



Gypsophilia

(and scurfpeas)

What is it?

- calcium sulfate dihydrate - $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
- crystalline forms - selenite and satin spar
- soft, fairly water-soluble



cobalt123 @flickr



meganpru @flickr

What is it?

when exposed, usually occurs as gypseous clay with occasional masses of selenite or satin spar; less often as gypsum sand



How does it form?

- evaporite!
- evaporation of salt-rich water leads to deposition of soluble minerals



Chuck Coker

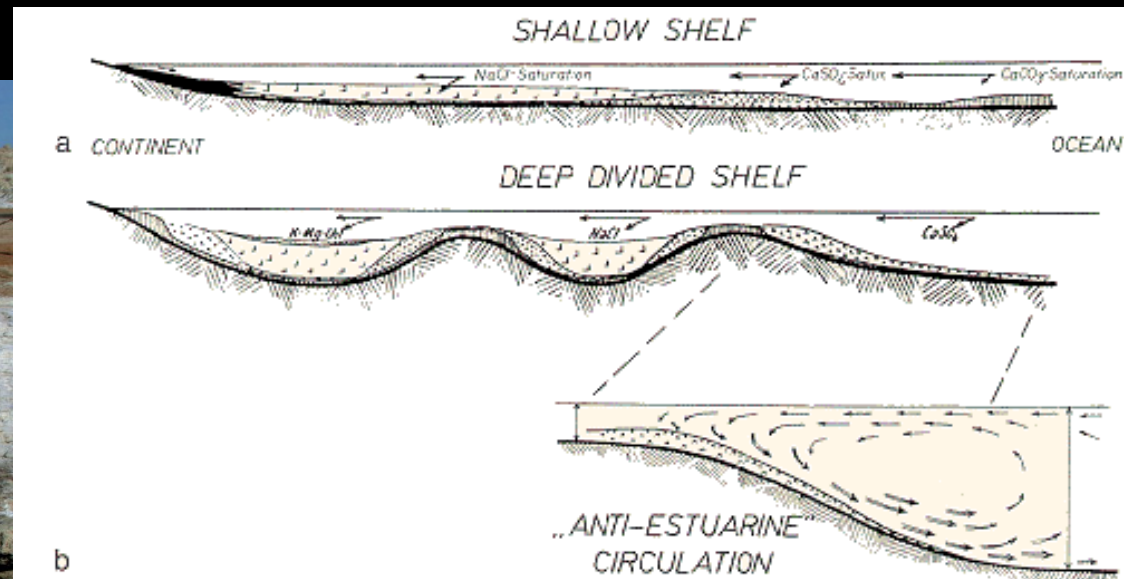
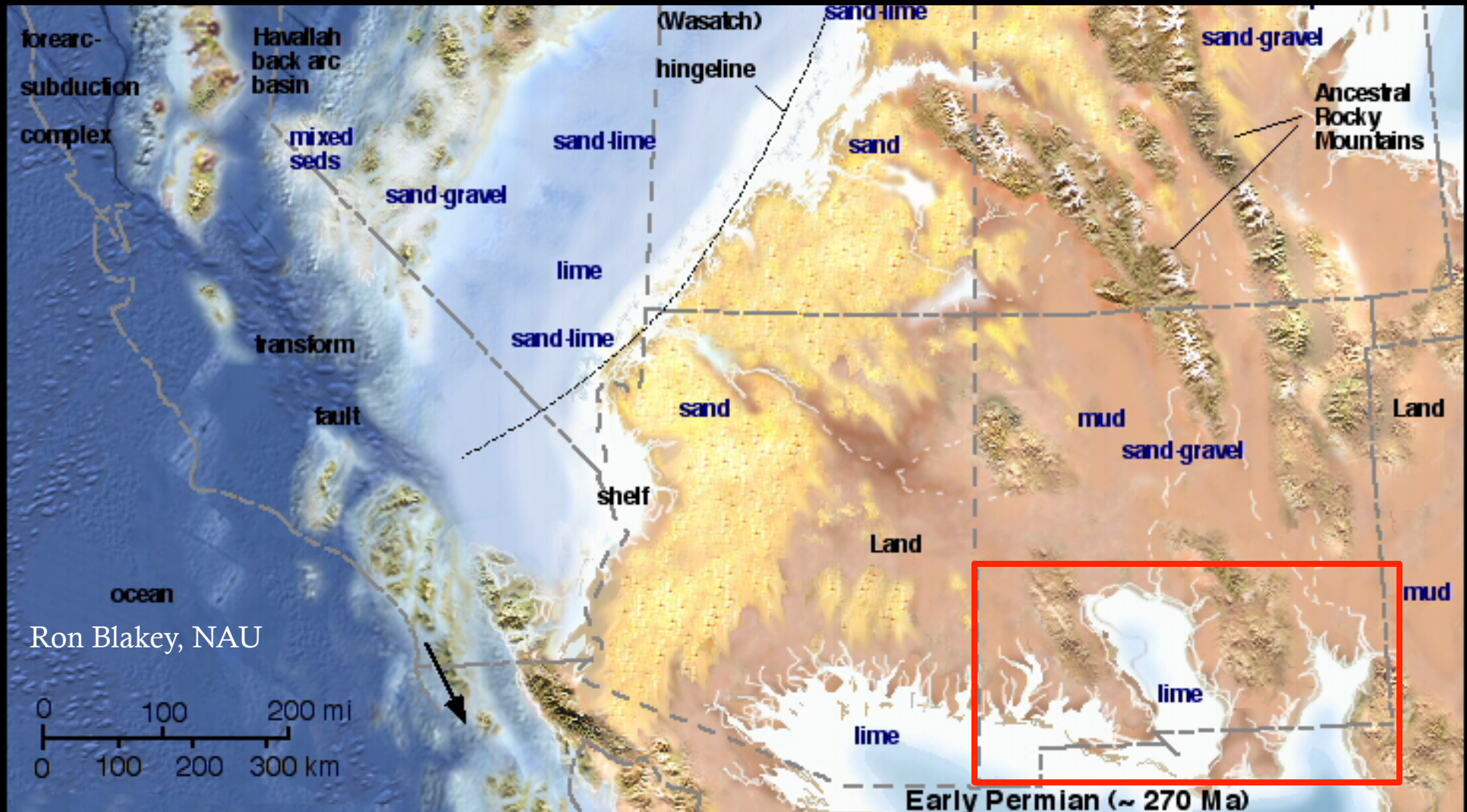


Fig. 3.11. Possible models for marine evaporite formation. **a** Serial fractionation in very shallow and extended basins. Saturation of different salts is reached in a series ocean to land. Terrigenous particles may be supplied from land. Recent example: Adshi-darja Lagoon attached to the Caspian Sea by Kara Bogaz Inlet (chemical conditions there are not fully comparable with open sea). **b** Serial fractionation and differential preservation in deeper basins divided by sills. Saturation of different salts is reached in a series shallow to deep water. *Detail* Only gypsum is precipitated near the sill. Halite saturation is not reached, because brine sinks down to the basin escaping further evaporation. Sill depths can be considerably reduced by carbonate and/or gypsum precipitation. No Recent example known. [G. Richter-Bernburg, 1955, Dtsch. Geol. Ges. 105 (4): 59]

