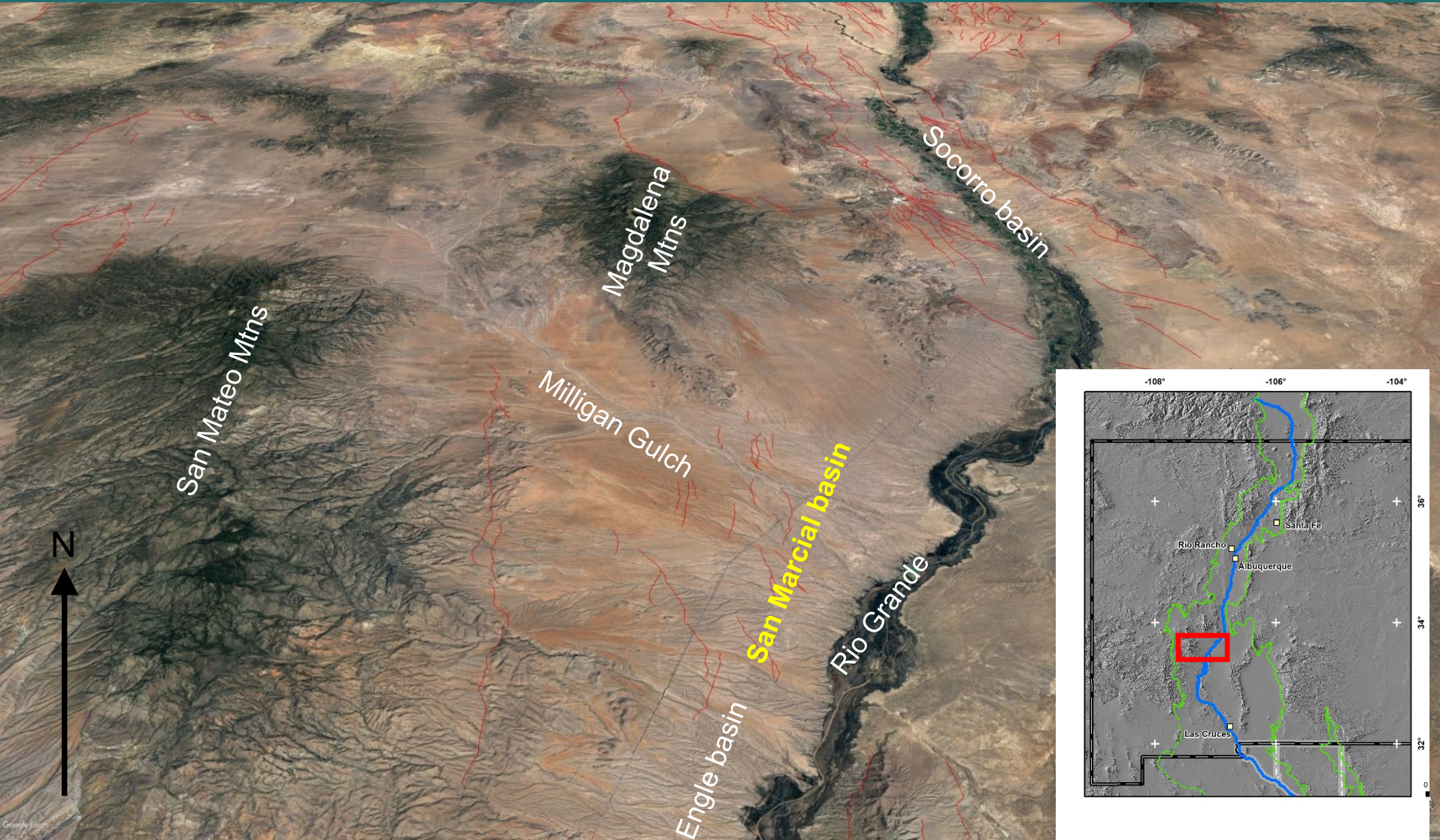


Middle-Late Pleistocene geomorphic features & evolution of the eastern San Marcial basin, southern Rio Grande rift, N.M.

Daniel Koning, Dave Love, Brad Sion, Kevin Hobbs, Andrew Jochems, Kristin Pearthree



An extensive geomorphic surface covers most of the basin

Surface projects to ~25-40 m above the modern Rio Grande floodplain

Post-Santa Fe Group, relatively coarse sediment below the surface informally called the “San Marcial formation.”

