum of Natural History



The Uinta Basin

- East-West synclinal basin
- Bounded by:
 - Uinta Mtns. (north)
 - Book Cliffs (south)
 - Wasatch Mtns. (west)
 - Douglas Creek Arch (east)

The Uinta Basin Record



} Duchesne River Fm.
 } Uinta Fm.
 } Green River Fm.
 } Wasatch Fm.

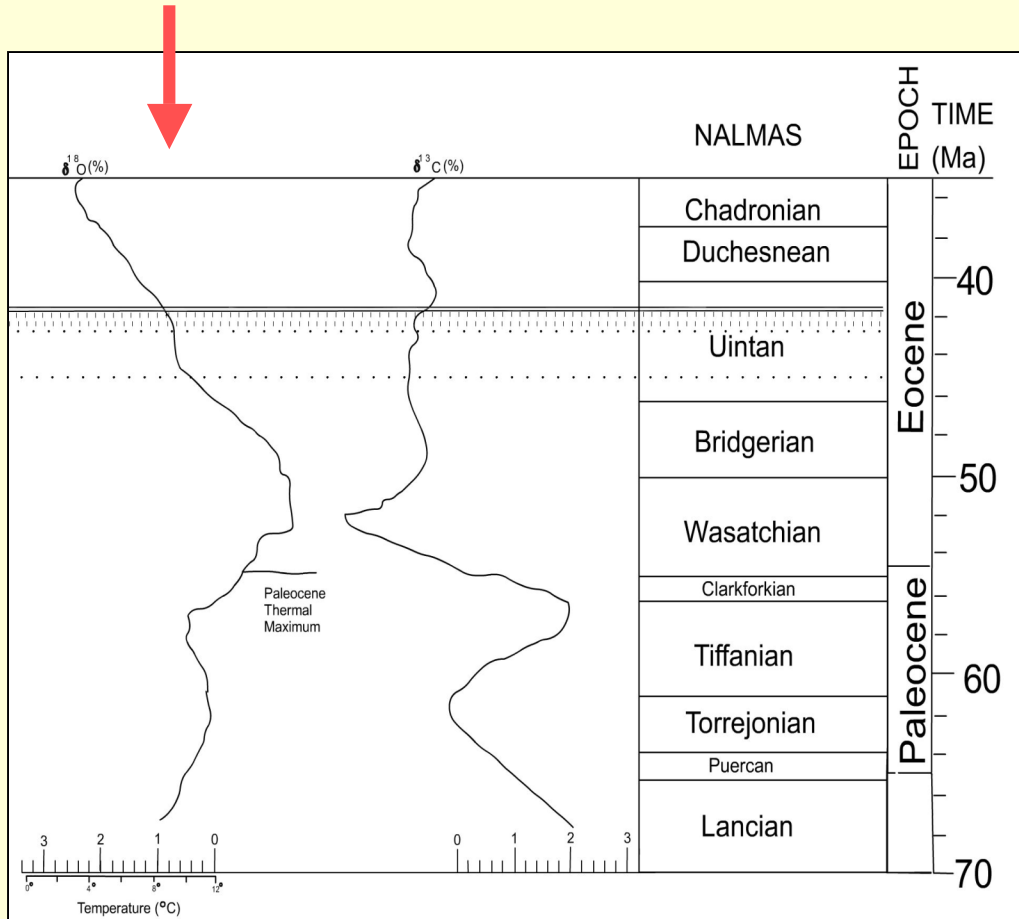
Nearly complete 20my record of deposition

The Uinta and Duchesne River Formations



- Fluvial deposition
- Change in source rocks between formations
- **Type sections for the Uintan and Duchesnean NALMAs respectively**

The Middle Eocene Environmental Record

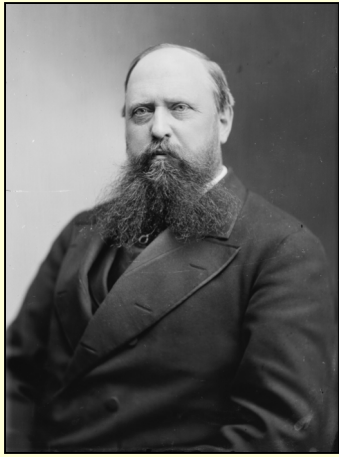


- Climate changes from hotter & wetter to cooler & dryer
- Change from tropical to woodland habitats
- Increase in provincialism