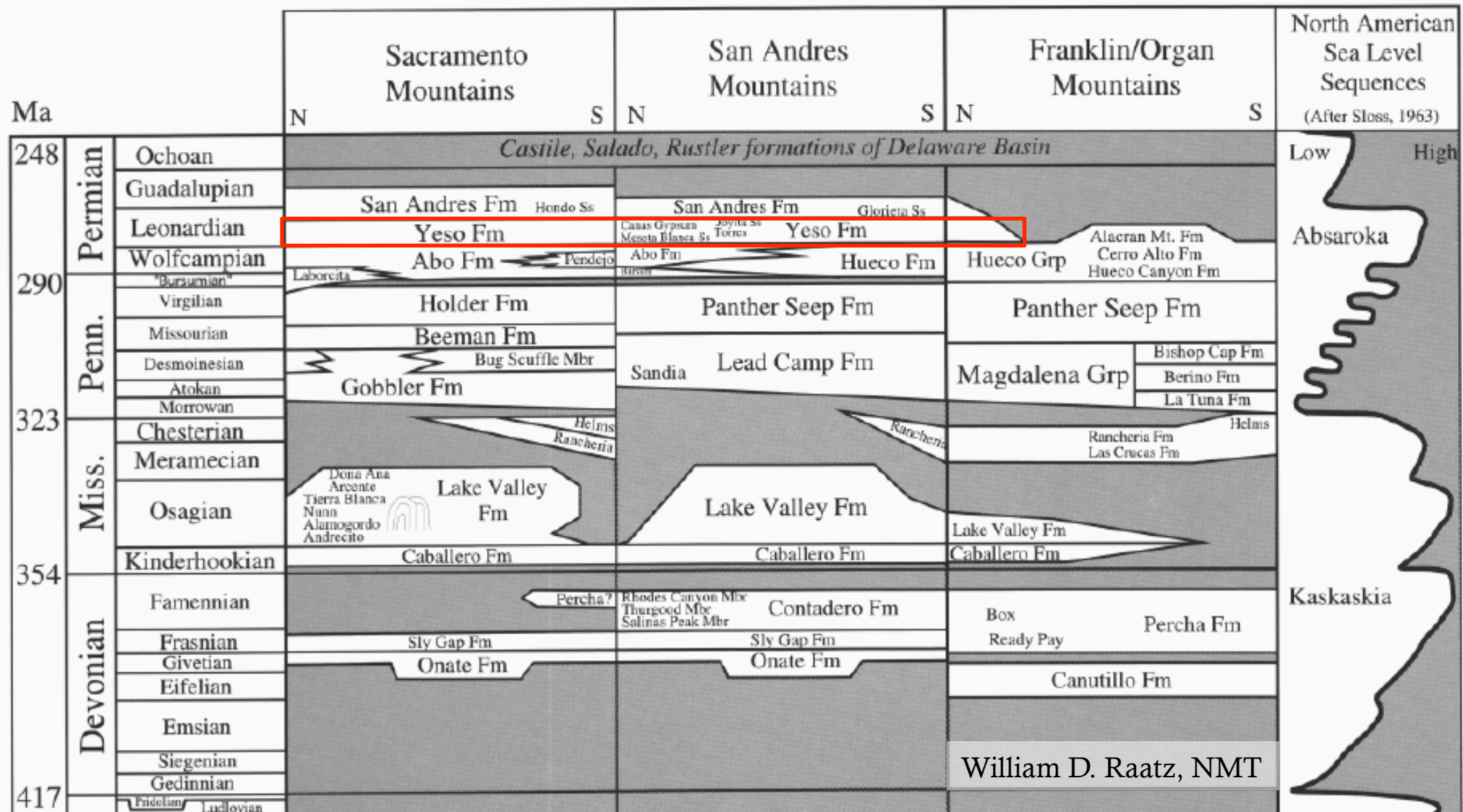
How does it form?

- in southern New Mexico, gypsum is mostly in the Yeso Formation;
- shallow coastal ocean waters ca. 280-270 million years ago (Permian)



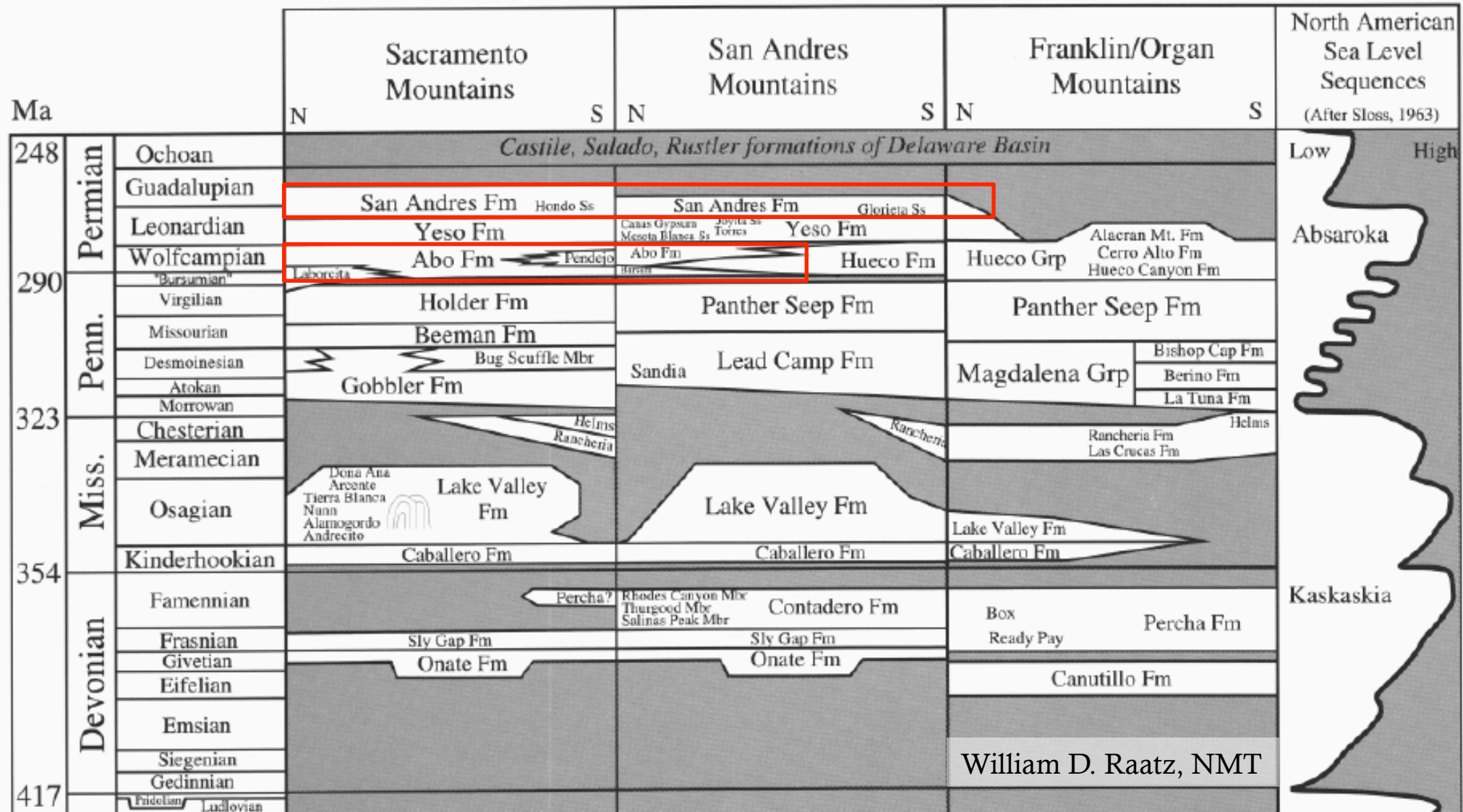
Where is it?

- in southern New Mexico, gypsum is mostly in the Yeso Formation



Where is it?