View to north from southern part of San Marcial basin

Chupadera Mtns

Mesa del Contadero

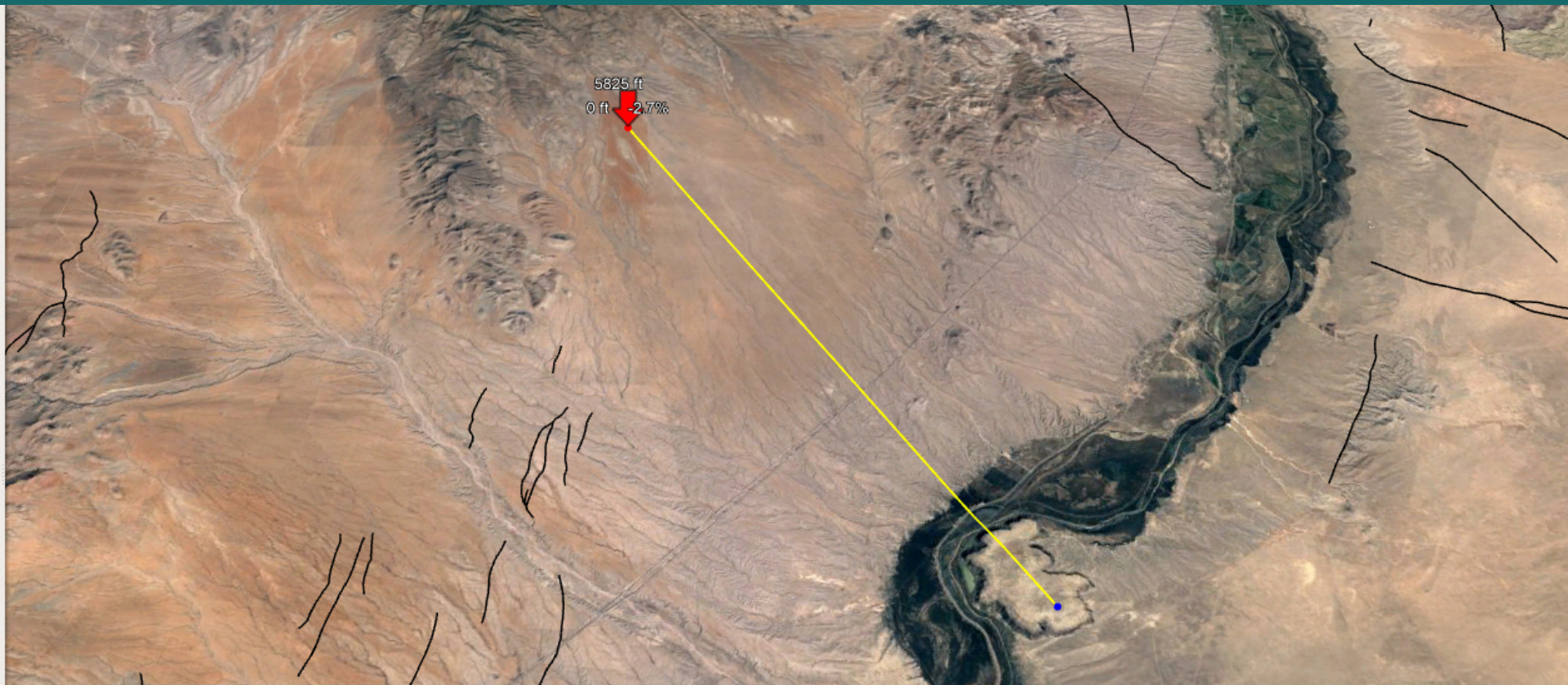
San Marcial fm

Palomas Fm (1-1.5 Ma)