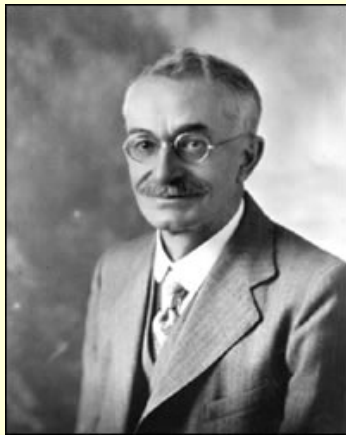
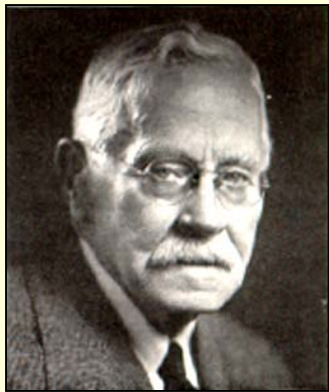
Middle Eocene faunal change

- Paleocene -
Early Eocene
 - primates
 - primitive ungulates
(e.g. “condylarths”)
 - oxyaenidans
 - hyaenodontans

- Uintan -
Duchesnean
 - rodents
 - selenodont
artiodactyls
 - rhinos
 - carnivorans



History of collecting in the Uinta Basin



- 1875 - O.C. Marsh for Yale Expeditions
- 1880's - F. Spier for Princeton
 - Studied by W.B. Scott and H.F. Osborn
- Early 1900's - O.A. Peterson and E. Douglass for the Carnegie Museum



Recent Work in the Uinta Basin



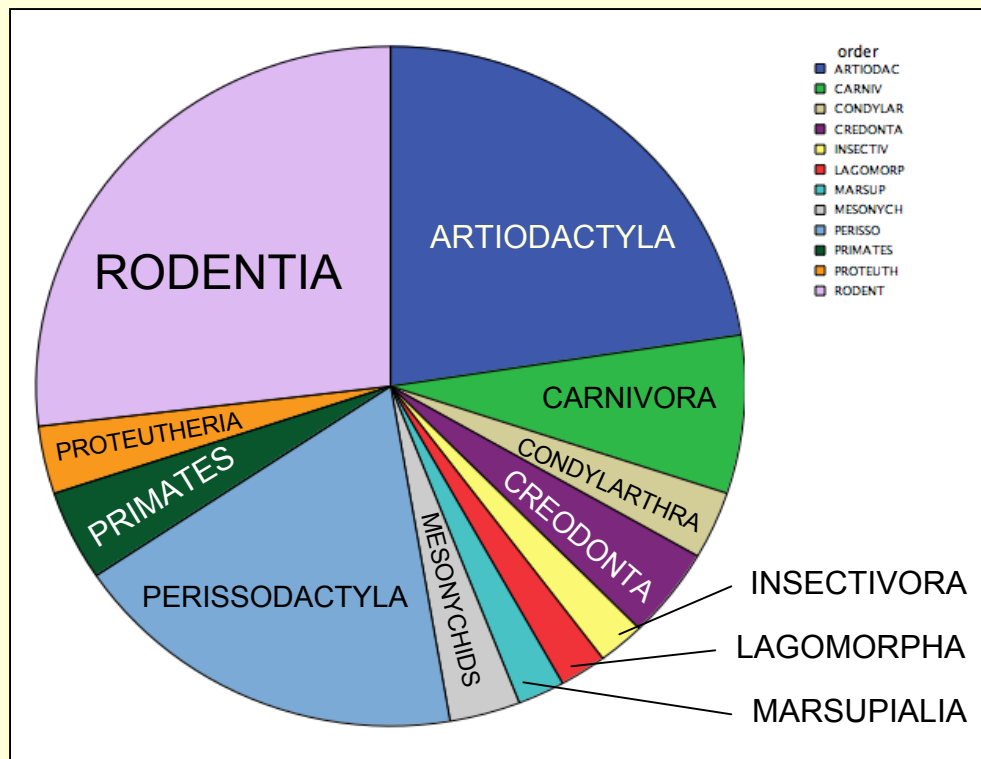
- Begun in the early 1990's
- First headed by D. Tab Rasmussen from Washington University in St. Louis
- Focus on small and medium mammals

Current Work in the Uinta Basin



- Begun in the early 2000's
- Leaders & Crews from:
 - UCLA
 - Midwestern University
 - San Diego Museum of Natural
 - College of Charleston
 - Lamar University

Recent Collecting Efforts



- 3000+ vertebrate specimens, a majority of which are identifiable to genus
- Most are small to medium-sized animals

New Species

- Proteutheria
 - *Pantolestes* n. sp.
- Lipotyphla
 - *Zionodon walshi*
(Dunn & Rasmussen, 2009)
- Primates
 - *Chipetaia lamporea*
(Rasmussen, 1996)
 - *Omomyini* n. sp.