- usually between the San Andres Formation & Abo Formation



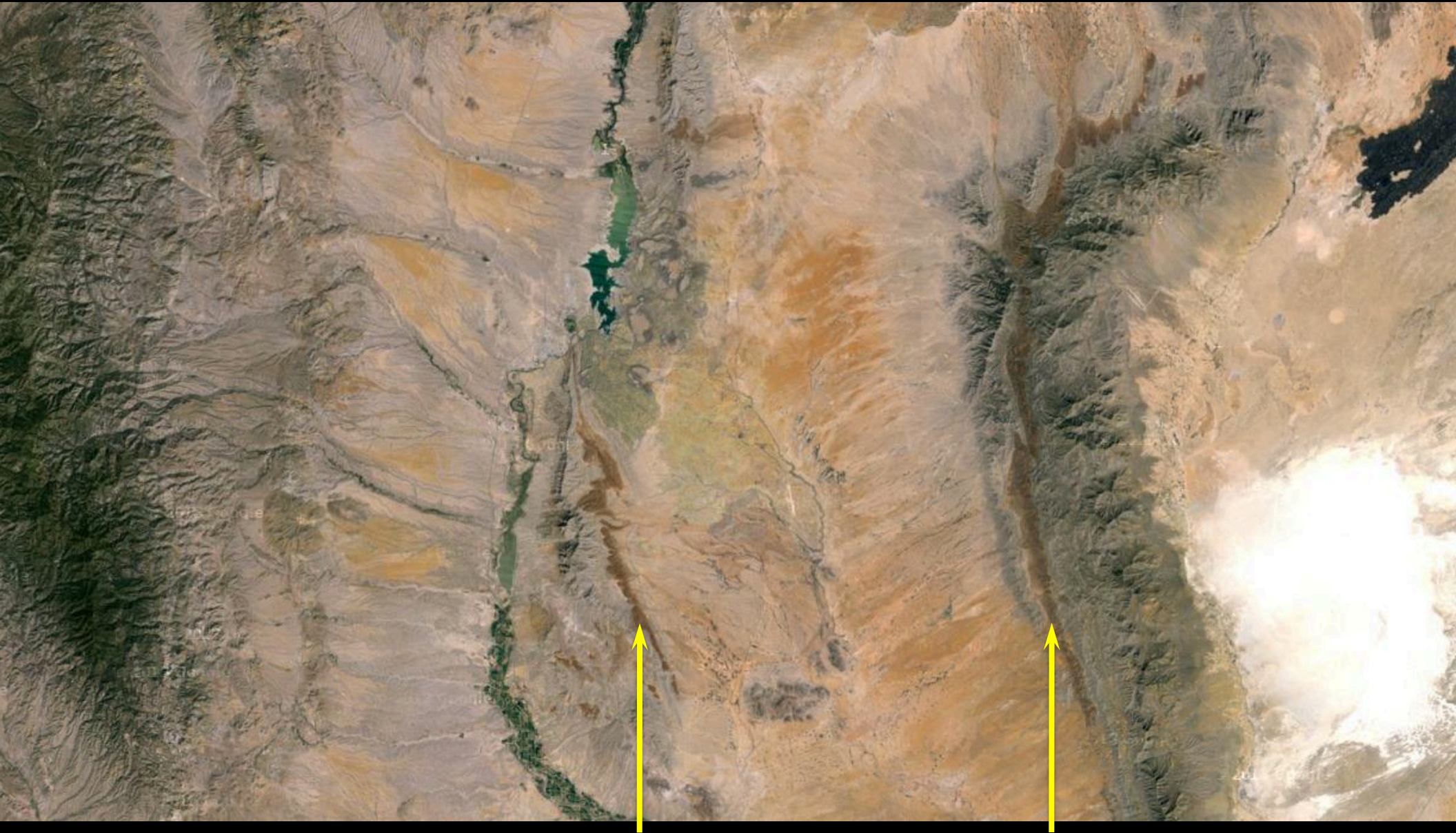
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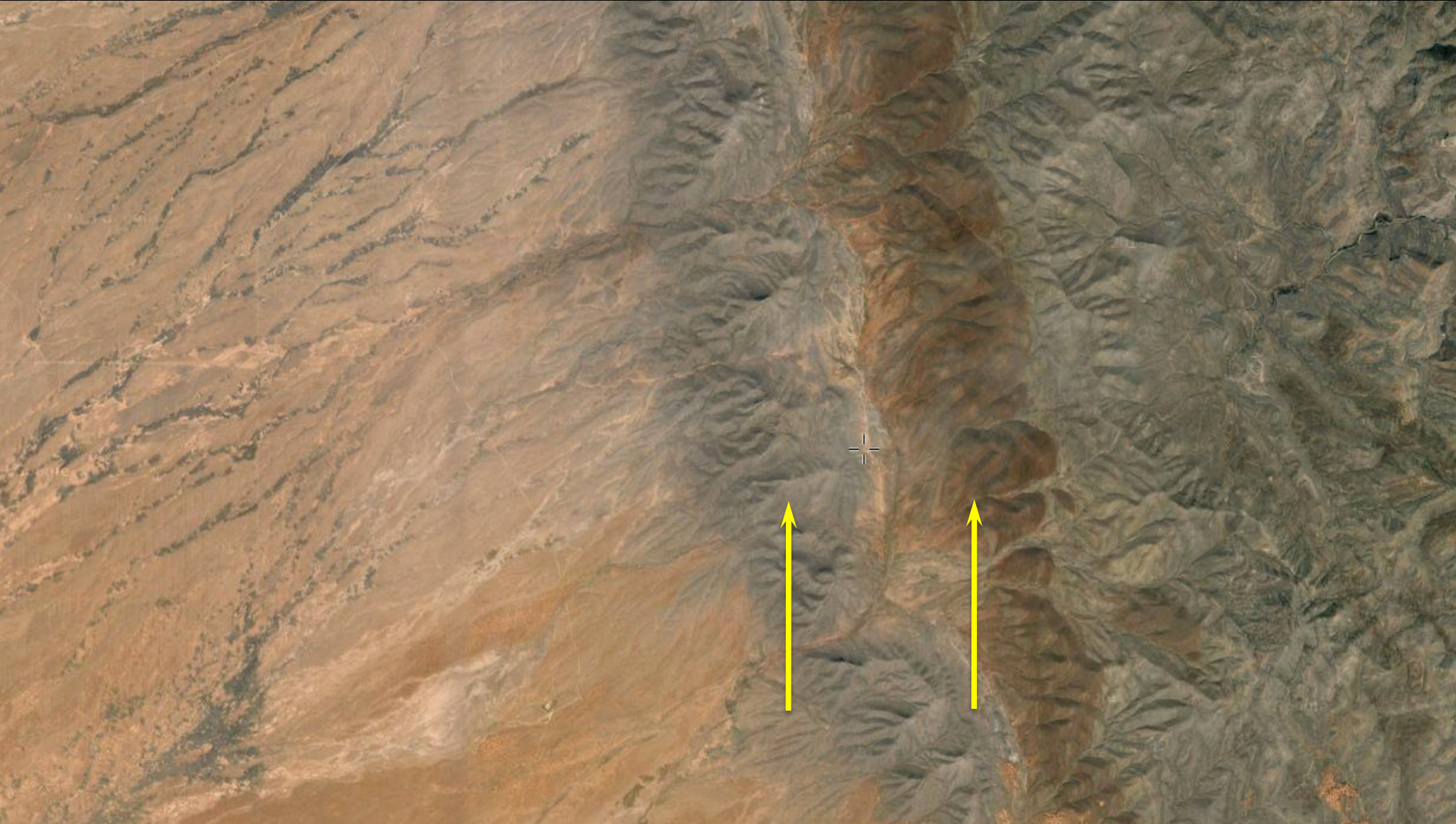
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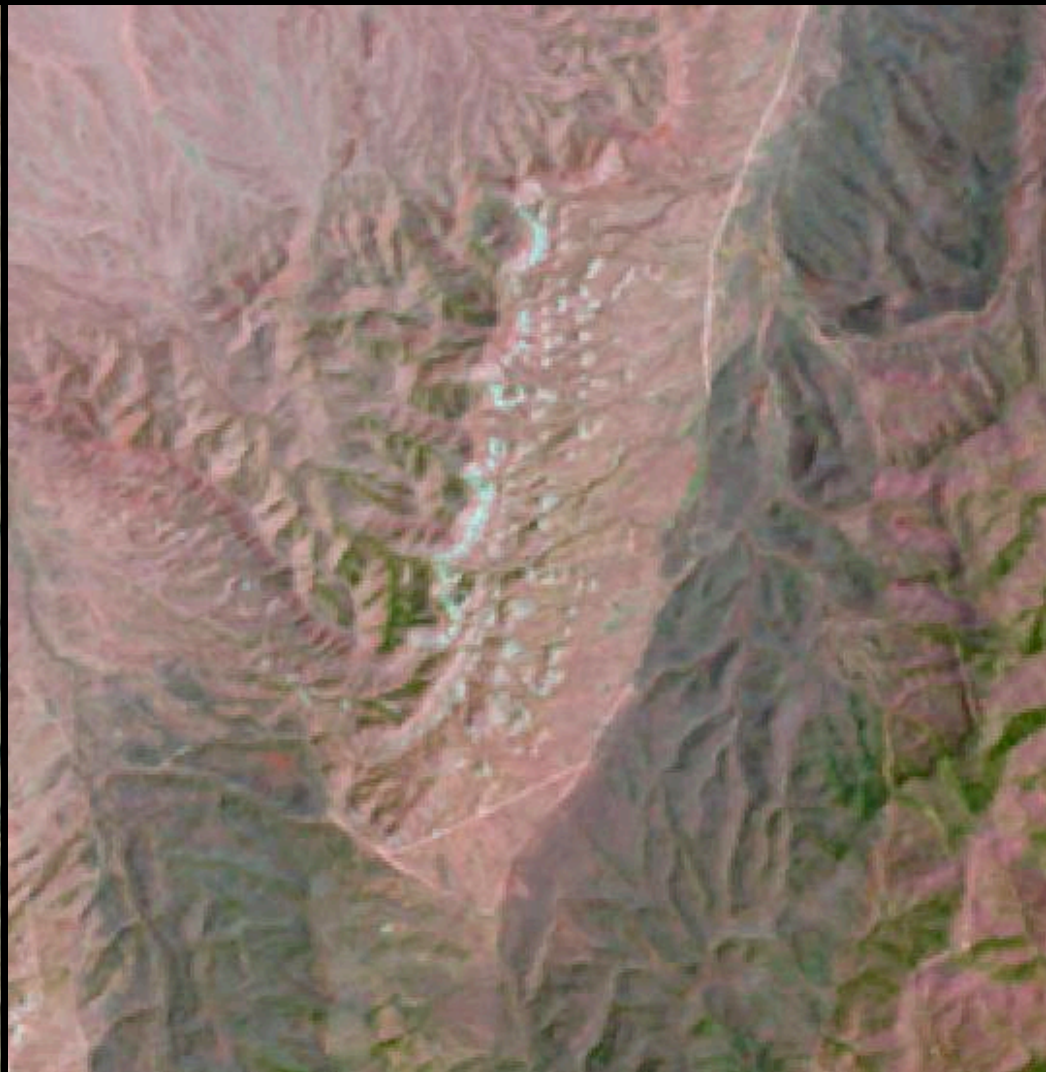


Where is it?

- gypsum shows up nicely on shortwave infrared satellite imagery



visible light



shortware infrared (7 4 3)

Where is it?

- because it is water-soluble, gypsum is often dissolved and carried away, sometimes accumulating in closed basins



Gypsum habitats

- gypsum sand dunes are uncommon worldwide, but we have the big one!



Gypsum habitats

- gypsum sand dunes are uncommon worldwide, but we have the big one!