Crawford Draw



Longitudinal profile of geomorphic surface

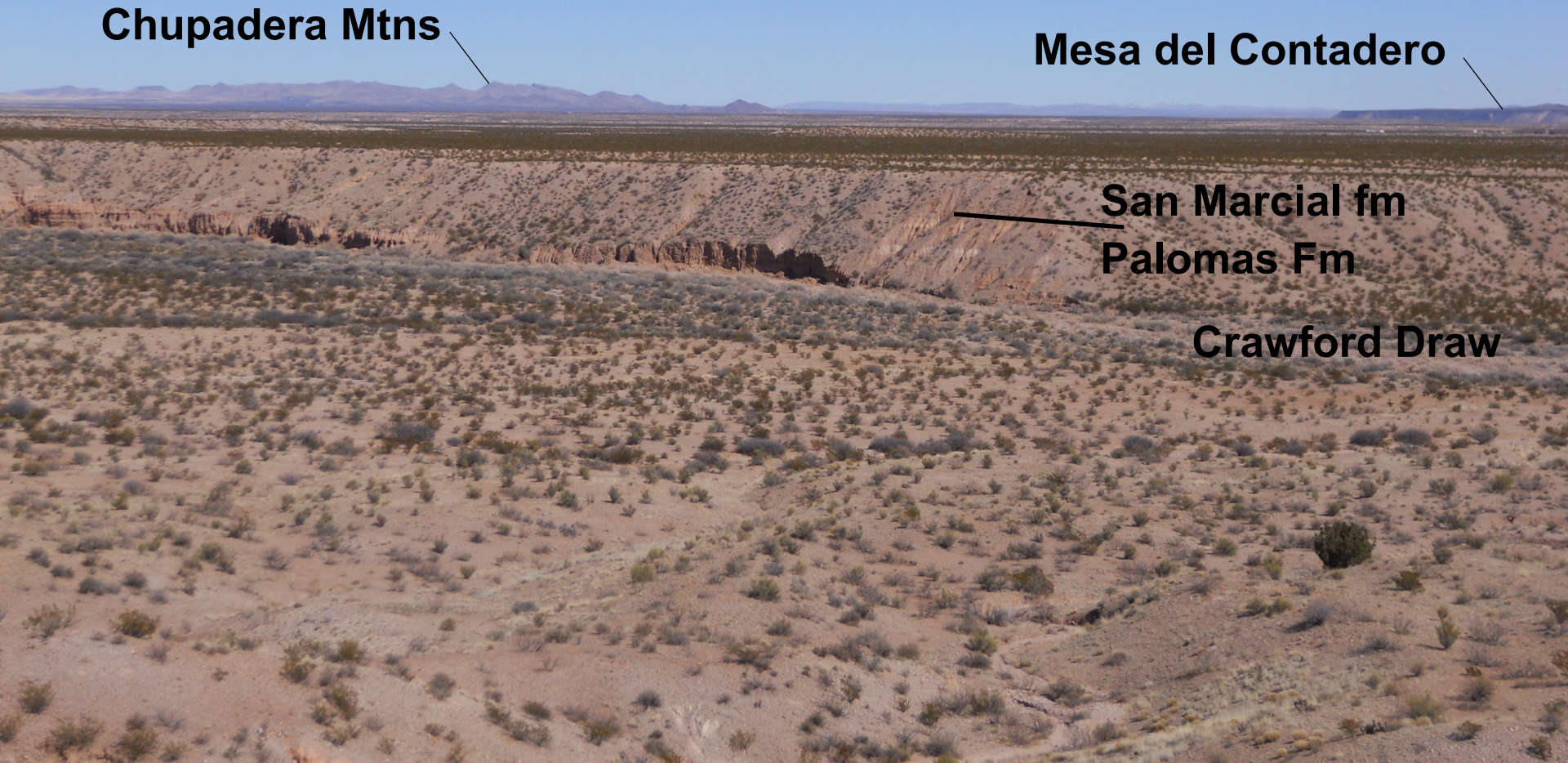


Graph: Min, Avg, Max Elevation: 4465, 5042, 5825 ft
Range Totals: Distance: 14.3 mi Elev Gain/Loss: 829 ft, -1682 ft Max Slope: 55.2%, -13.1% Avg Slope: 4.4%, -2.6%



Questions

- Really a single geomorphic surface on San Marcial fm, and if so what age?
- Formed by aggradation or erosion (i.e., a pediment?)
- What conditions promoted the development of this feature? – still under investigation
- How does surface relate to Rio Grande base level changes?



Results from field mapping

- To north, the geomorphic surface is comprised of three closely spaced surfaces (1-6 m apart).
- Each surface is associated with an allostratigraphic unit; sometimes there is more than one erosional surface on a given deposit.
- Because of areas of uncertainty in correlations, these allostratigraphic units are lumped into the lithostratigraphic San Marcial fm

