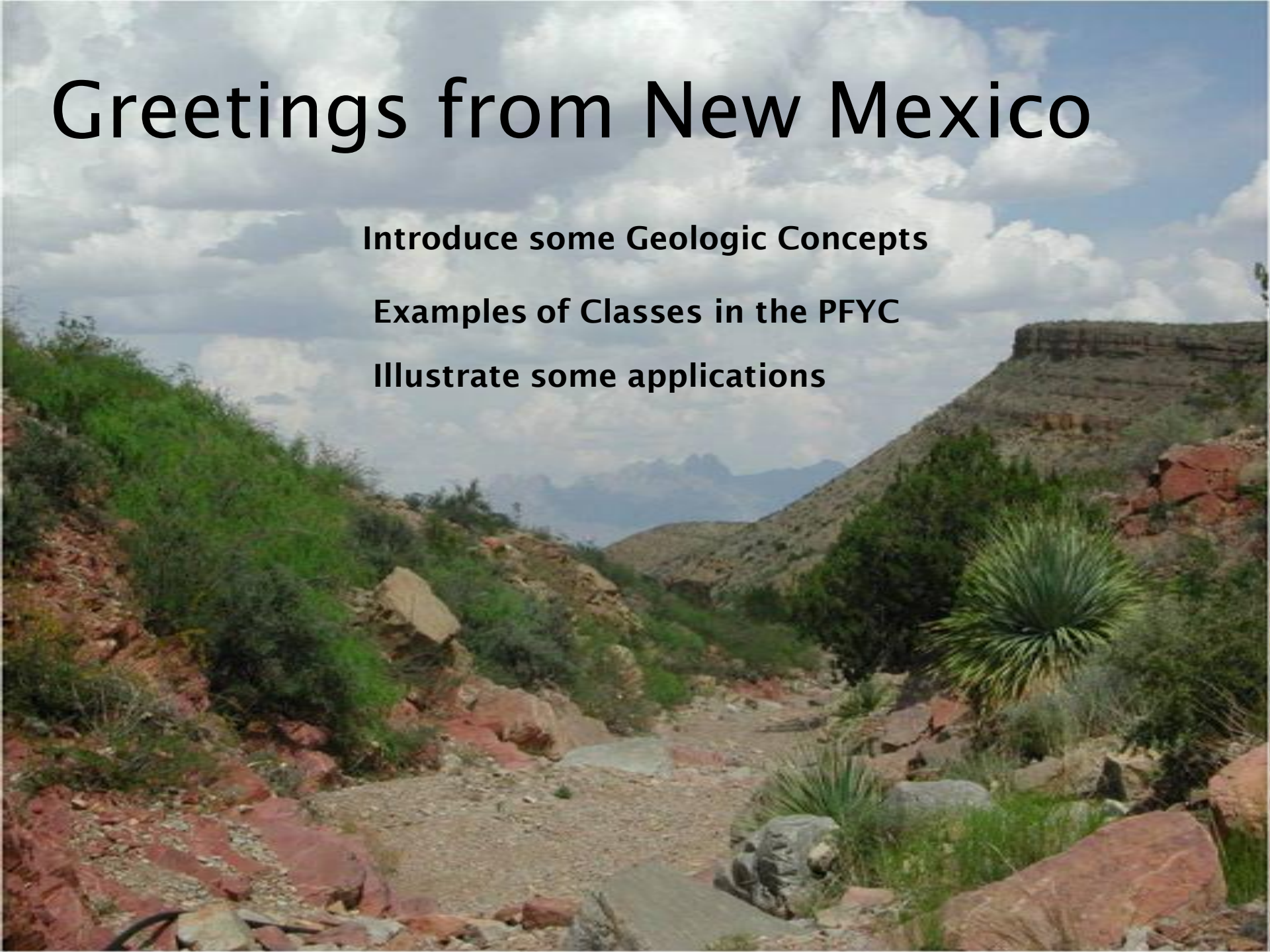
Greetings from New Mexico



Introduce some Geologic Concepts

Examples of Classes in the PFYC

Illustrate some applications

Geology

study of the Earth, what it's made of, the processes acting on it and the organisms inhabiting our planet.

how Earth's materials, structures, processes and organisms have changed over time.

Since paleontology is the study of those organisms, geology and paleontology are intrinsically connected.

Basic Rock Types

- Igneous
- Metamorphic
- Sedimentary

Sedimentary Rocks

- Chemical sedimentary rocks
  - Limestones and other carbonates
  - Evaporites (salt beds, sulfates)
  - Chert
- Detrital sedimentary rocks
  - Mudstones
  - Sandstones
  - Conglomerates

Depositional Environments

- Detrital grains are deposited in various settings under a variety of energy regimes

- Beaches, lakes, rivers, deltas, deserts, swamps, continental shelves
  - These environments are where plants and animals live and die

- Geologists describe various physical attributes of sedimentary rocks

- Grain size
  - Internal sedimentary structures
  - Bed geometry
  - Degree of sorting of grains
  - Relationship with underlying and overlying strata

A physical description of the “strata” is called lithostratigraphy

A biologic description of the “strata” is called biostratigraphy

Occurrences of Terrestrial Organisms

From: Terrestrial Ecosystems through Time:

Environmental Context	Macroplant	Microplant	Invertebrates	Vertebrates	Ichnofossils
Coastal:					
Offshore	+	++	((+))	(+)	-
Beach	((+))	-	-	(+)	+
Lagoon	+	++	((+))	++	+-
Estuary	++	+-	+-	+	+-
Fluvial/deltaic:					
Channel lags & bars	++	+	+	++	+
Abandoned channel	+++	+++	++	++	++
Levee	(+)	(+)	–	(+)	+++
Floodplain:					
Poorly drained	+++	+++	+	+	++
Floodplain:					
Well drained			(+)	+	++
Crevasse splay	+	(+)			
Interdistributary bay	++	++	+	+-	(+)
	++	++	(+)	+-	++
Lacustrine:					
Low oxygen:					
Large lake					
Deep	((+))	++	(+)	++	-
Small lake					
Deep	++	++	(+)	++	-
Small lake					
Shallow	++	++	(+)	++	(+)
Oxygenated:					
Large lake	(+)	+	++	++	+++
Small lake	(+)	+	+++	++	+++