Gypsum habitats

- we also have one of the smaller ones (OK, it's actually in Occupied New Mexico, a.k.a. western Texas)



Gypsum habitats

- Salt Basin gypsum dunes



Gypsum habitats

- gypseous clay (Caballo Mountains)



Gypsum habitats

- gypseous clay (Guadalupe Mountains)



Gypsum habitats

- gypseous clay (Phillips Hills)



Gypsum habitats

- gypseous clay (interdune at White Sands)



Why is gypsum challenging for plants?

- physical soil properties: impermeable soil crusts



Why is gypsum challenging for plants?

- physical soil properties: or soil movement...



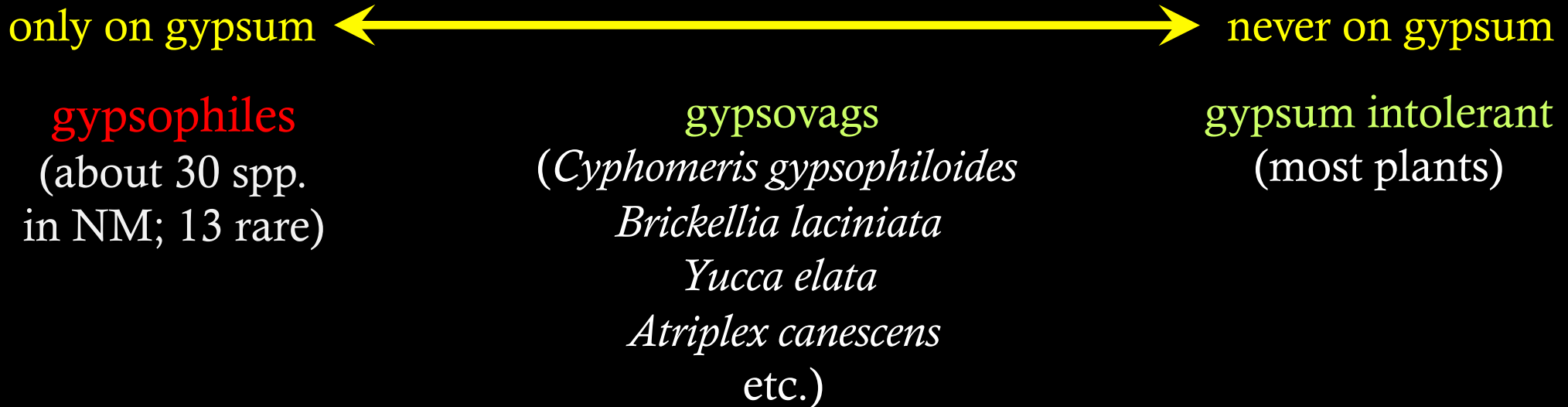
Why is gypsum challenging for plants?

- chemical soil properties - $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$:
 - low nutrient availability
 - sulfate ions - SO_4^{2-} - are toxic in high concentrations
 - various salts (NaCl, KCl, etc.) usually also present in/near evaporites



Gypsum endemism

- many plants have evolved to tolerate gypsum
- because gypsum occurs in small, isolated patches, these plants are often rare!



Gypsum endemism

- of the ca. 30 gypsophiles in NM - 8 were named in the last 25 years!

Sivinski, R.C. and M.O. Howard. 2011. A new species of *Linum* from the northern Chihuahuan Desert. *Phytoneuron* 2011-33: 1-7. Mailed 28 June.

A NEW SPECIES OF *LINUM* (LINACEAE) FROM THE NORTHERN CHIHUAHUAN DESERT

ROBERT C. SIVINSKI
New Mexico Forestry Division
P.O. Box 1948
Santa Fe, New Mexico 87504

MICHAEL O. HOWARD
Bureau of Land Management
1800 Marquess Street
Las Cruces, New Mexico 88005-3370

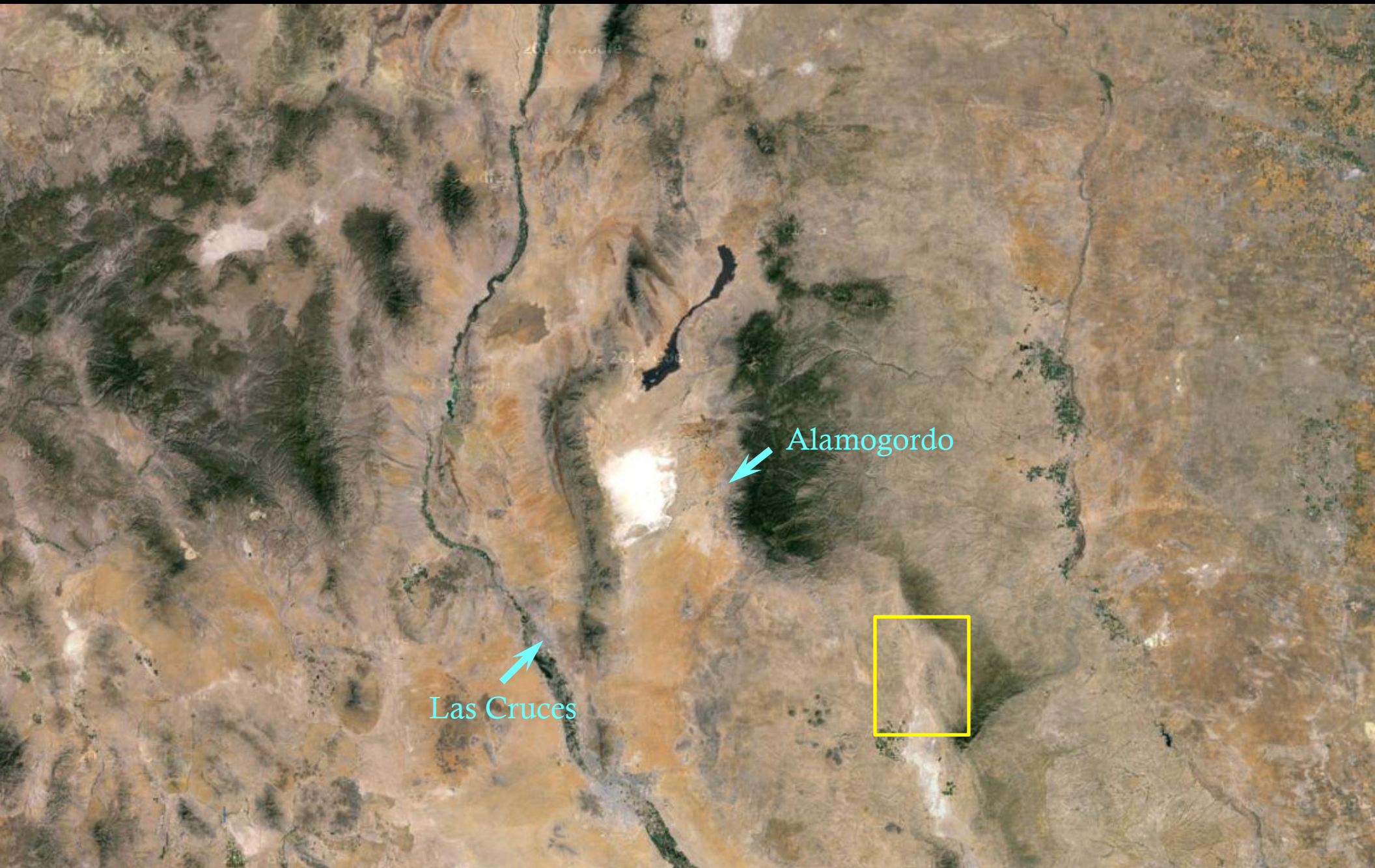
ABSTRACT

A new species, *Linum allredii* R.C. Sivinski & M.O. Howard, is described from gypsum substrates in the Yeso Hills of the northern Chihuahuan Desert in New Mexico and Texas. It is distinguished from its closest relative, *Linum puberulum*, by its suffrutescent habit, glabrous upper stems and upper leaves, and yellow petal bases.

KEY WORDS: Linaceae, *Linum*, Chihuahuan Desert, gypsophile.

Gypsum endemism

- a local center of gypsophilia: the west base of the Guadalupe Mountains



West base of the Guadalupe Mountains near Pup Canyon



West base of the Guadalupe Mountains near Pup Canyon



Alkali Lakes, basin west of the Guadalupe



Senecio warnockii (Warnock's ragwort), Asteraceae



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Lepidospartum burgessii (gypsum scalebroom), Asteraceae



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Lepidospartum burgessii (gypsum scalebroom), Asteraceae



Mentzelia humilis var. *guadalupensis* (Guadalupe stickleaf), Loasaceae



Mentzelia humilis var. *guadalupensis* (Guadalupe stickleaf), Loasaceae



Mentzelia humilis var. *guadalupensis* (Guadalupe stickleaf), Loasaceae



Anulocaulis leiosolenus var. *howardii* (Howard's gyp ringstem), Nyctaginaceae



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Anulocaulis leiosolenus var. *howardii* (Howard's gyp ringstem), Nyctaginaceae



Mike Howard



Homo sapiens (Rich Spellenberg), Hominidae



Recent excitement at Pup Canyon



Nerisyrenia hypercorax!