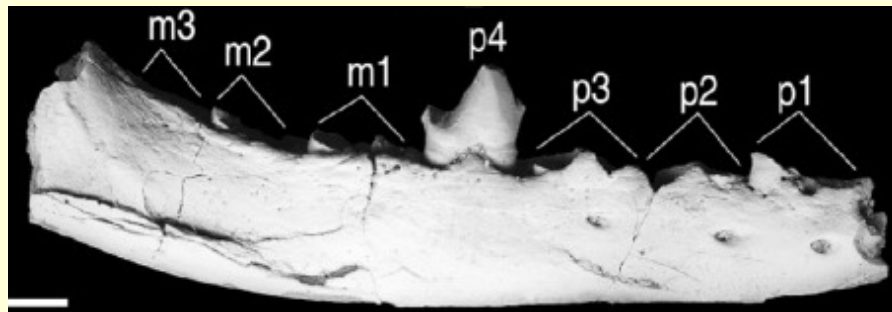
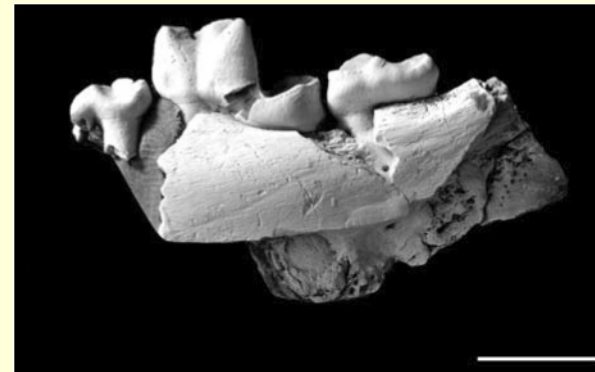
- Rodentia
 - *Natrona* n. sp.
 - *Sciuravus* n. sp.
- Carnivora
 - *Miocyon vallisrubrae*
(Friscia & Rasmussen, 2010)
- Artiodactyla
 - new genus