Occurrences of Terrestrial Organisms

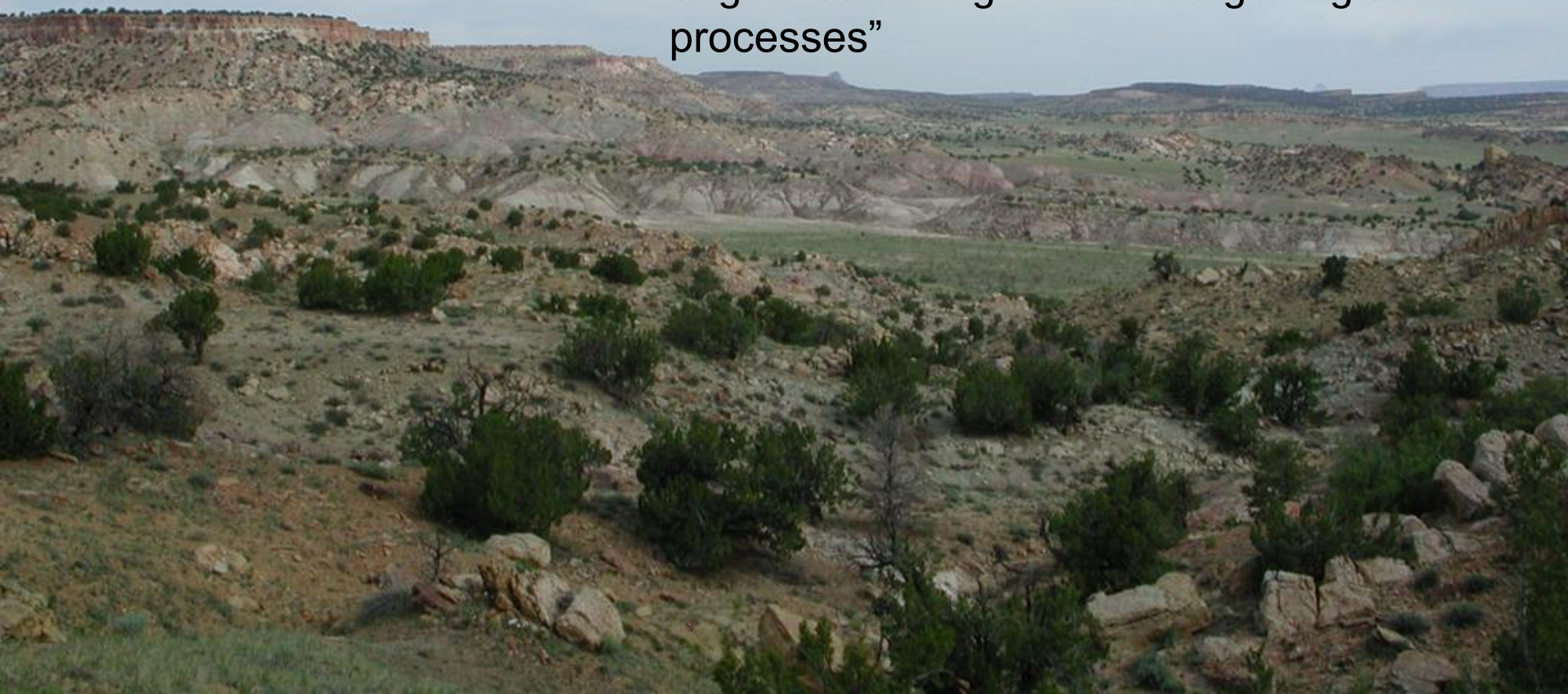
From: Terrestrial Ecosystems through Time:

Environmental Context	Macroplant	Microplant	Invertebrates	Vertebrates	Ichnofossils
Volcanigenic:					
Explosive	+	((+))	--	((+))	((+))
Ashfall	+	(+)	--	(+)	(+)
Lacustrine	++	+++	++	+++	(+)
Eolian:					
Dune	--	--	--	((+))	((+))
Interdune	+	+	(+)	(+)	+