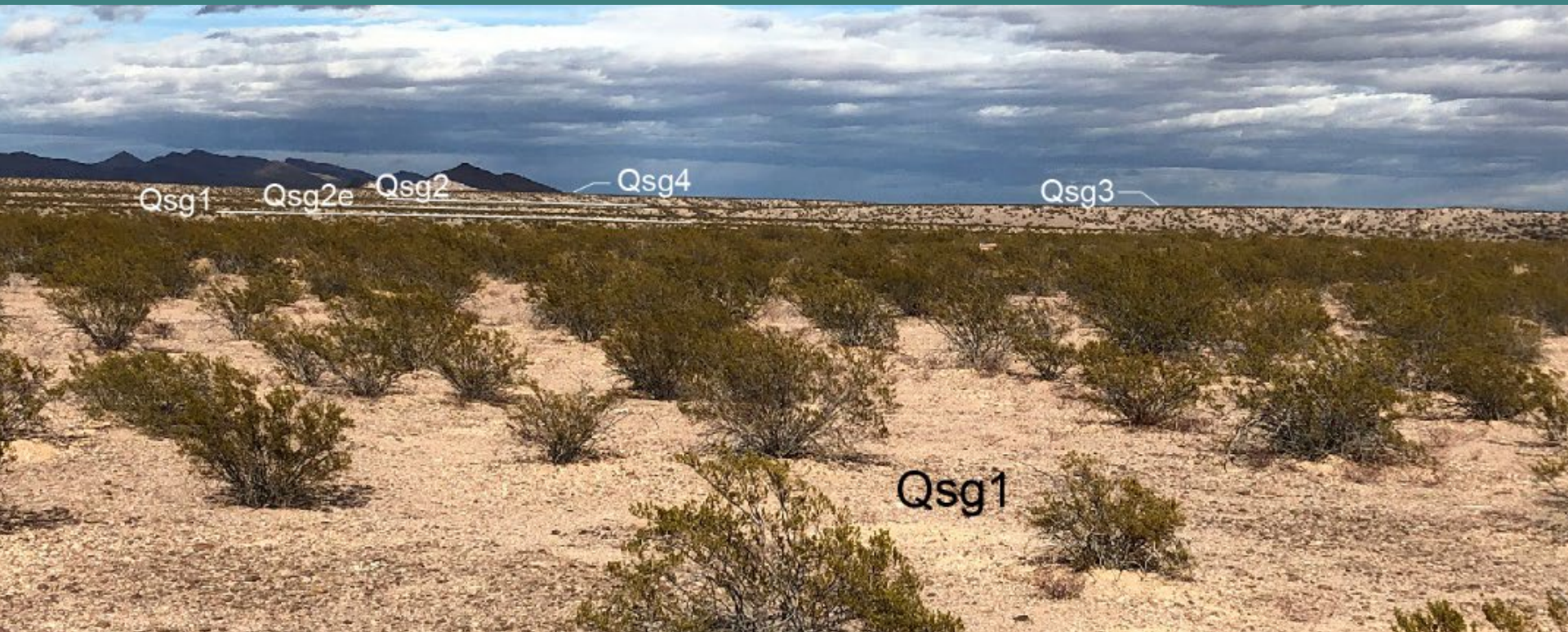
Qs3 → oldest

Qs2 → middle

Qs1 → youngest

Qsg# → Gravelly piedmont or terrace facies

Qsa# → Axial facies near the Rio Grande



Allostratigraphy in smaller tributary drainages NW of Rio Grande

Terrace stratigraphy away from Milligan's Gulch, Fort Craig quadrangle

SW

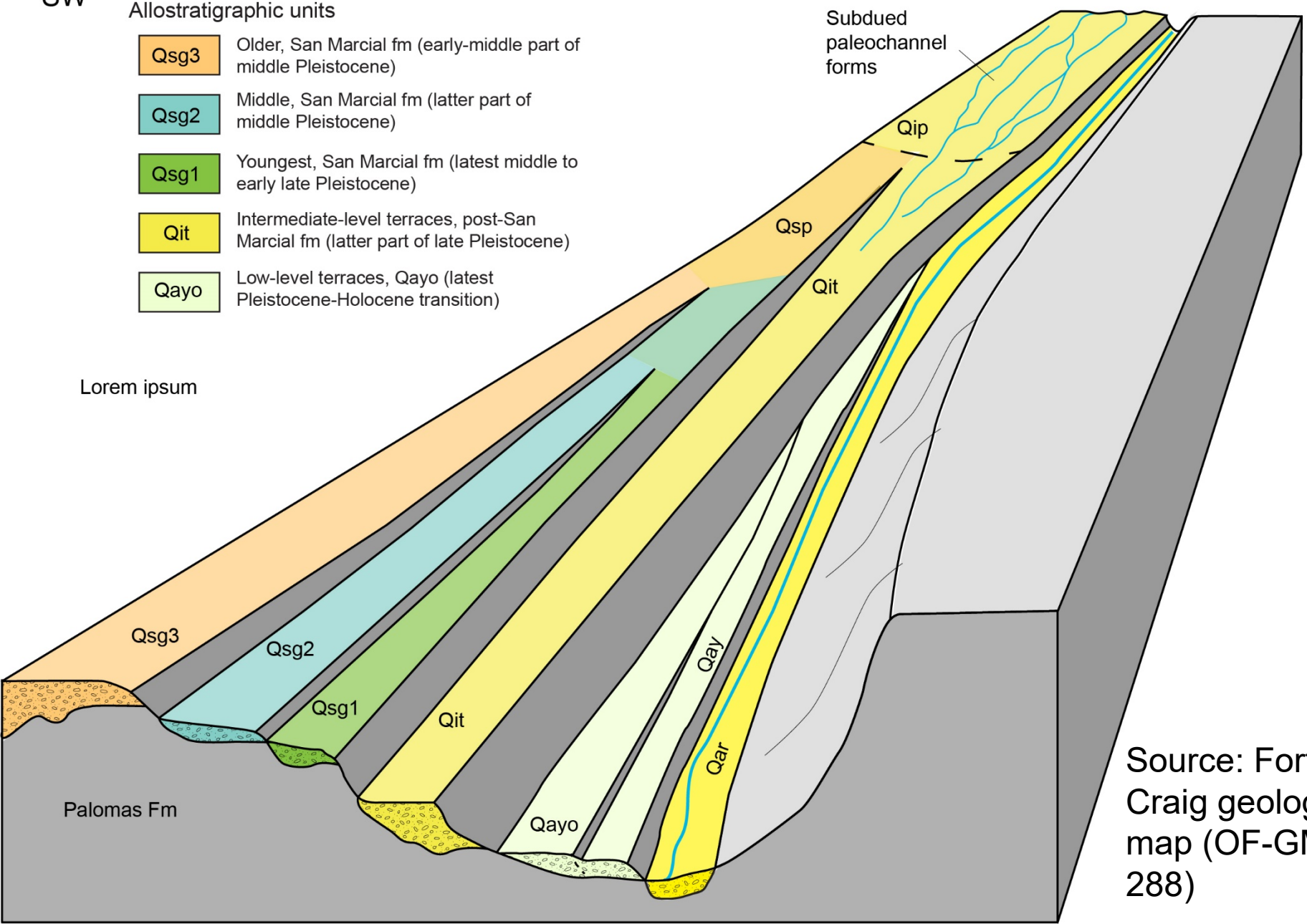
NE

Allostratigraphic units

- Qsg3** Older, San Marcial fm (early-middle part of middle Pleistocene)