New Species



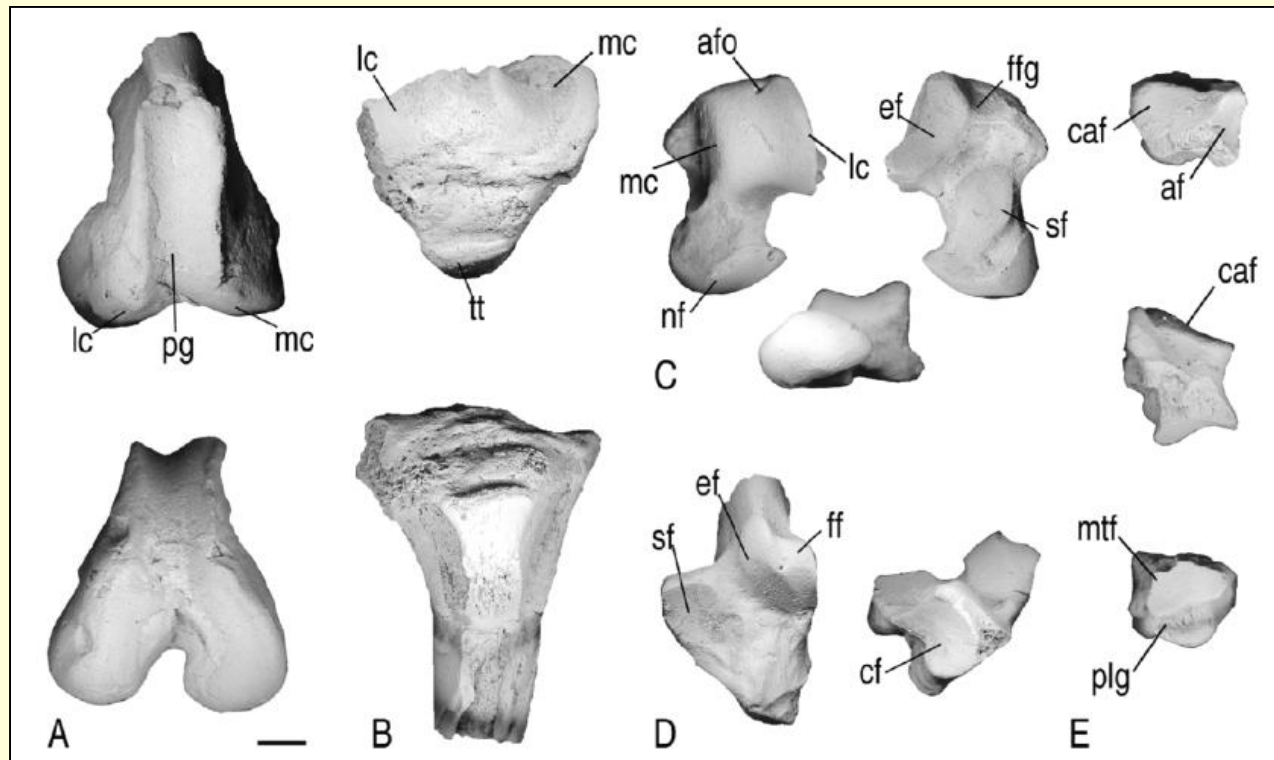
Chipetaia lamporea

Miocyon vallisrubrae



Zionodon walshi

Post-Cranial Remains



(from Dunn & Rasmussen, 2009)

Zionodon walshi

Preservation Examples



(from Dunn & Rasmussen, 2007)



Oxyaenodon dysclerus

Pseudotomus eugenei

Taphonomic Studies

WU-18

- “Gnat-out-of-Hell”
- Micro-mammal locality
- Analysis of breakage patterns shows it to be a possible raptor or small carnivore assemblage

(Thornton & Rasmussen, 2001)



Taphonomic Studies



WU-26

- “Pond Locality”
- Screen-washed & sorted
- Collection of terrestrial & aquatic mammals, fish, water turtles, small crocodilians
- Suggests a permanent freshwater environment
(Westgate et al., 2008)

Uinta Basin Stratigraphy

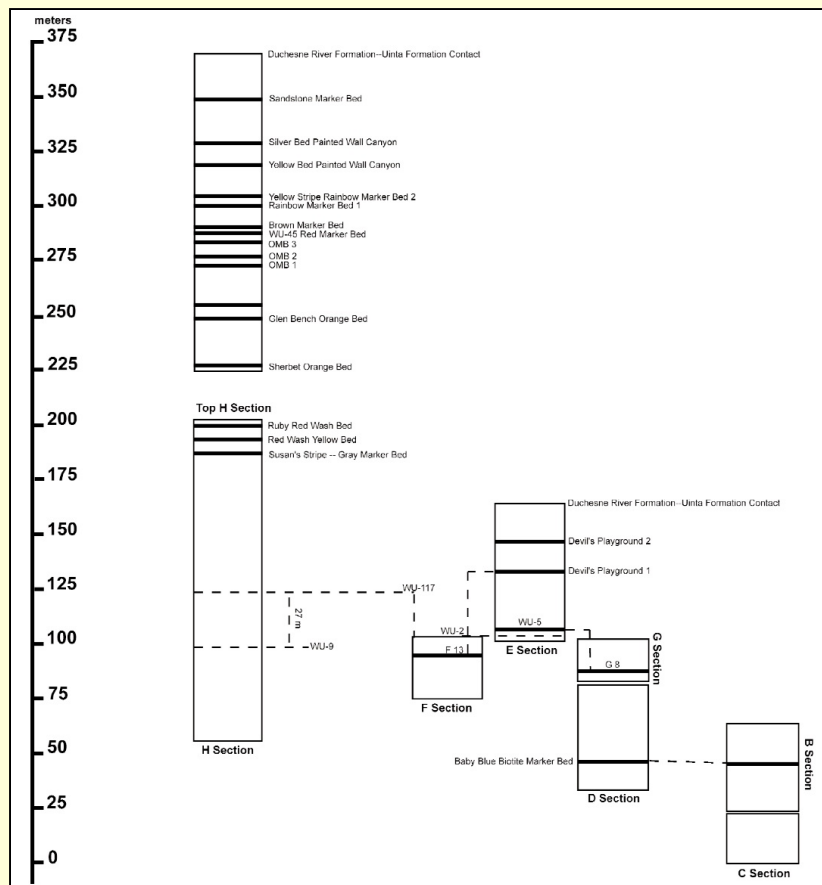


Early Stratigraphic Work - Uinta Formation

UINTA C
<i>"Amynodon Sandstones"</i>
UINTA B2
<i>"Metarhinus Sandstones"</i>
UINTA B1
UINTA A