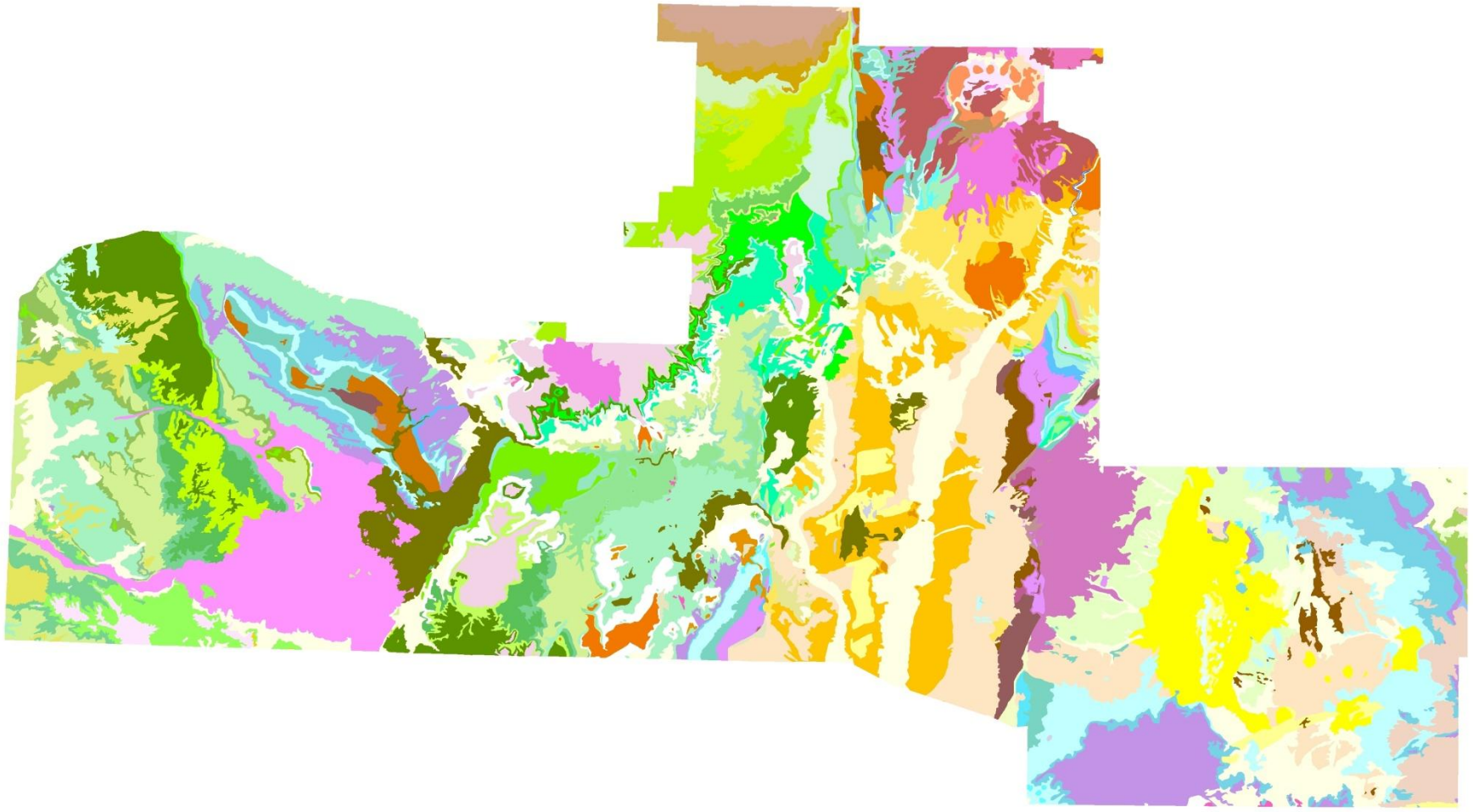
Geologic Formation

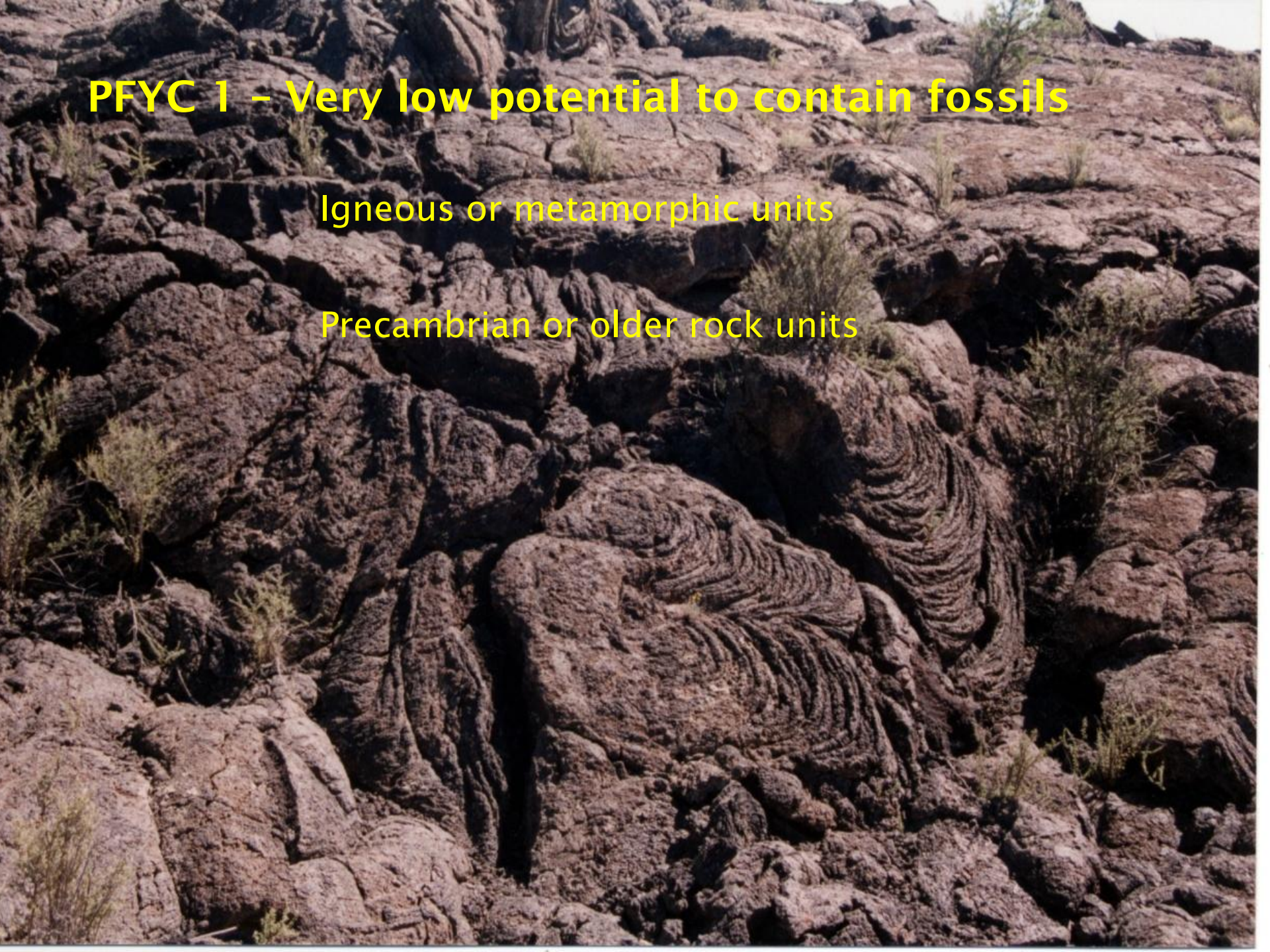
Most basic rock division which can be mapped.