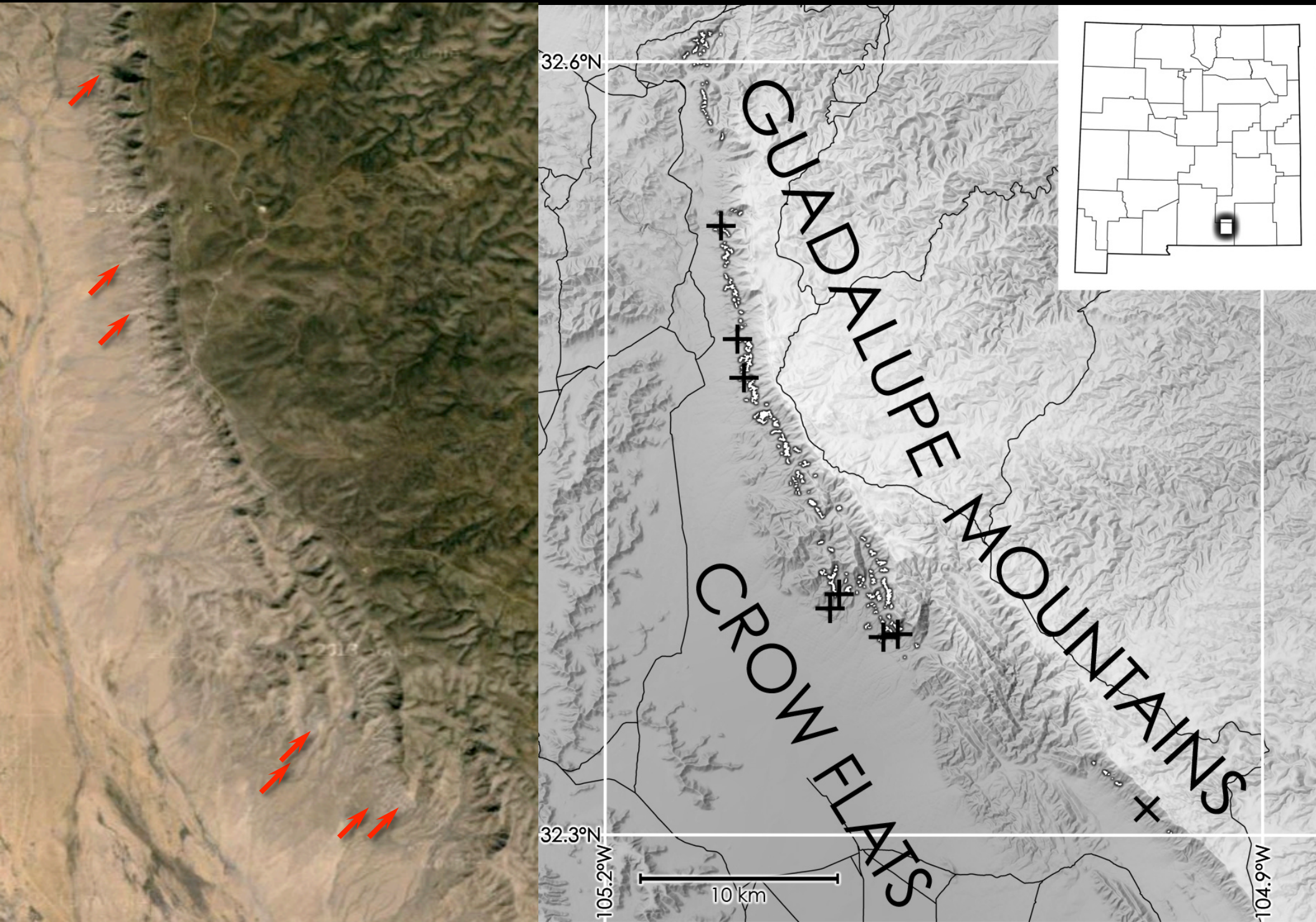
Nerisyrenia hypercorax!



Nerisyrenia hypercorax!



Nerisyrenia hypercorax!



Want to see more gypsum?

- go outside!
 - also, watch Plants Are Cool, Too! (episodes 4 & 5)
- <http://www.youtube.com/user/PlantsAreCoolToo>



A digression: *Pediomelum pentaphyllum* (Chihuahua scurfpea), Fabaceae



Pediomelum pentaphyllum (Chihuahuascurfpea), Fabaceae



Pediomelum pentaphyllum (Chihuahuascurfpea), Fabaceae



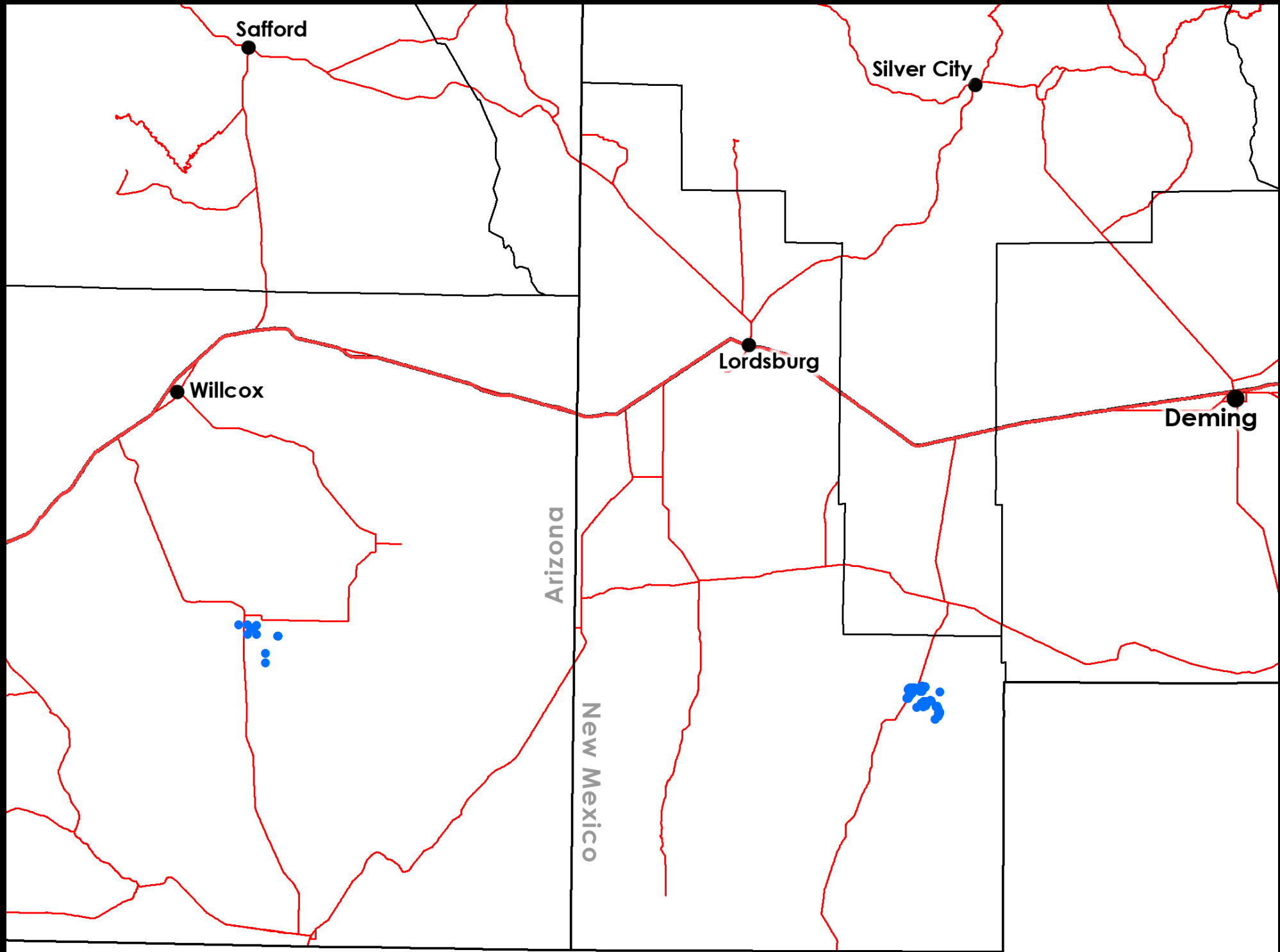
Pediomelum pentaphyllum (Chihuahuascurfpea), Fabaceae