- Stratigraphy established by Osborn (1895, 1929) and Riggs (1912)
- Lithostratigraphy was not well correlated with biostratigraphic horizons

Recent Stratigraphic Work - Uinta Formation



from Townsend et al., 2006

- Rigorous section measurement
- Established new lithostratigraphic boundary between Uinta B & C
- Found sandstone beds to be poor markers for stratigraphic (bio- & litho-) transitions
- More fine-grained biostratigraphic studies.

Stratigraphic Work - Duchesne River Formation

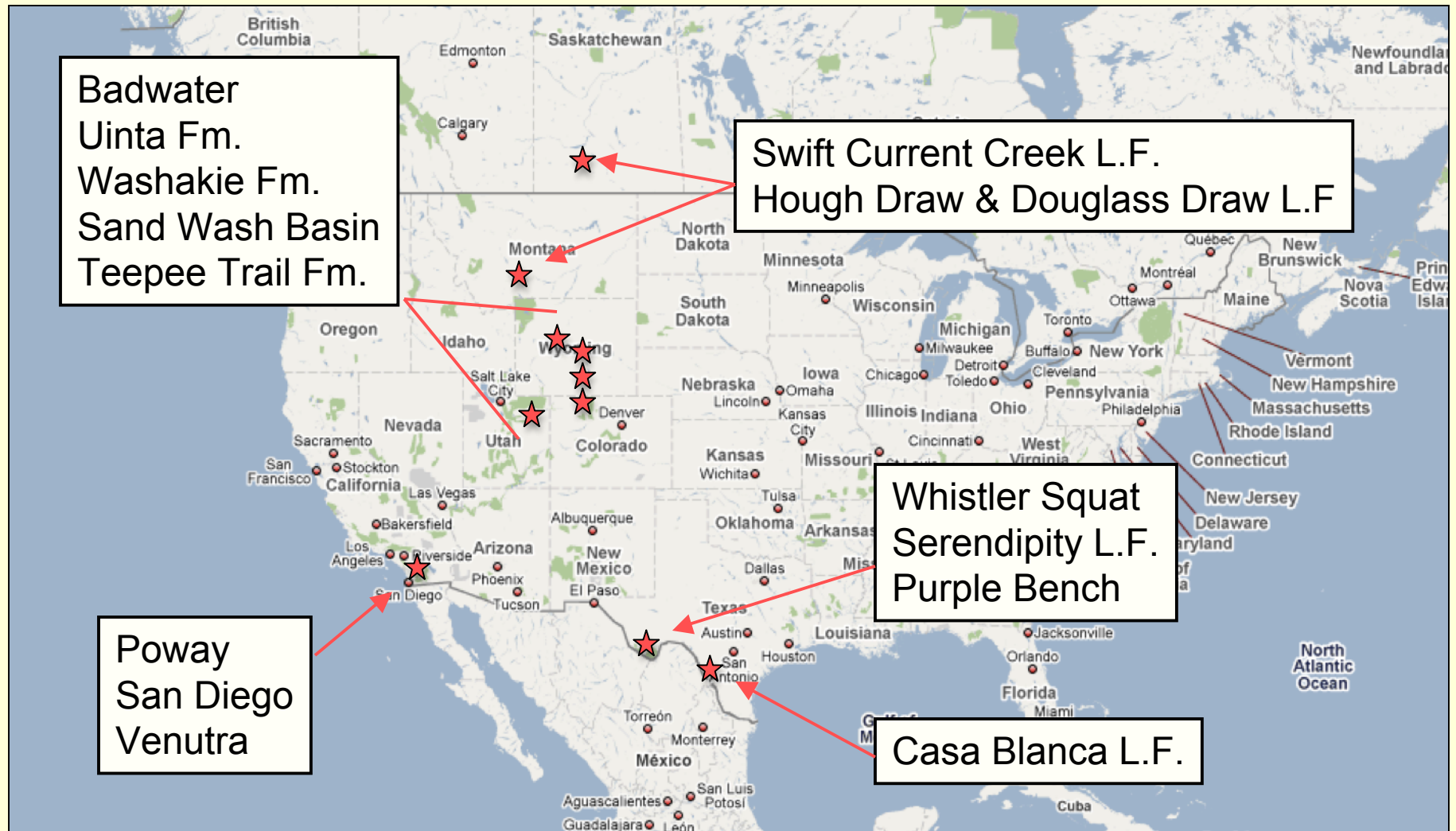
- More poorly fossiliferous than the Uinta Fm.
- Brennan Basin Member is probably Uintan in age
- Recent work has been successful at screen-washing the Dry Gulch Creek member, increasing the taxa characterizing the Duchesnean NALMA