- Qsg2** Middle, San Marcial fm (latter part of middle Pleistocene)
- Qsg1** Youngest, San Marcial fm (latest middle to early late Pleistocene)
- Qit** Intermediate-level terraces, post-San Marcial fm (latter part of late Pleistocene)
- Qayo** Low-level terraces, Qayo (latest Pleistocene-Holocene transition)

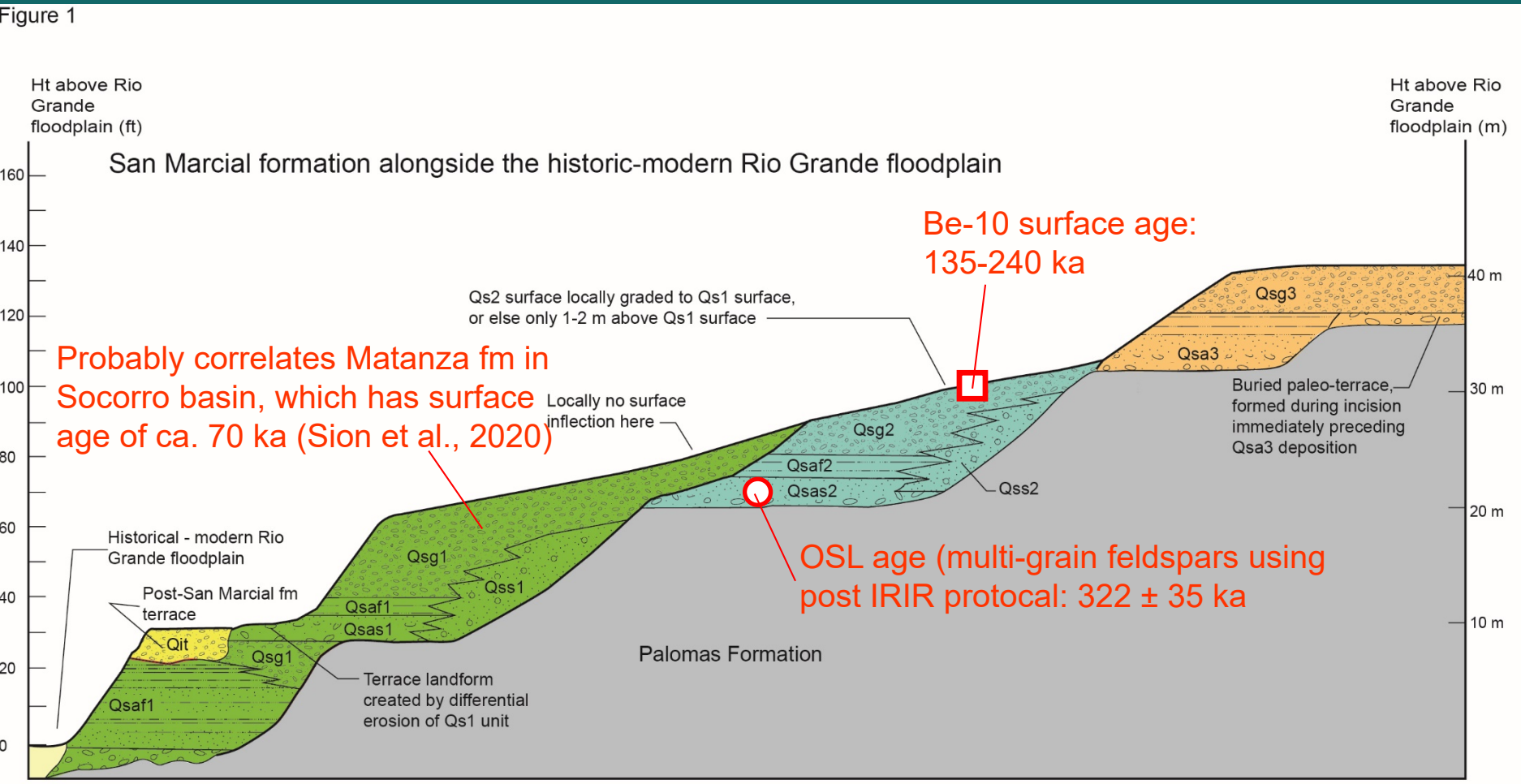
Subdued paleochannel forms

Lorem ipsum

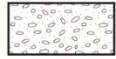


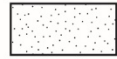



Source: Fort Craig geologic map (OF-GM-288)