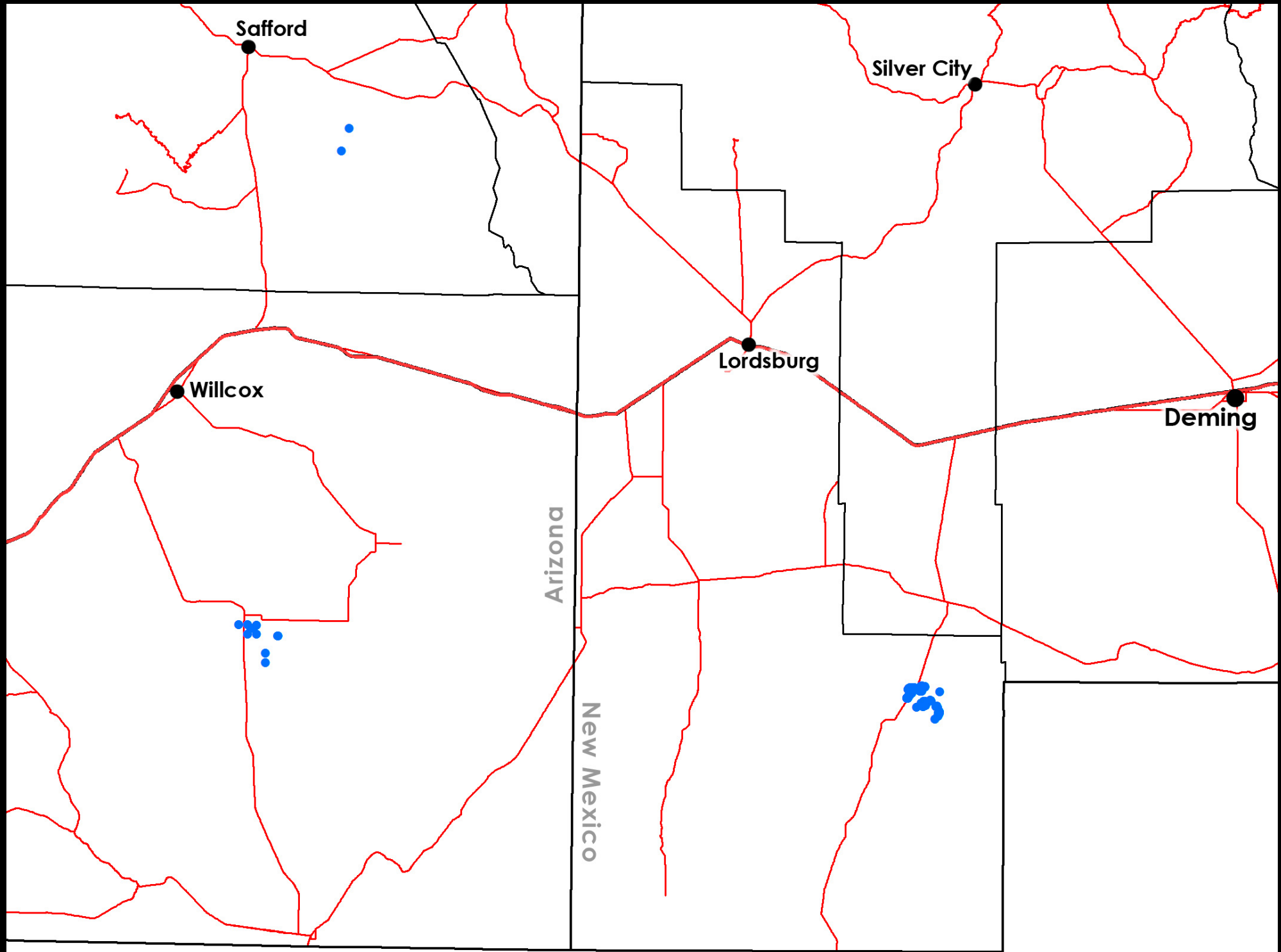
Pediomelum pentaphyllum (Chihuahua scurfpea), Fabaceae



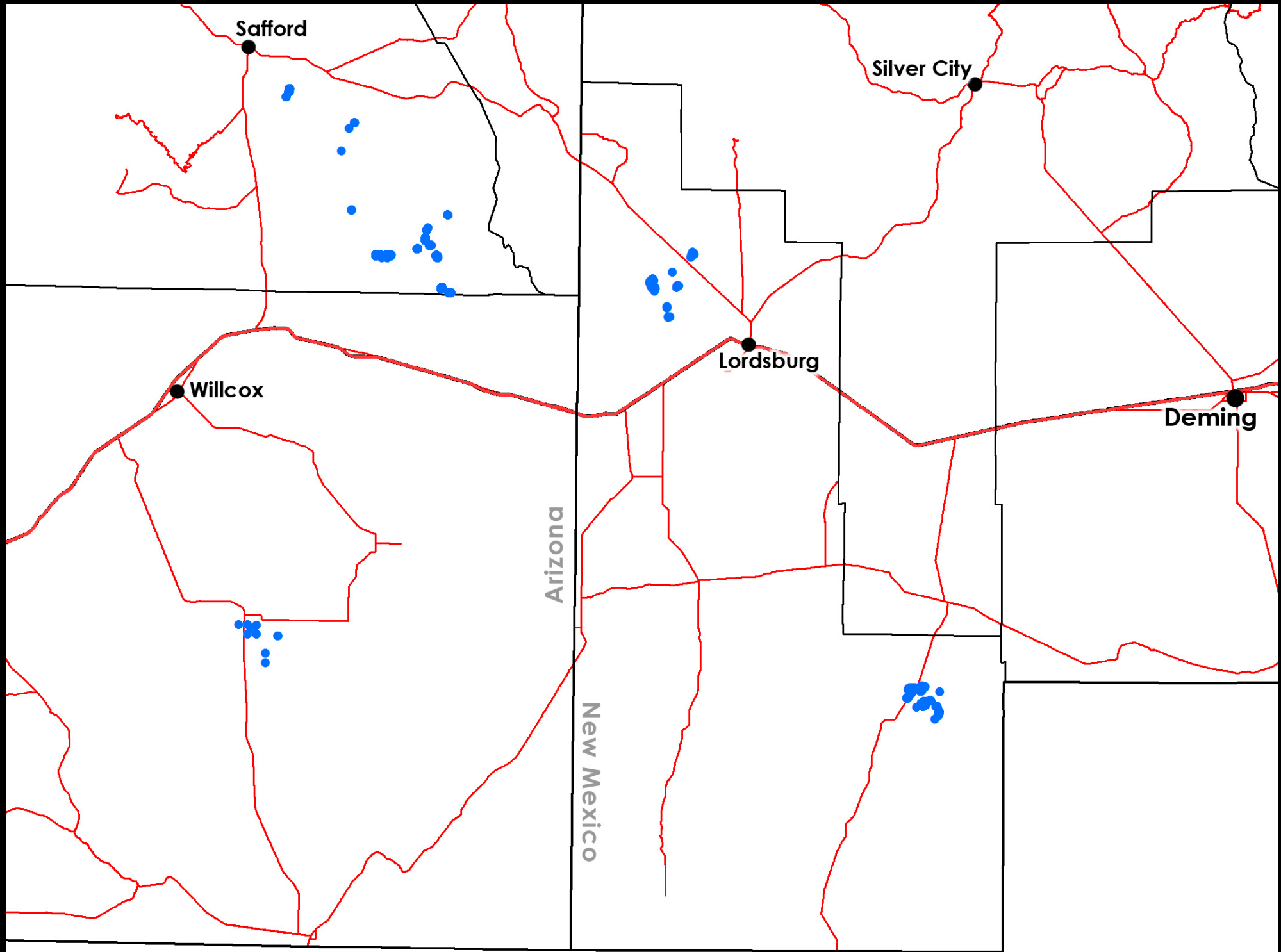
As of 2008: 2 known populations, petitioned for listing as an endangered species.



As of 2010: Multiple surveys, two new, small populations found.



As of 2014: Not as rare as we thought?