TABLE 5. HISTORY OF DUCHESNE RIVER FORMATION STRATIGRAPHIC NOMENCLATURE

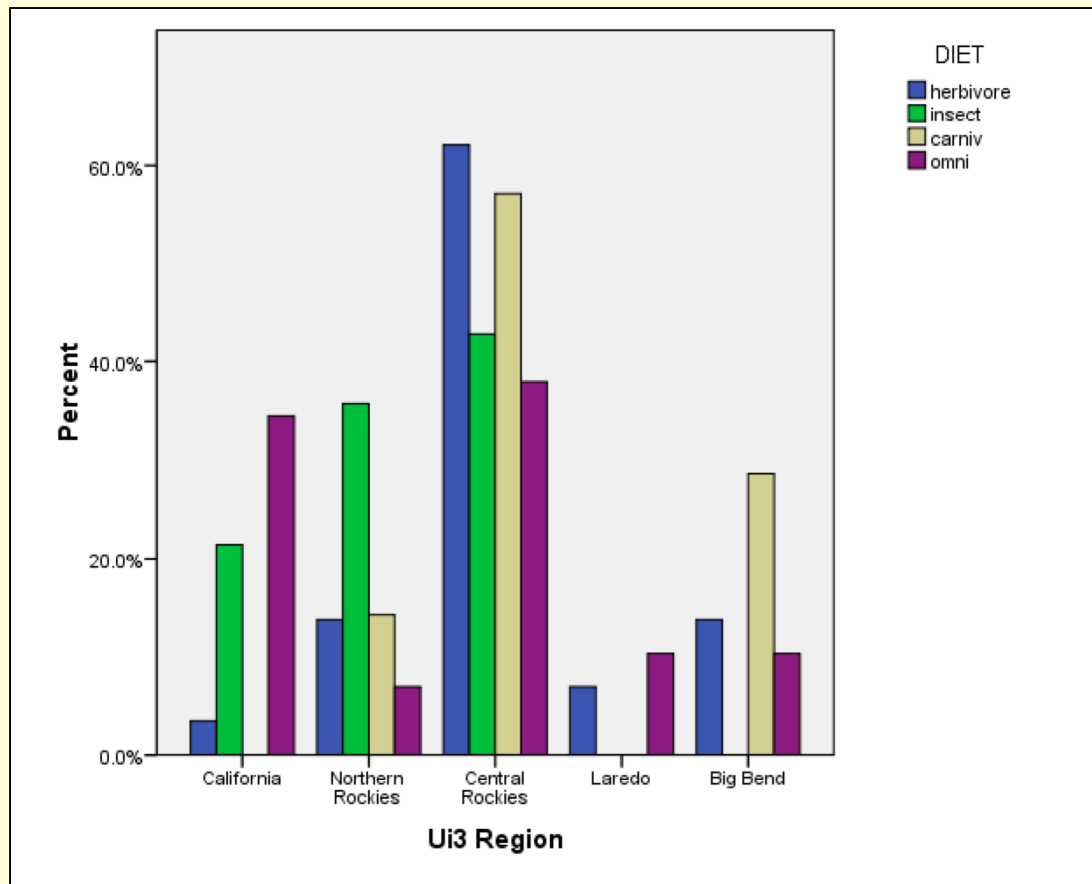
King (1878)	Peterson in Osborn (1895)	Douglass (1914)	Peterson and Kay (1931)	Scott in Peterson (1931)	Kay (1934)		Gazin (1955)	Warner (1963)	Andersen and Picard (1972)
Uinta Group (in part)	C horizon (in part) = upper Uinta Group	Uinta Tertiary (in part)	Upper Uinta redbeds separated from underlying Uinta Tertiary	Duchesne Formation	Duchesne River Formation	(not studied)	(not studied)	(not studied)	Starr Flat Member
						Lapoint horizon	Lapoint horizon	Major bentonite member	Lapoint Member
						Halfway horizon	Halfway horizon	Minor bentonite member	Dry Gulch Creek Member
						Randlett horizon			Brennan Basin Member