Stratigraphy and age control near the Rio Grande



Lithofacies

-  NW-derived tributary fan (sand, pebbly sand, and sandy pebbles)
-  Local fan from erosion of terrace buttress or riser (pebbly sand and sand)
-  Axial floodplain (very fine-fine sand and silt, minor clay)
-  Axial sand (quartz-rich, light-colored, mostly medium-grained)
-  Axial gravel (felsic volcanic rocks and high % of exotic clasts)

Allostratigraphic units

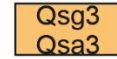
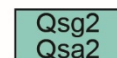
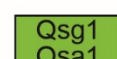

-  Qsg3 Qsa3 Older, San Marcial fm (early part? of middle Pleistocene)
-  Qsg2 Qsa2 Middle, San Marcial fm (latter part of middle Pleistocene)
-  Qsg1 Qsa1 Youngest, San Marcial fm (latest middle to early late Pleistocene)
-  Qit Intermediate, post-San Marcial fm (late Pleistocene)

Figure from: Fort Craig geologic map (OF-GM-288)

Two youngest allostratigraphic units



Mesa del Contadero

bluff line

QTpa

Qsg2

Qsa1

Allostratigraphic units Qsg2 and Qsg3



Basalt capping Mesa del Contadero: 818.3 ± 10.6 ka

Santa Fe Group culmination surface: 82 m above floodplain

Qsg3 (37-38 m above floodplain)

Qsg2

Differentiating allostratigraphic units Qsg1 and Qsg2



Can follow tread of given terrace if adequately preserved

Soil properties are helpful but surface erosion creates internal variability

Qsg2: Stage III+ to IV carbonate morphology

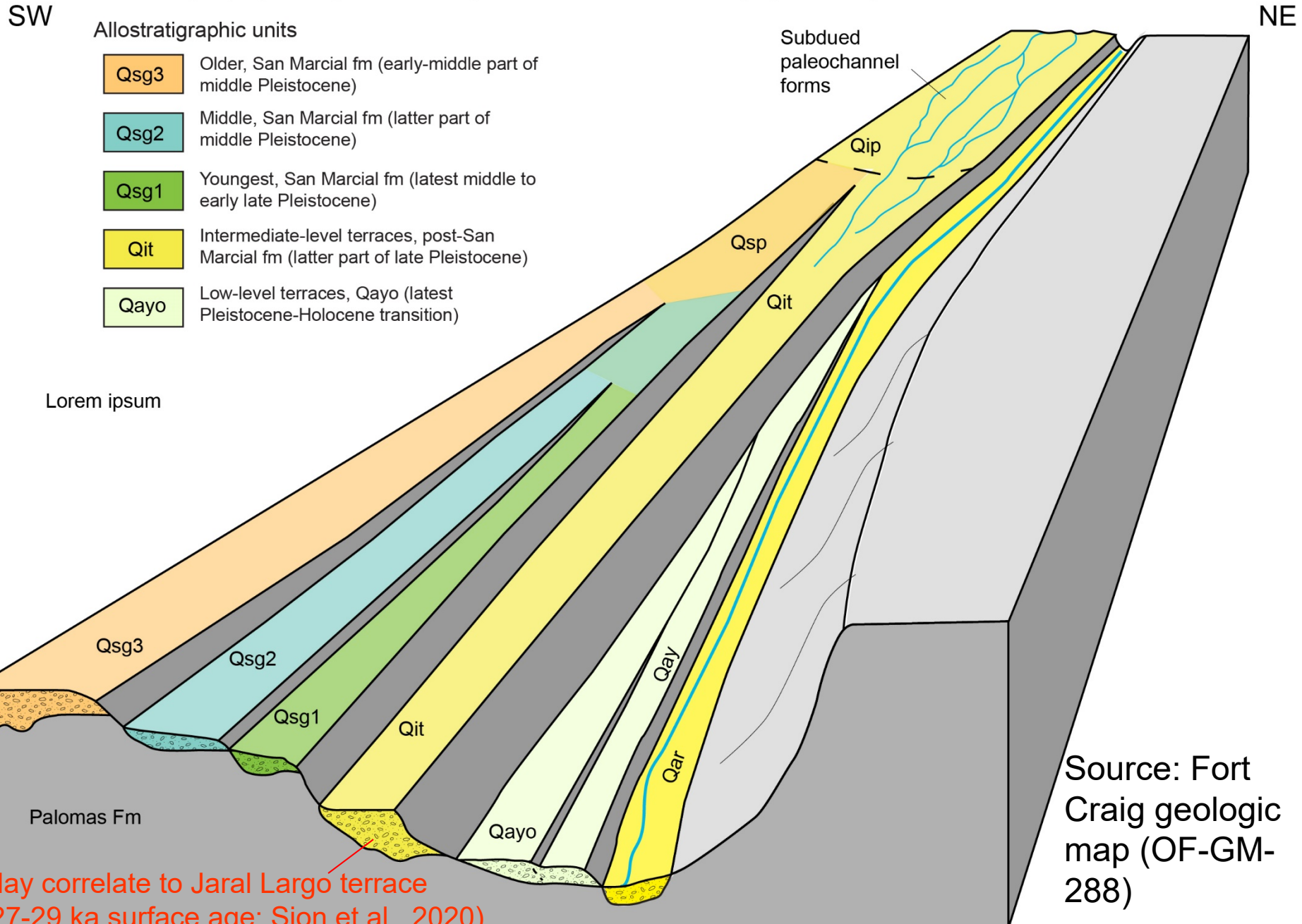
* Qsg3 shares a similar soil as Qsg2 but seems a little thicker.