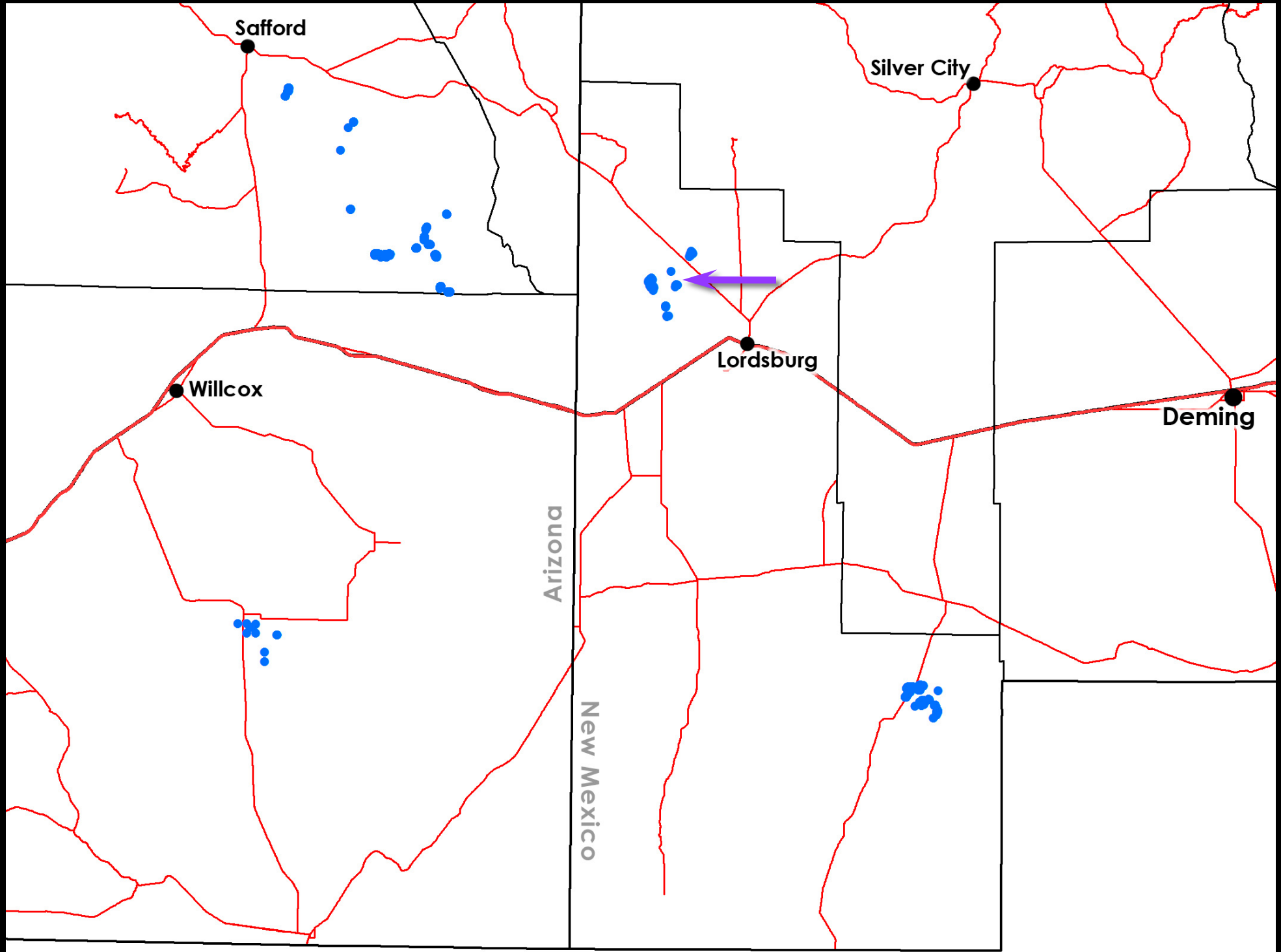
Why *Pediomelum pentaphyllum* can be hard to find...



Why *Pediomelum pentaphyllum* can be hard to find...



What habitat does it like?



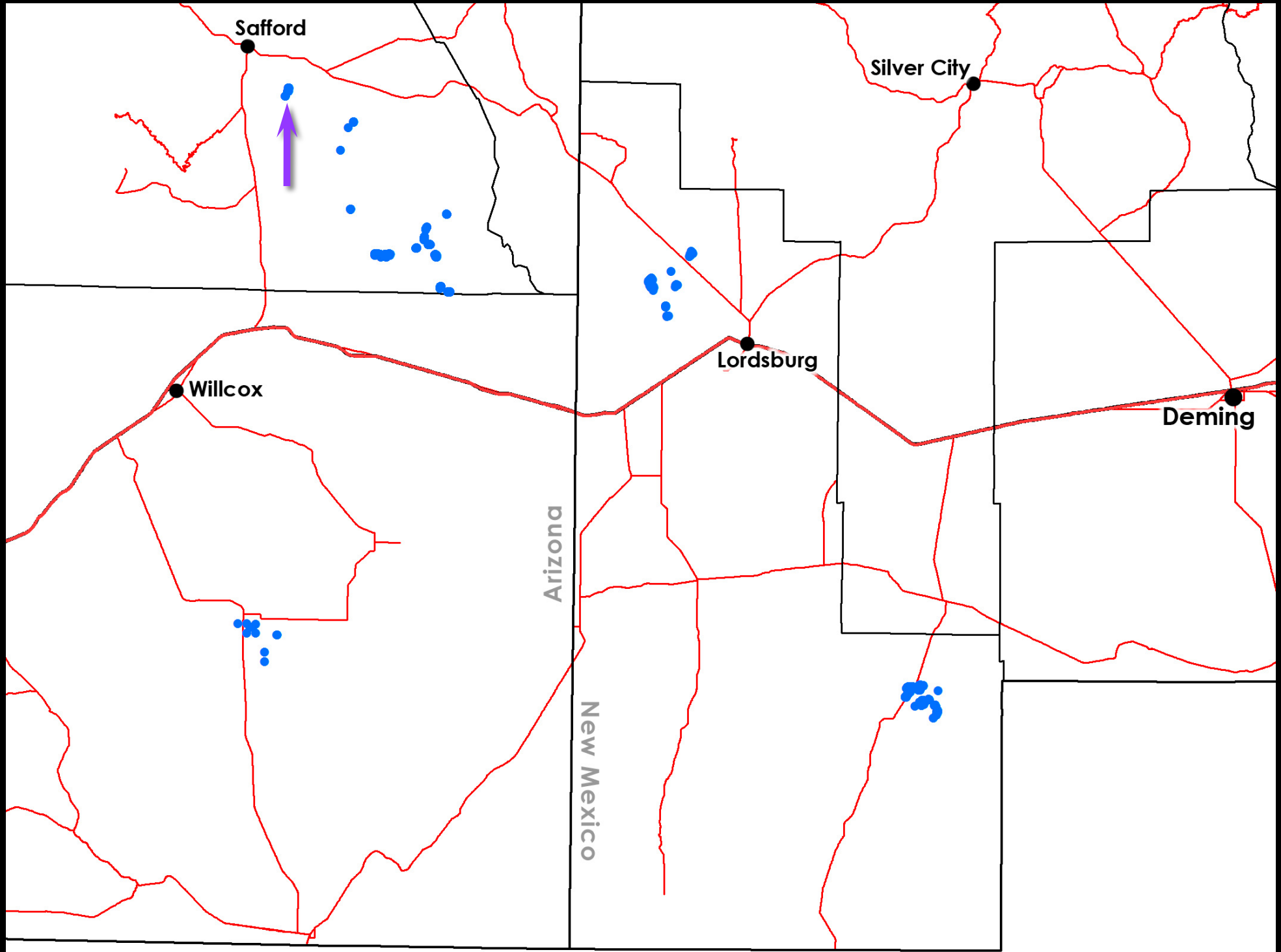
What habitat does it like?