from Murphey et al., 2011

North American Uintan Localities



Comparisons between Uintan Localities

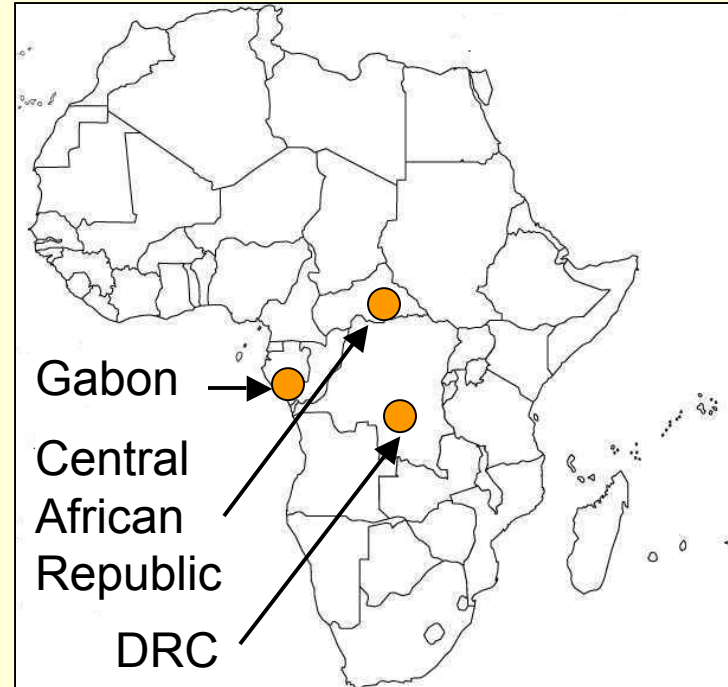


- Taxonomic provincialism does not translate to ecological provincialism
- California & Northern Rockies, and Central Rockies and Texas form similar pairs

Actualistic Modern Comparisons

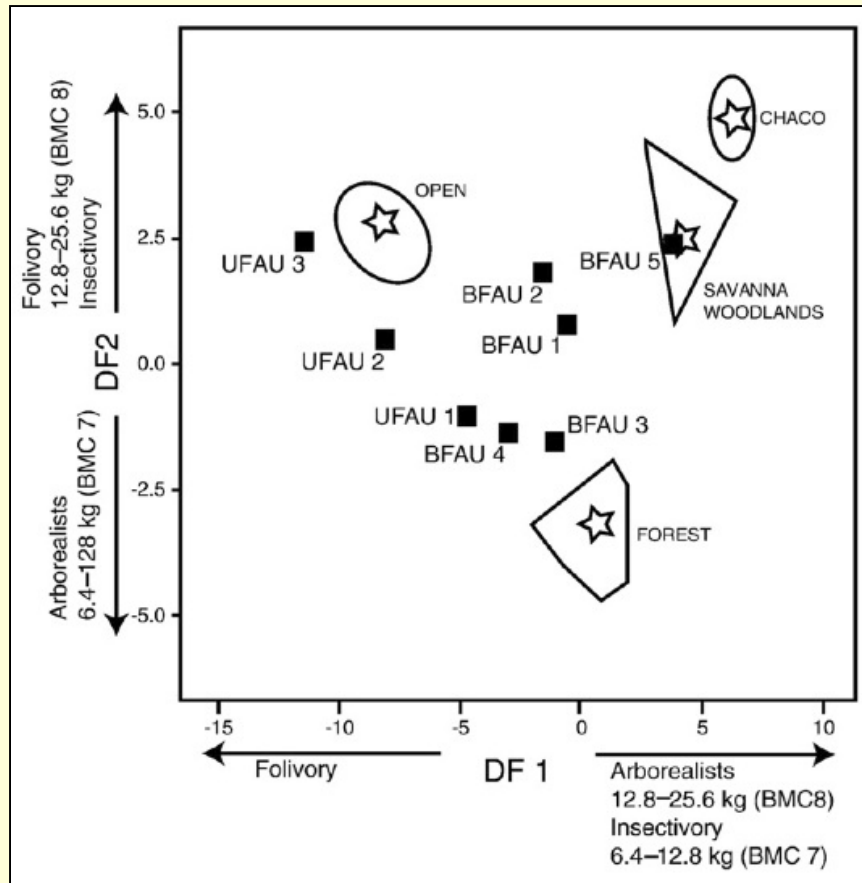


from Friscia and Kirk, 2008



- Comparison of Uintan mammalian carnivore distribution using modern taxa as an analogue
- “Creodonts” seem to be spottily distributed like herpestids, while carnivorans are distributed more like viverrids.