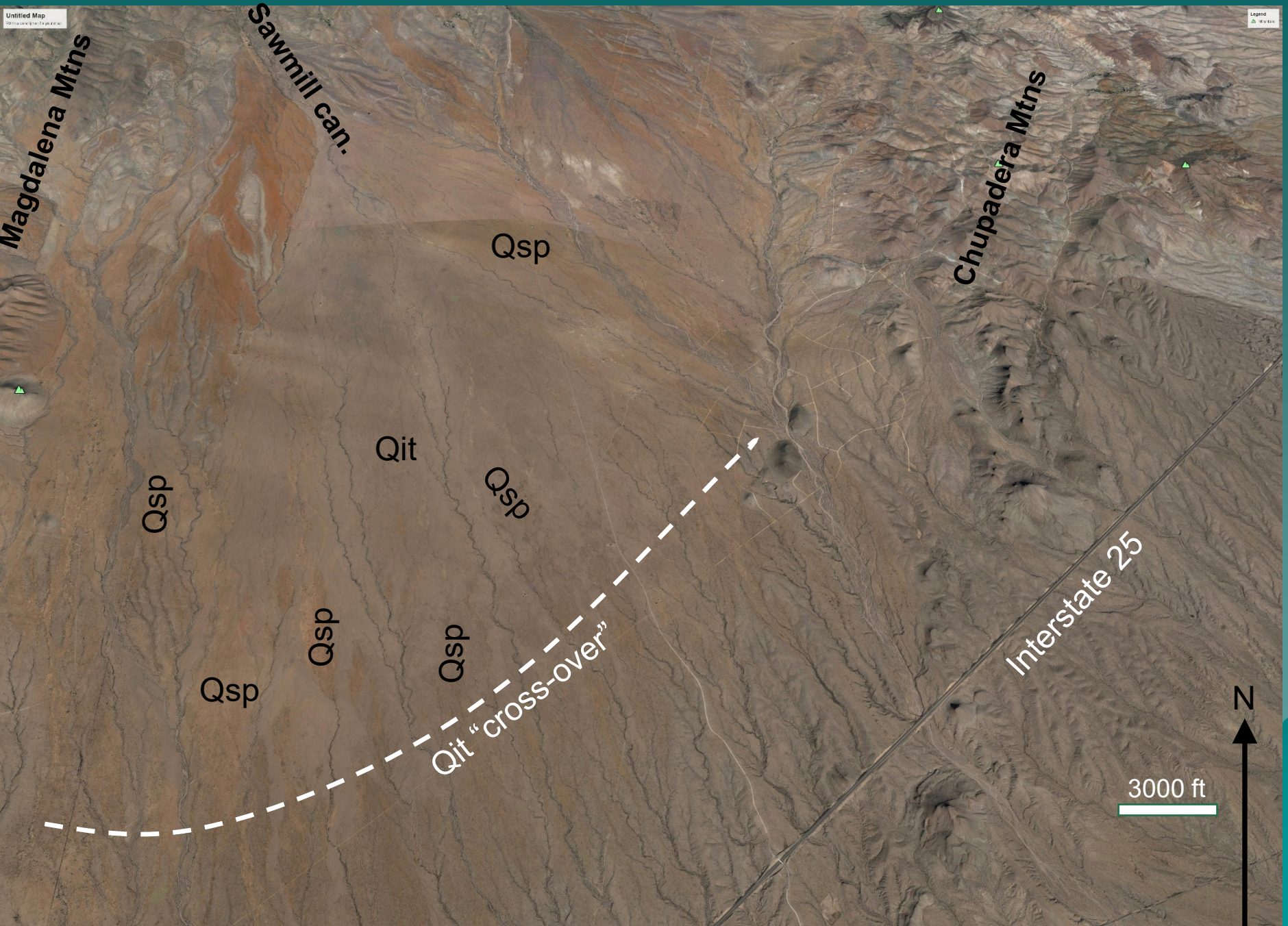
Qsg1: Stage II+ to III carbonate morphology

Intermediate-level unit (younger than San Marcial fm)