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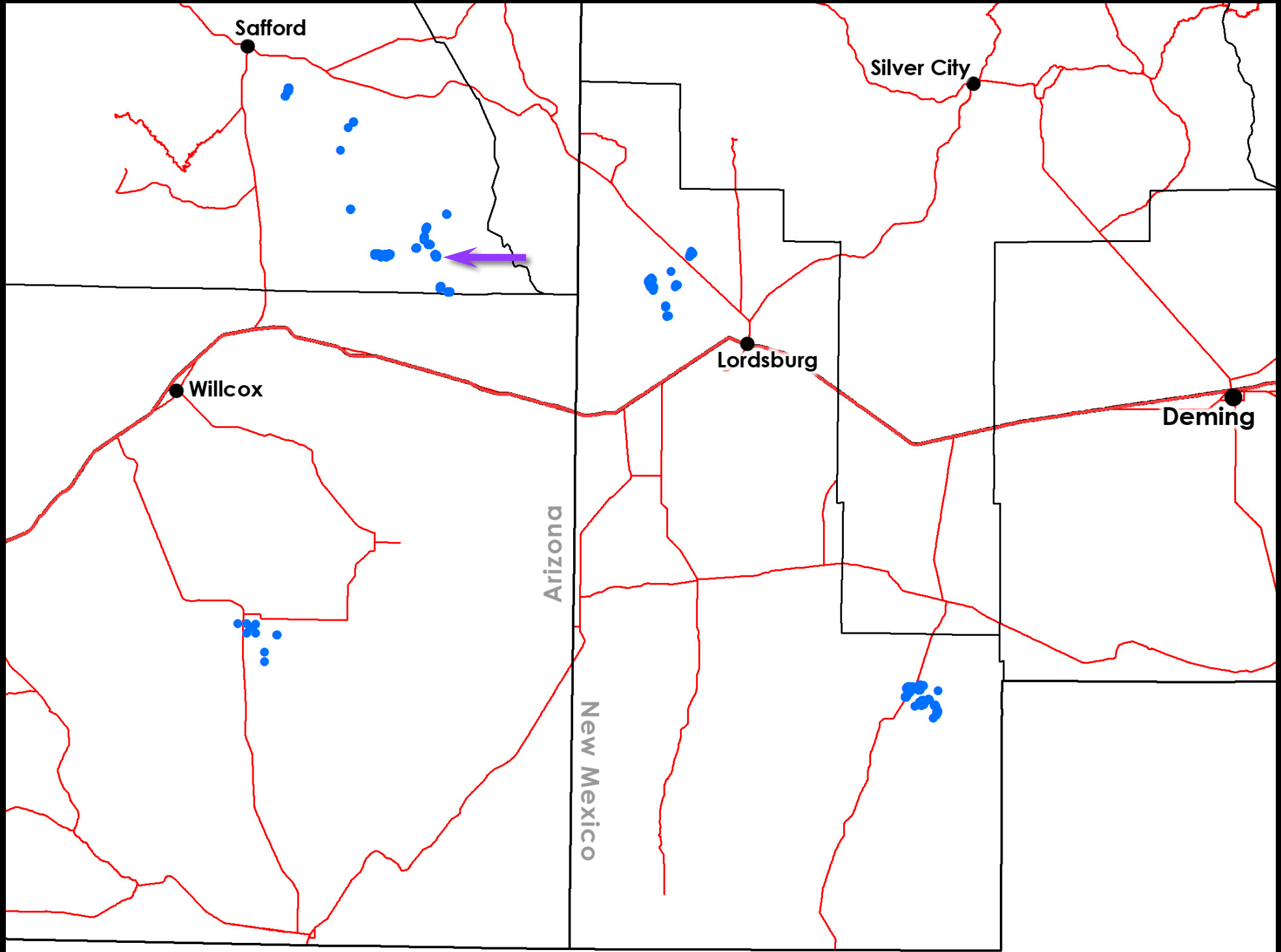
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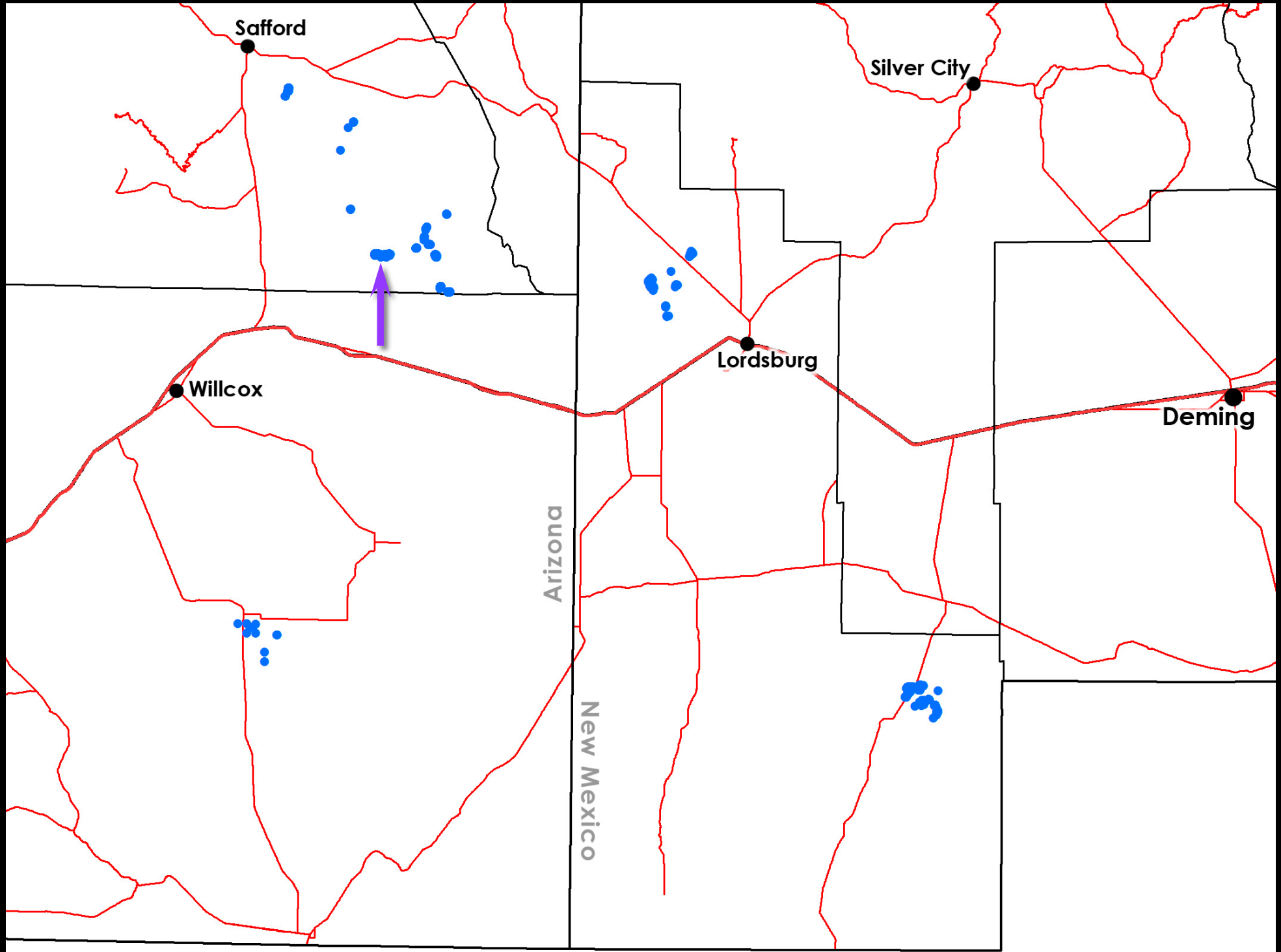
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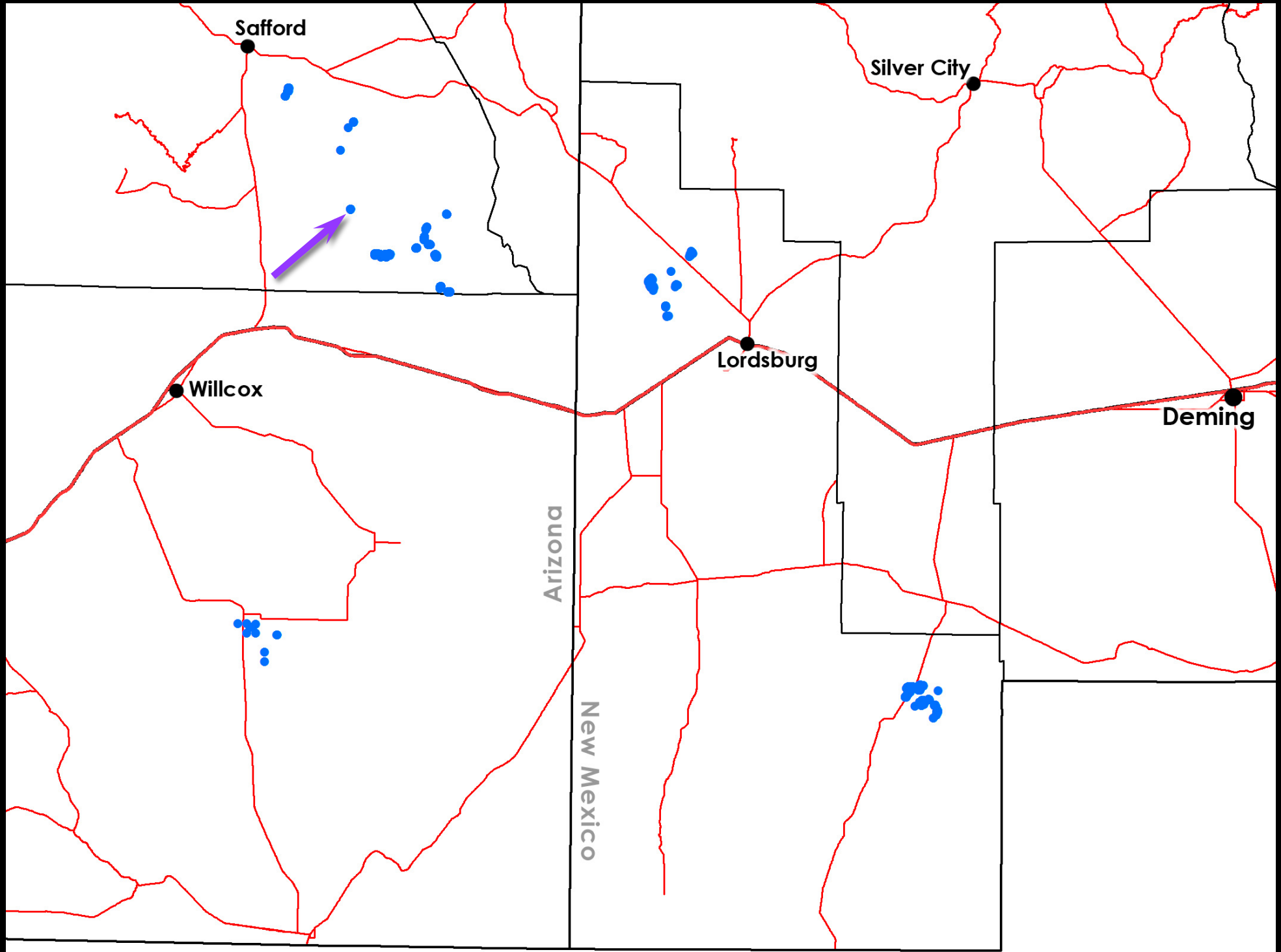
What habitat does it like?



What habitat does it like?



What habitat does it like?



What habitat does it like?



When is it growing?



When is it growing?