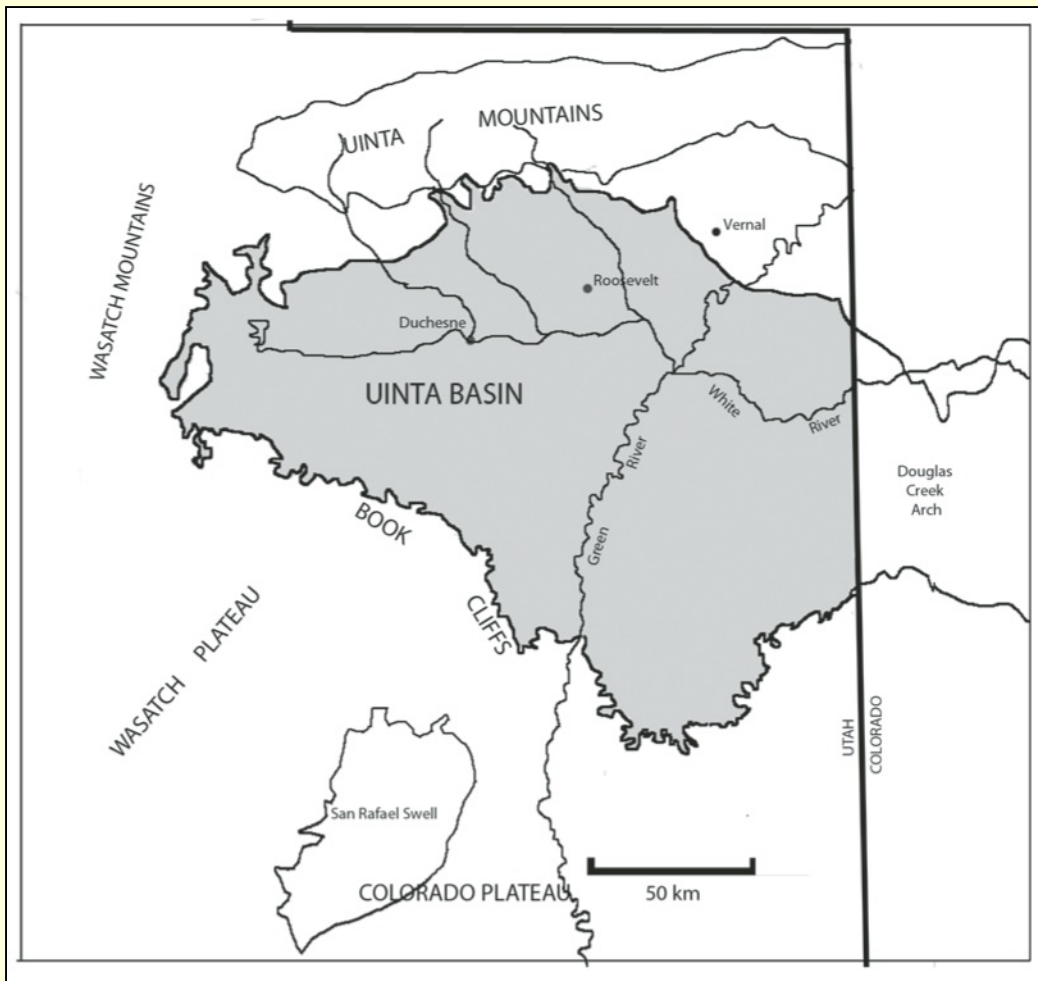
Tracking Environmental Change



from Townsend et al., 2010

- Comparing the ecomorphology of fossil faunas to known modern ones we can infer environmental shifts
- Ecomorphology demonstrates change from tropical to woodland habitats through the middle Eocene

Future Stratigraphic Work



- Linking stratigraphy from the base of the Uinta Fm. to the top of the Duchesne River Fm.
- Systematic sampling for small mammals through the section
- Better chronologic controls
- Sampling across the entire basin, including western basin

from Murphey et al., 2011

Salvage Work



- Large-scale petroleum development throughout the basin
- Better communication between paleontologists, petroleum companies, and state & federal agencies

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- The countless crew members over the past 15+ years who have collected, dug, sweat, cooked, drank, and supported us, all in the name of doing good science.