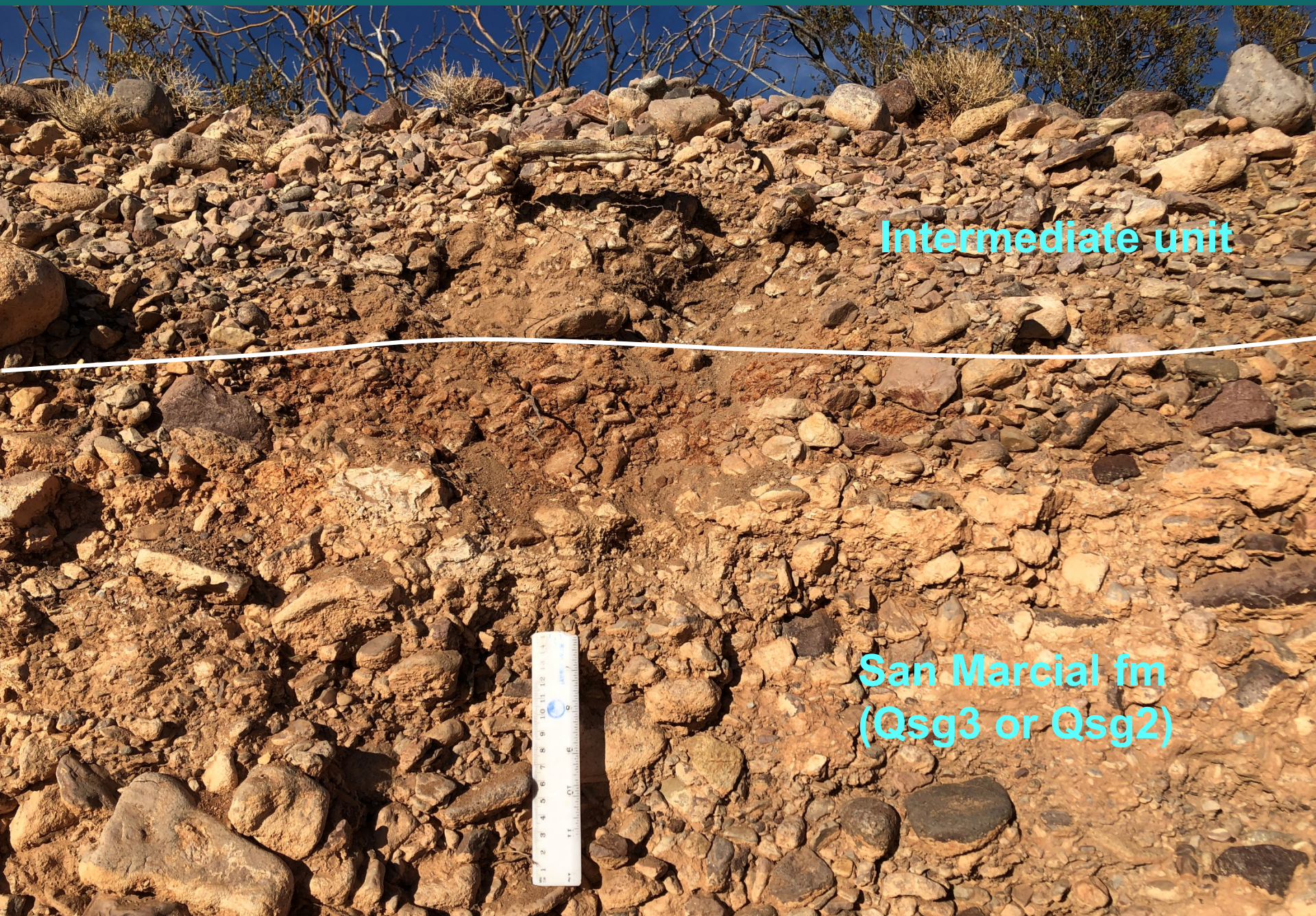
Terrace stratigraphy away from Milligan's Gulch, Fort Craig quadrangle



The intermediate unit (Qit) cross-over on the Sawmill Canyon fan



Cross-over of intermediate-level unit from terrace to piedmont



Intermediate unit

San Marcial fm
(Qsg3 or Qsg2)

CONCLUSION

Mapping and age-control observations

San Marcial fm

1. Three main allostratigraphic deposits recognized that span the Middle to Late Pleistocene.
2. Geomorphic surfaces are closely spaced (1-6 m vertical distance).
3. Surfaces and deposits converge upstream into a compound unit (Qsp).

Intermediate geomorphic unit

1. May correlate to a Late Pleistocene unit in Socorro basin (Jaral Largo Fm, surface age of 27-29 ka) If so, then deposit is probably in range of 30-60 ka.
2. Occupies well-incised terraces near river, but upstream transitions to a piedmont-lobe unit that covers large areas of the Sawmill Canyon fan.

Interpretations

1. Although prominent erosional surfaces are present, **most** of extensive geomorphic surfaces are related to aggradation.
2. Upstream convergence of deposits and surfaces indicate that base level for smaller drainages is strongly controlled by fluctuating Rio Grande, and the influence of these base level changes is muted >6-7 km away from the river.
3. Three Rio Grande-driven incisional events since ~0.5-0.6 Ma, paleovalleys filled over time scales of several 10s of k.y. to possibly >100 k.y.