"a distinctive series of strata that originated through the same geologic processes"



Rio Puerco Field Office Geology

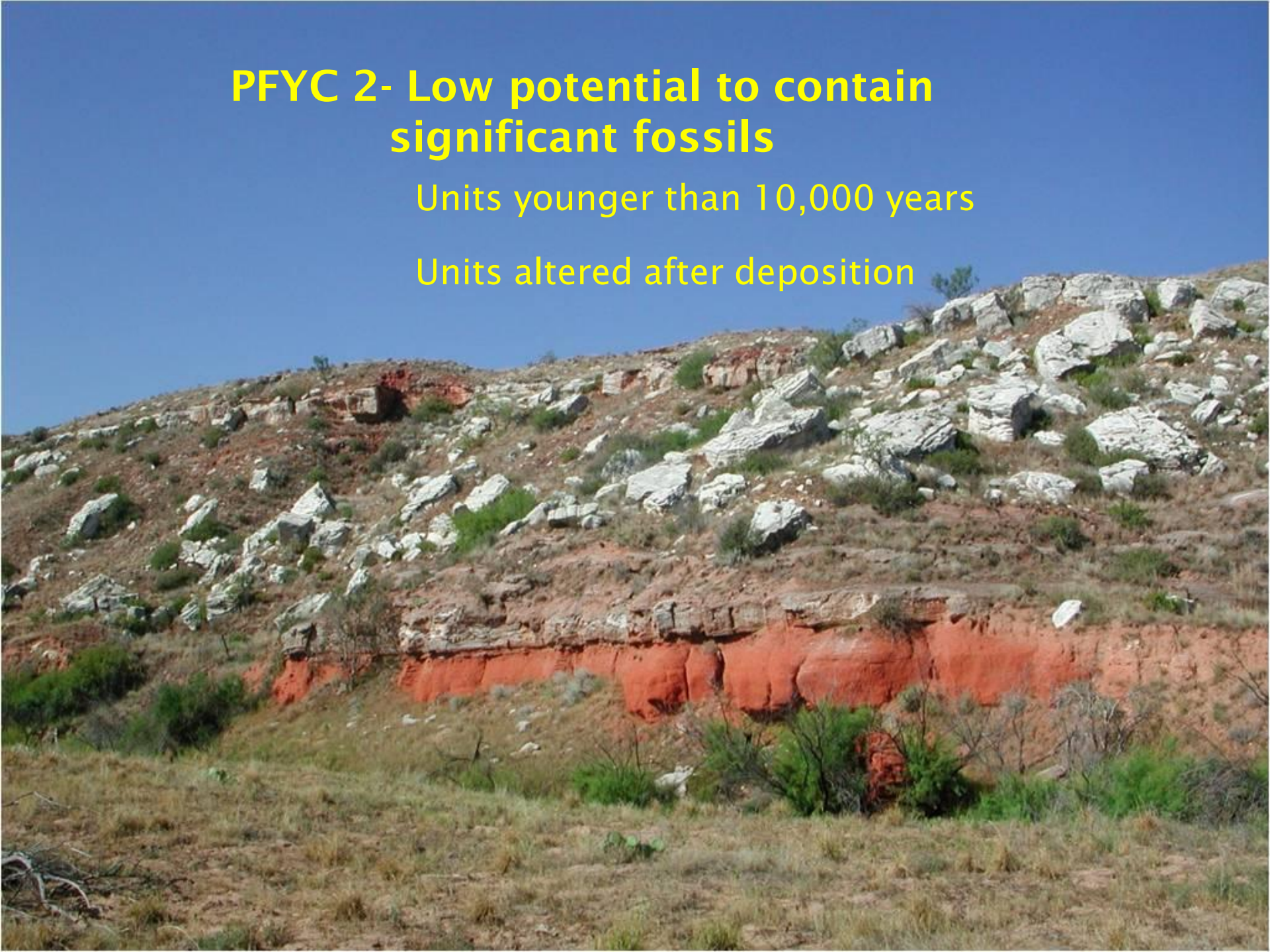




PFYC 1 – Very low potential to contain fossils

Igneous or metamorphic units

Precambrian or older rock units


PFYC 2- Low potential to contain significant fossils
Units younger than 10,000 years
Units altered after deposition

PFYC 3 - Moderate or Unknown Potential

Often marine in origin with sporadic known occurrences of vertebrate fossils 3a

Unknown potential – geologic features that suggest significant fossil present –but unit is poorly studied 3b

PFYC 4- High potential for significant fossils

Fossils are known to occur but may vary
In Occurrence and predictability


PFYC 5 -Very High Potential to Produce Significant Fossils
Highly fossiliferous geologic units consistently produce vertebrate fossils

Nacimento Formation: **PFYC 5**

Members: Arroyo Chijuillita, Ojo Encino and Escavada

The Paleocene (64 mya) Nacimento Formation of the San Juan Basin (Farmington, Rio Puerco Field Offices) is up to 500 meters thick and consists of non marine fluvial and lacustrine strata deposited in the Laramide San Juan Basin. Sediment accumulated in basins developing in response to uplifts forming during the late Cretaceous (70 mya) through Paleocene and Eocene (60 to 35 mya). This geologic event is called the Laramide Orogeny (mountain building). The unit consists of interbedded sandstones, mudstones and marker beds of silcretes and has been subdivided into three distinctive members based on lithologic distinctions.

Nacimento Formation

Paleocene fossils from the San Juan Basin were first collected in 1879 by David Baldwin, a local collector who collected for both Cope and Marsh. Over the years, expeditions from several institutions made fossil collecting efforts and collected vertebrate fossils from the Paleocene. Important collections of early Paleocene Fossils are now in the American Museum of Natural History, New York; the Museum of Paleontology, UC, Berkeley; University of Kansas, Lawrence; the University of Arizona, Tucson; and the New Mexico Museum of Natural History and Science, Albuquerque. (The UA collection was transferred to NMMNHS in 2005.) Collection continues into 2009 by Tom Williamson NMMNHS at some key localities and Yale University under Walter Joyce in 2005.

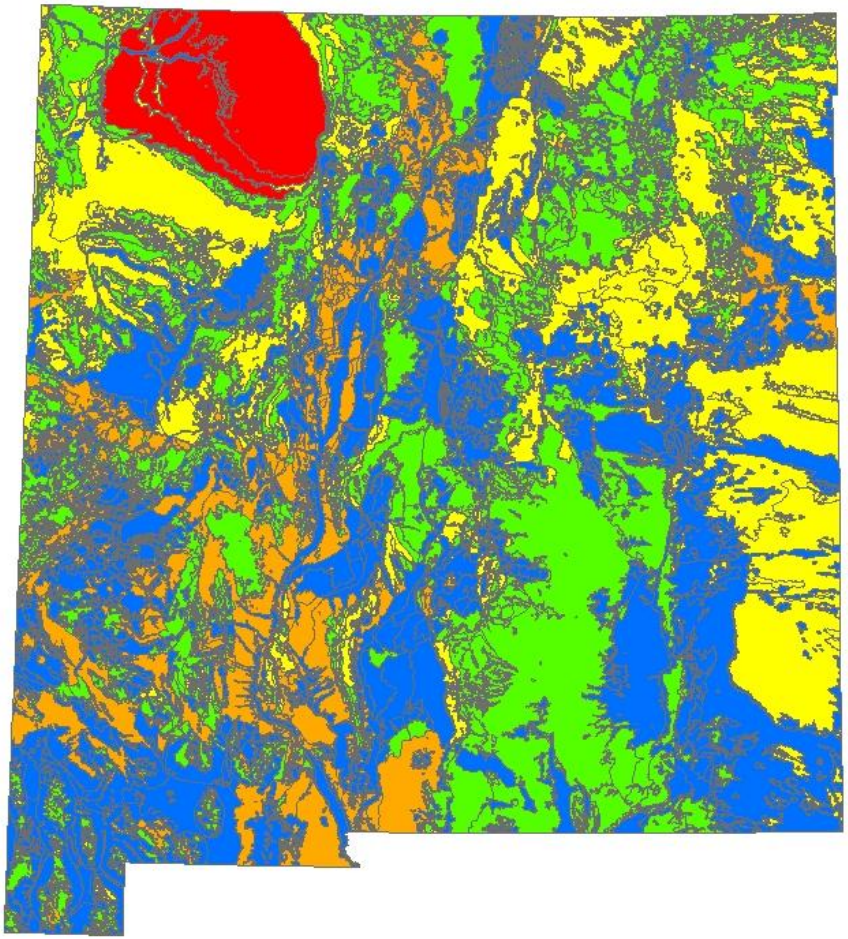
Significance of unit: Expansion of mammals after the extinction event at the end of the Cretaceous. North American Land Mammal Ages, Torreonion and Puercan were based on fossils collected from this unit.

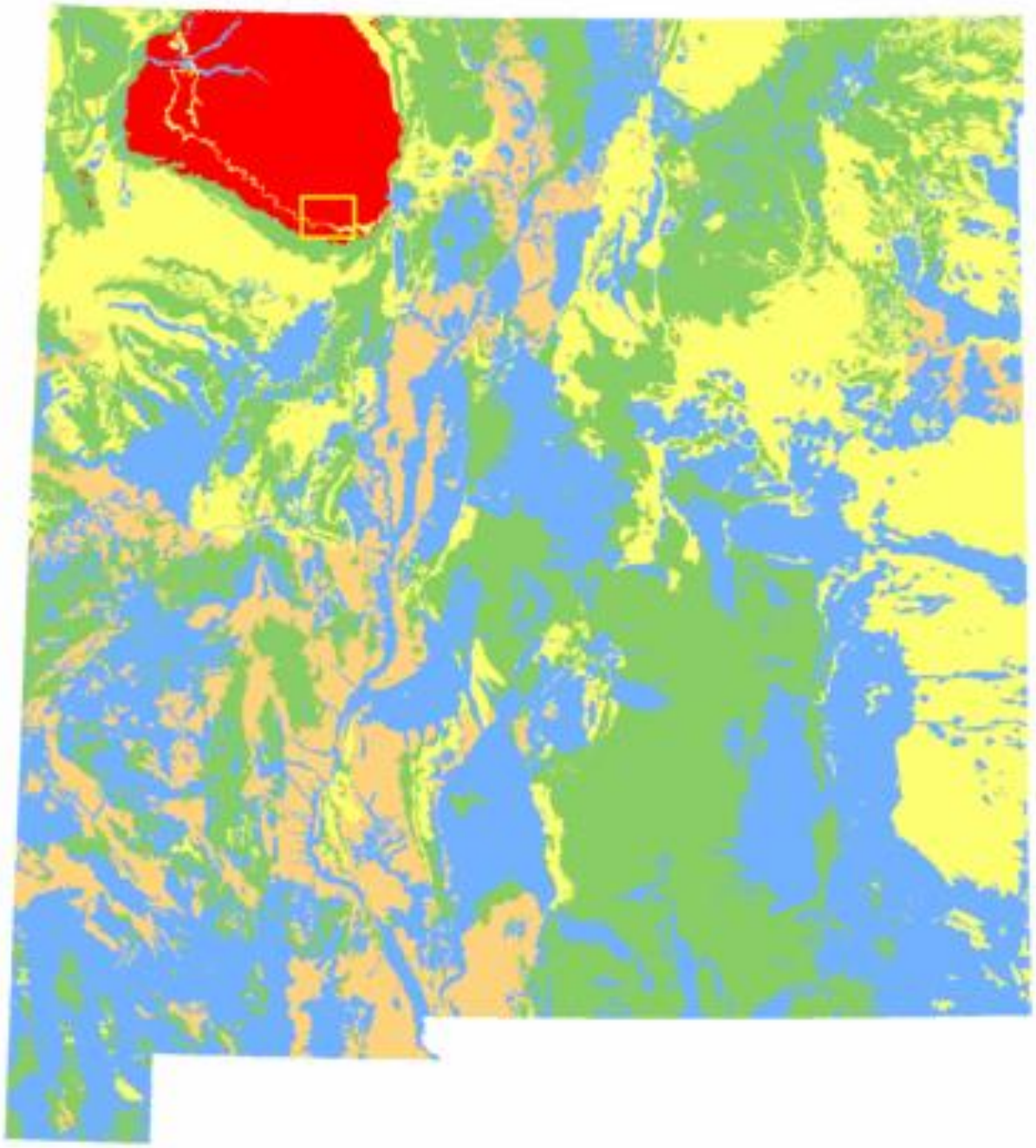
Other Paleocene Units in New Mexico: Raton and Poison Canyon Formation: exposed in Raton Basin (Taos Field Office)
Raton and Poison Canyon Formation have not produced the volume fossil material and should be considered on a case by case basis. Class 3a

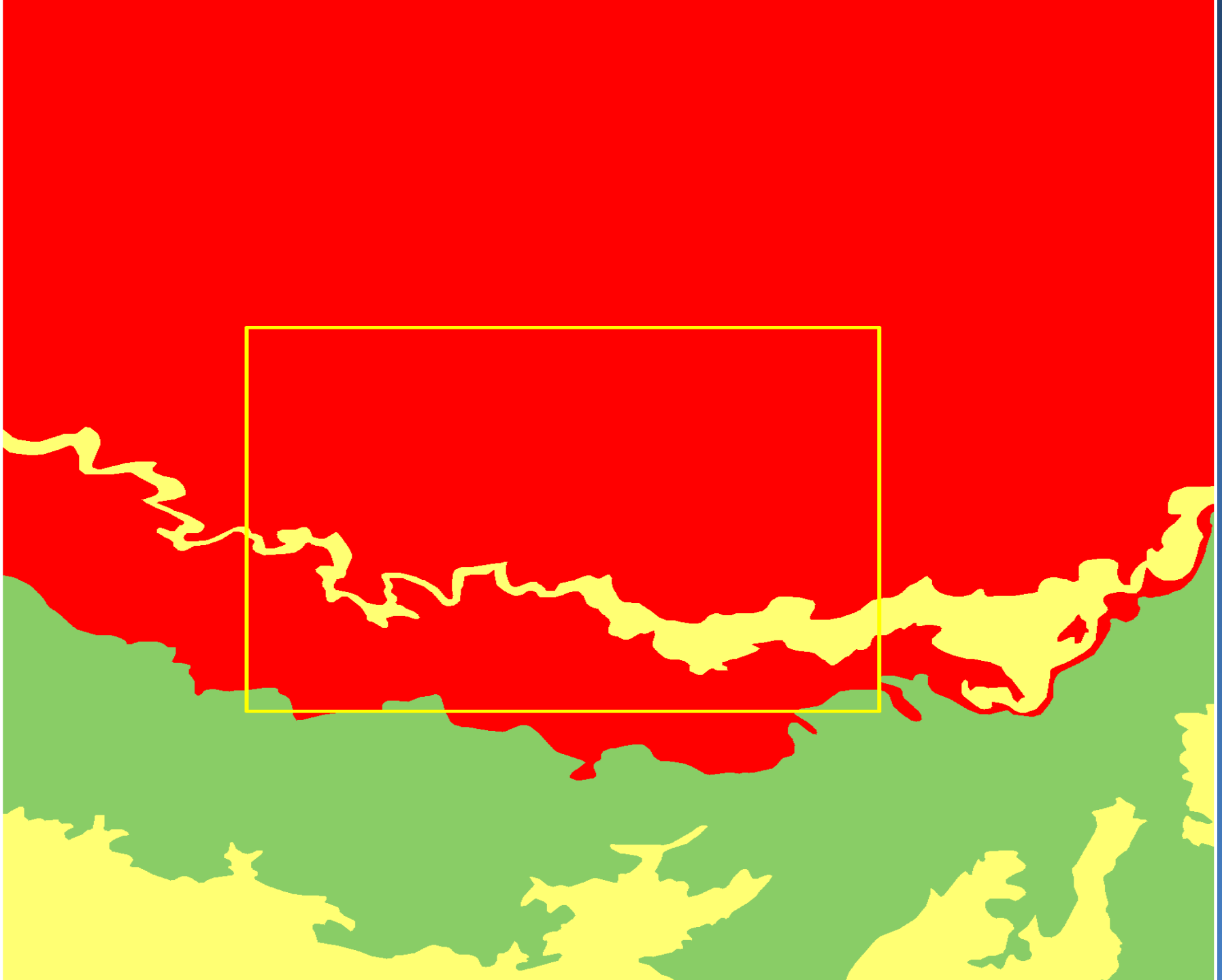
Reference: Advances in San Juan Basin Paleontology, 1981, New Mexico Press, Lucas, Spencer, Rigby, Keith, Kues, Barry eds.

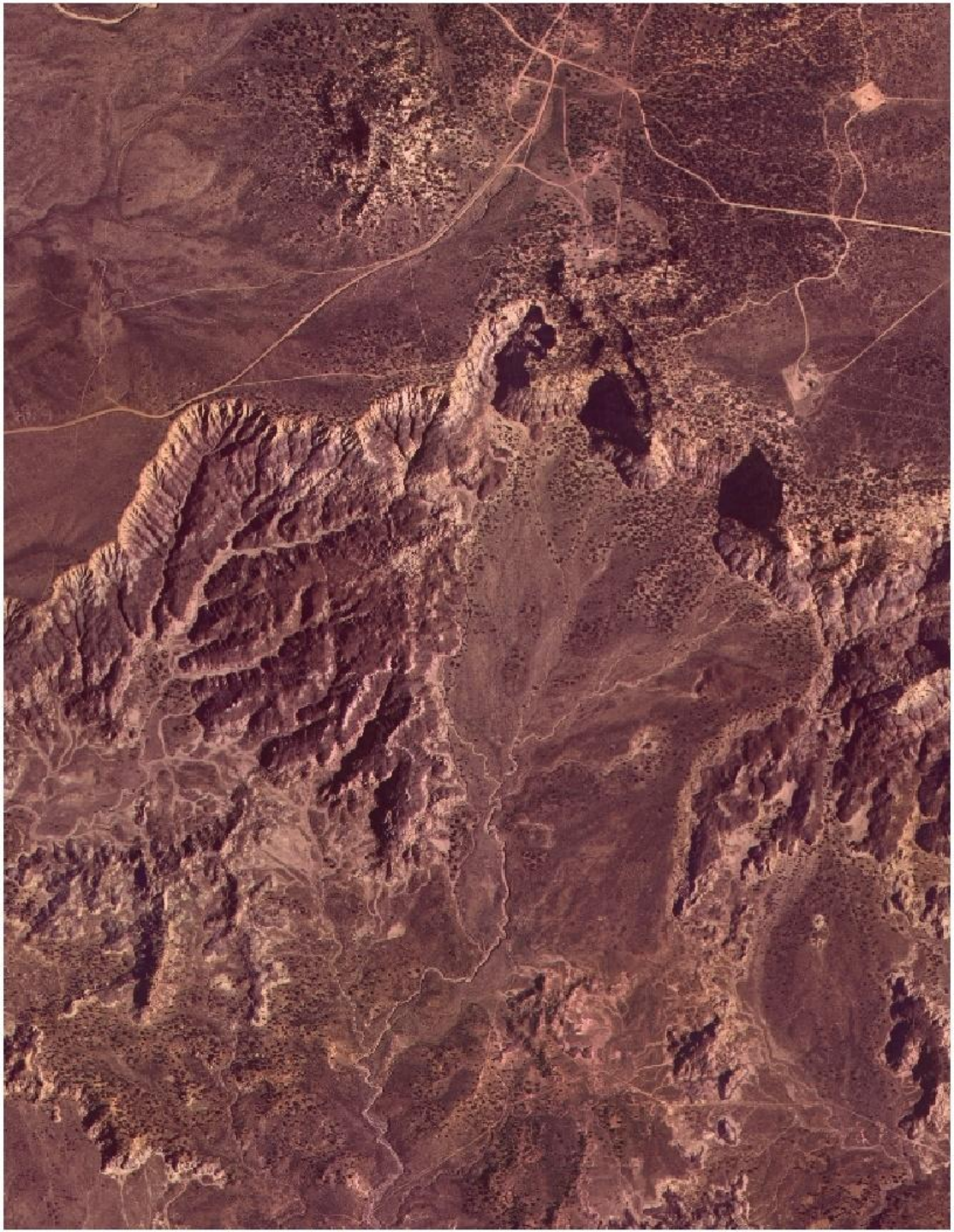
Williamson, Tom 1996, The Beginning of the Age of Mammals in the San Juan Basin, New Mexico: Biostratigraphy and Evolution of Paleocene Mammals of the Nacimento Formation, NMMNHS Bulletin 8.

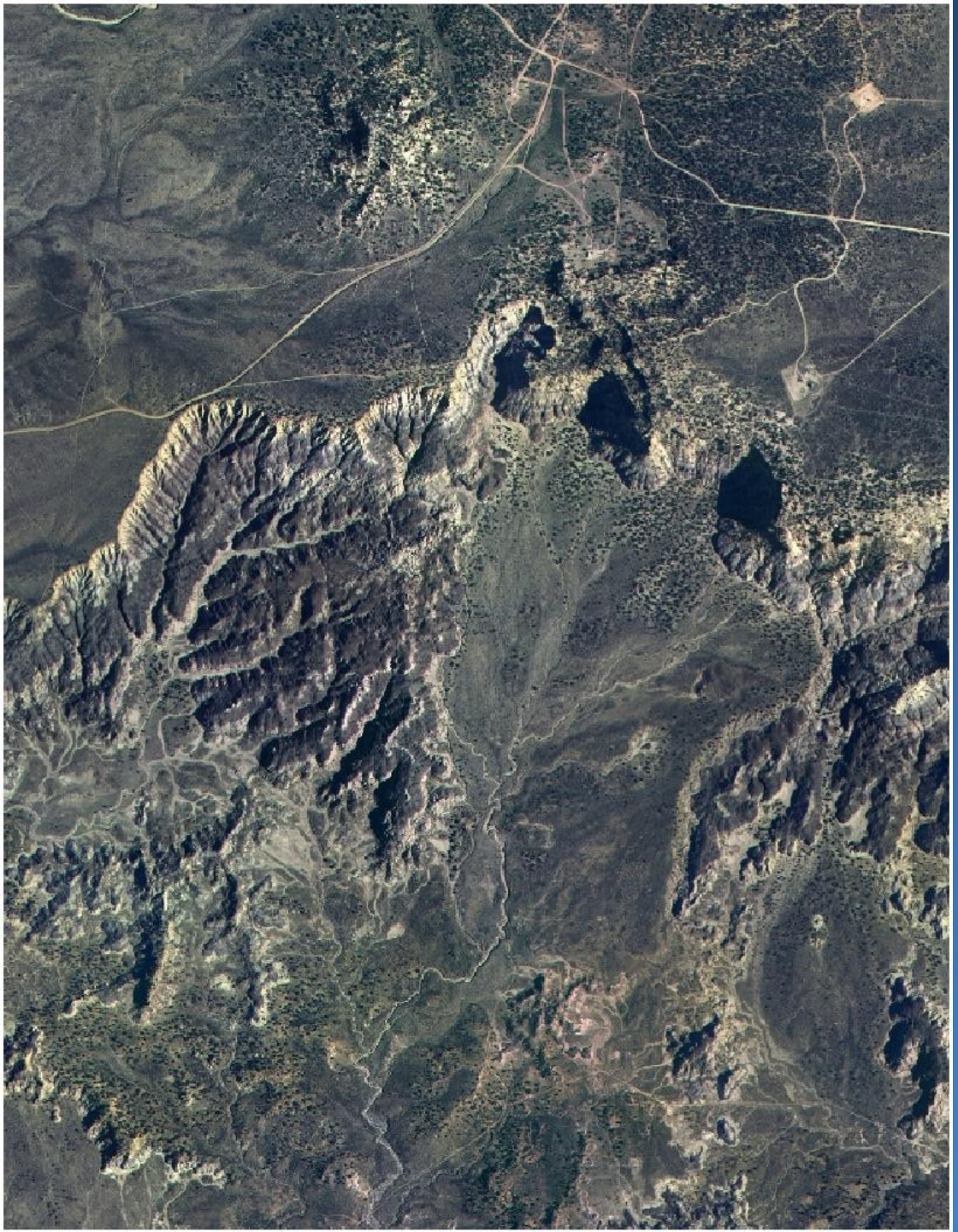
PFYC for New Mexico

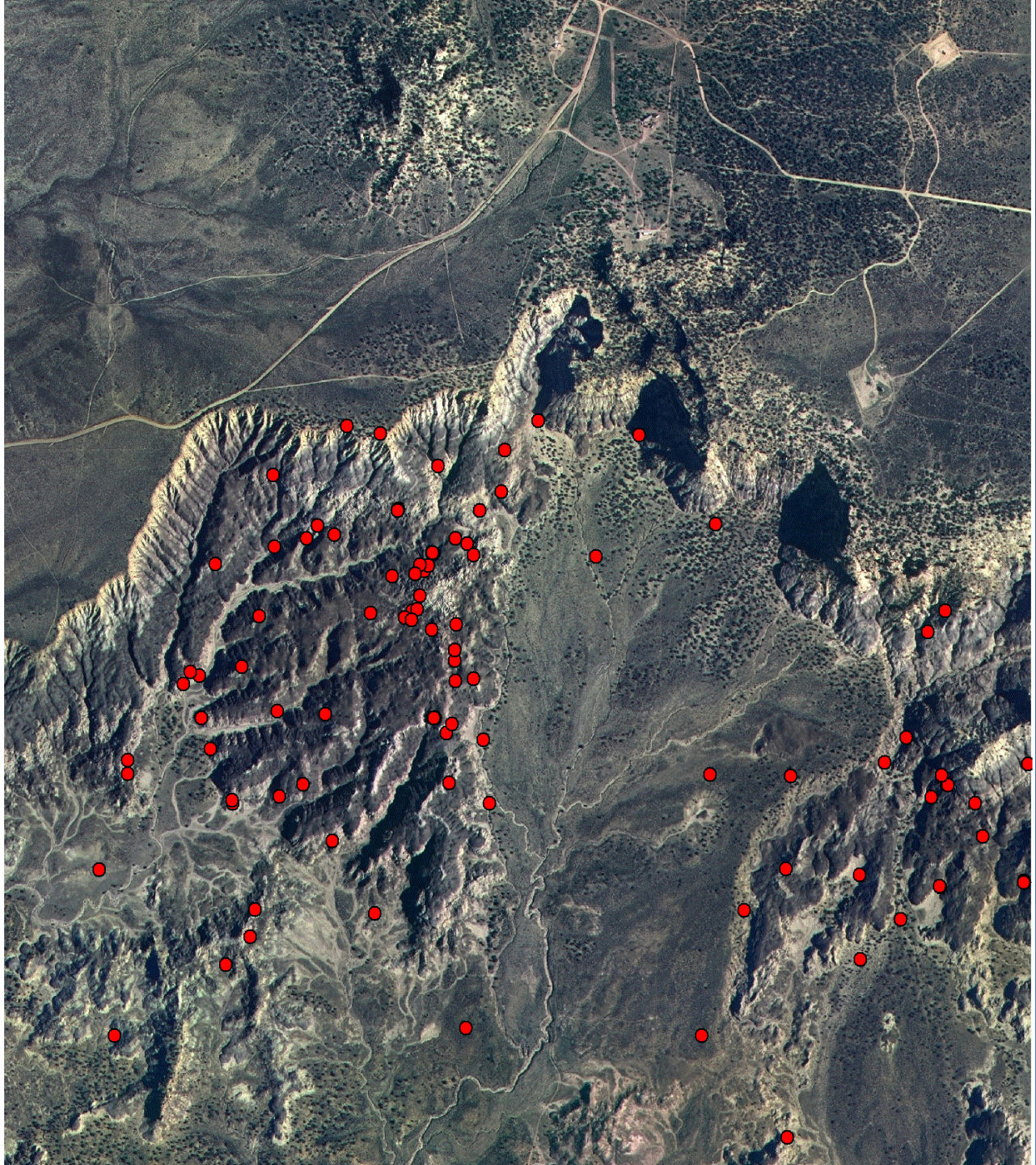













Good bye from New Mexico
Questions?